CURRICULUM, 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. Limited deficiencies in these areas can be made up after admission to the graduate program, preferably during the student's first year of classwork. The student's guidance committee (comprising the academic adviser and the nominated major professor) is responsible for identifying additional preparation courses that must be taken. They will decide, based on the student's previous course work, what make-up work will be required. If the Guidance Committee cannot agree on the extent of necessary preparation course work, the Plant Biology Executive Committee can be petitioned to make the final determination.

<table>
<thead>
<tr>
<th>Subject</th>
<th>UCD Example</th>
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<tbody>
<tr>
<td>Physics-Chemistry-Mathematics</td>
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<tr>
<td>Inorganic Chemistry, 1 year</td>
<td>Chemistry 1A, B and C</td>
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<tr>
<td>Organic Chemistry, 1/2 year</td>
<td>Chemistry 8A and B</td>
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<tr>
<td>Introductory Physics, 1 year</td>
<td>Physics 5A, B and C</td>
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<tr>
<td>Biochemistry, 1/2 year</td>
<td>BIS 102, 103</td>
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<tr>
<td>Calculus, 1/2 year</td>
<td>Mathematics 16A and B</td>
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<tr>
<td>Introductory Statistics, 1/2 year</td>
<td>Statistics 13</td>
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<tr>
<td>Biology</td>
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<tr>
<td>Genetics, 1/2 year</td>
<td>BIS 101</td>
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<tr>
<td>Plant Physiology + lab, 1 year</td>
<td>PLB 111, 112 &amp; 111L</td>
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<tr>
<td>Cell &amp; Molecular Biology, 1/2 yr</td>
<td>PLB 125, BIS 104</td>
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<tr>
<td>Ecology, Systematics &amp; Evolution,</td>
<td>EVE 100, 140, 141, PLB 108,</td>
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<tr>
<td>1/2 year</td>
<td>117</td>
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<tr>
<td>Plant Development &amp; Structure,</td>
<td>PLB 105 or 116</td>
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<td>1/2 year</td>
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B. Graduate preparation

Both M.S. and Ph.D. students will be required to take the following:

1. One quarter of Plant Biology 290A (Faculty Research Seminar). Every student will be expected to take this class during their first fall quarter.

2. One quarter of a participatory seminar is required each year until passing the qualifying examination (minimum of two). Whenever possible and appropriate, these should be Plant Biology 291 seminars. One quarter of a non-participatory, listening seminar is required each year in
residence.

3. Students should be conversant with major concepts in all specialty areas (e.g., Cell and Molecular Biology; Ecology, Systematics and Evolution; Integrative Plant and Crop Physiology; and Plant Development and Structure). The undergraduate courses listed on the first page of this document, as preparation for each area, will provide part of the necessary background for specialty areas outside the one in which the student is enrolled.

In addition, two courses (6 units), at least one at the graduate level (beyond those required as undergraduate preparation above), are required for breadth. These two courses must be taken in residence during the graduate program. They are to be taken in any specialty area(s) outside the one the student is enrolled in.

If the student and his/her adviser feel that additional background is called for, they should select additional courses from the specialty area lists (pp 4-6). Specialty Area Concept Lists, available from advisers, will help define the minimum limits of adequate preparation for each area.

4. Three courses (9 units) [four courses (12 units) in Development and Structure], at least 2 (6 units) at the graduate level [3 courses (9 units) in Development and Structure], must be selected from the course list of the student's specialty area (pp 4-6). For the M.S., two courses (6 units) [three courses (9 units) in Development and Structure] at the graduate level must be selected from the course list of the student's specialty area.

C. The M.S. degree in Plant Biology

Entering students will meet with their guidance committee (comprising the nominated major professor and the student's adviser) to design a course of study which will rectify deficiencies in preparation. Students will study for the M.S. degree in one specialty area of Plant Biology. Students may choose either of the two plans described in the Announcement of the Graduate Division. The requirements of the two plans are:

Plan I. Thirty units of upper division and graduate courses and a thesis. At least 12 of the 30 units must be in graduate courses, and at least six 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 12 required graduate units. Courses are selected with the advice of the graduate 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 a seminar on their thesis research.

**Plan II.** Thirty-six units of upper division and graduate course work and a comprehensive final examination. 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 on the research accomplished must be submitted to the instructor in charge of the 299 units. The guidance committee is responsible for directing each individual student's program. A faculty committee of three is appointed by the Executive Committee, on the recommendation of the guidance committee to conduct a comprehensive final examination. The oral exam must cover at least one additional specialty area beyond the candidate's own area of specialization. A committee member from the student's own area will normally serve as chair.

**D. The Ph.D. degree in Plant Biology**

Students will study for the Ph.D. degree in one specialty area of Plant Biology. The Plant Biology group operates under Plan B, as described in the Announcement of the Graduate Division.

1. **Study plan**

Entering students will meet with their guidance committee (comprising the nominated major professor and the student's adviser) to design a course of study which will rectify deficiencies in preparation, include the requirements of the Group and research specialization, and provide a coherent preparation for their qualifying examination and dissertation research. Each student will be required to take a minimum of 3 courses (totaling at least 9 units) in his/her area of specialization, of which 2 (6 units) must be at the graduate level. No course may be taken to satisfy more than a single requirement.

2. **Qualifying examination**

Students for the Ph.D. degree in Plant Biology are required to pass an oral qualifying examination. This is normally completed by the end of the 7th quarter in residence. Candidates are expected to show mastery of the breadth of knowledge in Plant Biology and the capacity for critical analysis and synthesis of information. The student's Guidance Committee is responsible for deciding when the student is prepared for the examination; all required courses must have been completed. The qualifying
examination committee comprises five members of the group, one from each area of specialization in Plant Biology, and an additional one from the student's chosen specialization, who will normally serve as chair of the committee. The student may suggest members of the committee, but the committee is nominated by the Executive Committee, which may choose other members of the Group as deemed appropriate, and appointed by the Graduate Division. The purpose of the qualifying examination is to evaluate the breadth of the candidate's understanding of Plant Biology and to verify his/her preparedness for conducting a productive research program which will culminate in a quality dissertation.

The examination will include a discussion of a research proposal prepared by the student. This proposal will be described in a 1-3 page written statement and distributed to the committee prior to the examination.

3. 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 dissertation must be approved by a research committee composed of the major professor (chair of the committee) and two others (usually PBGG members). The research 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 research committee is to guide the research project from its initiation to its completion. Research committee meetings should be held frequently to insure that the student and the committee share common expectations and goals at all times. The student should consider it their responsibility to arrange these meetings at least twice each year. The research 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.

The form of the dissertation is variable, but generally is the equivalent of 3 or 4 full publications in a reputable scientific journal. The composition 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 research committee members before it is filed with the Graduate Studies office. Generally, you will need additional copies of the dissertation for your department office and the members of your research committee. Detailed instructions on the
format of the dissertation and abstract (this is published in "Dissertation Abstracts") may be obtained from the Graduate Studies office. The deadline for submission can be obtained from the same office.

All students are expected to present a final exit seminar on their dissertation research. The Plant Biology Graduate Group office should be consulted to arrange for this presentation. Students in the final stages of writing may take part in graduation ceremonies prior to submitting their dissertation by making special arrangements with the Graduate Studies office.

4. Normative time

The normative time for completion of a Ph.D. program in Plant Biology is five years.

E. Curricula and courses within specialty areas

In developing study plans, students and guidance committees must follow curriculum requirements for the student's area of specialization.

1. Cell and Molecular Biology

**MS Plan I:** A minimum of 2 courses (totaling at least 6 units); one from the Cellular Courses list, one from the Molecular Courses list (see below).

**MS Plan II:** A minimum of 3 courses (totaling at least 9 units); one from the Cellular Courses list, one from the Molecular Courses list, and one laboratory course from any of the three lists below.

**Ph.D.** Minimum of 3 courses (totaling at least 9 units); one from the Cellular Courses list, one from the Molecular Courses list, and one from any of the three lists below.

**Cellular Courses:** MCB 221D, 231, 241, 250; PBI 208, 214, 217, 218A, 218B, 231, 231L; Cell and Developmental Biology 200, 205; Environ. Horticulture 226

**Molecular Courses:** Biological Chemistry 217, 222; MCB 121, 161, 170L, 221C 262; PLB 125; PBI 227, 228, 229; PBG 209; Genetics Graduate Group 223; Microbiology 215, 215L, 250, 260; Plant Science 140; Vegetable Crops 220, 220L; Plant Pathology 210

**Other Courses:** MCB 120L, 110, 111, 126, 221A, 221B; Microbiology 162; Chemistry 107A, 107B, 108, 150; Genetics Graduate Group 221; Vet Microbiology and Immunology 126, 126L; Medical Microbiology 107
2. Ecology, Systematics and Evolution

**MS Plan I:** A minimum of 2 courses (totaling at least 6 units) from the list below.

**MS Plan II:** A minimum of 3 courses (totaling at least 9 units) from the list below.

**Ph.D.:** A minimum of 3 courses (totaling at least 9 units) from the list below.

**Ecology:** Atmospheric Science 105 or 133; PLB 117, 121; PBI 210, 211; EVE 144, 149; Ecology, 206, 207; Entomology 225; Geography 117, 173; Plant Pathology 208; Plant Science 101, 126, 135; PBG 296; Range Science 134; Soil Science 208; Water Science 104 or 201

**Systematics:** PLB 102, 108, 118, 119; Environmental Horticulture 107; Range Science 100

**Evolution:** EVE 100, 140, 240, 243; PLB 116; PBG 203, 205, 209; Genetics Graduate Group 221; PBI 219

3. Integrative plant and crop physiology

Students whose specialty is integrative plant and crop physiology should ensure that they have adequate preparation in quantitative experimental subjects (UCD equivalent indicated) such as biometry (Ag. Science & Mgmt. 150, Agronomy 205, 206), quantitative analysis (Chemistry 5), physical chemistry (Chemistry 107 A/B, 110 A/B) and biochemical laboratory and instrumentation methods.

**MS Plan I:** A minimum of 2 courses (totaling at least 6 units) from the list below.

**MS Plan II:** A minimum of 3 courses (totaling at least 9 units) from the list below.

**Ph.D.:** A minimum of 3 courses (totaling at least 9 units) from the list below.

**Suggested Courses:** Agronomy 232, 233, 234; MCB 126; Environmental Horticulture 241; PBI 201, 202, 208, 210, 216, 225; Plant Science 101, 102, 112, 112L, 122, 126, 135; Pomology 203, 205; Soil Science 208; Water Science 201

**General Courses:** Ag. Science & Management 150; Agronomy 205, 206; Chemistry 107A/B; MCB 120L; PBI 211; Soil Science 102

4. Plant Development and Structure

Students whose specialty is plant development and structure
have interests and conduct research at all levels of biological organization. This includes the traditional areas of plant anatomy and morphology as well as research using genetic and molecular techniques to study spatial and temporal regulation of gene expression. Students with this specialization will utilize a variety of techniques in their research programs, including microscopy, and are encouraged to acquire broad training in modern laboratory techniques.

**MS Plan I and II:** A minimum of 3 graduate courses (totaling at least 9 units) from the A and B lists below; one of which must be PBI 220.

**Ph.D.:** PBI 220 and 3 additional courses (totaling at least 12 units) from the A and B lists below (one additional course from the A list and two courses from the B list.

**A List:** PBI 220, 227, 229; MCB 252, 253; or Pomology 210

**B List:** MCB 252, 253; PBI 208, 214, 220, 227, 229; Pomology 210; Viticulture 210

**C List:** PLB 105, 116, 118, 119; PBI 220; Pomology 210

Students in other areas of specialization should consider courses on the C list above to fulfill breadth requirements in the area of plant development and structure.

This form supersedes all forms - discard all previous forms.

6/96