



# **ACADEMIC PROGRAM GUIDELINES**

## **Program in Neuroscience**

## Guidelines to the Program in Neuroscience

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For the 2007-08 academic year, the Program Steering Committee consists of the following individuals:

Dora Angelaki  
Aaron DiAntonio  
David Dickman  
Robert Gereau  
Erik Herzog  
David Holtzman  
James Huettner  
Peter Lukasiewicz  
Steve Mennerick  
Michael Nonet  
Karen O'Malley

Steven Petersen  
Bradley Schlaggar  
Paul Taghert  
Kurt Thoroughman  
David Van Essen  
Robert Wilkinson  
Laura Duvall, Student Member  
Thomas Pearce, MSTP Student Member  
William Vanderheyden, Student Member

The Neuroscience Graduate Program has the goals of providing students with a broad knowledge of neuroscience and the skills to perform research in a particular field. Students are encouraged to further their experience by taking courses in additional areas of interest.

These guidelines have been written to assist students in making wise educational choices and to aid the faculty in advising them. The Program expects a student to satisfy three requirements before beginning a thesis project. The first requirement is to master the basics of neuroscience in general, as demonstrated by satisfactory completion of the core courses in the Program. The second is to demonstrate intellectual skills in analysis and synthesis, shown by passing the Qualifying Examination. The third is to demonstrate competence in laboratory rotations.

### 1. **Faculty Advisory Committee**

All incoming students are advised by a committee of faculty members: Dora Angelaki, Chair; Aaron DiAntonio, and Michael Nonet. The committee will meet with students each semester to assist in selecting courses, laboratory rotations and to monitor progress. Students are encouraged to consult with these advisors at any other time. Students will continue to meet with the advisory committee once each semester until a thesis lab has been chosen and the thesis committee has been convened. In addition, students are strongly encouraged to meet

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one on one with advisory committee member(s) of their choice (or others recommended by the advisory committee) to discuss their choice of thesis lab and any other important decisions prior to entering the thesis lab.

### **2. Prerequisites**

There are no formal prerequisite courses. However, courses in cell and molecular biology and biochemistry (either undergraduate or graduate) is strongly recommended.

### **3. Coursework**

In the first year of graduate study, all students will enroll in the **core curriculum** of the Program. This consists of **Cellular Neurobiology** (Bio 5571) and **Fundamentals of Molecular Cell Biology** (Bio 5068) in the fall semester and **Neural Systems** (Bio 5651) in the spring semester. (Note: MSTP students must take *either* Cellular Neurobiology or Neural Systems.) To meet the requirements of the program, each student must receive a grade of “A” or “B” in each of the first year courses. Furthermore, the Graduate School requires that all students maintain a "B" average. During the second year, students also take an “**oral presentation**” course (Bio 5565) which is typically offered in the fall semester and **Ethics** (Bio 5011) which is offered in the spring.

### **4. The advisor**

A student’s advisor is the head of his or her thesis lab. The roles of the advisor include guiding the student into and through a scientifically important research project, encouraging the student to develop his or her own ideas, and teaching the student to be critical and objective concerning his or her results and ideas. Although the amount of daily interaction will vary greatly according to lab structure and personalities, the student and advisor should meet frequently enough for the advisor to be aware of the student’s progress. Furthermore the relationship between the student and the advisor will evolve over time. The ultimate goal is for the student to progress to the point of being successfully self-reliant. Both the student and advisor should think carefully about the compatibility of their research goals, mutual interests, career goals, work habits, and personalities before choosing to work together.

### **5. Mentoring**

The advisor will most likely be the student’s primary mentor, scientifically and professionally. Important qualities in a mentor are enthusiasm, supportiveness, empathy and respect for the student’s capabilities and choices. A mentor should neither give a student excessive guidance nor allow the student to struggle needlessly. The relationship between the mentor and student is highly personal, and requires ongoing self-evaluation and a reasonable assessment of outcomes. Typically, the advisor is not the student’s only mentor. Post-doctoral fellows, other students, members of the thesis advisory committee, other faculty members, and collaborating scientists can also advise the student regarding his or her project, career goals, etc.

### **6. Laboratory Rotations**

Laboratory rotations are designed to: a) acquaint students with the scientific method, b) help students become proficient in selected techniques, and c) help students find the laboratory and the scientific problem most suitable for their thesis research.

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Students are encouraged to seek out faculty with whom they will do rotations in their first year of graduate education. Students usually do three rotations. The first rotation will typically take place in the summer preceding the first year or after the Cellular Neurobiology course in the fall semester. It is anticipated that students will have selected a thesis lab by the beginning of the second year. Although more time may be required, students are expected to be settled in a thesis lab no later than September of the second year in the Program.

The rotation advisor will confer regularly with rotation students and will evaluate students in terms of aptitude for laboratory research, ability to understand and interpret the results of experiments, and ability to place results in a general context. The rotation advisor will also provide a brief written evaluation of the student's performance at the end of the rotation. The critique should include a brief description of the project and of performance in the general areas outlined. Please notify Sally Vogt, (Student Coordinator) when you select your laboratory rotations.

### **7. Qualifying Examinations**

All graduate students in the Neurosciences Program are required to complete the Qualifying Examination. This examination requires writing and defending a paper that identifies issues, or gaps in our knowledge, on a specific research topic. It consists of two parts: a written document and an oral examination. The document should be written in a style that can be understood by neuroscientists who are not specialists in the field. The paper should convey to the reader why the topic is important and worth caring about. The paper ideally should also: 1) critically review the current state of knowledge in this area, including in most instances, descriptions of primary data and interpretations, 2) outline critical or controversial issues, or gaps in knowledge, in this research area, 3) propose future directions that might address these issues or gaps, and 4) outline potential outcomes of these proposed new directions. The new directions proposed would most often be in the form of a specific line of experiments, or in the development of new technology, methodology, or concept that is currently limiting progress on the research topic.

An essential goal of this examination is for the student to demonstrate the appropriate ability to critically examine and synthesize current data and current conceptual issues in their chosen topic, identify current limitations in experimental methodologies or experimental approaches, and describe and identify alternative approaches important to their research area. To achieve this goal, the students should read and reference primary papers in preparing their examination, and not rely extensively on review articles; this should be documented in the bibliography. The document should be 15 pages long (typed, double-spaced), divided between the critical review, the identification of controversial issues and the proposed future directions to resolve these issues.

A major purpose of this examination is to evaluate the student's qualifications to obtain a PhD in Neuroscience at Washington University. As such, it is a qualifying exam for degree candidacy. A second goal of this examination is to more deeply familiarize students with current knowledge and thinking about an area related to their research interests. Thus, the student is strongly encouraged to choose a subject area that is related to his/her current or proposed research interests. Students are free to discuss (orally) the specific topic with others (including members of the exam committee) during their preparation for the written and oral portions of the examination. The written document should be an original work, and should not utilize the related cuttings and pastings from grant proposals or reviews (of the potential

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thesis lab). Because this examination is an original work, critiques of any written form (i.e., outlines, drafts, final version) from the potential PI or any other source prior to its submission to the exam committee, however, is not allowed.

The Chair of the Qualifying Examination Committee will select individuals from the Committee to serve on each student's exam committee and will identify the Chair of each of these committees. In addition, the Chairs of the individual exam committees will, in consultation with the Qualifying Examination Committee Chair and the Program Directors, identify additional faculty members in the Neurosciences Program to serve on the individual exam committees. The student's potential PI cannot serve on the examination committee. Students will be notified by e-mail when the membership of her/his exam committee has been determined (usually within one week of selection of the specific exam topic). Committee members will be selected based on expertise in the area of the exam, and each committee will consist of a total of three to four faculty members, including the Chair. If, however, the specific topic changes during the course of developing the written portion of the exam, the Chair of the individual exam committee, in consultation with the appropriate Qualifying Examination Committee Chair and the Program Directors, may recruit an additional faculty member to the committee.

The oral examination will test the breadth and depth of the student's knowledge, the cohesiveness of their reasoning and the strength of their arguments by exploring their ability to defend a point of view. General knowledge will be tested within the framework of the written document. The student will be expected to have command of the experimental systems, the technical and statistical methods, as well as background conceptual knowledge that frames the area they have chosen to explore. The students should have an understanding of the limitations of the presented methodologies.

The oral exam will be heard by at least three Neurosciences Program faculty members, and, as noted above, a member of the Qualifying Examination Committee will serve as the Chair. The student will provide a brief (15-20 minute) summary of the state of knowledge in the area they have chosen to explore, the issues they have identified, and their proposed way of addressing the issues. The bulk of the examination will consist of detailed and in-depth discussion of the written document, including background information relevant to the written document.

To ensure consistent grading of the exams, a study section consisting of committee members and ad hoc examiners will assess the written and oral examinations and then agree on the appropriate grades. The Chair of the exam committee will prepare written critiques of both the oral and the written portions of the Qualifying Examination. Grades of "A" or "B" on both portions of the examination meet the requirements of the program. If "C's" are received on both portions of the examination, the student will be considered to have failed, but will be given an opportunity to take a second qualifying exam within 6 months, unless other actions are suggested by the Examination Committee or the Steering Committee. If the general area is the same as that of the first exam, the topic selected and the exam committee must be entirely different. The second exam committee will also consist of three faculty members; additional members will be selected by the Program Directors and Chair of the Qualifying Examination Committee. One member of the original exam committee (selected by the Program Directors) will also be present during the oral examination as an observer; this individual will not, however, participate in either the examination itself or the decision

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making about the student's performance, but can provide information to the committee on the past written and oral presentations and comparison of that information with current performance.

In the case of a grade of "C" on one portion of the examination, the student will be given the opportunity to redo the portion of the exam (i.e., written or oral) found to be deficient. The revised examination should ordinarily be completed within 4 weeks of receiving the written critique and will be evaluated by the same exam committee. If the deficiencies have been corrected, a grade of "A" or "B" will be assigned (and the qualifying examination requirements will be met). If the deficiencies have not been corrected, the student will be considered to have failed the qualifying examination, but will be given an opportunity to retake the examination within six months, unless other actions are recommended by the Qualifying Examination or Steering Committee (see above for details on retaking the qualifying examination).

Grades of "A" or "B" on both portions of the second examination meet the requirements of the program. If "C's" on both portions are obtained, the student will not be allowed to continue in the Program (see below\*\*\*). If a grade of "C" is obtained again on one portion of the re-examination, the student will be again given the opportunity to revise/redo the portion(s) (oral and/or written) of the exam deemed deficient for reevaluation by the same committee. A grade of "A" or "B" must be obtained on the revision for the student to continue in the program (see below \*\*\*).

### **\*\*\*Appeals Procedure**

If a graduate student who has failed the Qualifying Examination twice feels that the assignment of one or both of the failing grades was made incorrectly or inappropriately, the student may appeal the decision to the Program Steering Committee. The appeal must be made in writing and must state explicitly the reasons that the student believes the failing grades were incorrect or inappropriate. The Steering Committee will review the appeal and, if the student is agreeable, may invite the student to meet with the Steering Committee to discuss the appeal. The Steering Committee may (but is not required to) consult with the exam committee members directly as part of their deliberations. The Steering Committee will vote to either uphold the exam committee's decision (and the student will not be allowed to continue in the program) or find for the student (in which case the student will be allowed to retake the examination again). In the latter case, the procedures for retaking a Qualifying Examination detailed above will be followed. If the student feels that the action of the Steering Committee is incorrect due to a procedural flaw in the examination process, the student may submit a written petition to the Chair of the Programs and Student Affairs (PSA) Committee and, if warranted, the PSA Committee will hear that appeal.

### **Examination time line:**

Week 1: Find a bounded subject within the student's research interest area and identify seminal papers. End of Week 1: Approval of topic by examination chair.

Weeks 2 and 3: Detailed examination of the supporting data and outline current issues or critical gaps in the research topic area.

End of Week 3: Student presents outline of position paper to examination chair for comments and feedback.

Weeks 4 and 5: Write the final document. End of Week 5: Final papers due.

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Week 6: Prepare and practice oral presentation.

Week 7: Oral examinations.

### **8. Teaching**

All students are required to assist for one semester in courses offered by various departments of the Division. Every effort is made to assign individuals to courses which are appropriate to their background and interests. The teaching experience is intended to be of value in preparing the student for an academic career.

### **9.. Special Programs**

In keeping with our philosophy of flexibility, individualized programs for students can be designed. These individualized programs may use components of the different programs of the Division, i.e., Neuroscience - Cell Biology, etc. Details of such special programs are worked out on an individual basis by the students and the relevant program coordinators.

### **10. Degree Candidacy**

A student attains Candidacy for the Doctoral Degree once the student has completed 72 credit hours, passed the qualifying examination and successfully defended a thesis proposal.

### **11. Guidelines for Thesis Work, Proposal and Defense**

#### **THESIS ADVISORY COMMITTEE**

The Thesis Advisory Committee advises the student on general and experimental aspects of completed and proposed work. It will read and hear the Thesis Proposal and approve or reject it. Finally, the Thesis Advisory Committee will advise the student about an appropriate time to write the thesis.

It shall consist of the student's principal research advisor and three or more faculty of the Division of Biology and Biomedical Sciences. Members of the Committee should be chosen for their expertise in relevant research areas and for their willingness to contribute advice. The Committee must be chaired by a faculty member who is not the student's advisor, and students are advised to select a chair after discussion with all committee members and before the first meeting. The first meeting will be within six months after selection of the thesis lab, and the Committee should meet with the student roughly every six months throughout the candidate's graduate career. The composition of the committee can change to reflect changes in the student's scientific direction. The Thesis Advisory Committee will reach a consensus and summarize that consensus verbally to the student at the end of each meeting. The Committee will send a written report to the Graduate Student Coordinator on the appropriate form. The Committee also should decide on the date for the next meeting, and include this information in the written summary.

The Thesis Advisory Committee should be formed within 4-6 months after a thesis lab has been chosen. This Committee should be formed and at least one ("pre-thesis-proposal") meeting should be held by the end of the second graduate year. M.D. /Ph.D. candidates should form and meet with a Thesis Advisory Committee early in the second year. The student is responsible for initiating the appointment of the Thesis Advisory Committee at the appropriate time, and for making sure that the semiannual meetings are held and reported. Once a research direction has been established, students are encouraged to form their thesis

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committee. The thesis committee also serves to help the student prepare to present their thesis proposal. Students are encouraged to cultivate relationships with their thesis committee members, because these will be useful both scientifically and professionally.

### **Conflict of Interest Policy**

Research funding from sources that have intellectual property interests in the research, or in which the PI has personal financial interest, may create a real or perceived conflict of interest, given the dual roles of the principal investigator in obtaining funding for the lab and as a mentor for graduate students. Issues of paramount importance are (i) the ability to publish results in a timely fashion; (ii) the ability to communicate research results openly, especially to members of the thesis committee; and (iii) academic rights to publish and speak freely, especially as related to a graduate student's thesis and defense.

### ***Statement of policy.***

The following principles should apply to any situation involving a graduate student supported by funding that is associated with a confidentiality agreement:

The limitations and nature of the confidentiality agreement must be fully disclosed to and approved by the student, the thesis committee, and the DBBS Associate Dean for Graduate Affairs;

The confidentiality agreement must not place an unreasonable burden or delay in publication or reporting at scientific meetings;

The confidentiality agreement must not delay the writing or defense of the thesis.

The complete policy can be view at:

<http://www.dbbs.wustl.edu/dbbs/website.nsf/WV/D47E84300A563248862575BE006C522C?OpenDocument>

## **THESIS PROPOSAL**

A written document presenting the proposed experiments for the student's thesis research should be prepared generally according to the format of an NIH research grant. In preparing a thesis proposal, students should seek assistance from the members of their Advisory Committee as well as their thesis advisor. The written proposal will be given to the members of the Advisory Committee at least 2 weeks prior to the proposal meeting. At the meeting, the student should present relevant background and preliminary findings. The scientific merits of the proposed work will be discussed by the student and the Advisory Committee. At the end of the meeting the Committee will recommend acceptance, acceptance with modifications, or rejection. The decision will be communicated verbally to the student and in writing to the Graduate Studies Office on the appropriate form; and a copy of the proposal should be sent to that office. The Committee's evaluation of the proposal should emphasize a determination of the student's capacity to conceive a meaningful biomedical research project and to plan its execution. Therefore, there should be less emphasis on documenting extensive work completed. The student will have ample opportunity to document progress in the subsequent biannual meetings with the Advisory Committee.

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It is important to emphasize that the Thesis Proposal is considered a description of proposed/planned experiments, and it is not to be considered a binding document, as the direction of research may change as the project evolves.

For Ph.D. candidates, the Thesis Proposal should be presented no later than the end of the 5<sup>th</sup> semester of residency. For M.D. /Ph.D. students, the thesis proposal should be presented before the end of the second year of graduate study. Students not meeting this requirement would not be in good academic standing and could be dismissed if the proposal is not completed within the next 6 months.

### **DETAILED THESIS OUTLINE**

The student will prepare a written outline of major experimental observations and conclusions at least 4 months prior to the expected thesis defense date. This outline will be discussed with the student at the final meeting of the Thesis Advisory Committee. The Committee may recommend additional work, or recommend that the student begin to prepare the Thesis and establish his/her Thesis Committee.

### **THESIS EXAMINING COMMITTEE AND THESIS DEFENSE**

To be awarded a doctoral degree, a student must prepare and satisfactorily defend a doctoral thesis. The format of the thesis is prescribed by the Graduate School. Copies of the final written thesis should be in the hands of all members (including outside members) of the Thesis Examining Committee at least 14 days prior to the scheduled defense. If they are not, the thesis defense will automatically be rescheduled at the Committee's earliest convenience.

The Thesis Examining Committee will normally include the members of the thesis advisory committee, but it must have at least six members: four faculty members from within the student's program and at least two faculty members who are not in the student's program, but who are full-time faculty of Washington University. This Committee is chaired by thesis advisor. The Committee is approved by the Program Coordinator after consultation with the student and his/her advisor. In certain cases it may be desirable to invite experts from outside the University to participate in the Committee. In that situation, it is the responsibility of the student and the student's advisor to identify sources of funds which could be used to pay for the outside examiner's expenses and to obtain the approval of the Program Director and the Dean of the Graduate School of Arts & Sciences prior to extending the invitation to such an examiner. The outside examiner should have a chance to peruse the detailed outline of the thesis approved by the Thesis Advisory Committee.

Generally, the Thesis Defense consists of an oral presentation by the student of his/her principal findings, open questions from the public, closed session questioning by the Thesis Examining Committee, and final deliberation by the Committee. The Committee will determine whether the written thesis, the oral defense, and the responses to questions both from the general audience and members of the Committee demonstrate that the completed work meets scientific criteria acceptable to the Committee. At the end of each defense, the Thesis Committee has three options: a) to accept the thesis as written and presented, b) to reject the thesis, and c) to recommend to accept the thesis only after appropriate additions, deletions or corrections are made. While options a and b are fairly clear-cut, there is likely to be a range of possibilities for c, from revising portions of the text and/or figures to requiring successful completion of additional experiments. For each Thesis Defense, the Graduate School provides the Committee with the oral examination approval form. For the thesis to be accepted, this document must be signed by members of the Thesis Committee.

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### **ADDITIONAL FORMS REQUIRED**

Approximately six months prior to a Thesis Defense the student should complete the Title and Scope Form. An "Intent to Graduate" (diploma order) form should also be submitted at the beginning of the semester during which the student anticipates graduating. Fifteen days prior to the defense, a letter must be sent from the Graduate Student Coordinator to the Dean of Arts & Sciences setting up the student's defense. Ten copies of the student's thesis abstract and vita accompany this letter, prepared according to the guidelines of the Graduate School.

### **Students' Responsibility to Meet Program Requirements**

Graduate students in the Program in Neuroscience are responsible for completing the requirements of the program in a timely fashion. In particular, the requirements for courses, preliminary examinations, thesis proposals, and thesis committee meetings are important components of graduate training and should be regarded seriously. In the event that a student has trouble meeting any requirement, he or she should request consideration of the situation by the Steering Committee, which may agree to waive or delay the requirement.

### **Publication and the Ph.D. Thesis**

There is no specific requirement for publication to receive the Ph.D. However, high quality, peer-reviewed publications are an important determinant for a student's career. Similarly, the process of writing and submitting a manuscript and responding to reviewer critiques is an essential part of a student's training. Therefore, the publication record is one of several important and appropriate measures to be used by a thesis committee in evaluating a Ph.D. candidate. It is generally expected that students will have submitted and/or published one or more first author manuscripts in peer-reviewed journals at the time of the defense.

### **Transfer From and To Outside Programs**

Students are free to transfer to the Program in Neuroscience from any other program in the Division of Biology and Biomedical Sciences provided they are "in good academic standing". Students who transfer will be expected to meet all of the normal requirements of the programs, although special exceptions may be granted in rare cases by the Steering Committee. Students in the Program in Neuroscience also are free to transfer from the program to another program, with the approval of both program directors and provided a qualifying examination committee or program steering committee has not recommended against the student continuing in the Ph.D. program. Transfer is accomplished most easily during the first year, but can be done at later times if necessary.

6/10/09