Guide for Graduate Students
(updated September 2023)

The graduate program in **Cell and Developmental Biology (CDB)** provides state of the art research training in cellular based biology, including impacts on organismal development, homeostasis, and disease. It is hosted by the Department of Cell Biology, Neurobiology and Anatomy, but includes faculty mentors across multiple Departments and Centers of the Medical College of Wisconsin. Successful completion of this program leads to a Doctor of Philosophy (PhD) degree. This is accomplished through a combination of coursework, seminars, journal clubs, and "hands-on" research in the laboratory of a faculty mentor. This guide is intended to provide students with a list of requirements and a general timeline for completion of requirements for the PhD degree. Students are required to meet with their thesis committee starting in the second year of training – typically the first committee meeting is the qualifying exam. Following each committee meeting the student will write a 1-2 page summary detailing what was presented and discussed, any benchmarks or timelines that were established, and summarizing scholarly activities undertaken. A template of the **CDB Committee Meeting Summary and Development Plan** is available on the CDB website. The summary should be approved by the thesis mentor and then distributed to the thesis committee. Starting in year two, students should participate in two hours of annual Responsible Conduct of Research (RCR). RCR training is provided twice yearly in the Fall and Spring. As part of the overall 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. At minimum, one should be accepted for publication, if not already in press, while the other can at the "submitted" stage.

Requirements for PhD Program:

Graduate School requirements can be found on "PhD Completion checklist" on the Graduate School website.

Summary of CDB Requirements

- Attendance and participation in program seminars and scholarly activities
- Annual Thesis Committee Meeting and Summary Report in years 2+
- Annual RCR training in years 2+
- Presentation of research in years 3+
- First authorship of two papers published in peer-reviewed journals.

Credit Requirement and Distribution

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. Credits are granted by successful completion of coursework, Journal Club, or Readings and Research.

All students in CDB are required to take 9 hours of additional coursework either beyond the first semester (DA, IDP, NDP) or after the first two years of medical school (MSTP). Typically, credits are earned by completing advanced elective courses. However, up to 3 credits can come from journal club participation. In addition, courses offered outside of MCW are encouraged. Consult with the Program Director prior to taking outside courses so that appropriate credits can be awarded.

First Academic Year:

Students enter the CDB after matriculation through either the **Interdisciplinary Program in Biomedical Sciences (IDP)**, the **Neuroscience Doctoral Program (NDP),** the **Medical Student**

Training Program (MSTP), or through **Direct Admission (DA)** into CDB**.** The IDP and NDP 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. Students in MSTP matriculate after completing the first 2 years of medical school and laboratory research rotations. Direct Admission students directly join a CDB faculty members laboratory without research rotations.

*For **IDP, NDP, and DA** students, the 1st year requirements are:*

Fall Semester
Fundamentals of Biological Sciences I - VI
Techniques in Molecular and Cellular Biology
Professional Development

Spring Semester
Elective(s) (IDP, DA)
Fundamentals of Neuroscience (NDP)
Statistics
Professional Development I

Summer Semester
Writing a Scientific Paper course
Ethics & Integrity in Science course
Consider establishing the thesis advisory committee (see Thesis Advisory Committee section)

By March of the 1st year, IDP and NDP 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 who is part of the graduate program in Cell and Developmental Biology places the student in this program.

*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 spring proceed on the same schedule as the IDP and NDP students for completing the PhD qualifying requirements. Some MSTP will take the qualifying exam in spring of first year. MSTP students are required to take the Ethics & Integrity in Science course.

Second Academic Year:

Fall Term:
Writing an Individual Fellowship course
Professional Development II (16291)
Neuroscience Journal Club (NDP students)
Responsible Conduct of Research (RCR) (unless planned to be taken in Spring)
Readings and Research
Establish Thesis Advisory Committee (by Sept 15th)
Qualifying exam (see next section)

Winter/Spring Term:
Students may take an additional elective course
Responsible Conduct of Research (RCR) (unless already taken in Fall)
Research Ethics Discussion series
Readings and Research

Summer Term:

Readings and Research

Qualifying Examination:

Students must pass a qualifying examination that is required for continuation of work toward the PhD.

The qualifying examination for **IDP students** is administered by IDP. The qualifying examination for **DA, NDP and MSTP students** is administered by CDB. For each program the exam is evaluated by the thesis advisory committee. For IDP, there is an additional IDP-representative examiner, who serves are Chair of the examination. For DA, NDP and MSTP students the Chair of the examination is a thesis advisory committee member appointed by the Director of CDB (Brian Link). If a non-MCW faculty has already been selected to the thesis advisory committee, they can be invited to participate virtually in the exam but will not have an official vote. In the case of split decision, the Chair serves as the tie-breaker.

Due Dates:
Due dates for IDP with be set and communicated by the IDP.
For NDP and DA students, the proposal is due two weeks prior to the exam. The exam will be scheduled during the last three weeks of November or in December. For MSTP the qualifying exam should be completed within 9 months after entering CDB. The qualifying exam can be scheduled as soon as the thesis committee has been established. The Program Coordinator (Amy Ludwig-Kubinski) will assist with scheduling.

Specific Guidelines for the Qualifying Research Proposal:
The written qualifying proposal should follow the guidelines of the current NIH F grant style or a similar format in the case the student intends to submit the proposal to different funding agency.

<u>Current NIH F grant format</u>
Specific Aims (1 page)
Research Strategy (6 pages, Arial 11pt font)
A. Significance
B. Innovation
C. Approach

- The hypothesis-driven research question can be, and typically is, 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, and rigor and reproducibility should be incorporated.

Guidelines for the Oral Component of the Qualifying Examination:

- 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.

- If the examination results in a conditional pass and requires revisions, the examination committee shall set the completion date, taking into account the amount of work required.

- If the examination results in a fail, the student can retake the qualifying exam in the Winter/Spring term of year two.

- Upon successful pass of the exam, the Chair of the qualifying examination is responsible for completing the Chairs Report for the Qualifying Exam form. This should be submitted to the Program Coordinator of CDB (Amy Ludwig-Kubinski).

Thesis Advisory Committee:

For IDP, NDP, and DA students, the thesis advisory committee will be assembled by September 15 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 3 general qualities (Scholarship, Innovation, Professionalism) that relate to 3 core competencies (Knowledge & Skills, Communication, and Management & Leadership).

The committee will consist minimally of five members. Some committees add a sixth member. The members are the advisor serving as chair plus four additional faculty. The committee must include at least two Graduate Faculty members of CDB. One member from another graduate program at the Medical College of Wisconsin is encouraged. Also encouraged is one member from outside the Institution. The thesis mentor may choose to either serve as the chair of the committee or appoint another member to fulfill this role. Once set, 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 (Brian Link). The completed form should be submitted to the Program Coordinator of CDB (Amy Ludwig-Kubinski).

Students are expected to have full committee meetings as necessary, but at least once annually after the qualifying exam. Prior to the start of each meeting, the student will be asked to leave the room so that the committee can address progress and potential concerns in a candid manner. Following each meeting, it is required that the student complete a **CDB Committee Meeting Summary and Development Plan.** A template for this summary is available through the CBNA website.

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

The student must prepare a dissertation proposal describing the planned research to be conducted for the dissertation. The proposal document is typically an updated version of the qualifying exam proposal and in the same format. However, in some cases the thesis project may have changed significantly, and the dissertation proposal will be essentially a new document. The dissertation proposal is typically presented for approval at the next thesis advisory committee meeting following the qualifying exam. Approval is documented with the **Outline Approval Doctoral Dissertation form** and must be completed at least 18 months before the Dissertation Defense. This form should be returned to the Graduate School and the Program Coordinator of CDB (Amy Ludwig-Kubinski).

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.

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, Cardiac Biology and Heart Failure Meeting, Developmental and Stem Cell Biology Group Meeting, or Neuroscience Group Seminar.

Eighteen months prior to anticipated thesis defense, the student should file an **Outline Approval Doctoral Dissertation form** (found on Graduate School website) detailing the final thesis project. Typically this is done as part of the second thesis committee meeting during the third year.

Fall and Winter/Spring Terms:

Any relevant elective course(s)
Responsible Conduct of Research (RCR)
Readings and Research
Thesis advisory committee meeting

Summer Term:

Readings and Research

Fifth Year and beyond (if necessary):

Fall and Winter/Spring Terms:

Responsible Conduct of Research (RCR)
Reading and Research
Thesis advisor committee meeting

Completion of the Doctoral Dissertation:

Sixty days prior to defense, the Departmental Administrator should be informed of plans for post-doctoral studies in the thesis lab as this is considered a “staff hire”.

Six weeks prior to defense, candidate should contact the Graduate School for an appointment to review forms and procedures related to Graduate School requirements for defense and graduation.

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 and within the Graduate Handbook. 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.