

## CURRICULUM OF THE PLANT BIOLOGY GRADUATE GROUP

### A. Undergraduate Preparation

For both the M.S. and Ph.D. degree programs, a level of scholastic development equivalent to that attained by obtaining a Bachelor's degree in biological sciences from a recognized college or university is required. Preparation should be substantially equivalent to courses offered at UCD, as indicated by the example courses below. Deficiencies in these areas can be made up after admission to the graduate program, preferably during the student's first year of class work. The student's Guidance Committee (see below) is responsible for identifying additional preparation courses that must be taken. If the Guidance Committee cannot agree on the extent of necessary preparation course work, the Executive Committee can be petitioned to make the final determination.

<u>Subject</u>	<u>UCD Equivalent</u>
Physics-Chemistry-Mathematics	
Inorganic Chemistry, 3-Qtrs/2-Sem	Chemistry 2A,B,and C
Organic Chemistry, 2-Qtrs/2-Sem	Chemistry 8A and B
Introductory Physics, 2-Qtrs/2-Sem	Physics 7A and B
Calculus, 2-Qtrs/1-Sem	Mathematics 16A and B
Introductory Statistics, 1/2 yr	Statistics 100 or AMR 120
Biochemistry, 2-Qtrs/1-Sem	BIS 102 and 103
Genetics, 1-Qtr/1-Sem	BIS 101
Intro. Plant Physiology 1-Qtr/1-Sem	PLB 111 or 112
Cell & Mol. Biology, 1-Qtr/1-Sem	PLB 113 or BIS 104
Ecol., Systematics & Evolution, 1-Qtr/1-Sem	EVE 100, 140, 141, PLB 108 or 117
Plant Development & Structure, 1-Qtr/1-Sem	PLB 105 or 116

### B. Graduate Preparation

Both Ph.D. and M.S. students are required to take the following courses. All required courses for which a letter grade is offered must be taken for a grade and not Pass/Fail or Satisfactory/Unsatisfactory.

- Students should be conversant with major concepts in all areas of specialization in the graduate group, i.e., Cell and Developmental Biology, Environmental and Integrative Biology, Molecular Biology, Biochemistry, and Genomics, and Systematics and Evolutionary Biology. The undergraduate courses listed in Section A provide a foundation for the student's breadth of knowledge in plant biology.

For additional breadth, students are required to take the core courses for the Plant Biology Graduate Group PBI 200A-Fall, 200B-Winter, and 200C-Spring. These comprise three 5 unit courses taught at the graduate level that survey areas of

specialization in the group. Students are expected to complete the core courses during their first year.

If the student and his/her Guidance Committee feel that additional background is called for, they should select additional courses from the specialty area lists.

2. During their first year, students are required to enroll in Plant Biology 292, the Plant Biology Graduate Group Journal Club, each quarter that it is offered. In this course, students will read and discuss research articles covering a breadth of topics in plant biology. Students will also receive training in reading and analyzing the primary literature. In addition, students will be exposed to topics that they will likely encounter during their graduate career such as authorship, grantsmanship, teaching, and the qualifying examination.
3. Students are required to take Plant Biology 290B (Seminar) each quarter during their first two years in the program or until they pass the Qualifying Examination or graduate. PBI 290B is a 1 unit course in which student listen to research seminars presented by scientists usually from other universities and institutes. Attendance at the seminars is mandatory.
4. Students are required to take the seminar discussion course accompanying Plant Biology 290B (tentatively designated Plant Biology 290A) each quarter during their second year or until they pass the Qualifying Examination or graduate. The course provides students with the opportunity to discuss the research of the invited seminar speaker in the accompanying PBI 290B course and to meet with the speaker.

### **C. Advising**

An entering student will confer with his/her Graduate Adviser prior to the first quarter in the program to design an initial course of study. On the basis of this meeting, the Graduate Adviser, in consultation with the Master Adviser, will establish a Guidance Committee for the student that will consist of the Graduate Adviser and one other faculty member in the Group in the student's area of specialization. Once identified, the faculty who will become the major professor will also become a member of this Committee. A third Committee member will be appointed for students who enter the M.S. program under Plan II. The Guidance Committee will meet during the student's first, third, and fourth quarters in the program to advise the student on a course of study that will rectify deficiencies in preparation, include courses to fulfill the requirements of the Group, and provide a coherent preparation for the dissertation research or comprehensive examination. The study plan must be approved at each meeting by signature of each member of the Guidance Committee.

**D. The M.S. Degree in Plant Biology**

Students will study for the M.S. degree in one area of specialization in Plant Biology: Cell and Developmental Biology, Environmental and Integrative Biology, Molecular Biology, Biochemistry, and Genomics, and Systematics and Evolutionary Biology. Students may choose either of the two plans described in the Announcement of the Graduate Division. The requirements of the two plans are as follows.

1. **Plan I.** A minimum of 30 units of upper division and graduate courses, including Graduate Preparation classes (see Section B.) and a thesis are required. At least 12 of the 30 units must be in graduate courses, and at least 6 of these units (or two classes) must be in the student's area of specialization. A maximum of 9 units of research (Plant Biology 299) may be applied toward the total unit requirement, but these may not be used to satisfy the requirement for 12 graduate units. Courses are selected with the advice and concurrence of the Guidance Committee. The Major Professor serves as Chairperson of the Thesis Committee, which is appointed to advise the student in his or her research and to pass on the merits of the thesis. Students must present an exit seminar on their thesis research, usually in the Tuesday student seminar series, Plant Biology 291.
2. **Plan II.** A minimum of 36 units of upper division and graduate course work, a comprehensive final examination, and a written report on the research accomplished are required. At least 18 of the 36 units must be earned in graduate courses, and at least 9 of these units (or three classes) must be in the area of specialization. Each student must take a minimum of 3 and may take up to 9 units of research (Plant Biology 299) that will be counted towards the 36 unit requirement. A maximum of 6 of these research units may be used to satisfy graduate units other than those required in the area of specialization. A written report (10 pages minimum, plus references and table or figures) on the research accomplished must be submitted to the instructor in charge of the 299 units, as well as your master exam committee for approval. The Guidance Committee is responsible for directing each individual student's program. A faculty committee of three is appointed by the Graduate Advisers Committee, at the request of the student, to conduct a comprehensive final examination. The oral exam must cover general plant biology and at least one additional specialty area beyond the candidate's own area of specialization. A committee member from the student's area of specialization will normally serve as chair.

**E. The Ph.D. Degree in Plant Biology**

Students will study for the Ph.D. degree in one area of specialization in Plant Biology, i.e., Cell and Developmental Biology, Environmental and Integrative Biology, Molecular Biology, Biochemistry, and Genomics, and Systematics and Evolutionary Biology. The Plant Biology Graduate Group operates under Plan B, as described in the Announcement of the Graduate Division.

**Study plan**

In addition to the general requirements for all graduate students in the group, Ph.D. students are required to take a minimum of three additional courses (totaling at least 9 units). The student may take three courses selected from the course list for their area of specialization (see Advising Checklist). Alternatively, students may take two courses from the course list for their area of specialization and one course from a different area of specialization. Courses must be approved by the Guidance Committee. The expectation is that all three courses will be at the graduate level, although selected upper division undergraduate courses in the course lists are acceptable. No course may be taken to satisfy more than a single requirement.

**Guidelines for Ph.D. Qualifying Exam**

Students of the Plant Biology Graduate Group (PBGG) are required to pass an oral qualifying examination before being advanced to candidacy for the Ph.D. in Plant Biology. The qualifying examination is to be held before the end of the seventh quarter in residence and after the student has completed all PBGG course requirements. The student's Guidance Committee is responsible for deciding when the student is eligible and sufficiently prepared for the qualifying examination.

**Purpose of the Qualifying Examination.** The purpose of the exam is (1) to evaluate the breadth and depth of the student's knowledge and understanding of Plant Biology, and (2) to assess the student's intellectual capability and preparedness for conducting a productive thesis research, which should identify and address a significant question in Plant Biology and culminate in a dissertation of high quality.

**Qualifying Examination Committee.** Five faculty member of the PBGG constitute the Qualifying Examination Committee. Two committee members represent the student's area of specialization, one of whom will normally serve as the chair of the Qualifying Examination Committee. The chair is expected to ensure that the student receives a fair examination. The student may suggest eligible members to serve on the Qualifying Examination Committee. The members are nominated by the Graduate Advisers Committee, which may choose other faculty of the PBGG as deemed appropriate. Committee members will be appointed by Graduate Studies in accordance with the Academic Senate regulations. The Qualifying Examination Committee may not include the major professor who will serve as chair of the student's Dissertation Committee after advancement to candidacy.

**Format of the Qualifying Examination.** The Qualifying Examination will consist of three parts and will cover three of the four areas of specialization of the PBGG: (1) presentation and defense of the thesis research proposal, which will include a broader discussion of questions from the candidate's area of specialization; (2) an oral examination of the candidate's knowledge in general Plant Biology, which will be conducted at a level comparable to content and depth of the undergraduate preparation for the major and of the core course curriculum; and (3) a discussion of two topics from two areas in Plant Biology that will be selected by the student and will be different from the candidate's own area of specialization. These two topics must be selected from a list of nine topics that are equivalent to the descriptors of the four major areas of specialization of the PBGG (underlined): (a) Cell and Developmental Biology; (b)

Environmental and Integrative Plant Biology; (c) Molecular Biology, Biochemistry, and Genomics; (d) Systematics and Evolutionary Biology.

The candidate will be expected to distribute a written dissertation research proposal to the chair of the Qualifying Examination Committee at least two weeks prior to the oral examination. If necessary, the chair may make recommendations on improving the quality of the proposal before it will be distributed by the student to the other members of the committee at least one week prior to the examination. The student will prepare an oral presentation. In addition to the chalk/white board, the student may utilize visual aids to efficiently convey essential information as deemed necessary (limited to the display of information that is difficult to draw on the board). The presentation should not exceed 20 min, excluding intermittent discussions. The exam may not last longer than 3 hours.

**Dissertation Research Proposal.** The purpose of the dissertation proposal is to concisely introduce, describe and justify the proposed thesis research. The scope and format of the proposal should be similar to that of a formal application for funding (e.g., application for a doctoral fellowship). The student is expected to show mastery in scientific writing, in the critical analysis of preliminary data, and in the synthesis of information derived from the relevant literature. The dissertation research proposal (single-spaced, 12 pts font size, 1 in. margins) should be organized into five sections and should not exceed 5 pages for sections 1-4, including figures.

- (1) **General objective and specific aims.** State briefly the overall objective of your dissertation research in its broad context and list the specific aims to achieve this goal. (less than half a page).
- (2) **Background and significance.** Describe the background and rationale for your thesis research. Critically evaluate the existing knowledge relevant to your research and identify an important question or unsolved problem that your thesis research will address in order to advance the field. State concisely the significance of the proposed research and relate the specific aims to the long-term objective. (approx. one page).
- (3) **Preliminary data.** Briefly describe research that has been conducted and that is relevant to the proposal. Clearly state your contributions to this research (approx. one page).
- (4) **Experimental plan and research methods.** Outline the experimental design and the procedures to be used to accomplish the specific aims of your thesis research. Include the means by which data will be collected, analyzed and interpreted. Discuss the potential difficulties and limitations of the proposed procedures as well as alternative approaches to achieve the major objective. Provide a tentative timetable of your research. (two to three pages).
- (5) **References.** Consult a major journal in the field of plant biology and follow its style of citation. Each citation must include the names of all authors, title of the article, name of the journal or book, volume number, page numbers, and year of publication. (no more than two pages or 25 references).

**Qualifying Examination Evaluations.** PBGG students are strongly advised to meet with committee members to discuss their expectations for the Qualifying Examination. There are three possible outcomes: pass, not pass, and fail. *Pass* advances the student to candidacy for the Ph.D. *Fail* means that the student is disqualified. *Not pass* means that the student is required to retake all or part of the examination or to satisfy another requirement (e.g., take a specific class, assist a specific class as a TA, etc.). If requested, the second examination is to be scheduled at the earliest possible date deemed to be appropriate by the committee. The second examination will be administered by the same Qualifying Committee. Only two outcomes are possible for the second examination: *pass* or *fail*. The Qualifying Committee should make every effort to reach a unanimous decision. Split decision will be referred to Graduate Studies for a final decision.

### **Advancement to Candidacy and Dissertation Committee**

Following successful completion of the Qualifying Examination, the student is eligible to Advance to Candidacy for the Ph.D. degree. A Dissertation Committee is formed, consisting of the major professor (chair of the committee) and two others (usually PBGG members). The Dissertation Committee is selected by the student and major professor as soon as the qualifying examination is passed. A special form (Advancement to Candidacy form) and a small fee must be submitted to the Graduate Studies office for this purpose.

The function of the Dissertation Committee is to guide the research project to its completion and to approve the final thesis. Dissertation Committee meetings should be held frequently to insure that the student and the Committee share common expectations and goals at all times. The Committee members are expected to be full partners in the conduct of the research project in all of its phases and not mere signatures on the final dissertation. Students should consider it their responsibility to arrange Dissertation Committee meetings at least once each year although more frequent meetings are encouraged.

Following completion of the Qualifying Examination, satisfactory progress towards the Ph.D. degree will be based on three criteria. First, students must meet with their Dissertation Committee at least once each year. Second, the Committee members must agree that the student is making adequate progress towards their Ph.D. degree. Third, students must report their progress once each year in the Plant Biology 291 Student Seminar usually held each Tuesday at noon.

### **Dissertation**

The Ph.D. degree is awarded only to individuals who have made a significant, original contribution to knowledge in a field of Plant Biology through independent research. The form of the dissertation is variable, but generally is the equivalent of approximately three full publications in a reputable scientific journal. The dissertation sometimes consists of copies of published work, plus unpublished chapters; in other instances, it consists of several chapters, which will be published later. Regardless of the specifics of its composition, the format and content of the dissertation must be approved by all three Dissertation Committee members before it is filed with the Graduate Studies office. Generally, students will need additional copies of the dissertation for the department office and the members of the Dissertation Committee. Detailed instructions on the format of the dissertation and abstract (published in "Dissertation Abstracts")

may be obtained from the Graduate Studies office. The deadline for submission can be obtained from the same office.

### **Guidelines for Dissertation or Thesis Seminar**

Students must present a dissertation seminar (Ph.D.) or Thesis Seminar (M. Sc. Students), which will formally recognize the importance and academic value of this event for the student and the graduate group.

**Scheduling.** The Dissertation/Thesis Seminar should be given during the final stages of thesis writing. The seminar will remain part of the Tuesday-Noon Seminar series but will be scheduled on a quarterly basis to allow for better coordination of both the two requirements (thesis and seminar).

**Advertising.** The seminars will be advertised in *Dataline* as “PBGG Dissertation Seminars” to enhance their visibility and to possibly attract a broader audience.

**Evaluation.** All members of the Dissertation Committee should attend the seminar, provide feedback about the oral presentation and discussion, and convey a sense of academic accomplishment to the student. Similar formal feedback should be given to all student presentations of the Tuesday-Noon Seminars.

### **Normative time**

The normative time for completion of a Ph.D. program in Plant Biology is five years and two years for the M.S. program.

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