NEUROBIOLOGY

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Courses offered by the Department of Neurobiology have the subject code NBIO, and are listed in the "Neurobiology (NBIO) Courses" section of this bulletin.

GRADUATE PROGRAM IN NEUROBIOLOGY

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 information processing in vertebrate retina; structure, function, and development of auditory and visual systems; development and regeneration in the central and peripheral nervous system; neural mechanisms mediating higher nervous system functions, including perception, learning, attention and decision making.

NEUROBIOLOGY (NBIO) COURSES

For information on graduate programs in Neurobiology, see the "Neurobiology" section of this bulletin. Course and laboratory 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 (NBIO 206) 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 this basic course.

UNDERGRADUATE COURSES IN NEUROBIOLOGY

NBIO 101. Social and Ethical Issues in the Neurosciences
(Same as NBIO 201.) Influences on public debate and policy of scientific advances in the study of the brain and behavior: theories of brain function; philosophical and scientific approaches; advances in the neurosciences, possible uses in medical therapy, and interventions involving genetic screening, genetic selection, enhancement of neurological functioning, and manipulation of behavior; questions related to medical therapy, social policy, and broader considerations of human nature such as consciousness, free will, personal identity, and moral responsibility. May be taken for 2 units without a research paper. Prerequisite: Neuroscience, Biology, or Symbolic Systems major; or Human Biology core; or consent of instructor.

2-4 units, Spr (Hurlbut, W; Newsome, W)

NBIO 198. Directed Reading in Neurobiology
Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

NBIO 199. Undergraduate Research
Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

GRADUATE COURSES IN NEUROBIOLOGY

Primarily for graduate students; undergraduates may enroll with consent of instructor.

NBIO 201. Social and Ethical Issues in the Neurosciences
(Same as NBIO 101.) Influences on public debate and policy of scientific advances in the study of the brain and behavior: theories of brain function; philosophical and scientific approaches; advances in the neurosciences, possible uses in medical therapy, and interventions involving genetic screening, genetic selection, enhancement of neurological functioning, and manipulation of behavior; questions related to medical therapy, social policy, and broader considerations of human nature such as consciousness, free will, personal identity, and moral responsibility. May be taken for 2 units without a research paper. Prerequisite: Neuroscience, Biology, or Symbolic Systems major; or Human Biology core; or consent of instructor.

2-4 units, Spr (Hurlbut, W; Newsome, W)

NBIO 206. The Nervous System
Structure and function, 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.

7-8 units, Win (Dolmetsch, R)

NBIO 216. Genetic Analysis of Behavior
(Same as MCP 216.) 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, Spr (Goodman, M)

NBIO 218. Neural Basis of Behavior
Advanced seminar. The principles of information processing in the nervous system and the relationship of functional properties of neural systems with perception, behavior, and learning. Original papers; student presentations. Prerequisite: 206 or consent of instructor.

4 units, alternate years, not given this year

NBIO 220. Central Mechanisms in Vision-based Cognition

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, W; Moore, T), alternate years, not given next year

NBIO 221. Frontiers in Translational Medicine
Small group course for first year MSTP and Master's in Medicine students only. Focus is on pathways for combining science and medicine during graduate and postdoctoral training and in one's career, and practical aspects of translational medicine. Guest lecturers are physician-scientists who have advanced the frontiers of translational medicine. Previous lecturers have included Drs. Gilbert Chu, Jamie Topper, Irv Weissman, Beverly Mitchell, Geoff Duyk, William Mobley, Judy Shizuru, and David Cox. Prerequisite: consent of instructor.

1 unit, Spr (Barres, B)

NBIO 222. Imaging: Biological Light Microscopy
(Same as BIO 152, MCP 222.) Survey of instruments which use light and other radiation for analysis of cells in biological and medical research. Topics: basic light microscopy through confocal fluorescence and video/digital image processing. Lectures on physical principles; involves partial assembly and extensive use of lab instruments. Lab. Prerequisites: some college physics, Biology core.

3 units, alternate years, not given this year

NBIO 227. Understanding Techniques in Neuroscience
Techniques commonly used in the field of neuroscience, including molecular/genetic, electrophysiological, and whole brain imaging. Presentations by senior graduate students and examples from the literature. Optional laboratory demonstrations.

2 units, Aut (Carter, M; Villeda, S; Clark, K)

NBIO 228. Mathematical Tools for Neuroscience
Student-instructed. For students with no math background beyond basic calculus, or as a review for more advanced students. Techniques useful for analysis of neural data including linear algebra, Fourier transforms, probability and statistics, signal detection, Bayesian inference, and information theory.

1-3 units, Spr (Corrado, G)

NBIO 254. Molecular and Cellular Neurobiology
(Same as BIO 154, BIO 254.) For advanced undergraduates and graduate students. Cellular and molecular mechanisms in the organization and functions of the nervous system. Topics: wiring of the neuronal circuit, synapse structure and synaptic transmission, signal transduction in the nervous system, sensory systems, molecular basis of behavior including learning and memory, molecular pathogenesis of neurological diseases. Prerequisite for undergraduates: Biology core or equivalent, or consent of instructors.

4-5 units, Aut (Luo, L; Shen, K; Clandinin, T), alternate years, not given next year

NBIO 258. Information and Signaling Mechanisms in Neurons and Circuits
(Same as MCP 258.) How synapses, cells, and neural circuits process information relevant to a behaving organism. How phenomena of information processing emerge at several levels of complexity in the nervous system, including sensory transduction in molecular cascades, information transmission through axons and synapses, plasticity and feedback in recurrent circuits, and encoding of sensory stimuli in neural circuits.

5 units, alternate years, not given this year

NBIO 299. Directed Reading in Neurobiology
Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

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 (Moore, T), Win (Moore, T), Spr (Moore, T)

NBIO 399. Graduate Research
Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)