

Guide for Graduate Students (Sep 2014)

The program in **Cell and Developmental Biology** is the graduate program of the Department of Cell Biology, Neurobiology and Anatomy at MCW. The purpose of this program is to provide state of the art research training leading to a Doctor of Philosophy degree in Cell and Developmental Biology. This is accomplished through a combination of coursework, seminars, journal clubs, and "hands-on" laboratory research in the laboratory of a faculty mentor. This guide is intended to provide students with a list of requirements and a general time-line for completion of requirements for the PhD degree. To maintain full-time status, graduate students are required to take a minimum of 6 credits in the summer, 9 credits in the fall and 9 credits in the spring semesters. Accrual of at least 60 graduate course credits is needed for the PhD degree. Students are required to meet with their thesis committee starting in the third year of training. The student will write a 1-2 page summary of the meeting, detailing what was presented and discussed, and any bench-marks or time-lines that were established. This should be approved by the Thesis Mentor and then distributed to the thesis committee. As part of the training process, it is also required as a minimum that the student thesis research culminate in publication of at least 2 articles in peer-reviewed journals for which the student is first author. One should be accepted for publication, if not already in press, while the other can at the "submitted" stage.

First Academic Year:

Most students enter the **Program in Cell and Developmental Biology** after matriculation through either the **Interdisciplinary Program in Biomedical Sciences (IDP)** or the **Neuroscience Graduate Recruitment Program**. These are graduate recruitment programs that involve faculty from multiple departments at MCW, and each program has a set of core course requirements and laboratory research rotations for first year graduate students. Other students enter from the **Medical Student Training Program (MSTP)** after completing the first 2 years of medical school and laboratory research rotations.

For students in the **Interdisciplinary Program in Biomedical Sciences**, the 1st year requirements are:

Biochemistry of the Cell (4 credits) - Fall
Molecular and Cellular Biology (4 credits) - Fall
Techniques in Molecular and Cellular Biology (2 credits) -Fall
Introduction to Biomedical Research (2 credits) – Fall & Spring
Classical and Molecular Genetics (4 credits) - Spring
Mechanisms of Cellular Signaling (4 credits) - Spring

For students in the **Neuroscience Graduate Recruitment Program**, the 1st year requirements are:

Biochemistry of the Cell (4 credits) - Fall
Molecular and Cellular Biology (4 credits) - Fall
Fundamentals in Neuroscience (4 credits) – Spring
Mechanisms of Cellular Signaling OR Classical and Molecular Genetics OR
Nuclear Magnetic Resonance OR Functional MRI Contrast Mechanisms (4 credits)
Neuroscience Journal Club (1 credit)

For **MSTP students**, the 1st year in graduate school begins after they complete the first 2 basic-science years of medical school, identify a thesis advisor and join the program in the summer semester. Some students join in the fall semester because they are completing a clinical course in the summer. Those starting in the summer proceed on the same schedule as the IDP and Neuroscience students for completing the PhD qualifying requirements. MSTP students entering in the fall are delayed 1 or 2 months in meeting the qualifying milestones.

By **June of the 1st year**, **IDP and Neuroscience students** are expected to have chosen a faculty advisor in whose laboratory they will conduct research that will form a basis of their PhD dissertation. Choice of an advisor in the **Program in Cell and Developmental Biology** places the student in this program. However, the qualifying examination for IDP students is administered by IDP. The qualifying examination for **Neuroscience and MSTP students** is administered by the Graduate Committee of the Cell and Developmental Biology program. All students are required to take a 3 credit course during Fall term when the qualifying examination is occurring.

Students electing Cell and Developmental Biology are required to take 9 hours of additional coursework beyond that completed during the first year. Typically, this consists of three 3-credit courses.

Summer Term:

Readings and Research (5 credits)
Ethics and Integrity in Science (1 credit)

Second Academic Year:

Fall Term:

Students from the **IDP** are required to take
One elective course* (3 credits)

*Note Neuroscience Program students typically chose either Cellular Molecular Neurobiology OR Advanced Systems Neuroscience OR Special Topics in Neuroscience
Readings and Research (to Complete the Qualifying Examination) (to add to 9 credits total)

Winter/Spring Term:

Students take an elective course (3 credits)
Research Ethics Discussion series (1 credit)
Students register for Readings and Research (5 credits)

Summer Term:

Readings and Research (6 credits)

Qualifying Requirements and Examination Committee:

During the second year, students must pass a qualifying examination that is required for continuation of work toward the PhD.

Interdisciplinary Program in Biomedical Sciences

Students entering the Cell and Developmental Biology Graduate Program through the Interdisciplinary Program in Biomedical Sciences complete this requirement as part of the Interdisciplinary Program. An examination committee is formed by the IDP during the Fall semester, and the student prepares a Qualifying Research Proposal or "mock grant proposal" to test an original hypothesis that the student has generated. The mock proposal becomes the focus of an oral examination by the committee. The oral examination will cover broad topics selected from the 1st year curriculum.

The coordinator of IDP mock proposal examinations will announce two informational meetings to discuss the mock proposal, format of the oral examination and what should be covered in the oral examination. One meeting will be for students and their thesis advisors, and the other will be for faculty members serving on the oral examination committees.

- *Typically* the Written Abstract is due Monday of the 2nd or 3rd week of September: Check with the Chair of the IDP examination committee for specifics.
- *Typically* the Written Qualifying Proposal is due Monday of the last week of October: Check with the Chair of the IDP examination committee for specifics.
- Oral qualifying examination is scheduled during the first two weeks of December.

Neuroscience Program

Students entering the Cell and Developmental Biology Graduate Program through the Neuroscience Program undertake the qualifying examination administered by the Graduate Committee. The format and scheduling for the Cell and Developmental Biology Program examination is as follows:

During the Fall Semester of 2nd Year, the student consults with their thesis mentor to identify a suitable, hypothesis-driven topic for the qualifying proposal. By the 3rd week of September a written abstract is submitted to the Graduate Program Director. The abstract is one page and should convey the general topic, the main hypothesis, and the experimental frame work. The Departmental Graduate Committee then identifies a chairperson of the qualifying examination committee. The four-member committee will include the chair, the thesis advisor, a faculty member from the student's department and another faculty member that may be from a different department. The two faculty members will be chosen based on their expertise related to the topic of the qualifying proposal. For Neuroscience students, the Chair of the qualifying examination will schedule a meeting with the student to go over the format and expectations of the qualifying proposal and exam. During proposal writing, the student may approach faculty outside their committee to discuss research ideas. When the proposal is completed, the student submits a PDF version to the Chair of the examination committee. However, the thesis advisor will take on the role of the primary mentor and provide overall guidance for the mock proposal. During the Oral exam, the advisor participates in the questioning phase, but does not answer for the student or vote on the student's performance and is excused during voting deliberations.

Due dates for the topic abstract is the Friday of the 3rd in September. The proposal is due the last Friday of October. The exam will be scheduled during the last three weeks of November or in December.

Medical Sciences Training Program

Students entering the Cell and Developmental Biology Graduate Program through the Medical Sciences Training Program are to fulfill the following PhD qualifying requirements. Within 6 months after entering the graduate program the student should form their dissertation advisory committee (as defined below). Within 9 months after entering the graduate program, MSTP students should complete a hypothesis-driven Qualifying Research Proposal (described below) or submit an NRSA F30 fellowship. Once completed, the MSTP student defends this proposal as an Oral Examination. The thesis advisory committee serves as the examiners for the qualifying proposal and oral defense. Through this process, the thesis advisor, with input from the dissertation advisory committee, will identify any additional coursework necessary to fill potential knowledge gaps required to prepare the student for ongoing research and training.

Specific Guidelines for the Qualifying Research Proposal (written requirement for qualifying examination):

- The written qualifying proposal (also called the "Mock" proposal) will be a maximum of 4500 words (Arial 11). It should be formatted either in the old NIH grant style or the current NIH grant style:
 - **Old NIH grant format**
Specific Aims (1 page)

Background and Significance (~2 pages)
Experimental Approach (~2 pages)
Anticipated Outcomes and Alternative Approaches (~1 page)
References and Figures (not included in the word count)

Current NIH grant format

Specific Aims (1 page)
Research Strategy (6 pages)
A. Significance
B. Innovation
C. Approach

- The hypothesis-driven research question is to be generated by the student, and it cannot be the anticipated thesis hypothesis.
- The specific aim(s) should directly address the hypothesis. The number of specific aims should be as few as possible. The project should not just yield descriptive data, but should address underlying mechanisms.
- The experiments proposed should be clearly described from both a technical and conceptual standpoint. Well-designed controls should be included.

Guidelines for the Oral Component of the Qualifying Examination (IDP and Neuroscience students):

- Each exam will begin with a 20- to 30-minute uninterrupted presentation by the student. Students may use overheads or other visual aids to facilitate their presentation. While a brief background may be given, the bulk of the presentation should be focused on describing the experimental design and how it addresses the hypothesis/specific aim.
- After the presentation, the remainder of the exam will consist of interactive discussion and questions. In addition to the specific areas of the proposal, students will also be expected to be familiar with related areas, including methods, experimental design and controls, interpretation of possible alternative outcomes, and alternative approaches to the proposed experiments. A major component will involve questions directed at topics discussed in the background sections. *The student is strongly advised to review their coursework, especially covered-topics related to the proposal.*
- There is no absolute time limit on the length of the exam. Past experience indicates that the length of the exam averages 2 hours.
- When completion of the Examination requires submission of a Revised Proposal, the examination committee shall set the completion date, taking into account the amount of work required. Minor revision can be accomplished within 1-2 weeks.

Dissertation Committee:

For IDP and Neuroscience students, the PhD dissertation committee will be assembled by the end (July 1) of the second year. For MSTP students, the PhD dissertation committee should be assembled within 6 months of starting in the graduate program. The purpose of the committee is to provide guidance and evaluate the student's progress to a thesis that meets committee approval and fulfills the dissertation requirement for the doctoral research degree. The Graduate School expects the student to be trained in the 7 core competencies consisting of 1) biomedical knowledge within program area, 2) research skills, 3) interpersonal and communication skills, 4) professionalism, 5)

analytical and creative critical thinking, 6) lifelong learning and improvement, and 7) interdisciplinary commitment (collaboration).

The committee will consist minimally of five members. Some committees add a sixth member. The members are the advisor serving as chairperson plus four additional faculty. The committee must include at least two members of the Department of Cell Biology, Neurobiology & Anatomy and one faculty must be a primary member in this Department. One member from another graduate program at the Medical College is encouraged. In addition, one member from outside the institution is also encouraged. The student obtains the approval of the graduate program director for the committee composition and completes the thesis committee form of the Graduate School by getting the signatures of the advisor and the program director. The student then submits the completed form, including an NIH-style biosketch for each member, to the Graduate School Dean for approval of the thesis committee. Forms are available at <http://www.mcw.edu/graduateschool/formslandingpg.htm>

Following approval of the proposal, the student is expected to have full committee meetings as necessary. ***A meeting of the committee to review progress is required at least once annually. Following each meeting, it is required that the student circulate to the members a summary of the meeting including accomplishments, concerns, expectations, and time-lines. The Graduate School requires completion of an annual progress form to be completed by the Thesis advisor.***

PhD Dissertation Proposal and Advancement to Candidacy for the PhD Degree:

The student must prepare a dissertation proposal describing the research to be conducted for the dissertation. The proposal should be in either old or current NIH format and NOT exceed 7000 words (Arial 11 recommended), excluding figures, legends and references.

The first draft of the proposal should be completed, and the first meeting of the dissertation committee should occur by January 15th of the third year (IDP and Neuroscience students) or within 17 months of starting the PhD program (MSTP students). The student is encouraged to get the individual input of members of the committee during preparation of the proposal. Approval of the proposal can occur only after a meeting of the thesis committee. The meeting format is expected to involve a presentation of a draft proposal by the student followed by continuation of questions and discussion. The student should demonstrate knowledge in the thesis research area, and the ability to formulate a testable hypothesis. Based on committee input, typically refining the hypothesis and focusing the aims, defining the methods, experimental and control groups and addressing adequacy of the statistical power and methodology, the proposal is revised to meet committee approval. If the student meets these expectations they will be advanced to candidacy for the PhD degree. If the student does not meet these expectations, the committee can make a alternative recommendations.

The approved dissertation proposal accompanied by a completed proposal approval form should be submitted to the Graduate School office by February 1 of the third year (IDP and Neuroscience students) or within 18 months of starting the PhD program (MSTP students). After approval by the Graduate School, the student is advanced to candidacy for the PhD degree.

While the approved proposal is a required, critical milestone demonstrating the ability of the student to define a focus area of research that advances the field, it is not a contract list of tasks that once completed guarantees awarding of the doctoral degree. Typically, the original aims are modified by consensus as experimental findings emerge.

For IDP and Neuroscience students, an F31 NRSA (updated to reflect current research results and experimental directions) may be substituted. For MSTP students, an F30 NRSA (updated to reflect current research results and experimental directions) may be substituted. For either fellowship application, NIH guideline should be followed.

Third and Fourth Years:

In year 3 or 4, the graduate student presents his/her research-in-progress findings in a 40-50 minute seminar format. Examples include, but are not limited to, the following: CBNA Departmental Seminar, Developmental and Stem Cell Biology Group Meeting, or Neuroscience Group Seminar. This seminar requirement should be approved by the Graduate Program Director.

Fall and Winter/Spring Terms:

Ethics and Integrity in Science (1 credit, on-line course)
Readings and Research (8 or 9 credits)

Summer Term:

Readings and Research (6 credits)

Fifth Year:

Fall and Winter/Spring Terms:

Reading and Research (9 credits)

Completion of the Doctoral Dissertation:

A completed copy of the final dissertation must be provided to each committee member at least 2 weeks in advance of anticipated defense date.

The Dissertation Defense date must be scheduled with committee approval and advertised campus-wide 30 days prior to the public defense. The Graduate School has specific requirements for the public defense announcement (cover page, abstract and curriculum vitae) described on the website <http://www.mcw.edu/graduateschool/currentstudents/Handbook/CompletionofPrograms.htm> - [Defense Program](#)

Following the public dissertation defense seminar and questions from non-committee attendees, the entire committee meets in closed session for further questioning to determine if the student passed the defense. Before the examination day, the student should contact the Graduate School to determine which forms are to be completed by the committee and by the student to satisfy the dissertation requirements. The forms are available on the Graduate School website at <http://www.mcw.edu/graduateschool/formslandingpg.htm>