

## ***Neuroscience Ph.D. Progress through Degree***

The Neuroscience Graduate Program offers a Ph.D. program only with a standard completion time of 5 to 5.5 years. [Note: *We do not admit students who wish to pursue a Master's degree.* However, when a student experiences a significant change in career orientation, after successful completion of the qualifying exam, a Masters degree may be awarded.]

Standard 5 to 5.5 Years Course of Study Timeline by Year						
	First	Second	Third	Fourth	Fifth	Final
Lab Rotations (3@10 wks)	*					
Rotation Presentations	*					
Coursework (3 grad level courses min.)	*	*				
Teaching (2 semesters total)		*	*			
Qualifying Examination		*				
Graduate Seminars (minimum 2)			*	*	*	
Research Presentation (NEUROSC 294)				*		
Research		*	*	*	*	*
Dissertation writing, presentation and filing				*	*	*

The program provides a great degree of flexibility for students as they cultivate their scientific interests. Individual curricula and research are arranged in consultation with the student's Thesis Mentor and the Graduate Adviser. Formal coursework is usually taken during the first two academic years. Since the program's emphasis is largely training in research, requirements are defined on the basis of individual needs. Students select from a wide range of courses offered by the Program and other campus departments, including Molecular and Cell Biology, Psychology, Chemistry, Plant and Microbial Biology, Integrative Biology, Physics, Bioengineering, Statistics, Computer Science, Public Health, Vision Science, and Biomedical and Environmental Health Sciences.

### ***I. Lab Rotations and Presentations***

During the first year of graduate study, each neuroscience graduate student spends three 10-week periods performing research projects in different faculty laboratories. The goal is to expose students to different techniques and approaches in neuroscience and to provide training in experimental design, critical analysis of data, and presentation of research findings. Performance in rotations is evaluated and graded. Rotations also allow students to identify the laboratory in which their thesis research will be performed. During the Spring semester, students formally present results from the laboratory rotations in a dedicated course – NEUROSC 290 – designed to train students in clear,

effective presentation of scientific findings.

The program has the following set of rules and guidelines for laboratory rotations:

1. Rotation assignments for the Fall and Spring semesters are made by the Graduate Advisers Committee and are based on student preferences and availability of space in faculty laboratories. While students and program faculty are encouraged to discuss potential rotation projects, they should not enter into private agreements about rotation assignments.
2. A student may participate in an early rotation starting in July of the entering year. Both the rotation faculty mentor and the head graduate adviser need to pre-approve this option. At the beginning of the fall semester the student can request either to continue in the same laboratory through the first rotation, or alternatively to rotate in another laboratory. Regardless of summer rotations, all students are required to rotate in 3 different laboratories during the regular school year.
3. To maximize the opportunities afforded by the laboratory rotations, a student who was either an undergraduate or research assistant working in a Berkeley Neuroscience faculty laboratory will not be permitted to rotate in that faculty's laboratory. However, a student in this situation is free to choose his/her that laboratory for his/her thesis dissertation research at the end of the normal rotation period.
4. A student may elect to participate in a 4th laboratory rotation following the normal rotation period if s/he is unable to find a suitable laboratory for his/her thesis dissertation research.

Students earn academic units for their rotations by enrolling in NEUROSC 291 A-B, a year-long course. Grading is done by the Graduate Adviser according to grades and evaluations from rotation mentors.

During the Spring semester of the first year, students participate in SERPs (Student Evening Research Presentations), a course facilitated by a faculty member. The intent of SERPs is to familiarize and instruct students in presenting research findings in a clear and incisive manner. Students make presentations describing overall objectives, experimental approaches used, and results obtained in two of the three rotations. Students enroll in NEUROSC 290 to fulfill this requirement.

## **II. Coursework**

The major goal of the coursework guidelines is to ensure that neuroscience graduate students receive sufficiently broad training to be conversant in all areas of neuroscience while allowing focus in the area of primary research interest.

### ***Course Requirements:***

1. During the first two years in the program, students are required to take a minimum of three 3- or 4-unit graduate lecture courses (200-level) according to the Course

Distribution (see below).

2. After passing the qualifying examination and advancing to candidacy, students are required to take two additional graduate topical seminars and/or lecture courses according to their specific interests. This requirement ensures students' continued involvement in the academic campus-wide community as well as further refinement and deepening of expertise.

3. During the 4th year of study, students must enroll in NEUROSC 294 and make a presentation of their thesis research.

*Course Distribution:*

To ensure breadth in the student's neuroscience graduate education, during the first two years in the program, the student must select courses as follows:

*Option A:* 3 graduate courses, one from each of the three categories A, B, C (see below).

*OR*

*Option B:* 3 graduate courses distributed across two categories, plus one upper division undergraduate course, as follows:

a. 3 graduate courses distributed across Categories A and B (i.e., two from Category A and one from Category B, or one from Category A and two from Category B), plus either Psych 117 or Psych 127;

*OR*

b. 3 graduate courses distributed across Categories B and C (i.e., two from Category B and one from Category C, or one from Category B and two from Category C), plus MCB 160.

*Course Categories:*

Category A – Cellular, Molecular & Developmental Neuroscience:

MCB 261: Advanced Cellular and Molecular Neurobiology (Spring even years)

MCB 263: Advanced Developmental Neurobiology (Spring odd years)

MCB 200: Biochemistry and Molecular Biology (Fall every year)

MCB 230: Advanced Cell Biology (Spring every year)

MCB 231: Advanced Developmental Biology (Spring every year)

MCB 240: Advanced Genetics (Spring every year)

*MCB 160: Upper division undergraduate course: Introduction to Neurobiology (Every semester)*

Category B – Systems & Computational Neuroscience:

IB 245 and IB 245L: Functional Neuroanatomy and Lab (Spring every year)  
MCB 262: Systems/Computational Neurobiology (Fall odd years)  
Psych 210C: Sensory Systems (Spring even years)  
Psych C213/IB C240: Stress Effects on Brain and Behavior (Fall odd years)  
Psych 290Z: Neuronal Mechanisms of Learning and Memory (Spring even years)  
Vision Science 298: Neural Computation (Fall even years)

Category C – Cognition, Brain and Behavior:

Psych 210A: Cognitive Neuroscience (Fall odd years)  
Psych 210D: Learning and Memory (Fall even years)  
Psych 211: Hormones and Behavior  
Psych 214: Functional MRI Methods (Fall every year)  
Psych 240A: Proseminar: Biological, Cognitive and Language Development (Fall odd years)  
Public Health C217D: Biological and Public Health aspects of Alzheimer's Disease (Spring odd years)  
*Psych 117: Upper division undergraduate course: Human Neuropsychology*  
*Psych 127: Upper division undergraduate course: Cognitive Neuroscience* (Fall every year)

Recommended statistical methods courses:

Psych 205: Data Analysis  
EECS 221A: Linear Systems Theory  
EECS 226A: Random Processes in Systems  
EECS 229: Information Theory and Coding  
Statistics 241A: Statistical learning theory  
Statistics 248: Analysis of time series

***Coursework Notes:***

1. All required coursework must be taken for a letter grade and passed with a grade of B or higher.
2. Students without prior undergraduate coursework in general neurobiology are strongly encouraged to take MCB 160 in the first semester of study.
3. Students must take the three required graduate courses within the first two years in the program. This allows them to finish or be close to finishing the core course requirements prior to the Qualifying Examination. The course requirement provides the basis for the neuroscience general knowledge requirement on the Qualifying Examination.
4. NEUROSC 290, or Neuro Student Research Presentations, is a forum for first year students to present their rotation projects to the rest of the class. The course is held during the Spring semester and is required for all first year students. This course cannot be taken as an elective graduate seminar/course.
5. MCB 293C is the Ethics in Research course, also held during Spring semester and is

required of all first year students who are appointed trainees on NIH Training Grants. This course cannot be taken as an elective graduate seminar/course.

6. NEUROSC 294 is a Journal Club course that can be taken any number of times for a Satisfactory/Unsatisfactory (S/U) grade. During their 4th year of study, students are required to make a presentation on the progress of their thesis work while enrolling into this course for a letter grade

7. In lieu of a thesis defense examination, students must present a thesis seminar to the neuroscience community during the semester they file their dissertation.

### **III. Teacher Training**

Neuroscience students are required to serve as Graduate Student Instructors (GSIs) for two semesters. Whenever possible, GSI assignments are determined with an eye toward student research interests; teaching occurs during Fall semester of the second year and Spring semester of the third. Teaching affords students supervised experience in a variety of educational situations, including labs, discussion sections, and demonstrations. GSIs also participate in record-keeping, grading, advising, and student consultations.

GSIs are evaluated by both supervising faculty and the students they teach. These evaluations become a permanent part of the student file. Deserving GSIs are nominated for the Outstanding Graduate Student Instructor Award. The following Neuroscience Graduate Students have been recent recipients of this award:

Noopur Amin (MCB 160) 2005-06  
Annaliese Beery (MCB 163L) 2004-05  
Leah Byrne (MCB 163L) 2007-08  
Natalia Caporale (MCB 160) 2003-04  
Aubrey Gilbert (IB 245L) 2004-05  
Bradley Voytek (MCB 163L) 2005-06  
Erica Warp (MCB 163L) 2007-08

### **IV. Qualifying Examination**

All Neuroscience students take an Oral Qualifying Examination during the Spring semester of the second year. The exam is administered by four faculty members: three from within the Neuroscience Graduate Program, and a fourth from an outside department. Please use the [Application for Qualifying Exam form](#). This form must be received by the Graduate Affairs Office 6 weeks before the examination date. For the Qualifying Examination Report, please use the [Report Form](#). This form must be signed by all committee members and brought to the office immediately upon the completion of the Qualifying Examination.

The examination is structured around two written proposals, the first being the student's proposed area of thesis research, the second from a subject area outside the student's thesis topic. The proposals, prepared in research grant proposal format, are reviewed by examiners prior to the examination.

During the exam, students demonstrate the ability to recognize fundamentally important research problems, propose relevant experimental approaches, and display comprehensive knowledge of appropriate disciplinary areas and related subjects. All students are required to pass the qualifying examination before advancing to doctoral candidacy.

Please see [Guidelines for the QE](#) for additional details regarding Qualifying Examination preparation, timeline, and format.

**V. The Thesis Committee, Research, and the Dissertation**

After passing the Qualifying Examination, students establish a Thesis Committee and advance to [Doctoral Candidacy](#).

Thesis committees are comprised of four faculty members: the thesis mentor, two members of the Neuroscience Graduate Program, and one from an outside department. Students assemble their committees by meeting with their mentors and the Graduate Adviser.

Once students have advanced to Doctoral Candidacy, they are required to meet with the thesis committee at least once yearly. The Annual Thesis Committee Meeting is a time to discuss dissertation progress, review experimental results, set goals, and ensure students are adhering to appropriate timelines to completion.

The Thesis Committee meetings must be scheduled as follows:

6th year students: between September 1st to October 1st  
5th year students: between September 1st to October 1st  
4th year students: between October 1st to November 1st  
3rd year students: between November 1st to December 1st

Years three through five are spent primarily on dissertation research. At this stage, students are encouraged to present posters or speak at scientific meetings and conferences whenever possible. During the fourth year, students are advised to start arranging postdoctoral training. In addition to help from the thesis mentor, the thesis committee members and other neuroscience faculty members, students can also consult with counselors at the [Career Center](#) to aid them in searches, portfolios, and more.