Oklahoma State University

Multidisciplinary Ph.D. Program

in

Plant Science

PROGRAM COORDINATOR
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PROGRAM DESCRIPTION

Among the most pressing and timely challenges to modern plant science are determining how plants function in both natural and modified ecosystems. Among these issues are how plants respond to and resist pests, pathogens, and environmental stresses. Additional practical issues include the modification of plants to satisfy the global needs for food, fiber, fuel and medicine.

Traditionally these issues were investigated only through research in individual disciplines. Realizing the need for an integrated approach to plant science research, Oklahoma State University's faculty in the departments of, Biochemistry & Molecular Biology, Plant Biology, Ecology, and Evolution, Entomology & Plant Pathology, Horticulture & Landscape Architecture, Microbiology & Molecular Genetics, Natural Resource Ecology & Management, and Plant & Soil Science have formulated a multidisciplinary Ph.D. degree program in Plant Science.

The Plant Science PhD Program at Oklahoma State University provides the opportunity for exceptional students to undertake coursework and research tailored to their individual career goals. In this program, students can experience the many facets of plant science which affords them the flexibility to seek employment in a variety of settings. With the Advisory Committee's guidance, students develop a program in one of three specialization areas:

Cellular & Molecular
Organismal
Ecological

Even though students will develop a specialization area, they are expected to develop a sound foundation across the disciplines of plant science. For example, a student specializing in the Cellular and Molecular area will also be required to have a basic understanding of Organismal and Ecological plant sciences.

You will find in this booklet information on how to apply for admission to the Plant Science PhD Program. Included is information about the requirements for admission and the degree requirements. For a list of the participating faculty in the Plant Science Ph.D. Program, please, see the PBEE web site (http://plantbio.okstate.edu/people_research/faculty.html) or the other participating departments listed in the Plant Science Ph.D. Guidelines. If you identify a faculty member (or members) with whom you would like to study, you should directly contact them prior to applying. Please consider visiting the Oklahoma State University campus to gain familiarity with potential advisors, the program, and our excellent facilities. Travel support for an exploratory visit to OSU may be available – please inquire.

PARTICIPATING DEPARTMENTS

Biochemistry and Molecular Biology
Dr. John Gustafson, Head
Departmental Contact
Dr. Andrew Mort
246 Noble Research Center
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Microbiology and Molecular Genetics
Dr. Tyrrell Conway, Head
Departmental Contact
Dr. Wouter D. Hoff
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Plant Biology, Ecology, & Evolution
Tom Wikle, Interim Head
Departmental Contact:
Dr. William Henley
301 Physical Sciences
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Natural Resource Ecology and Management
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Departmental Contact
Dr. Stephen W. Hallgren
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Entomology and Plant Pathology
Dr. Phillip Mulder, Head
Departmental Contact
Dr. Steve Marek
127 Noble Research Center
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stephen.marek@okstate.edu

Plant and Soil Sciences
Dr. Jeff Edwards, Head
Departmental Contact
Dr. Michael Anderson
368 Agriculture Hall
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Horticulture and Landscape Architecture
Dr. Janet Cole, Head
Departmental Contact
Dr. Neils Maness
358 Agricultural Hall
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niels.maness@okstate.edu

APPLICATION PROCEDURES

The steps in the application process are (1) identify advisor and funding; (2) submit paperwork; and (3) approval by the home department, Plant Science Ph.D. Program and Graduate College. All required documents are to be submitted to the Graduate College via an interactive web site: https://www.applyweb.com/oksugrad/. It is also advisable to email unofficial copies of documents directly to your prospective mentor (faculty member) so they and the home department may begin considering your credentials prior to completion of the application process. Required documents include:

- An official Graduate College application for admission and the non-refundable application fee. The current fee is indicated in the application materials.
- Original official transcripts for all undergraduate and graduate course work.
- Graduate Record Examination (GRE) scores. The Department code for the Plant Science Degree Program is 0112 and should be used on your GRE application.
- A statement of purpose and goals that should include relevant information about your background, research interests, and career objectives. It should be tailored toward the specific faculty member(s) with whom you wish to work.
- A resumé (curriculum vita) summarizing your academic and professional accomplishments.
- Three letters of recommendation must be directly uploaded to the application software. You must provide referees' contact information and the system will email them directly. Be sure to ask them before listing them as references!
- An abstract of the Master of Science degree thesis, if applicable.
- [International students only] A minimum TOEFL score of 570 (paper-based) or 88 (web-based). A minimum S score of 26 is required to be eligible for a teaching assistantship.
- [International students only] A financial affidavit in accordance to OSU requirements.

Once the application is complete it will be forwarded to the Coordinator of the Plant Science Ph.D. Program for review. It is the applicant's responsibility to ensure that all application materials arrive at OSU in a timely manner.

Finding an Advisor and Financial Assistance

To gain full acceptance into the Plant Science Ph.D. Program, the applicant must search out a suitable advisor for her or his academic study. As this program's faculty is housed in different departments, you will need to contact the faculty with whom you have a common interest. Contact the faculty member(s) you think is/are best qualified to advise you as a graduate student. You should seriously consider visiting our campus to acquaint yourself with the Plant Science faculty, program, and excellent research facilities. Financial support needs to be arranged with the advisor and home department.

Evaluation of Application

The applicant's credentials are evaluated in the home department of the faculty who will serve as advisor. Upon making a decision, the potential advisor informs the Program Coordinator, who forwards the admission recommendation to the Graduate College. The Graduate College notifies the applicant of these results by letter.

MATRICULATION AND GRADUATION

Advisory Committee

An Advisory Committee must be formed. It is to the advantage of the student to form the Advisory Committee as early as possible. The Advisory Committee should consist of graduate faculty members who will facilitate the research and monitor the academic progress of the student. Each student must schedule and attend meetings with his or her committee at least once each year to discuss course and research progress. In the rare instance that a committee member becomes unavailable permanently or for a substantial period of time (departure from OSU, retirement, or protracted illness), a substitute may be named with approval of the student and the other committee members. The substitution may be temporary (e.g. for the oral exam) or permanent, depending on the circumstances. Temporary committee member absences (e.g. sabbatical) from meetings or exams may be accommodated by conference call, Skype, etc.

Plan of Study

A Plan of Study must be developed by the end of the first academic year. The Plan of Study will indicate how core and specialization requirements of the chosen area will be met and how the credit hour requirements for graduation will be fulfilled.

One course can satisfy more than one requirement. For example, a student in the "Cellular and Molecular" specialization area may take Community Ecology and have it count for both the General Ecology and the Diversity requirement in the Ecology area.

The remainder of the course work in the Plan of Study must be approved by the Advisory Committee and Program Coordinator. These courses should reflect the breadth of plant science, the student's goals, and the acquisition of strength in one of the three specialization areas. The Plant Science Program Coordinator will review the student's Plan of Study and may consult the Steering Committee. The student, in conjunction with her/his Advisory Committee, may petition the Coordinator and Steering Committee for a change or waiver of any requirement.

Annual Progress Report

At least once a year each student should provide a written progress report. The Advisor responds to the annual progress report with a written evaluation. This annual appraisal and development procedure is meant to ascertain that student and Advisor communicate routinely about progress and possible deficiencies, and keep members of the Advisory Committee and the Department Head of the student’s home department updated on the student’s progress.

On or before November 15, the Program Coordinator reminds Advisors to obtain an annual progress report from their graduate students. The following time line is recommended: On or before first week of class in January, the student submits the report to her/his advisor. On or before last day of February, the Advisor writes an annual appraisal and development report

and meets with the student to discuss progress, strengths, goals, etc. On or before March 15, the Advisor sends a copy of the report (student report and vita, faculty letter) to the Program Coordinator, the members of the student's Advisory Committee, and the Department Head of the student's home department.

The format of the annual progress report is at the Advisor's discretion. It is recommended the Advisor provides the student with a short list or a few keywords, to help her/him cover all relevant topics of an annual report correctly reflecting the student's progress towards graduation as well as possible deficiencies. The student should present her/his progress with course work as well as research, mention special achievements in the last 12 months, such as published manuscripts or conference presentations, and briefly describe the next goals on the path towards graduation. A current CV should be attached to the annual progress report.

Core and Specialization Requirements

The Plant Science Program is designed to provide a mechanism for students from a diverse range of backgrounds (in plant science or other disciplines) to achieve an advanced level of training in the plant sciences. For this reason, no specific courses are required for entrance into the program. Students with little plant science course background will work with their Advisory Committee to develop an appropriate Plan of Study to address deficiencies.

Core Degree Requirements

Seminar (2 credits): Research proposal and final research seminar, to be taken within the home Department.

Diversity (6-8 credits): One course in each of the two specialization areas not selected. Courses must be approved for graduate credit, and at least one course must be taken in residence. As course offerings are often dynamic, specific courses available to fill the diversity requirement are not indicated in this document. However, on pages 8-10 is a list of courses that the student and Advisory Committee may consider for fulfilling these requirements.

Quantitative Skill (3-4 credits): Statistics, biochemical methods, computer language, experimental design, quantitative analysis, etc.

Courses in the following areas are required but may be omitted if taken previously at the undergraduate or graduate level as determined by the Advisory Committee:

- Ecology
- Genetics
- Plant Anatomy and Morphology
- Plant Classification and Taxonomy
- Plant Physiology

Teaching Component

A specific teaching activity is not required by the Plant Science Ph.D. Program, but is strongly encouraged. This should be developed by the student in consultation with the Advisory Committee and home department.

Graduate College Requirements for a Ph.D.

To receive a Ph.D. degree students must enroll in a total of 90 credits beyond the B.S./B.A. or 60 credits beyond the M.S./M.A. Note that the Graduate College does not recognize some international M.S./M.A. degrees, so students should enquire before applying. The Graduate College recommends that 75 percent of courses in the Plan of Study be at the 5000-6000 level. Research hours will be taken at the 6000 level within the home Department.

SPECIALIZATION AREAS

Students in each Specialization Area must meet the Core Requirements described under Matriculation and Graduation. In addition, students in each Specialization Area will meet the following requirements.

Cellular and Molecular

Research must address an issue or problem within plant cellular and molecular biology.

At least nine hours of classes approved for graduate credit and designated within the specialty area of Cellular and Molecular Plant Science are required. Courses taken previously may be counted toward this total, but only if they were approved for graduate credit. The nine hours must include the following:

1. In addition to the requirement for an undergraduate level Plant Physiology course (see Matriculation and Graduation), an additional graduate (5000-6000 level) course in Plant Physiology is required (such as BOT 5214, 5423; HORT 5133, 5433; PLP 5724).
2. Plant Biochemistry (such as BIOC 6793)
3. Molecular Genetics (such as GENE 5102)

Organismal

Research must address an issue or problem within the area of organismal plant science.

At least nine hours of classes approved for graduate credit and designated within the specialty area of Organismal Plant Science are required. Courses taken previously may be counted toward this total, but only if they were for graduate credit.

Two quantitative skills classes (rather than the general Core Requirement's specification of one) are required. At least one of these must be a statistics course (STAT 5013 or equivalent).

Ecological

Research must address an issue or problem within the area of ecological plant science.

At least nine hours of classes approved for graduate credit and designated within the specialty area of Ecological Plant Science are required. Courses taken previously may be counted toward this total, but only if they were for graduate credit.

Two quantitative skills classes (rather than the one specified in the general Core Requirements) are required; these are statistics (STAT 5013 and 5023 or equivalent).

RULES FOR THE CONDUCT OF PLANT SCIENCE DOCTORAL QUALIFYING EXAMS

Introduction

The purposes of the qualifying exam are to determine whether the student possesses adequate knowledge of the claimed area of expertise and can articulate answers in a professional manner. The preparation of a student for the qualifying exam (and dissertation/thesis defense) is a shared responsibility between the student and the student's advisor. However, the risk of not complying with the following rules lies solely with the student; the Advisory Committee bears no obligation to lower its standards to allow a student who does not meet its expectations to graduate; the award of a degree is not an entitlement.

Any deviation from these rules must be requested by the committee Chair and approved by the Program Coordinator.

Timing

The doctoral student must take the qualifying exam after the majority of disciplinary course work (excluding research hours) has been completed.

Responsible Parties

The student's committee Chair is responsible for the administration of the qualifying exam.

Student Consultation with Committee Members

The student should consult with the committee Chair before providing notification that s/he is ready to take the exam. The student also should consult with other committee members to ascertain their exam performance expectations.

Student Notice of Intent to Take the Exam

If after consulting with committee members the student believes that s/he is ready to take the qualifying examination, the student should notify the Advisory Committee in writing and send a copy of the notice to the Program Coordinator. The Chair consults with other committee members to develop a list of questions and formulate an examination schedule. The Chair must then inform the student of the schedule and specific examination format.

Components of the Examination

Both written and oral exams are required of all doctoral students. No exceptions are possible.

Written Examination

The written examination must include questions from all committee members. Each committee member should provide two to four essay questions and/or problems (each can contain multiple parts) to the committee Chair. Each question should require the student to provide a short paper (1-5 pages for each question), including citations to relevant literature. The format of the examination (open- versus closed-book) and the time line (days provided between sets of answers) is at the discretion of the committee members. The student should be aware that different committee members may prefer different exam formats and allow different materials to be used. It is recommended that the committee Chair provides to all committee members all of their questions and the student's answers.

Grading

Each question on the written exam should be graded by the committee member who authored the question. If one or more answers are not satisfactory the committee member may give the student the chance to correct/improve the answers. This option can only be given once (by each committee member) and should clearly define the amount of time allowed, usually not more than a few days. The committee member grades each question as "pass" or "no pass" and forwards the grades, with comments, to the committee Chair. The Chair will review the grades and comments and send a summary of the comments and the consensus grade to the student and the other committee members.

If a student earns a "no pass" on any question, the committee Chair should consult with other committee members and reach consensus on whether to allow the student to proceed to the oral portion of the exam. If the student is not allowed to proceed, then the Chair will issue a failing grade on the written exam and communicate this to the student along with the grades and comments provided by committee members. The student must be given a choice to retake the exam in its entirety or withdraw from the program. If the student wishes to retake the exam, s/he must wait at least three months. The Chair must inform the Program Coordinator that the student did not pass the written exam and indicate whether the student wishes to retake the exam or withdraw from the program.

If the committee decides that the student should proceed to the oral exam, then the Chair will so inform the student and provide the grades and comments offered by committee members.

Oral Exam

All committee members must participate in the oral examination. Recommended Format: The oral exam should be approximately two hours and held in executive session (not open to the public). The committee Chair is responsible for the conduct of the meeting.

Scheduling

The oral examination should be held between 2-4 weeks after receipt of the results and comments on the written exam. The student should consult with the committee Chair about reserving and preparing the room prior to the beginning of the exam.

Grading

At the conclusion of the questioning session, the student should be asked by the committee Chair to leave the room. The committee members should then engage in a discussion to reach consensus on whether the student passed or failed the exam. In order to pass the exam, no more than one member may vote "unsatisfactory". The student should then be called back into the examination room and informed of the results by the committee. If the student passed, the committee Chair must so inform the Program Coordinator by email.

If the student did not pass the oral exam, then the Chair must inform the student of this and ask whether the student would like to retake the exam or withdraw from the program. If the student wishes to retake the exam, then the student must wait at least three months and must retake only the oral examination. The committee will provide to the student the appropriate steps to be taken for remediation. The Chair must inform the Program Coordinator that the student has failed the oral exam and indicate whether the student wishes to retake the exam or withdraw from the program.

Limit on Number of Times to Take the Qualifying Exam

If the committee permits the student to retake either the written or oral component, or both, of the qualifying exam, only one retake of each component is permitted.

PLANT SCIENCE COURSES

The following table is a list of courses for the student and Advisory Committee to consider in developing a Plan of Study to meet the requirements for specialization in either Cellular and Molecular (C&M), Organismal (ORG), or Ecological (ECOL) plant science. Other courses may be used with the permission of the student' advisory committee and the Program Coordinator.

Department	Course Number	Course Name	C&M	ORG	ECOL
Biochemistry & Molecular Biology					
	BIOC 6733	Functional Genomics	X		
	BIOC 6753	Epigenetics	X		
	BIOC 6793	Plant Biochemistry	X		
	GENE 5102	Molecular Genetics	X		
Plant Biology, Ecology and Evolution					
	BIOL 3034	General Ecology			X
	BIOL 5524	Biological Laboratory Instrumentation			
	BOT 3013	Biological Microtechnique	X	X	
	BOT 3024	Plant Diversity		X	
	BOT 3114	Plant Taxonomy		X	X
	BOT 3233	Plant Anatomy	X	X	
	BOT 3463	Plant Physiology	X	X	
	BOT 5023	Community Ecology			X
	BOT 5104	Mycology (same as PLP 5104)		X	
	BOT 5110.351	Field Botany		X	X
	BOT 5214	(Ecology of) Algae & Aquatic Plants		X	X
	BOT 5423	Plant Mineral Nutrition		X	
	BOT 5533	Multivariate Methods in Community Ecology			X
	BOT 5553	Molecular Phylogenetic Analysis	X		
Entomology & Plant Pathology					
	ENTO 5613	Host Plant Resistance (same as PLP 5613)	X	X	X
	PLP 4923	Applications of Biotechnology in Pest Management	X	X	X
	PLP 5003	Plant Nematology		X	X
	PLP 5012	Plant Virology Lab	X	X	X
	PLP 5013	Plant Virology	X	X	X
	PLP 5104	Mycology		X	X
	PLP 5304	Phytobacteriology	X	X	X
	PLP 5413	Plant Disease Epidemiology		X	X
	PLP 5524	Integrated Management of Insect Pests and Pathogens		X	X
	PLP 5543	Principles of Plant Pathology	X	X	

	PLP 5613	Host Plant Resistance (same as ENTO 5613)	X	X	X
	PLP 5623	Advanced Biotechnology Methods	X		
	PLP 5724	Physiology of Host Parasite Interactions	X	X	X
	PLP 6303	Soilborne Diseases of Plants			X
Horticulture & Landscape Architecture					
	HORT 4953	Plant Growth & Development (web)	X	X	
	HORT 4693	Horticulture Physiology (web)	X	X	
	HORT 5133	Temperature Stress Physiology	X	X	
	HORT 5233	Experimental Horticulture		X	X
	HORT 5422	Flowering & Fruiting in Horticulture Crops		X	
	HORT 5443	Basic Lab Experimentation	X	X	
	HORT 5433	Post-Harvest Physiology	X	X	
Microbiology & Molecular Genetics					
	MICR 5123	Virology	X	X	
	MICR 5133	Molecular & Microbial Genetics	X		
	MICR 5203	Bioinformatics		X	
	MICR 5213	Environmental Microbiology		X	X
	MICR 5214	Microbial Ecology			X
	MICR 5353	Photobiology	X	X	
	MICR 6143	Advanced Microbial Physiology	X		X
	MICR 6213	Molecular Microbial Ecology	X	X	X
	MICR 6253	Microbial Evolution	X		X
Natural Resource Ecology & Management					
	NREM 4213	Forest Ecophysiology			X
	NREM 4323	Timber Management			X
	NREM 4333	Forest Resource Management: Planning & Decision Making			X
	NREM 5033	Ecology of Invasive Species			X
	NREM 5043	Ecology & Evolution of Symbiosis			X
	NREM 5133	Advanced Topics in Forest Biometrics			X
	NREM 5403	Advanced Wetland Ecology			X
	NREM 5523	Population Ecology			X
	NREM 5682	Grassland Plant Identification		X	X
	NREM 5692	Grassland Monitoring and Assessment			X
	NREM 5713	Grassland Fire Ecology			X
	NREM 5723	Ecology of Fire Dependent Ecosystems			X
	NREM 5783	Prescribed Fire			X
	NREM 5793	Advanced Prescribed Fire			X
Plant & Soil Sciences					
	PLNT 3554	Plant Genetics and Biotechnology	X	X	X

	PLNT 4113	Advanced Weed Science		X	X
	PLNT 4123	Plant-Environment Interactions		X	X
	PLNT 4353	Plant Breeding		X	
	PLNT 4673	Cropland Ecosystems		X	X
	PLNT 4783	Cotton Production		X	X
	PLNT 5110	Problems and Special Study	X	X	X
	PLNT 5112	Herbicide Fate in the Environment		X	X
	PLNT 5293	Plant Response to Water Stress	X	X	
	PLNT 5403	Physiological Action of Herbicides	X	X	
	PLNT 5414	Plant Breeding Theory, Methods and Strategies		X	X
	PLNT 5433	Biotechnology in Plant Improvement	X		
	PLNT 5443	Advanced Genetics	X	X	
	PLNT 5452	Cytogenetics	X	X	
	PLNT 6010	Advanced Topics and Conference	X	X	X
	PLNT 6410	Topics in Plant Breeding and Genetics	X	X	
	SOIL 5613	Laboratory Methods of Soil, Plant and Environmental Analysis	X	X	
	SOIL 5813	Soil-Plant Nutrient Cycling and Environmental Quality		X	

APPENDIX

STUDENT NAME: _____ ADVISOR: _____

PLAN OF STUDY CHECKLIST
PLANT SCIENCE Ph.D. REQUIREMENTS

The student candidate and the major professor should use this guide when formulating the student's study plan to insure that the requirements of the Plant Science PhD program are met. Please send a copy of the completed from to the Program Coordinator, Dr. William Henley, 301 Physical Science.

Core: 90 hrs, 60 hrs beyond the M.S.
75% recommended at 5000 level or higher

(for each item below, list the course(s), and when taken)

1. Seminar: 2hrs _____ _____

2. Diversity: One graduate credit course in each specialization area not selected, one of these must be taken in residence. (check area of specialization and list courses for other areas)

_____ cell & mol. _____ org _____ ecol

3. Quantitative: 3-4 hrs, – Stat., biochem. methods, computer, exp. design or quantitative _____

4. Also, (omitted if taken as undergrad, but indicate if so) a course in each of:

ecology _____

plant anatomy & morphology _____

plant physiology _____

genetics _____

plant classification & taxonomy _____

Specializations:

Cell & Molecular	Organismal	Ecological
1. Research in the area of specialization	Research in the area of specialization	Research in the area of specialization
2. 9 hrs approved for graduate credit in the area of specialization	9 hrs approved for graduate credit in the area of specialization	9 hrs approved for graduate credit in the area of specialization
_____	_____	_____
_____	_____	_____
_____	_____	_____
3. graduate level plant physiology (such as BOT 5214, 5423; HORT 5133, 5433; PLP 5724)	STAT 5013 (or equivalent) and another quantitative course	STAT 5013 and 5023 (or equivalent)
	_____	_____
_____	_____	_____

PLANT SCIENCE Ph.D. PROGRAM
OKLAHOMA STATE UNIVERSITY

Qualifying Examination Report

Date: _____

Name: _____ CWID _____

Department: _____ Specialization: _____

The above student took the Doctoral Qualifying Examinations during the

_____ Semester _____ Year

Comments:

Signatures of Committee Members:

	Satisfactory	**Unsatisfactory**
Graduate Advisor:	_____	_____
Member:	_____	_____
Member:	_____	_____
Member:	_____	_____
Member:	_____	_____
Member:	_____	_____

Note: The Graduate Advisor should fill out this form, have all Advisory Committee members sign it after the examination, and return it to the Plant Science PhD Program Coordinator.

Plant Science PhD Outcomes Assessment

Date: **Name of graduate student:**

Rubric A: Assessment of Learning Outcomes Following **Qualifying Exam**.

ELEMENTS OF LEARNING OUTCOME	**Level of achievement** 1 2 3 4 5 poor fair excellent				
Graduates will have a basic understanding of all aspects of Plant Science, including:					
Ecology					
Genetics					
Anatomy and Morphology					
Classification and Taxonomy					
Physiology					
Graduates will have a comprehensive understanding of their area of specialty.					
Graduates will be able to conceive an independent research project.					
Graduates will be able to determine appropriate field and/or laboratory research methods to address that research project.					

Note: Each member of the Advisory Committee should complete this rubric and return it to the Plant Science PhD Program Coordinator.

Plant Science PhD Outcomes Assessment

Date: **Name of graduate student:**

Rubric B: Assessment of Learning Outcomes following **Dissertation Defense**
(modified from Chris Golde, "Preparing Stewards of the Discipline" in July 2006 *Carnegie Perspectives*)

ELEMENTS OF LEARNING OUTCOME	Level of Achievement 1 poor	2	3 fair	4	5 excellent
Outcome 1: Demonstrate a sound foundation across the disciplines					
Understands the history and fundamentals of plant science					
Able to defend knowledge against challenges and criticisms					
Able to judge which ideas are worth keeping and which are outmoded					
Outcome 2: Demonstrate the capacity to conceive independent research					
Able to ask interesting and important questions					
Able to formulate appropriate strategies for investigating these questions					
Able to conserve most important ideas and findings from past and current work					
Outcome 3: Demonstrate the ability to conduct and complete independent research					
Able to conduct investigations with high degree of competence					
Able to analyze and evaluate results of investigations					
Able to generate new knowledge					
Outcome 4: Possess the knowledge, skills and attitudes to be effective stewards					
Able to transform that knowledge to a variety of audiences					
Able to communicate results to others to advance the field					
Able to represent and communicate ideas effectively					
Understands other disciplines					
Understands differences between disciplinary views of the world					
Can communicate across traditional boundaries					
Demonstrates sense of responsibility to apply knowledge, skills, findings, and insights in the service of problem solving or greater understanding					
Has adopted a sense of purpose that is larger than oneself, i.e., a steward of the discipline rather than just a manager of one's own career					

Note: Each member of the Advisory Committee should complete this rubric and return it to the Plant Science PhD Program Coordinator.