Guidelines to the Program in Neuroscience

The Neuroscience Graduate Program aims to provide students with a broad knowledge of neuroscience and the skills to perform research in a particular field. These guidelines have been written to assist students in making wise educational choices and to aid the faculty in advising them.

Program Directors and Coordinator
The Program Directors, Erik Herzog and Larry Snyder, and the Program Coordinator, Sally Vogt, are here for you. We strongly encourage you to meet with us whenever you have any issues you would like to discuss. Contact us at any time:

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1. Faculty Advisory Committee
All incoming students are advised by a committee of faculty members. The committee will meet with students each semester to assist in selecting courses, laboratory rotations and to monitor progress. Specific advising sessions are set up so that students 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 one on one with advisory committee member(s) of their choice, the directors, or other faculty members to discuss their choice of thesis lab and any other important decisions prior to entering the thesis lab.

2. Coursework
All students will enroll in the core curriculum of the Program. In the first year of graduate study, this consists of Cellular Neurobiology (Bio 5571) and Fundamentals of Molecular Cell Biology (Bio 5068) in the fall semester and Neural Systems (Bio 5651) and 1st Year Fundamentals (Bio 5646) in the spring semester. (MSTP students may opt out of either Cellular Neurobiology or Neural Systems.)
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In the second year, students take **Oral Presentation of Scientific Materials** (Bio 5565) and **Responsible Conduct of Scientific Research** (Bio 5011), both in the spring. Students often take additional courses that are specific to their fields of interest, often in association with a Pathway. Popular pathways include Cognitive, Computational and System Neuroscience (CCSN), Imaging Sciences (ISP), Markey Pathway in Human Pathology, and Interface in Psychology, Neuroscience and Genetics Training (IPNG). See Neuroscience Program website for specific details.

To meet the requirements of the program, each student must receive a grade of at least a “B-” in each of the six required core courses. Furthermore, the Graduate School requires that all students maintain a "B" average across all of their courses, both required and not required.

3. **Selecting a thesis advisor and lab: Laboratory Rotations**

Choosing a thesis advisor is the single most important decision required of a Graduate Student. The advisor is the head of the student’s thesis lab. The role of the advisor includes 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. 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. Note, however, that the hallmark of a successful Advisor is that they continue to provide advice and support (e.g., letters to funding agencies) for many years after the student has received their PhD. Therefore, before choosing to work together, both the student and putative advisor should think carefully about the compatibility of their research goals, mutual interests, career goals, work habits, and personalities.

The choice of a thesis lab is a negotiation between the student and faculty. Both parties must be in agreement. Typically, a student identifies a faculty member by meeting them in a class or on-campus lecture, by navigating to their lab website, or by being directed to them by a faculty advisor or by another student. The student then meets with the faculty member and, if both are in agreement, arranges for a laboratory rotation. During the rotation (see below for details), the student evaluates the faculty member and the faculty member evaluates the student. During or at the end of the rotation, either the student or the faculty member may initiate a conversation to express interest in or to join the lab. Often a provisional decision will be reached, with a final decision pending additional lab rotations (on the student’s part) or the resolution of other unknowns (on the faculty member’s part, e.g., decisions regarding funding or commitments from previous rotators).

Laboratory rotations are intended, first and foremost, to help students find a thesis advisor and scientific problem most suitable for their thesis research. Secondarily, rotations help acquaint students with the scientific method and learn new techniques. Finally, rotations introduce students to a range of approaches to science and to mentoring.

Students usually do three rotations. A rotation should in general last long enough for the student to gauge their level of interest in the particular lab, and no longer. Typically, this is two or three months, but in extreme cases could be as short as two weeks or as long as five months. The first rotation will typically take place in the summer preceding the first year or
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simultaneously with the Cellular Neurobiology and Fundamentals of Molecular Cell Biology courses in the fall semester. Students decide the schedule in consultation with the prospective mentor, though either party is free to end a rotation at any time. Please notify the Graduate Student Coordinator when you select your laboratory rotations, when you start them and when you end them.

During each rotation, the rotation advisor (typically the lab head) will confer regularly with the student and will evaluate them 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 should 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.

Ideally, students will select a thesis lab by the end of the second semester of the first year, and are expected to be settled in a thesis lab no later than September of the second year.

4. Qualifying Examinations

All graduate students in the Neurosciences Program are required to complete the Qualifying Examination at the start of the summer of their first year. An essential goal of this examination is to demonstrate the ability to critically examine and synthesize current data and conceptual issues in the chosen topic and to identify current limitations in experimental methodologies or experimental approaches. The exam consists of two parts: a written document and an oral examination. The written portion of the examination consists of a critical review of the current state of knowledge of the topic, including a statement of major unresolved issues, a description of primary data and interpretations. This should be the principal focus of the document. Most students propose specific experiments in addition to the critical review. If this is done, then these experiments must follow directly and logically from the review of knowledge and the identification of critical gaps. Students will be evaluated on how well motivated the experiments are, the extent to which each of the possible outcomes are described and interpreted, and how the results would advance the field. The writing should be in a style that can be understood by neuroscientists who are not specialists in the field.

In the oral portion of the examination, the student succinctly describes the major features of the written document and responds to questions from the examiners. The questions will probe the student’s depth of understanding of the topic and general knowledge from their first year of classes. Students are evaluated in their knowledge of the relevant background material, their ability to synthesize this knowledge into a coherent picture, to analyze this picture in order to identify important questions that remain, to formulate hypotheses regarding those questions, to design new experiments to test those hypotheses and to anticipate and interpret the potential results of those tests.

A major purpose of this examination is to evaluate the student’s qualifications to obtain a PhD in Neuroscience at Washington University. A second goal is to jump-start the thesis research. With regard to the second goal, students are strongly encouraged to have chosen a thesis lab prior to the start of the exam, and to select a topic that is related to their current or proposed research interests. They should read and reference primary papers in preparing their examination, and not rely on review articles; this should be documented in the bibliography.
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The written and oral components of the Qualifying Exam will be mid-May thru July 3rd; students should plan to remain in town for this entire period. Additional specifics will be provided before students begin to prepare for the QE. We note here two important points. First, the written document must be an original work. Any sections derived from or paraphrased from any source, published or unpublished (e.g., grants or grant proposals from the student’s thesis lab) must be clearly cited. Second, while students are encouraged to discuss (orally) their ideas with members of the exam committee, their thesis mentor, other faculty and students, no one may look at or comment on any written portions of their Qualifying Exam (including outlines, specific aims, drafts, final version). This prohibition includes exam committee members; for example, students may not send a committee member an email that contains their specific aims. The sole exceptions to this rule are non-science peers (e.g., asking a roommate or significant other not involved in science to proof-read) and members of the Danforth Campus Writing Center. Infractions of either rule will lead to immediate failure of the exam and possible expulsion from the Program.

Three to four faculty members will serve on each student’s exam committee. Thesis mentors, likely thesis mentors and close collaborators with a thesis mentor cannot serve on the examination committee. Students will have two weeks to finalize their topic selection with one of the Qualifying Exam Committee co-chairs. They will then have three weeks to prepare a 15 page, double-spaced document. One to three weeks after the document is turned in, an oral exam will be conducted. This will include a brief (15-20 minute) presentation from the student, along with detailed questions and discussion of the written document, including relevant background information and basic neuroscientific knowledge.

Students will be separately graded on the written and oral portions of the exam. Grades of "A" or "B" on both portions of the examination meet the requirements of the program. Grades of B- or below on both portions of the exam will constitute a failed exam. If a grade of “B-“ or less is received on just one portion of the examination, the student will receive a “provisional pass” and be given the opportunity to redo that portion (i.e., written or oral). 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 passing grade will be assigned. If the deficiencies have not been corrected, this will constitute a failure of the exam.

In the event of a failure, the student will be given an opportunity to retake the examination with a new committee and the option to change topics. 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 the decision 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. The procedure on the retake is otherwise exactly the same as the procedure for the initial exam: to pass the exam, a grade of “B” or better is required on both portions; if one passing and one failing grade is received, the student has an opportunity to retake the failed portion, typically within 4 weeks, to be evaluated by the same committee. The exact timing will be determined by the Qualifying Exam Chairs, and the entire process must be completed by December 17th of the student’s second year.
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A student who fails the Exam twice may not continue in the Program. If the student 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 Affair (PSA) Committee and, if warranted, the PSA Committee will hear that appeal.

5. Teaching
Effective communication of information and concepts is a critical skill for biomedical research scientists. While much of the teaching that scientists engage in is through one-on-one interactions with individuals in the laboratory, all scientists must be able to deliver lectures to a wide audience (from peers in the field to neophytes with a limited understanding of the nuances of the topic), and scientists in faculty positions will often teach courses to undergraduate and graduate students. Therefore, DBBS students must demonstrate the ability to effectively communicate complex ideas and concepts to groups of individuals at various levels of understanding. Students are encouraged to be proactive in nominating courses they would like to TA. Typical courses include, but are not limited to: Cellular Neurobiology, Neural Systems, Laboratory of Neurophysiology, and Principles of the Nervous System. To develop these critical communication skills, DBBS students will:

- Complete the TA orientation and three approved workshops offered by the Teaching Center by the end of the 2nd year of graduate studies
- Serve as a Teaching Assistant in a DBBS-approved graduate or undergraduate course for 1 or 2 semesters. The TA assignment will include giving lectures and/or leading lab sessions. The TA is usually completed in the 2nd year of graduate studies.
- Deliver a minimum of four oral presentations at journal clubs, seminars, scientific conferences, and retreats. Presentations given as part of a TA assignment, lab meetings or thesis committee meetings will not satisfy this requirement.

6. Transfers and other special circumstances

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” and that both Program Directors approve the transfer. 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 out of the program and into another program, subject to the rules and
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discretion of the Program into which they wish to transfer. Transfer is accomplished most easily during the first year, but can be done at later times if necessary.

In keeping with our philosophy of flexibility, individualized programs for students can be designed. These individualized programs may use components of the different Pathways or 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.

7. **Thesis Committee**

The Thesis Advisory Committee advises the student on many aspects of their graduate student career. The Committee advises the student on general and experimental aspects of completed and proposed work. This includes the overall scope of the Thesis, including the appropriateness of particular experimental Aims; on particular experiments and methodologies; on the best places to publish particular findings, etc. The Committee helps the student shape their Thesis Proposal and then either approves or rejects it. The Committee advises the student about an appropriate time to defend the Thesis, and then either approves or rejects the Defense. The Committee provides advice on ancillary issues, including career advice such as what fellowships to apply to, when and where to apply for post-doctoral positions, and how to pursue alternative career paths. The Committee, and especially the Committee Chair, may provide letters of reference for the student throughout their career. Finally, the Committee, and especially the Committee Chair, will serve as a counselor and an advocate for the student in those rare cases in which there is disagreement between the student and Thesis Advisor or between the student and the Program.

The Committee consists of a Chair, two or more additional DBBS faculty and the student's Thesis Advisor. The committee members, including the chair, are chosen by the student, with advice from the Thesis Advisor. Members of the Committee should be chosen for their expertise in relevant research areas and for their willingness to contribute advice. The composition of the Committee can change to reflect changes in the student's scientific direction. Students are encouraged to add an additional member from outside Washington University who will not be required to attend every meeting (expenses would be the responsibility of the Thesis Advisor). The Committee must be chaired by a faculty member who is not the student's advisor. Students should choose their Chair carefully, based on their shared research interests and a sense that the Chair will represent the student’s interests. It is wise to choose as Chair a senior faculty member (Associate or Full Professor) who the student has a good rapport with and who is not too closely tied to the Thesis Advisor. The Chair is charged with documenting the comments from the Committee to the student and to the Program at the end of each Committee meeting. Committee members decide on the date for the next meeting and edit the written progress evaluation after each Thesis Committee meeting.

Students should form their Thesis Advisory Committee within 4-6 months after a thesis lab has been chosen. At least one (“pre-thesis-proposal”) meeting should be held by the end of the second year. (M.D./Ph.D. candidates will frequently choose their thesis lab early in their first year, and they should form and meet with a Thesis Advisory Committee early in the second year.) The Committee should continue to meet with the student roughly every six
8. **Thesis Proposal**

The Thesis Proposal should be prepared generally according to the format of an NIH research grant, although it may be substantially longer and it will often include an extended “background” section. Having completed several Grant-Writing workshops and the First Year Fundamentals Grant-Writing course, and having written a Qualifying Exam on their topic, students are well prepared to undertake this task. In preparing a Thesis Proposal, students should seek assistance from the members of their Thesis Committee and Thesis Advisor. The Thesis Committee will usually instruct the candidate on an appropriate time to Propose. Preliminary data are not required for a Proposal, although preliminary findings will be available in many cases. However, the candidate should have an excellent grasp of their chosen field, including the current state of knowledge, the areas in which gaps exist, and how their work will fill one or more of those gaps. The Qualifying Exam will often provide a starting point for this background knowledge, but the student’s knowledge will have grown substantially by the time of the Proposal. The written document will be given to the members of the Advisory Committee at least two weeks prior to the Proposal meeting. At the meeting, the student should present their Thesis Aims, relevant background, any preliminary findings, and an outline of the proposed experiments. Possible outcomes should be described, along with interpretations of each of these possible outcomes and the effect they will have on the field. The student and the Thesis Committee will discuss the strengths, weaknesses and alternatives of the proposed experiments. Note that the Proposal outlines future experiments. It is not a contract; the direction of research may change as the project evolves.

At the end of the meeting the Committee will recommend acceptance, acceptance with modifications, or rejection. The Committee's evaluation will be communicated to the student and Program Coordinator, emphasizing the student's capacity to conceive a meaningful biomedical research project and to plan its execution. In the event of a rejection, the student must repeat the Proposal, at a time to be determined by the Committee.

For Ph.D. candidates, the Thesis Proposal should be successfully presented no later than the end of the fifth semester of residency. For M.D. /Ph.D. students, the thesis proposal should be successfully presented before the end of the second year of graduate study. With written permission from the Thesis Committee Chair, and provided a pre-proposal meeting has taken place, these deadlines may be delayed for up to an additional six months.

**Conflict of Interest Policy**

DBBS requires the Thesis Advisor to complete a Conflict of Interest statement at the time of the Thesis Proposal. Research funding from sources that have intellectual property interests in the research, or in which the Principal Investigator (PI) has personal financial interest, may create a real or perceived conflict of interest, given the dual roles of the PI 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.
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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 viewed at: http://www.dbbs.wustl.edu/curstudents/DBBSStudentPolicies/Pages/ConflictofInterestPolicy.aspx

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 Neuroscience Program Steering Committee, which may agree to waive, alter or delay the requirement.

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.

INTENT TO GRADUATE
Approximately six months prior to a Thesis Defense the student should submit an "Intent to Graduate" (diploma order) form 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. A copy of the student's thesis abstract and vita should be prepared and initialed by the student’s thesis advisor.

DETAILED THESIS OUTLINE
The student will prepare a written outline of major experimental observations and conclusions at least four months prior to the expected thesis defense date. This outline will be presented by the student at a Committee meeting and then discussed by the Committee and student. The Committee may recommend additional work (and possible additional meetings), or recommend that the student begin to write the Thesis and prepare for the Thesis Defense.
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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 thesis must be in the hands of all members (including outside members) of the Thesis Examining Committee at least 14 days prior to the scheduled defense or the thesis defense will be rescheduled at the Committee's earliest convenience.

The Thesis Examining Committee, at the time of the defense, typically includes the members of the Thesis Advisory Committee, but unlike that committee, it must have at least five members: the thesis advisor, three faculty members affiliated with the Neuroscience Program, and at least one faculty member with an affiliation from outside of the Neuroscience Program. Four members must be full-time faculty of Washington University. The fifth may be a full-time faculty member from outside Washington University. The Committee is approved by the Associate Dean of the Graduate School of Arts & Sciences. Note that the Thesis Advisor must arrange to cover any expenses related to an outside examiner.

Unlike prior Thesis Committee meetings, the Thesis Defense is chaired by the Thesis Advisor. 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 with the student excused from the room. The Committee will determine whether the written thesis, the oral defense, and the responses to questions demonstrate that the completed work meets scientific criteria for a Ph.D. in Neuroscience. The 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 particular changes are made. These changes may range from textual modifications to additional experiments. In the event of changes, the Committee may require that just one or all members sign off on the revised Thesis.

PUBLICATION AND THE PH.D. THESIS

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. Although there is no specific requirement for publication to receive the Ph.D., 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 criteria that may be used by a Thesis Committee in evaluating a Ph.D. candidate.

10. CAREER DEVELOPMENT

We believe it is important to not only train students to be the best scientists possible, but also to assist them in career planning either within or outside of academia. The resources for this include, but are not limited to, the MyIDP AAAS individual development tool, introduced to the students at orientation; the University’s Career Resources Center; student-led groups such as the Biotechnology and Life Sciences Advising Group (BALSA), designed to provide students with real-world experience in the life science industry; the BioEntrepreneurship Core, designed to help students think about how to commercialize their science; science outreach in the form of the Young Scientist Program (YSP) and ProSPER (Promoting Science Policy, Education, and Research); and counsel from the student’s own Thesis
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Advisory Committee. Please see DBBS Student Resources for more information (http://www.dbbs.wustl.edu/resources/Pages/Organizations-Student-Groups.aspx).

11. Academic standing

The Program, Division and the Graduate School have multiple requirements for Graduate Students to remain in good academic standing. Failure to maintain these standards may result in being placed on academic probation. Academic probation serves three purposes. It serves to (1) explicitly warn the student of his or her status, provide the student with clear guidelines of the performance that will be necessary to return to good standing, and (3) provide the student with reasonable time to meet these expectations.

In particular, students may be placed on academic probation if they: (1) receive a grade of “C” or lower in a core academic course, or who fail to maintain an overall grade of “B” or better; (2) have not joined a lab by September 1 of their second year; (3) have not formed a Thesis Committee by the end of their second year; (4) have not attempted a Thesis Proposal by the end of their third year, or have not successfully completed a Thesis Proposal by December of their fourth year; (5) fail to meet with their Thesis Advisory Committee at least once per year; (5) receive one or more reports of unsatisfactory progress from their Advisory Committee; (6) do not successfully defend their Thesis. (Note that academic probation does not apply to the Qualifying Exam, which has its own guidelines and timetable for remediation of poor performance.)

We stress that the purpose of academic probation is not punitive. It is a mechanism to help establish firm milestones through each students training, and to ensure follow through by all parties towards those milestones.

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