The Graduate Program in Neuroscience
Program Requirements – 2016-2017

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Introduction

The goal of the Graduate Program in Neuroscience is to produce the best neuroscientists possible. The breadth of our faculty allows us to provide interdisciplinary training drawing from a variety of topics, techniques and perspectives, including neuroanatomy, biochemistry, molecular biology, physiology, biophysics, pharmacology, in vivo brain imaging (e.g., fMRI, M-EEG), computational modeling and behavior. A graduate of our program will be well versed in the neurosciences, prepared to conduct independent research, and equipped to pursue a variety of career paths.

Curriculum

Core Sequence. During the first year, students are required to take a series of seven graduate level courses that provide exposure to core principles of neuroscience. NEURO 501, 502, 503 & 504 cover topics in cellular neurophysiology, cellular and molecular neurobiology, developmental neurobiology, neuroanatomy, neuropharmacology, systems neuroscience, cognition and behavior. NEURO 527 is a reading and discussion course focusing on topics covered in NEURO 501-504. NEURO 545 exposes students to quantitative methods and modeling used in neuroscience. NEURO 559 introduces students to a wide variety of neurological and psychiatric diseases.

Seminar Series. All students are expected to attend the Program seminar series (NEURO 510) throughout their graduate careers. Students receive credit for this course during their first two years.

Lab Rotations. During the first year, students are required to complete three one-quarter laboratory rotations (NEURO 526). At the end of each rotation, students deliver a short oral presentation describing their work. The rotation advisor will provide a written evaluation of the student’s performance. Students should contact the Program Office at the beginning of each quarter with the name of their rotation advisor. All students in the Program are expected to attend the quarterly rotation talks.

Electives. Students complement their coursework with electives in areas of interest. Students must complete electives totaling at least 10 credits. Electives may be taken for a grade or on a pass/fail basis. Single credit courses that represent lab meetings, departmental journal clubs, etc., do not fulfill the elective requirement. Entering graduate students will in general not be allowed to take elective courses in their first year, but may do so under special circumstances (e.g., a course is not offered every year) with prior approval. More senior students should consult with their advisor and Supervisory Committee to determine an appropriate curriculum of elective courses. The Program’s Core Elective Course List provides an up-to-date listing of elective courses that do not require prior approval for credit. In addition, students may petition to receive credit for courses that are not part of the core list, but are deemed important for the student’s dissertation project. Approval for any elective not on the list is required before the student enrolls in the course. Students may also petition for credit for courses taken at other institutions while enrolled in the Program, such as summer courses at Cold Spring Harbor or Woods Hole. All students who have not completed their electives requirement are required to submit an advisor-approved elective plan annually by the end of Summer Quarter.
Required Graduate Student Courses

NEURO 501: Introduction to Neurobiology: Molecular & Cellular Neurobiology. (3) (Offered: A) Carlson
Concepts and techniques of molecular and cell biology as applied to understanding development and function of the nervous system. Required for all first year students.

Introduction to neuroanatomy and modules on sensory and motor systems, examination of macroscopic and microscopic neural tissues. Required for all first year students.

NEURO 503: Cognitive and Integrative Neuroscience (4) (Offered: Sp) Phillips
A discussion of higher neural processes like learning, memory, and decision making. Lecture and laboratory discussion of original literature, exercises in data analysis and quantitative reasoning. Required for all first year students.

NEURO 504: Biophysics of Nerve, Muscle, and Synapse (3) (Offered: A) Sullivan, Zagotta
Introduces biophysical properties of nerve and muscle cells. Topics include intrinsic electrical properties of neurons, ion channels, receptor signaling, calcium signaling, contraction of muscles, and synaptic function. Required for all first year students.

NEURO 510: Seminar in Neurobiology (0.5) (Offered: A, W, Sp)
Weekly seminar on current topics in neuroscience. Attendance is expected throughout graduate training. Required for first and second year students.

NEURO 515: Teaching Practicum in Neurobiology & Behavior (3-6) (Offered: A, W, Sp, S)
Supervised training in the teaching of neuroscience and related scientific topics. Teaching internships are assigned as part of the annual “match” or by approval by one of the Directors.

NEURO 526: Introduction to Laboratory Research in Neurobiology & Behavior (4) (Offered: A, W, Sp, S)
Students carry out research projects in the laboratories of different faculty members on a quarterly rotation basis.

NEURO 527: Current Topics in Neurobiology & Behavior (1) (Offered: A, W, Sp) Rieke
Critical discussion of original scientific literature, both classic and contemporary; topics complement those in the concurrent NEURO 501 - 504 series, including introductory neurostatistics. Emphasizes student participation. Required for all first year students.

NEURO 545 Quantitative Methods in Neuroscience (3) Rieke, Bair, Fairhall
This course provides exposure to a variety of quantitative methods that are applicable to the study of the nervous system. It provides an intensive tutorial on mathematical methods and their application to neuroscience research. The course format revolves around computer exercises and discussion of journal papers. Topics can include linear systems theory, Fourier analysis, ordinary differential equations, stochastic processes, signal detection theory and information theory. Required for all first year students.

NEURO 559 Neurobiology of Disease (3) (Offered: S) Grabowski
Introduces medically important neurological and psychiatric diseases and experimental approaches to understanding the basis for diseases and their treatments. Covers stroke, epilepsy, autoimmune diseases of the CNS, neurodegenerative diseases, autism, psychosis, anxiety disorders and mood disorders. Required for all first year students.

NEURO 600: Neurobiology & Behavior Research/Independent Study. (Variable-max 10 cr.) (Offered: A, W, Sp, S)
Independent research. Taken prior to General Examination.

NEURO 800: Doctoral Dissertation (Variable-max 10 cr.) (Offered: A, W, Sp, S)
Dissertation Research. Taken after completion of General Examination. Limited to graduate students in the program.
Graduate School Minimum Requirements

It is the responsibility of the student to meet the following minimum graduate school requirements. Most are met by the Program requirements, but they should be considered when selecting your elective courses.

1. At least 18 credits of your course work must be at the graduate level and must be completed prior to scheduling your General Exam. The Graduate School accepts numerical grades in 400-level courses approved as part of the major and all 500-level courses.

2. A minimum cumulative GPA of 3.00 is required for a graduate degree. The Graduate School provides a quarterly report of graduate students whose GPA's fall below 3.0 either cumulatively or for that quarter. This can result in academic probation.

3. The student must pass the General Exam. Registration as a graduate student is required the quarter the exam is taken.

4. The student must prepare a doctoral dissertation on a topic in neuroscience. The topic and scope of the dissertation are developed with guidance from the dissertation advisor and thesis committee. There is no clear-cut definition of a minimum requirement for a thesis. However, the dissertation should describe original research that advances the field of neuroscience and clearly indicates training in research. Credit for the dissertation ordinarily should be at least one-third of the total credit. The Candidate must register for a minimum of 27 credits of dissertation over a period of at least three-quarters.

5. The student must pass a Final Examination, usually devoted to the defense of the dissertation. The General and Final Examinations cannot be scheduled during the same quarter. Registration as a graduate student is required the quarter the exam is taken and the degree is conferred.

6. Completion of all work for the doctoral degree must be done within ten years of matriculation. This includes quarters spent On-Leave or out of status as well as applicable work from the master's degree from the University of Washington.

7. Registration must be maintained as a full- or part-time graduate student at the University for the quarter in which the degree is conferred.

8. A student must satisfy the requirements that are in force at the time the degree is to be awarded.
Supervisory Committee

Students must establish a Supervisory Committee by the end of Autumn Quarter of the second year in the Program. This Committee serves several important functions, including evaluating the student's progress, advising the student on their research, and conducting the student's General Exam. Students can meet with their Supervisory Committees as often as necessary, but a minimum of one meeting per year is required to ensure adequate and timely progress toward the PhD degree. The first annual Supervisory Committee meeting must be held before the end of Winter Quarter of the second year. These meetings are not examinations. They consist of a presentation on progress and future plans and extensive discussion. The Committee should approve the student's progress before the General Exam is scheduled.

The Committee is made up of Faculty that the student selects, in consultation with the dissertation advisor, and with approval of the Program Directors. The Supervisory Committee must contain at least three individuals who are members of the Program training faculty. At least one member of the Committee should represent an area of neuroscience outside the student’s immediate area of research. A criterion for “outside” status is membership in a focus group outside the field of the advisor.

In addition, the student will select a Graduate School Representative (GSR) to the Supervisory Committee. The GSR represents the interests of the student and should not have a primary appointment in the advisor’s home department, nor be part of the Neuroscience list in Graduate Faculty Locator. The GSR must attend the General Exam and Final Exam, but is not required to attend annual Supervisory Committee meetings, although he or she should be invited.

It is suggested that the Committee contain at least four members (in addition to the GSR) to avoid having to cancel the General Exam if a committee member cannot attend. While it is not always possible to have all of the Supervisory Committee members attend each annual meeting, it is a requirement of the Graduate School that the advisor(s) and the GSR attend the General Exam and Final Exam.

NOTE: The Supervisory Committee must be appointed at least 1 month before the warrant request to schedule the exam is submitted on-line to the Dean of the Graduate School. Contact the Neuroscience Program Office to request Committee approval from the Directors and the Graduate School.

General Examination

Students must take their General Exam by the end of the Spring Quarter of their second year. The General Exam consists of two written components and two oral sections. The written parts consist of a brief research proposal and answers to three questions on prepared topics. The oral sections consist of a 20 minute presentation on the thesis proposal and questioning about topics related to the area of the dissertation and general knowledge. Details on the format of the General Exam are provided below.

Prior to the Examination, the student should designate a member of the Committee who is not the advisor or the GSR to serve as the General Examination Administrator, who will be responsible for collecting written questions and administering the General Examination.

Note: In order to schedule your General Exam, you will need to submit a warrant request on-line to the Dean of the Graduate School. You can submit a warrant request on-line at MyGradProgram (http://www.grad.washington.edu/mygrad/student.htm).

Warrant requests must be submitted on-line to the Graduate School and approved by the Neuroscience Program at least 3 weeks before the General Exam

While the General Examination is a requirement of the Graduate School for the advancement of the student to candidacy towards the Ph.D., it also serves several important purposes in the training of students in the Graduate Program in Neuroscience. The format of the General Exam has been designed to achieve the following goals:

1. Emphasize that the student formulates a novel scientific question and devises a method to answer it.
2. Ensure timely progress of the student through the program and toward the PhD.
3. Ensure the rigor of the exam, especially in areas of general knowledge.
4. Provide a method to ensure consistency of the examination for students

The student is required to meet with committee members (not the GSR) either individually or in a pre-exam meeting before the examination to identify one or two topics of general knowledge for each member in which to prepare. These areas are selected by the committee member in an area of his or her expertise but tailored to the student’s area of interest. Although the thesis committee members will ultimately serve to advise the student on
progress toward the dissertation, their role before the general examination is to identify areas of neuroscience in which depth and breadth of knowledge are likely to be helpful to the student’s training. The committee member and the student should clarify the scope, but there is much latitude here. For example, the area may be broadly defined (e.g., development, the olfactory system, ion channels, learning and memory, etc.) or more focused (apoptosis, tyrosine kinase signaling, voltage gating, signal to noise determinants in retina, role of superior colliculus in gaze control, etc.). Together, the student and the committee member should develop a reading list based on standard texts, review papers and primary scientific literature. The committee member should keep in mind that the student will be preparing in several areas, depending on the number of committee members and the number of topics they require.

To schedule the general exam, the student’s advisor and the committee as a whole must be satisfied that the student is making progress in the laboratory. A student who has not demonstrated dedication and some degree of acumen in areas relevant to conducting the thesis research will not be eligible to take the general exam. (Because this situation is considered to be not making satisfactory progress towards the Ph.D., it is expected that this will be a rare occurrence.) When scheduling the general exam, the student should identify a member of the Supervisory Committee who will serve as Administrator for the examination. The student selects the Administrator with concurrence of the thesis advisor. The thesis advisor and the GSR are not eligible to serve as the Administrator. The student, thesis advisor and Examination Administrator should notify the Neuro office of this arrangement by email. The role of the Examination Administrator is spelled out below.

B.1. Format of the written exam. There are two parts: (1) a brief thesis proposal with emphasis on background and rationale; (2) answers to three “knowledge” questions, which are submitted by the committee.

(1) Thesis proposal. The document should develop the background and rationale for the proposed dissertation research, and it should outline an experimental plan to address one fundamental question. The document should be no more than five pages single spaced, plus bibliography. It should (i) emphasize published studies pertinent to the proposed research area, (ii) develop the rationale for the proposed study, emphasizing gaps in current knowledge in the proposed research area, (iii) advance one or two hypotheses, and (iv) describe an experimental strategy to test the hypothesis. Preliminary data should not be included. The proposal is due two (2) weeks before the exam. For purposes of the general examination, the student will be evaluated on scholarship, clarity and content of the proposal, logical development of a scientific hypothesis, and overall merit of the strategy.

(2) Questions on general knowledge. Two weeks prior to the examination date, the Examination Administrator will obtain a written question from each member of the committee. The questions can be essay, problem format, or analysis. The answers should require no more than two (2) pages per examining committee member. The Administrator will select and forward to the student questions from three committee members. The dissertation advisor is not expected to submit questions, but he or she may do so at the discretion of the Examination Administrator. The GSR may also submit questions at the choice of the Examination Administrator. The student has one (1) week to complete all answers. The answers to all questions shall be provided to all committee members one (1) week before the oral examination. A PDF attachment to an email is the preferred format.

B.2. Format of the oral exam. The examination begins with a 20 minute “chalk-talk” about the proposed research. The focus is on the rationale for the project and the proposed experimental strategy; background information should be presented only when directly relevant. Although preliminary data are not required for the oral exam, data slides may be presented as supporting material. Following the “chalk-talk”, the committee will examine the student on themes related to the proposal, principles of experimental design, and any other areas that are seen as pertinent to the goal of developing a rigorous scientific inquiry in the student’s proposed dissertation area. This part of the exam is expected to last approximately one hour. The second part of the exam will focus on general knowledge and is also expected to last approximately one hour. The topics are expected to include the areas previously identified by committee members with the student. Questions on general knowledge covered in the 1st year course curriculum are also to be part of the process. Students should ensure that they have assimilated and consolidated the information presented in the first year coursework to be adequately prepared for this part of the exam. The Administrator of the General Examination will control the conduct of the oral exam. As described above, this is a committee member chosen in advance by the student and dissertation advisor who is not the GSR or the student’s advisor. While the dissertation advisor may correct a misstatement or misinformation offered by the student, the advisor should not participate in general discussions and questions during the exam. When scheduling the General Exam, be sure to plan for sufficient time to allow for all components; 3 hours is recommended.

B.3 Consequences of failing the General Examination A student whose performance on the General
Examination is considered to be not satisfactory may be allowed to have a first reexamination if the Supervisory Committee considers this to be appropriate. A student who does not pass the General Examination on the second attempt may be allowed a third and final attempt to pass the exam, but only with the approval of the Program Directors. There must be exceptional circumstances that are clearly defined by the Supervisory Committee in a letter to the Directors that explains why a 3rd attempt is justified.

Dissertation and Final Exam

1. **Two months** before the planned final exam, the student shall designate and get approval for the **Reading Committee** (advisor/s, plus two members of their Supervisory Committee, not to include the GSR).

2. **Six weeks prior** to the projected final exam date, the student distributes a **full draft of the entire dissertation** to all members of the **supervisory committee** and to the Neuroscience program office (neurogrd@uw.edu). We encourage students to do this electronically.

3. At that time, the student may initiate **scheduling a room** and obtaining the **warrant**.

4. **Four weeks prior** to the target final exam date, the program office staff will request 1) **confirmation from the entire committee** that each member is available for the exam; and 2) **confirmation from the Reading Committee** that each member thinks there is a **draft dissertation that is sufficiently complete** to move forward with scheduling the final exam.

4. **At least three weeks prior** to the exam date, with (and only with) those approvals, the program office will **officially enter the exam** into the Graduate School website.

5. When **submitting the dissertation electronically through ProQuest**, the student must also **submit an electronic pdf of the dissertation to the Neuroscience Program Office** (neurogrd@uw.edu). The Neuroscience Office staff will handle the printing and binding of Program’s paper copy of the dissertation.

6. Other steps occur according to the Graduate School rules.

* Neuroscience dissertation guidelines:

There is no clear-cut definition of a minimum requirement for a thesis. However, the dissertation should describe original research that advances the field of neuroscience and clearly indicates training in research. A reasonable goal for many students is two first-author articles targeted for professional, peer-reviewed journals, such as *The Journal of Neuroscience*. The dissertation should include an introduction that provides the scientific background supporting the rationale for the thesis work. This chapter should briefly review the literature and help put the work into a broader context. Subsequent chapters should include the dissertation work itself, and may be in the format of submitted or accepted publications. The thesis should conclude with a final chapter synthesizing the major findings and proposing future directions for the work.

Training and Teaching

We expect our students to develop proficiency in teaching neuroscience to undergraduate and/or graduate students. A minimum of two teaching quarter credits (total of 6 course credits) are required for graduation (Teaching Practicum, NEURO 515). At the end of year 1 and until this requirement is completed, each student selects his or her preferences for teaching internships for the following academic year. The faculty conduct a “match” to optimize these preferences in light of the opportunities available and demand. Students have the option to postpone teaching one year if there are compelling reasons. A list of the current opportunities can be found on the Neuroscience website under “Teaching Requirements.” Students must fulfill their teaching requirement through the match.

Student Evaluations and Annual Reports
First year students are evaluated at the end of each lab rotation; each student can review rotation evaluations in his or her personal, secure Google Drive Mail Box.

After joining a dissertation lab, each student will work closely with his or her mentor on an Individual Development Plan (IDP). Then, every year before each student’s annual committee meeting, the student and his or her mentor will sit down to update the student’s Annual Report (combined IDP/Progress Report), addressing any unmet Milestones or other program requirements. As soon as a student schedules his or her annual committee meeting, he or she should let the Neuro office know so Lucia or Margie can check the student’s records and inform the student of any issues that need to be addressed. When this information is returned, we will also send the student’s mentor(s) the appropriate Student Evaluation form (either 2nd & 3rd Year or Senior). http://depts.washington.edu/neurogrd/current-students/academic-progress/milestones/

The IDP/Progress Report should be reviewed at the beginning of each annual committee meeting. If the student has not yet completed his or her elective requirements, this would also be a good opportunity to discuss course options that would be most useful to the student’s development. Within 14 days of the annual committee meeting, the student must submit the updated Annual Report to the Neuro office, along with the advisor’s completed Student Evaluation Form, cc-ing the advisor on this email. The Annual Committee Meeting Milestone will not be met until this paperwork is submitted. The Evaluations and Reports will be reviewed by the Graduate Training Committee, and any concerns and/or problems are referred to the Directors.

Satisfactory Progress

Satisfactory progress is not just a matter of maintaining a satisfactory (3.0) GPA. The Neuroscience Program also expects that students will reach their academic milestones in a timely manner (see Neuroscience Milestones). Any student who is judged not to be making satisfactory progress may be reviewed by the Graduate Training Committee and the Directors at any time, and action will be taken to address the lack of progress. Failure to meet established milestones can result in a Program Probation and if not resolved to the satisfaction of the Directors, may result in formal sanctions and removal from the Program. The requirements are in place to facilitate progress toward the dissertation and a successful graduate school experience. We encourage students to perceive them not as hurdles but as stepping stones.

Additional Program Requirement Documentation

The following referenced documentation is available via the Neuroscience website http://depts.washington.edu/neurogrd/current-students/

Forms:
- Request to Form a Supervisory Committee
- Intent-to-Attend-General-Exam Form
- Request to Form a Reading Committee
- Reading Committee Confirmation Form
- Intent to Attend Dissertation Defense
- UW Grad School Reading Committee Approval Form
- Teaching Requirement Fulfillment Form

Policies/Lists

- Core Electives
- Milestones – General & MSTP