

The background of the page is a close-up photograph of several green leaves, likely from a plant, showing their veins and texture. The leaves are arranged in a somewhat circular pattern, filling the entire frame.

**2015-2016
Intercollege
Graduate
Degree Program in
Plant Biology
Student and
Faculty Handbook**

<http://www.huck.psu.edu/content/graduate-programs/plant-biology>

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Preface

This Handbook has been compiled to assist graduate students and faculty in the Intercollege Graduate Degree Program in Plant Biology. (Hereafter, the program will be referred to as the Plant Biology Program or as the Program.) It contains the advanced degree requirements and other information pertinent to the Program. Other statements of Program policy and general information are also included. In many cases, the degree requirements given are specific to the Graduate Degree Program in Plant Biology. The Pennsylvania State University Graduate Degree Programs Bulletin, the Guide to Graduate Life, and the Thesis Guide must be consulted for additional University policies and requirements.

The University

The Pennsylvania State University had its beginning in 1855 as the Farmers' High School. From this beginning Penn State has become a multi-campus university of over 85,600 students. Approximately 46,068 students, including about 6,065 graduate students, are on the University Park campus. Penn State is Pennsylvania's Land-Grant University. Faculty and students in the Plant Biology Program are all located on the University Park campus.

Program Overview

The Plant Biology Program at Penn State was established as the Intercollege Graduate Degree Program in Plant Physiology in 1983. The Program provides a better educational and research experience for students interested in diverse biological problems in plants than would be possible in the departments of individual faculty advisors. This is accomplished through enhanced faculty cooperation and direct student interactions with several faculty members other than the thesis advisors. As the field of plant research has significantly expanded since the establishment of the Program more than two decades ago, the name of the Program was changed to its current name in July 2006 to better reflect the diverse research areas and graduate training opportunities offered by the Program faculty. Also, as part of the re-organization of all intercollege graduate degree programs in life sciences at Penn State, the Ecological and Molecular Plant Physiology (EMPP) option of the Integrative Biosciences (IBIOS) Graduate Program was merged with the Plant Biology Program in Spring 2006.

The Plant Biology Program offers graduate work leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. It is designed to provide education and research experience in advanced plant biology to prepare qualified students for teaching and research positions in colleges and universities and for research positions in industry and government.

The Plant Biology Program brings together faculty from the departments of Agricultural and Biological Engineering, Biochemistry and Molecular Biology, Biology, Chemical Engineering, Chemistry, Ecosystem Science and Management, Entomology, Plant Pathology and Environmental Microbiology, and Plant Science. These nine departments are from three colleges, the College of Agricultural Sciences, the Eberly College of Science, and the College of Engineering. Faculty members have diverse expertise to prepare candidates in almost all sub-fields of plant biology, from the cellular, molecular and biochemical levels to the whole plant. (See <http://www.huck.psu.edu/content/graduate-programs/plant-biology/faculty> for the current Program faculty members and their research areas.)

The Plant Biology Program provides one full year (Fall and Spring Semesters plus the Summer prior to Year 2) of financial support to all first-year students in the Ph.D. degree program. (See Section I for financial support in subsequent years of study.) The students are required to conduct lab rotations to explore potential Ph.D. projects and faculty advisors.

After the students have chosen their thesis advisors (before the end of the Fall Semester or Spring Semester of Year 1), each student will become associated with the advisor's academic department. The advisor's department provides research facilities and office space, and may also

provide financial support. Applicants are encouraged to explore opportunities for research by contacting faculty members working in the areas of their interest.

Work for an M.S. degree in Plant Biology is usually completed in two years and students must complete an M.S. thesis based on their research. The Ph.D. degree in Plant Biology requires three or more years of study and research beyond the M.S. level.

There are two 4-credit advanced plant biology courses that are required for all students. These courses, titled “Plant Resource Acquisition and Utilization” and “Integrative Plant Communication and Growth”, are team-taught by the Program faculty and are designed to cover the breadth of modern plant biology. Students are introduced to faculty research programs and develop skills in problem solving. Additional required courses for M.S. students are described in Section II.

Students enrolled in the Ph.D. degree program are required to take three 2-credit laboratory intensive modules designed to introduce them to modern techniques and theories used to solve problems in three research areas: ecophysiology, plant cell biology, and plant molecular biology. Additional required courses for Ph.D. students are described in Sections II and III.

The Plant Biology Program organizes and hosts a weekly seminar series during the academic year. Presentations are made by Penn State faculty members from both inside and outside the Program, Plant Biology students, postdoctoral scholars, and invited scientists from outside Penn State. Student-invited seminars were incorporated into the Plant Biology Seminar series in Spring 2001. Each semester, the students collectively choose a guest speaker to come to campus and give a presentation. The students are in charge of hosting the visit of the speaker. In addition, the Distinguished Lecture in Plant Biology series was inaugurated in Spring 2011. It is sponsored by the Huck Institutes of the Life Sciences and hosted by the Plant Biology Program. One distinguished speaker is invited in each semester. Information about the current and past seminar series (dating back to Spring 2000) is available at the Plant Biology Program website, <http://www.huck.psu.edu/content/graduate-programs/plant-biology/seminars>.

The Plant Biology Program has been hosting the Penn State Symposium in Plant Biology since 1986. This three-day symposium is one of very few international symposia in plant biology that are organized entirely by the faculty of a single graduate program. The theme of the symposium changes each time and attracts outstanding speakers and participants from throughout the United States and the world. The special focus on diverse topics gathers together many people who would not otherwise attend the same meeting, because of their wide-ranging specialties. The most recent Plant Biology Symposium (the 20th) was held in May 2015 on the theme of stress-omics in a changing climate. For the topics of all previous symposia, visit the Plant Biology Program website, <http://www.huck.psu.edu/content/graduate-programs/plant-biology/symposium/2015>

Research Facilities

Because the Plant Biology Program brings together faculty from nine different academic departments, a wide array of modern scientific equipment is at our disposal. This includes facilities for all components of plant research, from fields and greenhouses to modern, well-equipped research laboratories.

Furthermore, since the Plant Biology Program is hosted by the Huck Institutes of the Life Sciences (<http://www.huck.psu.edu>), this association provides a number of core user services, such as the Genomics Core Facility, the Metabolic Core Facility, and the X-Ray Crystallography Facility (See <http://www.huck.psu.edu/content/instrumentation-facilities> for a complete list). These facilities are available for student use on a fee for service basis. Students should discuss their needs for use of these services with their thesis advisor.

About This Handbook

This Handbook constitutes the policies, procedures and requirements that govern specific details for the student's course of study in the Plant Biology Program. Along with the Graduate Degree Programs Bulletin, it should be frequently consulted for all appropriate information during the course of a student's studies. While the Program will make every attempt to assist students, the ultimate responsibility for ensuring that all the requirements for completing a degree have been met rests with the student.

The Program Chair, upon advice of the Steering Committee and Program Faculty, reserves the right to amend or change the policies, procedures and requirements outlined in this Handbook to further the growth and improvement of the Plant Biology Program. Any changes made to this Handbook will apply to the next incoming class. Students who are previously enrolled may opt to continue their studies using newer editions of the Handbook, or they may continue to use the guidelines under which they were admitted. However, a student may not "pick and choose" between two Handbook editions. If a student opts to use a newer edition of the Handbook, all the requirements of the newer edition will apply.

The current 2015-2016 edition of the Handbook is available online at <http://www.huck.psu.edu/content/graduate-programs/plant-biology/requirements>

Other Resources

As previously mentioned, the Graduate Degree Programs Bulletin, the Guide to Graduate Life and the Thesis Guide must be consulted for additional information on University policies and requirements, and for a more detailed look at some topics that are mentioned in this Handbook. This Handbook does not attempt to duplicate or replace these other documents where similar information is covered in full. To obtain a personal copy of these documents, please follow the instructions given below.

Graduate Degree Programs Bulletin

The Bulletin contains general information about graduate study at Penn State (student services, graduate life, tuition and charges, student aid, academic information and procedures, graduate degree requirements, etc.), as well as specific information about individual graduate programs at Penn State (degrees conferred, graduate faculty, degree requirements, courses offered, etc.).

The Bulletin is updated every two years, and only the current edition is posted at

<http://www.psu.edu/bulletins/whitebook/>.

Guide to Graduate Life

The Graduate and Professional Student Association (GPSA) publishes the Guide to Graduate Life, which provides very helpful information for the graduate student who is new to State College and Penn State. The Guide is available free of charge from the GPSA office in 315 HUB-Robeson Center and the Huck Graduate Programs Office in 101 Life Sciences Building. It is also available at: gpsa.psu.edu/wp-content/uploads/sites/12283/2014/05/guide2gradlife.pdf

In preparing the Guide, the members of the GPSA tried to anticipate any information individuals who are new to this area would need, thus making life easier as a graduate student.

The Thesis Guide

The Thesis Guide is published by the Thesis Office (115 Kern Building), and it contains the technical requirements, as well as detailed instructions for preparation and the procedures for submission of M.S. and Ph.D. theses. The guide is available as a PDF file at <http://www.gradschool.psu.edu/current-students/etd/thesisdissertationguidepdf>

Graduate Writing Center

The Graduate Writing Center is open year-round to provide free individual consultation for graduate students to discuss their writing with a peer writing consultant. Consultations aim to help students improve both their writing and critical thinking skills.

Students working on any writing project from any graduate discipline are encouraged to schedule an appointment at <https://secure.gradsch.psu.edu/wccal/studentview.cfm>. The Graduate Writing Center is located in 111-H Kern Building. For additional information about Writing Center services please e-mail gwc.psu@gmail.com.

Career and Professional Development

The Huck Institutes of the Life Sciences provides graduate students with the resources necessary to be successful in obtaining and securing satisfying and rewarding careers, no matter what career paths they choose. For details, see http://www.huck.psu.edu/content/graduate-programs/career_professional_development.

SECTION I: POLICIES AND PROGRAM INFORMATION

Admission Procedures and Requirements

Before being offered admission to the M.S. or Ph.D. degree program, applicants must be reviewed and recommended for admission by the Program's Selection Committee, with additional input from the rest of the Program Faculty. Decisions on admission are based on previous academic records, letters of reference, an applicant's written statement of goals, GRE general test scores and other previous experience. All international applicants whose first language is not English, or who have not received baccalaureate or M.S. degrees from an institution in which the language of instruction is English, must take the TOEFL. To be considered for admission, the Graduate School and the Plant Biology Program require a minimum TOEFL score of 80 on the Internet-based test (IBT), with a minimum score of 19 on the speaking skills component.

When entering the Plant Biology Program, a student may choose one of three paths:

- The student may work toward an M.S. as a terminal degree.
- The student may work through an M.S. to a Ph.D. degree.
- The student may enter directly into the Ph.D. degree program.

B.S. level applicants who have good academic records and have had strong training in plant biology and related courses, including research experience, are generally admitted directly into the Ph.D. degree program and bypass the M.S. degree.

Provisional Admission and Admission Deficiencies

Students entering the Plant Biology Program should have a strong foundation in the physical and biological sciences, including biochemistry, general physics, and college mathematics through calculus. In certain cases and when other circumstances warrant, an applicant may be granted provisional admission status. Examples of this might be a student who is excellent in all other regards, but needs a certain course to bring his or her skills up to the admission level. If the applicant is admitted with provisional status, the reason for the provision must be removed by the end of the first year and before the candidacy examination is taken. For more information, please see "Application and Admission Procedures" in the Graduate Degree Programs Bulletin.

Financial Considerations

The Plant Biology Program has no separate application for financial aid. All applicants for the Ph.D. degree program are automatically considered for financial support. Applicants for the M.S. degree program must fund their study through personal and/or other sources (e.g., external scholarships).

All students accepted into the Ph.D. degree program are guaranteed financial support (stipend plus full tuition grant-in-aid) throughout their tenure, provided that they remain in good academic standing and maintain satisfactory performance.

The sources of funding for Ph.D. students will vary from year to year, depending on the availability of faculty research grants, training grants from outside funding agencies, teaching assistantships from the departments with which faculty advisors are affiliated, Graduate School Fellowships, and prior commitments of Plant Biology Program funds.

Research Assistantships

In each academic year, the Graduate School provides the Program a certain number of research assistantships, each of which carries a stipend and a remission of tuition. The Program Chair administers these assistantships, which are awarded to continuing Ph.D. students during academic semesters (excluding summer sessions) on the basis of academic record, individual merit, specific needs, and the availability of other funding sources.

In general, the appointments made by the Program are for one semester at a time. To retain an assistantship, students must maintain a B (3.0) grade point average and be registered for at least 9 credits, if they have not passed the comprehensive exam, or for Ph.D. Dissertation (zero credit), if they have passed the comprehensive exam. If courses are dropped and the total credits fall below the minimum, or if students are deemed to not be making satisfactory progress in thesis research, unspent assistantship stipends will be forfeited for the remainder of the semester.

The Huck Institutes of the Life Sciences provides the Program funds for graduate stipends (including both academic semesters and summer sessions) and tuition grants-in-aid. These are awarded exclusively to incoming students in the Ph.D. degree program.

The Eberly College of Science provides the Program tuition grants-in-aid on a year-to-year basis (depending on availability), which are awarded to incoming students who are likely to carry out their Ph.D. thesis research with Plant Biology Program faculty members who are also members of the College.

Other research assistantships may be available directly from the Plant Biology Faculty members or from their academic departments.

Graduate Fellowships

Graduate School fellowships (University Graduate Fellowship, Eva J. Pell Distinguished Graduate Fellowship, and Bunton-Waller Graduate Award) and J. Lloyd Huck Fellowship (inaugurated in Spring 2013) are awarded to first-year students on a competitive basis. Each fellowship also carries a tuition grant-in-aid. The Program Chair, in consultation with the Selection Committee, makes the nominations for these fellowships for prospective students during the recruiting process.

Professional societies and other external agencies award other fellowships. Information on the availability of these fellowships is available from the student's advisor or the Program Chair.

Teaching Assistantships

Some academic departments provide teaching assistantships to Plant Biology students through their thesis advisor. Students should contact their thesis advisor for information on the availability of a departmental teaching assistantship.

Supplemental Recruitment Funds

The Graduate School provides Graham Endowed Fellowships, FEGR (Fund for Excellence in Graduate Recruiting) Awards, and Shannon Scholarship for incoming students on a competitive basis. These fellowships/scholarships/awards (ranging from \$2,000 to \$5,000 per student) are to be used to supplement research assistantships and fellowships awarded to incoming students of superior quality. The Eberly College of Science provides Braddock/Roberts Scholarships to supplement research assistantships and fellowships awarded to incoming students who are likely to pursue their Ph.D. thesis research with Plant Biology faculty members who are members of the College. For all these supplemental funds, the Program Chair, in consultation with the Selection Committee, makes nominations for prospective students during the recruiting process.

The Plant Biology Program Office

The Plant Biology Program, along with four other interdisciplinary/intercollege graduate programs in life sciences, is housed under the Huck Institutes of the Life Sciences (for a complete list of the Huck graduate programs see <http://www.huck.psu.edu/content/graduate-programs>). The Huck Institutes foster an interdisciplinary, innovative, collaborative approach to research by offering cutting-edge life sciences research with more than 379 faculty participants from both University Park and Hershey campuses representing a wide range of institutes and graduate programs. The staff of the Huck Institutes assists the Program Chair with all Program affairs and activities. The Huck Graduate Programs Office is located in 101 Life Sciences Building, and the office hours are 8:00 a.m. – 5:00 p.m. Deborah Murray is the contact person

for the Plant Biology Program, and her office phone number is 814-865-8165. Voice mail is available 24 hours a day. The Program's campus mail address is 101 Life Sciences.

In 1997, the Graduate School decentralized the many administrative functions performed by the Graduate School office staff. This change shifted the responsibility for admissions and other administrative tasks to the individual programs or departments, allowing students to work through just one office for most of the situations that administrative help is needed.

The Huck Graduate Programs Office offers a wide variety of assistance and support to both students and faculty. If you need help with registration, scheduling courses, adding or dropping courses, grades or transcripts, please feel free to contact the Office Personnel. You will also need to contact the Office when it is time to appoint your committee, schedule your exams, and arrange for graduation. It will be very important to work closely with the Office during each phase of your studies to assure that all flows smoothly.

Registration

Pre-registration and Required Credit Loads

Students are strongly encouraged to pre-register for the forthcoming semester. Pre-registration allows reasonable enrollment estimates to be made and helps prevent course cancellations. The Registrar's Office publishes the dates after which students may begin to register for the next semester. The exact dates vary by semester, but generally fall about midway through the current semester. Students should plan their academic schedules in consultation with their advisor and/or thesis committee.

A student who is enrolled for 9 credits or above is considered a full-time student. In most cases, full-time registration is required for both the fall and spring semesters. Graduate Assistants must carry the required credit loads and international students must register with visa considerations in mind.

A Ph.D. candidate is required to register continuously for each semester from the time the comprehensive examination is passed and the two-semester residence requirement is met until the thesis is accepted by the doctoral committee, regardless of whether work is being done on the thesis during this time.

An M.S. candidate is not required to register for the final semester in order to graduate, or in order to make a minor revision to the thesis and/or take a final examination, unless required by the student's visa or the Program Chair.

How to Register

You may register for classes in several ways:

- Over the Internet using the eLion web registration system
- In person at the Registrar's Office
- Through the Huck Graduate Programs Office

Before you attempt to register, you should meet with your thesis advisor or Program Chair, and reach an agreement on the courses that you have chosen. You will also need to know the unique schedule number for each course you want to take. This number can be found in the publication, Schedule of Courses, available in the HUB Bookstore, in the Huck Graduate Programs Office, and on the web at <http://schedule.psu.edu/>. Detailed instructions on how to register using any of the three methods listed above may be found on the web at:

http://www.registrar.psu.edu/registration/registration_index.cfm

Completing your Registration

The registration process at Penn State consists of two steps:

- Enrolling in specific courses

- Completing the registration by payment of tuition and fees or confirmation of registration electronically (when all charges will be covered by Graduate Assistantship or financial aid)

When you have enrolled in your courses, you will receive a statement of tuition and fees from the Bursar's Office through e-mail. This statement includes amounts due, as well as any credit amounts from any applicable forms of financial assistance. Depending on your source of funding, it is possible that you may not have to make any payment to the University, and in some cases you may even receive a refund. **In all cases, regardless of the amount due, action is required to complete the registration process.** Your registration will not be considered complete until you have filed an estimated semester bill.

To complete your registration, you must file your semester bill, along with any amount due, with the Bursar's Office in 103 Shields Building. To avoid late payment fees you should do this prior to the date printed on the semester bill. **If you do not receive a semester bill, contact the Bursar's Office immediately by calling 814-865-6528.** Students who do not complete their registration by the deadline on their electronic bill will be charged a late payment fee of \$50.

Failure to complete the registration process may result in any or all of the following actions:

- You will not receive any grades for courses you are attending and you will be unable to enroll for future semesters.
- If you receive student loans, you may enter into repayment status with your lender.
- If you receive student aid, some of the aid sources may be cancelled and unavailable for reinstatement at a later date.
- If you are living in University Housing, you will need to vacate your housing.
- Starting with the first day of the semester you will not be allowed to add courses.
- If you receive a Federal Work Study award, you will not be eligible for employment.
- Faculty are not obligated to provide instruction or administer assessment for you.

Late Registration

Registration must be completed (enrolling for classes and filing the estimated semester bill) prior to the first day of classes each semester. A late registration fee (\$250) will be assessed if you register on the first day of classes or thereafter. Students who register late will receive a semester bill from the Bursar's Office for the applicable tuition and fees. Courses may be dropped or added until the bill due date.

Using eLion to File Semester Bills for those with Graduate Assistantships

- Log on to eLion and click on "Financial" on the left side, bring up your semester bill by clicking on "Bursar/Tuition Bill" in the left-hand menu.
- Choose current semester
- Under the four selections listed at the top of your bill choose "View/Pay my bill." (If you wish to print a copy of your bill, do it now by clicking on "View printable copy of your bill," then hit File and Print at the top of the window main pop-up menu.)
- Hit "Continue" twice. The first click gives you a message that if you continue you will not be able to print a copy of your bill. If you just printed it, then click on "Continue" the second time to proceed.
- Click on "without a payment"
- Under the heading "Select All That Apply", check the box "Graduate Assistantship/Fellowship."
- Further down in the middle of that page under "I expect the adjusted semester charges to be \$xxx.00" You will change the \$ value to \$0.00 (Enter all Zero's in box).

- At the bottom of that same page, click the button that says “Request changes with no payment”.
- Click on “Continue”. Then print the next page for your records. It gives you a confirmation message which says “Your registration is not complete until the Office of the Bursar reviews and approves your submission. You have requested a review of your tuition bill. The following will be submitted to the Office of the Bursar: Graduate Assistantship/Fellowship.”
- Lastly, you will then receive an e-mail from the Bursar that your bill has been processed. If you do not receive this message within 24 hours, please revisit your student account to check the balance.

PLEASE NOTE – You must have a semester bill prepared and showing on your student account, in order for the electronic system to work. If you just scheduled your classes it may take a day or two for a bill to be generated.

Grading

Most of the courses in the Plant Biology Program are graded with A, A-, B+, B, B-, C+, C, C-, D and F, which are known as “quality grades”. Any grade below a C is not considered to be a passing grade for a required course. A minimum grade point average of 3.0 for work done at the University is required for graduation.

A grade of R is also available for Colloquium (PLBIO 590), Thesis Research (PLBIO 600) and Individual Studies (PLBIO 596). R grades do not carry grade points and do not contribute to the GPA, but the credits earned do count toward the credit requirements.

The Graduate Council has established limits on the total number of research credits that can be assigned quality grades. Ph.D. degree students may accumulate a maximum of 12 quality grade credits for PLBIO 600 and M.S. students have a total limit of 6 quality grade credits.

Seminar Policy

Colloquium

All Plant Biology students must take a Colloquium course (PLBIO 590) during their first year: Ph.D. students are required to register for one credit each in the Fall and Spring semesters, and M.S. students are required to register for one credit in either semester. At a minimum, students should attend all the seminars in the weekly Plant Biology seminar series to receive credit. Additional responsibilities are detailed in the course syllabus.

Research Seminar

The Program strongly recommends that all Ph.D. and M.S. students present research seminars in the weekly Plant Biology Seminar series. A seminar may be given after you have formulated a thesis research plan and obtained promising preliminary results.

Since many Plant Biology faculty members and students regularly attend the Plant Biology seminars, giving a seminar early in thesis research will allow you to receive valuable input and feedback to benefit further research. After you have made substantial progress in thesis research and have an opportunity to present the findings at a regional or national meeting, giving a seminar in the Plant Biology Seminar series will help polish your presentation to a wider audience.

To give a seminar, please sign up with the faculty seminar coordinator. The sign up period precedes the beginning of a semester by several weeks and spaces are limited.

Thesis Defense Seminar

Students are strongly encouraged to present a public thesis defense seminar as part of the final thesis examination. The seminar is generally immediately followed by the closed-door oral exam by the thesis committee.

To give a thesis defense seminar, please provide the Huck Graduate Programs Office with all the necessary seminar information at least two weeks before your seminar so that the formal announcements can be made.

Dates and Deadlines

Throughout your course of study, there will be a series of deadlines that must be met. The Huck Graduate Programs Office will send you periodic notices of upcoming deadlines to assist you, but the final responsibility for being aware of all dates and deadlines rests with you.

The Graduate School publishes several calendars of important dates on their web site.

Point your browser to <http://www.gradschool.psu.edu/calendars/important-dates/> to look up academic deadlines.

Look at <http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/> for thesis related deadlines.

Other Plant Biology Program deadlines may be found throughout this Handbook, under the appropriate sections.

Information Services

Electronic Messaging

The Plant Biology Program operates several Listserv® mailing lists that are used to distribute information electronically. The Super list serves the entire Plant Biology Program Faculty, all the Plant Biology students, and any other people who have asked to be on our mailing list.

There are two additional lists that are subsets of the main list, one for the Program Faculty and the other for the Students. See Appendix I for the Listserv® addresses.

The types of messages that are sent to the Super list include upcoming seminar announcements, plant-biology-related news releases from the American Society of Plant Biologists (ASPB) and other organizations, job and research opportunities, and grant announcements.

The faculty and student lists are used together to send information that is specific to the Plant Biology Program, and separately to send messages to only students or only faculty members.

All new students and faculty members are automatically added to the Plant Biology Students list and the Plant Biology Faculty list, respectively. Students who have graduated may remain on the Super list for as long as their Penn State Access Account is active.

If you wish to be removed from or remain on the Super list after graduation, please send an e-mail message to Paula Brown <pmg1@psu.edu> of the Huck Graduate Programs Office. All current students and faculty must be on the Plant Biology Students and Plant Biology faculty list, respectively.

Student Representative to the Steering Committee

The Student Representative to the Steering Committee serves as a liaison between the Plant Biology students and faculty. In this way, students' input and opinion will be considered by the Steering Committee when discussing issues, such as course requirements, degree requirements, financial support, etc., that have a direct impact on the Plant Biology students as a whole. The Student Representative will also solicit students' input into issues that the Program faces, e.g., new facilities, new faculty hires, new training grants, etc.

The Student Representative should be a student in the Plant Biology Program. The term of the Student Representative is two years, and it begins on July 1 and ends two years later on June 30. The election of a new Student Representative will take place after the end of the spring semester of the second year term. The current Student Representative will solicit nominations from all students in the Plant Biology Program (self-nomination is allowed), and send out ballots for students to cast their votes.

The duties of the Student Representative also include organizing social events for students, assisting the Program Chair to organize faculty/student social events, and soliciting nominations for and hosting student-invited seminar speakers. Because of the range of duties that the Steering Committee performs, the Student Representative will be invited to attend those Steering Committee meetings that are relevant to student affairs.

Graduate Student Evaluations

Graduate student evaluations create the opportunity for an annual meeting between students and their advisors. The purpose of this meeting is to provide a forum to examine and assess a student's work and progress toward his or her degree.

While students and their advisors should meet regularly over the course of a year, the annual evaluations ensure that at least one meeting has been held to specifically look at the student's progress and performance. This meeting is the opportunity for both student and advisor to talk about long- and short-term goals, share levels of satisfaction, and express feelings and opinions that might otherwise be put off.

The Huck Graduate Programs Office will send the evaluation forms to faculty advisors of Plant Biology students after the end of each spring semester, and the faculty advisors will be asked to set up appointments to meet with their students. The faculty advisors should complete and return the graduate student evaluation forms to the Office by June 15.

See Appendix IV for a sample of the Huck Institutes of the Life Sciences Graduate Program Evaluation form.

Leave-of-Absence

While the Graduate School has no policy on leave-of-absence at present, a student may be granted a leave-of-absence from the Plant Biology Program under certain circumstances. Depending on the source of funding, a student may be permitted to miss summer sessions without being considered as having taken a leave-of-absence. However, after an absence of one or more fall or spring semesters, the Graduate School requires a completed "Resume Study" form. This form must be submitted at least one month prior to the semester the student wishes to return. Students requiring a "Resume Study" form should contact the Huck Graduate Programs Office.

Any student requiring a leave-of-absence should work closely with their advisor, the Program Chair and the Huck Graduate Programs Office. Any questions regarding continued funding upon the student's return should be resolved prior to taking a leave-of-absence.

Program Dismissal

When the Program Chair, on the advice of the student's advisor or thesis committee, determines that a student must be dismissed for unsatisfactory scholarship, the student must be given advance notice in writing. This notice will advise the student of the reasons for the dismissal.

Upon receipt of this notice, the student will have the opportunity to seek a review of the decision. If the student desires such a review, the student must submit a written appeal to the Program Chair within 10 days of receipt of the notice.

Travel to Meetings

Financial support for travel is considered as a reward for academic excellence and research accomplishments. Its purpose is to further the education of the graduate student. In general, priority is given to those students making a presentation, and travel support is subject to the availability of funds.

The Plant Biology Program Travel Award

The Graduate School provides the Plant Biology Program with \$1200 travel support funds in each fiscal year for the Program to support its students to attend scientific conferences and meetings.

A student may receive this travel award only once during his/her tenure in the Program; however, exceptions may be made on a case-by-case basis. Both M.S. and Ph.D. students are eligible, but priority will be given to students who are near the end of their study or are making an oral or poster presentation as senior author. The amount of an award will vary depending on the number of requests, the needs of the student, and the availability of other sources of support. The maximum award a student may receive is \$500.

The travel award money will be budgeted over the Fall and Spring semesters, with any undistributed funds left over from the Fall rolled over into the Spring semester.

To apply for the Plant Biology Program Travel Award, students should request a PDF file of the application form from Deborah Murray of the Huck Graduate Programs Office. Completed applications should be returned to the Office or to the Program Chair. There is no deadline for this application, but because funds are very limited, early applications are likely to have an advantage.

The Huck Institutes of the Life Sciences Travel Award

The Huck Institutes of the Life Sciences Travel Awards, made possible by the J. Lloyd and Dorothy Foehr Huck Endowment, provide travel support to Ph.D. students enrolled in all Huck graduate programs who have completed their comprehensive examinations, and who will give poster and/or oral presentations at domestic or international conferences. To apply for this travel award, submit a request form at <https://home.huck.psu.edu/forms/on-line-travel-stipend-request-form>. The application will be sent to the Chair for review and approval. The maximum award for domestic travel is \$750, and the maximum award for international travel is \$1,500. Students are only eligible to receive the award once during their study at Penn State.

College of Agricultural Sciences Graduate Student Travel Award

Plant Biology students whose thesis advisors are on the faculty of the College of Agricultural Sciences may apply for the Graduate Student Travel Award through the College. The total amount of funding available varies by year, and the average award per student is approximately \$300. This award may be combined with other awards and sources of funding, including the Plant Biology Program Travel Award. Detailed information about this travel award may be found at <http://agsci.psu.edu/graduatestudents/currentstudents/travel-awards>.

To apply for the Agricultural Sciences Travel Award, download the application form at http://agsci.psu.edu/graduatestudents/funding-opportunities/copy_of_travel-awards and return the completed application to 217 Agricultural Administration Building. Applications are accepted and reviewed on an ongoing basis.

Other Sources of Funding

At various times, other sources of travel funding are available to Plant Biology students. Such sources include travel grants offered by various societies. The Program Chair will send an announcement, usually via e-mail, when such funds become available. A student wishing to

travel should also consult with his or her advisor to determine if any departmental funds are available.

Huck Graduate Student Advisory Committee

The Huck Graduate Student Advisory Committee (HGSAC) was established in January 2015 and consists of graduate student representatives from each of the six graduate programs in the Huck Institutes of the Life Sciences as well as the BMMB graduate program (Eberly College of Science). This committee is made up of a maximum of 15 students, including the Chair and two representatives from each program. For details about this committee, see http://www.huck.psu.edu/content/graduate-programs/career_professional_development/graduate_student_advisor_committee.

SECTION II: GENERAL REQUIREMENTS FOR ALL PLANT BIOLOGY PROGRAM DEGREE CANDIDATES

Advisors

The Program Chair will serve as the temporary advisor for all entering Plant Biology students prior to their selection of thesis advisors. All students in the Ph.D. degree program must conduct laboratory rotations in at least one of the semesters during their first year. Students may design their laboratory rotation schedule, upon consultation with the Program Chair and faculty members with whom they are interested in conducting thesis research.

Ph.D. candidates are highly recommended to choose their thesis advisors before the end of the first Spring Semester. Students in the M.S. degree program are strongly advised to contact faculty members of interest to select their thesis advisors, prior to or soon after the beginning of their studies.

After the selection of their thesis advisors, all students should consult with their advisors for approval of their course schedule each semester.

Core Courses

Tutorial Courses

All Plant Biology degree candidates must complete two tutorial courses “Plant Resource Acquisition and Utilization” (PLBIO 512) and “Integrative Plant Communication and Growth” (PLBIO 513).

These courses are team taught by the Program Faculty and are designed to cover the breadth of modern plant biology. Students are introduced to faculty research programs and develop skills in problem solving. One 4-credit tutorial course is taken each semester. Both courses should be completed by the end of the first year.

In the tutorial courses, students will be presented with advanced lectures in central areas of plant biology. Each week, a faculty member will present two lectures and assign challenge problems to the students to be solved independently through library research. Each student will be assigned to provide written solutions to four or five challenging problems in each tutorial course. A discussion of each problem set will be held on the day the written solution is due. These papers will be evaluated based on the ability of the student to reason, demonstrate understanding and knowledge of a subject area, creativity, and quality of written and oral presentations.

Those students not writing and presenting a solution to a challenge problem are required to write a summary of the presentations and discussions led by other students.

This dossier of papers will constitute the written diagnostic for the M.S. degree. It will also form the basis for the Ph.D. oral candidacy exam. A member of the Program Faculty will coordinate each of the two courses. At the end of the respective semesters the faculty coordinator will present a summary and evaluation of all the students’ progress to the Chair of the Candidacy Examination Committee.

Colloquium Requirement

Ph.D. students must take the Colloquium course (PLBIO 590) in both the Spring and Fall semesters of their first year, and M.S. students must take this course in one of the semesters.

Through attending the weekly Plant Biology Seminar series, the students will be exposed to diverse topics in plant biology and to some of the research projects being carried out by the Program Faculty. The students will learn from accomplished scientists how to formulate testable hypotheses, design appropriate experimental approaches, and critically analyze and interpret

experimental data, etc. These will be critical to the success of their thesis research. Moreover, the students will learn how to effectively communicate research findings to other scientists.

Ethics in the Life Sciences

All Plant Biology degree candidates are required to take the Ethics in the Life Sciences (MCIBS 591) course in the first Fall or Spring Semester. This course examines integrity and misconduct in life sciences research, including issues of plagiarism, data collection, publication, authorship, and peer review.

Responsible Conduct of Research Training Requirements and Academic Integrity

Starting in Fall 2009, all new students in the Plant Biology graduate program must complete an online Responsible Conduct of Research (RCR) training course during their first year. The online course is offered through the CITI (Collaborative Institutional Training Initiative) Program and supplements the in-class, discussion-based RCR training provided in MCIBS 591, Ethics in the Life Sciences, a required 1-credit course taken during the first year. Together, these two courses satisfy RCR training requirements mandated by Penn State's SARI (Scholarship and Research Integrity) Program, an RCR initiative organized through the Office for Research Protections (administrative unit within the Office of the Vice President for Research).

First year students should complete the online CITI RCR course before or during Orientation. To register, go to the Penn State CITI website <http://citi.psu.edu/> where you will find instructions. Select your campus, then select Pennsylvania State University Courses and register for the Biomedical Responsible Conduct of Research Course. Students must work on their own to complete the course modules and pass the on-line quizzes. All modules must be completed before 12:00 noon, August 24, 2015, and a copy of the student's Completion Report must be submitted to the Huck Graduate Programs Office (101 HLSB or email dkm9@psu.edu).

For Penn State Faculty Senate Academic Integrity Policy, see <http://senate.psu.edu/policies-and-rules-for-undergraduate-students/47-00-48-00-and-49-00-grades/#49-20>.

Other Courses included in the Plant Biology Major

Depending on individual students' background preparations, research interests and subject areas of thesis research, they may take elective courses offered by other academic departments. The list below provides some examples of courses that may be considered as courses in the Plant Biology major. Not all the courses are offered every year. Students interested in taking any elective courses should consult with their thesis advisors or the Program Chair prior to registering.

See Section V for a detailed list of the courses offered by the Plant Biology Program.

BMB 400	Molecular Biology of the Gene (3)
BMB 443W	Laboratory in Protein Purification and Enzymology (3)
BMB 445W	Laboratory in Molecular Genetics I (2)
BIOL 407	Plant Developmental Anatomy (3)
HORT 402W	Plant Nutrition (3)
HORT 407	Plant Breeding (3)
HORT 412W	Post-Harvest Physiology (3)
HORT 420	Plant Growth Regulators (3)
HORT/BIOTC 459	Plant Tissue Culture and Biotechnology (3)
HORT 517	Ecology of Plant Roots (2)

BMMB/MCIBS 551	Genomics (3)
MCIBS 593	Molecular Biology Laboratory (3)

Statistics

While not required for a degree in Plant Biology, all students are encouraged to take a course in statistics. Some possible choices are:

STAT 460	Intermediate Applied Statistics (3)
STAT 462	Applied Regression Analysis (3)
STAT 480	Introduction to Statistical Program Packages (1)
STAT 502	Analysis of Variance and Design of Experiments (3)

Grade Point Average Requirement

A minimum grade-point average of 3.0 for work done at Penn State is required for the doctoral candidacy examination (Ph.D.), oral diagnostic exam (M.S.), comprehensive and final examinations, and graduation. The Graduate School will not schedule examinations for students whose GPA is below 3.0.

Transfer of Credits

A maximum of 10 credits of graduate course work earned at accredited institutions within five years of the first registration at Penn State may be applied toward the requirements for an M.S. or a Ph.D. degree. However, credits earned to complete a previous M.S. degree may not be applied toward a second M.S. degree at Penn State.

The Program Chair, the student's thesis advisor, and the Director of Graduate Enrollment Services must approve transferred credits. Forms for transfer of credits may be obtained from the Huck Graduate Programs Office or from the Graduate Enrollment Services.

Time Limitation

M.S. students must complete all the degree requirements, including acceptance of the thesis paper, within eight years of admission to the Plant Biology Program.

Ph.D. students are required to complete the program, including acceptance of the doctoral thesis, within eight years from the date of passing their doctoral candidacy examination.

In appropriate circumstances, the Director of Graduate Enrollment Services may grant extensions to the time limitation. The Program Chair, upon recommendation of the student's advisor, must make the request for extension in writing.

English Proficiency

The language of instruction at Penn State is English. All international applicants whose first language is not English, or have not received baccalaureate or M.S. degrees from an institution in which the language of instruction is English, must take the TOEFL and submit the test results with the application for admission.

To be considered for admission, the Graduate School and the Plant Biology Program require a minimum TOEFL score of 80 on the Internet-based test (IBT). A minimum of 19 points (out of 30) on the speaking portion is required for admission.

The University requires international students who plan to be teaching assistants to take the Penn State American English Oral Communication Proficiency Test prior to beginning their first semester. Students who score 250 or above will be issued a certificate of fluency and they will be allowed to teach with no restrictions. Students who score between 230 and 249 must take

ESL 118G and receive a grade of “A” before they are permitted to teach. Students who score between 200 and 229 must first take ESL 117G and receive a grade of “A”, and take ESL 118G and receive a grade of “A” before they are permitted to teach. Students who score below a 200 must take ESL 115G, ESL 117G and ESL 118G in sequence, and receive a grade of “A” in each one before they are permitted to teach.

All international students entering the Plant Biology Program must take the Proficiency test. Even if a student does not plan to be a teaching assistant immediately, it is highly recommended that students earn the certificate of fluency should they be asked to be a teaching assistant at a future time. In addition, those who do not pass the test will find that taking ESL 117G/ESL 118G will greatly benefit their coursework, even if they do not teach.

Communication and Foreign Language Competence

Effective Fall 1992, the Plant Biology Program discontinued the foreign language requirement for Ph.D. candidates. This was done to accommodate an increased importance placed on satisfactory competence in English, as described above. Additional courses in English communication and in college teaching preparation may be considered. Examples of appropriate courses include ENGL 417 (The Editorial Process; 3 credits) and ENGL 418 (Advanced Technical Writing and Editing; 3 credits).

Residency

A Ph.D. candidate must spend at least two semesters, over some 12-month period following admission to the program, in residence at University Park as a registered student engaged in full-time academic work, devoting half-time or more to graduate studies and/or thesis research. After a student has met the two-semester residency requirement and has passed the comprehensive examination, no further registration for course credits is required. However, continuous non-credit registration is required as described under “Post-Comprehensive Registration” in Section III.

Thesis Requirements

To graduate with an advanced degree in Plant Biology, all students must complete a thesis. The student’s thesis advisor, committee members and the Program Chair indicate the acceptance of the thesis by their signatures on the Doctoral Approval Page or Master’s Approval Page. The thesis must also meet the editorial standards of the Graduate School so that it constitutes a suitable archival document for inclusion in the University Libraries. Current Graduate School thesis regulations may be found in the publication, *The Thesis Guide*, which is available online at: <http://www.gradsch.psu.edu/current/thesis.html>.

The Graduate School requires that all doctoral and Master’s theses be submitted in electronic format (eTD). The thesis must be submitted to the Thesis Office of the Graduate School at <https://etda.libraries.psu.edu/> by the announced submission deadline for the semester.

SECTION III: THE Ph.D. DEGREE IN PLANT BIOLOGY

Graduate School Requirements

The Graduate School at Penn State does not specify a number of courses or credits earned to assure a student of attaining a Ph.D. degree.

The doctoral program consists of a combination of courses, seminars, individual studies, and thesis research that meet the minimum requirements of the Graduate School and are approved by the doctoral committee for each individual student.

Plant Biology Program Requirements

In addition to the core courses listed in Section II, Ph.D. candidates must complete all three modules of the laboratory-intensive jumpstart courses. These courses are designed to introduce students to the techniques and theories used to solve problems in three research areas, and to view plants from the whole plant down to the molecular level.

The jumpstart courses earn 2 credits each and meet for five weeks (10 class sessions) each. All three involve lecture and laboratory time. PLBIO 515 (Modern Techniques and Concepts in Plant Cell Biology) is generally offered in the fall semester, and PLBIO 514 (Modern Techniques and Concepts in Plant Ecophysiology) is offered in the spring. PLBIO 516 (Modern Techniques and Concepts in Plant Molecular Biology) is offered in either the Fall or the Spring semester. Students should have completed all three modules by the end of their second year.

Transfer of Credits

You may transfer a maximum of 10 credits of previous graduate course work to Penn State. All transfer credits must have been earned at accredited institutions within five years of the first registration at Penn State. Credits earned to complete a previous M.S. degree may not be applied toward a Ph.D. degree at Penn State.

Forms for transfer of credit may be obtained from the Huck Graduate Programs Office or from Graduate Enrollment Services in 114 Kern Building. The student's academic advisor, the Program Chair and the Director of Graduate Enrollment Services must approve any transferred credits.

Minor Field

Ph.D. candidates in the Plant Biology Program may elect to follow a minor field of study. This requires the approval of the student's doctoral committee. A minor consists of no fewer than 15 credits of integrated or articulated work in one field related to, but different from, that of the major. A minor normally may be taken only in one of the approved graduate degree programs offered at Penn State, or in a formal graduate minor program that has been approved by the Graduate Council.

A minor program must have the approval of the departments or committees responsible for both the major program and the minor field. If more than one minor is being proposed, a separate group of courses must be taken for each minor. If a student has already received an M.S. minor in the same field as is being proposed for a doctoral minor, then the 15 credits taken must be above and beyond those used for the M.S. minor. At least one faculty member from the minor field must be on the student's doctoral thesis committee.

English Competency

A Ph.D. candidate is required to demonstrate a high level of competence in the use of the English language, including reading, writing and speaking, as part of the language and communications requirements for the Ph.D. degree. All Ph.D. students (domestic and international) in the Plant Biology Program will be evaluated on their English writing competency by way of the papers

written for the tutorial courses, PLBIO 512 and PLBIO 513, and chosen for the oral candidacy examination.

If a student fails to demonstrate acceptable writing skills, he or she will be required to work with an English tutor or enroll in additional English composition courses. When appropriate, the student will then be reevaluated.

The oral candidacy examination will also be used to assess English reading and speaking competency. Student performance will be evaluated on clarity of understanding and ability to clearly organize and present a set of ideas. Students not demonstrating acceptable competence will be required to present verbal critiques of assigned papers to their major professor at least monthly until the professor is satisfied with the student's level of competence in the use of the English language.

International students should note that passing the TOEFL minimum requirement does not demonstrate the level of competence expected of a Ph.D. candidate at Penn State. Soon after arrival at Penn State, international students from non-English speaking countries will be tested for their oral proficiency in English by the Center for English as a Second Language. Based on the results of this examination, a student may be required to complete one or more of the special English as a Second Language courses (ESL 115G, 117G and 118G). Please see the "English Proficiency" heading of Section II for details.

Candidacy Exam

According to the *Graduate Degree Programs Bulletin*, "A student who has been admitted to the Graduate School and has been accepted by the department or committee in charge of a major program in which a doctorate is offered may begin working toward a doctoral degree. However, the student has no official status as a doctoral student and no assurance of acceptance as a doctoral candidate until the candidacy examination has been passed."

One of the main goals of the candidacy examination is to determine the potential of a student to successfully obtain a Ph.D. The candidacy examination is intended to be a rigorous test of a student's abilities, prior to the major investment in time and effort necessary to pass the comprehensive examination.

In April 2001, the Program Chair, based on student input and in consultation with the Program Faculty, devised a new format for the Plant Biology Program candidacy examination. The new exam procedure became effective for the class of students that entered the Program in August 2000 and took their candidacy exams in the Fall 2001 semester.

The Plant Biology Program candidacy examination is an oral exam based on the term papers a student has written for the tutorial courses, PLBIO 512 and PLBIO 513.

The oral candidacy examination may be given after at least 18 credits have been earned in graduate courses (including credits earned prior to enrolling at Penn State). It also must be taken within three semesters (summer excluded) of entry into the Plant Biology Program.

The Candidacy Exam and Enrollment

To assist students and ease funding complications, the Graduate Council decided in March 2001 that enrollment would no longer be required during the summer session for students to take their doctoral candidacy exam. However, enrollment is still required to take the candidacy exam during the fall and spring semesters.

The Candidacy Examination Committee

Annually, the Program Chair appoints the Chair of the Candidacy Examination Committee before the end of the spring semester. After all first-year students have each been assigned two papers to defend on their candidacy exams (see "The Oral Candidacy Exam Format" below), the Program Chair will appoint the members of the Candidacy Examination Committee, which

forms the pool from which candidacy panels are chosen to administer the candidacy examination to students.

The number of committee members will vary depending on the number of students taking the candidacy exam and the exact papers that the students have been assigned to defend for the candidacy exam. The Program Chair will generally appoint to the Candidacy Examination Committee those faculty members whose topics students have been assigned to defend.

Three members of the standing Candidacy Examination Committee plus the student's advisor are appointed to act as each student's candidacy panel to administer the oral candidacy exam. Students may take the candidacy exam during the summer session or any time afterwards, but the exam must be taken before the end of the second Fall Semester.

The Oral Candidacy Exam Format

Immediately after the end of the first Spring Semester, each first-year Ph.D. student will be asked by the Chair of the Candidacy Examination Committee to rank order the term papers he or she has written in each tutorial course. The Chair of the Candidacy Examination Committee, in consultation with the two coordinators of the tutorial courses, will choose one paper from each tutorial course for each student to defend on the candidacy exam.

Within one month after the end of the Spring Semester, all the students will be told which two term papers they will prepare for the oral candidacy exam. You will have the option of rewriting one or both term papers if you so choose.

If you choose to rewrite, you must inform the Chair of the Candidacy Examination Committee immediately after the papers have been assigned, and the Chair will set the length of time allowed for you to complete the rewriting.

The objective of this examination is to determine your ability to synthesize "knowledge" from facts, to think on your feet, and to determine your aptitude for research. This examination will also be used as one additional mechanism to assess English competency. Please see the "English Competency" heading of this Section for further discussion.

Scheduling the Candidacy Exam

To schedule your candidacy examination, you must first contact your candidacy panel members and arrange a mutually agreeable time for the exam. All the candidacy panel members must be present for the exam to take place. You must also arrange for and reserve a room in which to hold the exam by contacting the Huck Graduate Programs Office.

When all this is done, contact the Huck Graduate Programs Office with this information so that your examination paperwork can be prepared. Please allow at least three workdays for the papers to be prepared.

Evaluation of Examination Performance

The candidacy panel chair for each student must report the results of the exam, including any comments and recommendations of the candidacy panel for the student's plan of study, to the Program Chair immediately following the exam. The Program Chair will then inform the Graduate School of the results of the examination.

The possible results are:

PASS – A favorable vote of two-thirds of the candidacy panel members is required for a student to pass the candidacy examination.

FAIL – The student has the option to retake the candidacy examination one time, at a date no later than 90 days following the first examination and before the end of the second Fall semester.

FAIL WITHOUT RE-EXAMINATION OPTION – This decision results in the termination of the student from the Plant Biology Ph.D. degree program.

After the candidacy examination results have been received and processed by the Graduate School, you will receive a letter informing you of your official status as a doctoral student at Penn State.

Appointing a Permanent Advisor

All Ph.D. students are required to conduct laboratory rotations in their first year of study. It is highly recommended that each student explore possible thesis research opportunities with at least two faculty members. The student should inform the Program Chair the names of the faculty members with whom he or she will conduct laboratory rotations. The Program Chair will serve as the temporary advisor of each student prior to his or her selection of the thesis advisor.

The student should choose a permanent advisor no later than the beginning of the second Fall Semester. You will then become associated with your advisor's laboratory and academic department. The advisor's department provides research facilities and office space, and may provide financial support.

Your permanent advisor must be a member of the Plant Biology Program Faculty, but you may choose a co-advisor from outside the Program. Among other duties, your advisor should approve your schedule each semester. Please contact the Huck Graduate Programs Office as soon as you have chosen your thesis advisor so that an official appointment can be made.

Appointing a Doctoral Committee

Committee Structure

The doctoral committee must have at least four active members of the Graduate Faculty, consisting of a Chair, an Outside Field Member and at least two people from the student's major area of study. Your advisor should be a committee member, but does not have to be the Chair of the committee. However, your committee Chair must be a member of the Program Faculty. The Outside Field Member represents a field outside the candidate's major field of study and is expected to provide a broader range of disciplinary perspective and expertise. A list of the Plant Biology Program Faculty members may be found at <http://www.huck.psu.edu/content/graduate-programs/plant-biology/faculty>.

If you have chosen to study a minor field, at least one faculty member from the minor field must be on your doctoral committee.

In some cases, you may wish to have a Special Member as part of your committee. A Special Member is a person who is not a member of the Penn State Faculty, but has particular expertise in the candidate's research area. A curriculum vitae and a memo supporting the student's request must accompany the committee appointment paperwork. The Special Member is appointed upon recommendation by the Program Chair and approval of the graduate dean (via the Office of Graduate Enrollment Services). The Special Member must participate in both the comprehensive and final exams and must sign both exam documents and the final thesis.

If a doctoral committee member is unable to attend the exams in person, he or she may participate via videoconference, telephone conference or other electronic means. Under these circumstances, permission from the Graduate School must be made at least three weeks in advance of the exams.

In some cases, you may wish to have a Signatory Member on your committee. The Signatory Member participates in guiding your research outline, approves your thesis proposal, and reads and signs your final thesis. However, this person is not appointed as an official member of the committee and does not have to participate in administering the Comprehensive and Final Oral Exams. To appoint a Signatory member, you must have the approval of your Committee Chair and the Program Chair. You must supply the person's curriculum vita when you request your appointment paperwork from the Huck Graduate Programs Office.

The Committee Responsibilities

Your doctoral committee is responsible for your general guidance as a student. The committee will approve the broad outline of your academic program and your thesis proposal. This is done in the Program Planning Meeting, which is held after you have passed the candidacy examination and formulated a research plan with your thesis advisor. It is recommended that this meeting be held within two semesters of passing the candidacy examination.

The committee will also prepare, administer and evaluate your comprehensive and final oral examinations. A favorable vote of at least two-thirds of the members of the committee is required to pass the comprehensive and final oral exam. If you fail an examination, it is the responsibility of the committee to determine whether or not another exam may be taken.

Appointing the Committee

Appointing a doctoral committee is a formal process, done through the Graduate School. To assemble a committee, you should meet with the desired faculty members to determine if they are willing and able to serve. After getting verbal agreements, you should contact the Huck Graduate Programs Office with the names, indicating in what capacity each will serve, so that the committee appointment papers can be prepared. This may be done in person, by telephone, or by e-mail.

When you receive the Doctoral Committee Appointment Signature Form from the Huck Graduate Programs Office, you should sign it and then gather the signature of each of your committee members. It is your responsibility to get the signatures, and the appointments cannot be made until the form is fully signed. The appointment form must then be returned to the Huck Graduate Programs Office for final processing. The Graduate School will make the formal appointment of the committee members. This will take a minimum of three weeks after the Graduate School has received all the necessary documents. To avoid problems, you should have your committee appointed and in place well before attempting to schedule your comprehensive exam.

Changes in Committee Membership

For various reasons, it may occasionally become necessary for you to make changes to your committee membership. To make any changes to an appointed committee, contact the Huck Graduate Programs Office.

To add a member, you have to inform the Office of the name of the person and in what capacity he or she will serve. A new appointment form must be prepared, but you will only need to get the signature of the new member. This form must be returned to the Office for final processing.

To remove a member, a memo making the request must be sent by the Program Chair to the Graduate School.

It will take a minimum of two weeks after the Graduate School has received all the documents before changes in committee membership become finalized.

Program Planning Meeting

It is highly recommended that you hold your Program Planning Meeting within two semesters after passing the candidacy examination. All your doctoral committee members should attend this meeting and your thesis advisor will be in charge. The purpose of this meeting is to develop your plan of study and to review and discuss your proposed thesis research.

Prior to the Program Planning Meeting and in consultation with your advisor, you should prepare and distribute a preliminary plan of study and thesis research proposal to the committee. During the meeting, the committee will determine your strengths and weaknesses in the subject matter areas through questioning and informal discussion.

The discussion may center on the thesis proposal. The committee will review and make any necessary modifications to the thesis proposal. The thesis proposal may be approved, approved pending revision, or not approved.

If the proposal is not approved, a new proposal must be prepared and another committee meeting held to review and approve the new proposal. This should be completed within one month of the original meeting.

Following the Program Planning Meeting, the committee chair should report the results of the meeting to the Program Chair and provide copies of the plan of study to the Huck Graduate Programs Office. If major changes in the research plan become necessary during the course of the research, you should discuss these changes with the individual committee members.

Thesis Proposal

You are required to file an approved copy of your thesis proposal with the Huck Graduate Programs Office. Prior to the Program Planning Meeting, you should request a Thesis Proposal Cover Sheet from the Office (See Appendix V for a sample of the Cover Sheet). Please allow a day or two for the sheet to be prepared.

When your committee approves your thesis proposal, each committee member should sign the cover sheet, indicating that your thesis proposal has been accepted. You should also sign the cover sheet and return it to the Office along with a copy of your proposal for your file.

Comprehensive Examination

The purpose of the comprehensive examination is to assess your understanding of the many aspects of plant biology. The examination is administered to a student when he or she has essentially completed all the coursework in the plan of study and when both the advisor and the student feel he or she is ready. You will need to have a minimum grade point average of 3.0, and must have demonstrated a high-level of competence in the use of the English language, including reading, writing, listening and speaking. (See English Competency of this Section.)

The examination will determine if the student has attained a level of training in plant biology with sufficient depth and breadth to be worthy of the Ph.D. degree upon submitting an acceptable thesis.

The Comprehensive Exam and Enrollment

You must be enrolled during the semester that the comprehensive exam is scheduled, even during the summer sessions. If you are a graduate assistant and plan to take the comprehensive exam during the summer, you may apply to the Graduate School Tuition Assistance Program. The deadline for this application can vary by year but is usually around March 31. Please consult the current Graduate School Calendar for the exact date.

To satisfy the Graduate School's enrollment requirement, you only need be enrolled for one credit. However, you should consider any funding or visa stipulations regarding enrollment that may take precedence. During the summer sessions, you may enroll for one credit in either session to satisfy the enrollment requirement. This enrollment will be good for the entire summer, until classes start in the fall, allowing the comprehensive exam to be scheduled more easily.

You should not register for PLBIO 601 (Full-time Ph.D. Dissertation) or PLBIO 611 (Part-time Ph.D. Dissertation) until the semester following your comprehensive exam.

Scheduling the Comprehensive Exam

Scheduling a comprehensive examination is a formal process, done through the Graduate School. The exam is officially scheduled and announced by the Director of Graduate Enrollment

Services upon recommendation of the Program Chair. You must schedule your exam at least three weeks in advance.

To schedule a comprehensive examination, you must first contact all your committee members to determine a mutually agreeable date and time for the exam. All the doctoral committee members must be present for the exam to take place. You must also reserve a room in which to hold the exam. To reserve a room, see the secretaries of the building you would like to use.

If a doctoral committee member is unable to attend the exams in person, he or she may participate via videoconference, telephone conference or other electronic means. Under these circumstances, permission from the Graduate School must be made at least three weeks in advance of the exams.

When you have all this information, contact the Huck Graduate Programs Office by phone, e-mail, or in person.

Procedure of the Examination

The comprehensive examination is an oral examination administered by the student's doctoral committee with the Chair of the committee in charge. The committee members will take turns questioning the student. At the end of the examination, each committee member will be asked to rate the student's performance.

Evaluation of Examination Performance

The possible results are:

PASS – A favorable vote of two-thirds of the committee members is required for a student to pass the comprehensive examination.

FAIL – The student has the option to retake the comprehensive examination one time at a date no later than 90 days following the first examination.

FAIL WITHOUT RE-EXAMINATION OPTION – This decision results in the termination of the student from the Plant Biology Program Ph.D. degree program.

The results of the exam will be reported to the Graduate School and to the Plant Biology Program Chair on forms provided by the Graduate School. The Chair of the Doctoral Committee is responsible for forwarding the appropriately signed examination reports to the Huck Graduate Programs Office.

The results of the comprehensive examination will be entered into your official record once the Graduate School has received them.

Post-Comprehensive Registration

Once you have passed the Comprehensive Exam, you must maintain your status as a student by remaining continuously registered until your doctoral committee approves your thesis. This does not include the summer sessions. The course numbers 601 and 611 are used for special non-credit registration for thesis preparation work. You also must have met the two-semester residence requirement.

You may enroll in PLBIO 601 (Full-time Ph.D. Dissertation) and up to a maximum of 3 additional credits of course work for audit by paying only the dissertation fee. Students wishing to take up to a maximum of 3 additional credits of course work for credit, along with PLBIO 601, may do so by paying the dissertation fee and an additional flat fee. Enrollment for more than 3 credits, either for audit or credit, along with PLBIO 601 will require special approval from the Graduate School.

If you have passed your Comprehensive Exam and wish to enroll part-time, you should choose PLBIO 611 (Part-time Ph.D. Dissertation).

Teaching Experience

Many Ph.D. students in the Plant Biology Program are preparing for academic careers, which will generally include a teaching component. If you are planning to teach in your future career, gaining teaching experience during your years of study at Penn State will be important. Some advisors and their academic departments have teaching assistantships and grants available. If you are interested in teaching, be sure to ask your advisor about any available opportunities. Some departments require that students take a pedagogy course before they are eligible for serving as teaching assistants. For example, Biology Department requires that all students take BIOL 598A (Experimental Teaching in Biology I; 2 credits; offered each fall) before they are eligible for teaching.

Students not supported by a teaching assistantship may gain teaching experience by registering for SUBJ 602 (Supervised Experience in College Teaching). Please see the Graduate Degree Programs Bulletin for more details about SUBJ 602. Some examples of SUBJ 602 courses are BMMB 602 and MCIBS 602. Students wanting recognition of their commitment to college teaching may earn the Graduate School Teaching Certificate; for details, see <http://www.gradschool.psu.edu/current-students/tacert/>.

The Final Stages

The final stages of completing a Ph.D. degree require careful planning, with special attention paid to the details, many of which are quite time-sensitive.

When a specific semester for graduation is targeted, it may be helpful to devise a timeline and count backward from the announced date of the commencement ceremony to be sure everything can be done in time.

Intent to Graduate

In order to graduate, you must first have your name placed on the graduation list for the appropriate semester. This is accomplished by notifying the Graduate School of your “Intent to Graduate”, which can be done through eLion at <https://elion.psu.edu>. There is a deadline to file your “Intent to Graduate”, and it falls early in each semester. The deadline cutoff date varies by semester and can be accessed over the Web by visiting the Academic Deadlines site (see Appendix I) or by calling the Huck Graduate Programs Office.

When you believe that you may be ready to graduate, it is best to file your intention with the Graduate School. It is *much* easier to remove your name from the graduation list than to get it added on after the deadline!

The Final Oral Exam

The final oral examination is scheduled with the recommendation of your thesis advisor, after you have satisfied all the other requirements for the Ph.D. degree. The request to schedule the final examination must be made at least three weeks prior to the desired examination date.

When choosing a date, remember that there is a published deadline set by the Graduate School as the last day a final oral examination may be taken for graduation in the same semester.

There is also a Graduate School rule that a minimum of three months must elapse between the comprehensive and final examinations.

The major part of the final examination will be an oral thesis defense. The following points may be used as guidelines for evaluation:

- Has the candidate demonstrated originality, creativity and resourcefulness in conduct of the research?
- Does the research utilize proper experimental designs, appropriate techniques, and are these adequately described?

- Is the candidate able to satisfactorily defend the methods, findings and conclusions of the research as embodied in the thesis?
- Is the candidate sufficiently knowledgeable in the literature of the thesis subject, and can the candidate place his or her contribution in proper context with the literature?
- Is the thesis research worthy of publication in a refereed scientific journal?

Public Thesis Defense

As stated earlier under the Seminar Policy in Section I, students are strongly encouraged to present a public thesis defense seminar. Students should schedule the seminars through the Huck Graduate Programs Office so that appropriate announcements and seminar flyers can be made.

Scheduling the Final Exam

Scheduling a final oral examination is a formal process, done through the Graduate School. The exam is officially scheduled and announced by the Director of Graduate Enrollment Services upon recommendation of the Program Chair. You must schedule your exam at least three weeks in advance.

To schedule a final oral examination, you must first contact all your committee members to determine a mutually agreeable date and time for the exam, and reserve a room in which the examination may be held. All the doctoral committee members must be present for the exam to take place. When you have all this information, contact the Huck Graduate Programs Office by phone, e-mail or in person.

If a doctoral committee member is unable to attend the exam in person, he or she may participate via videoconference, telephone conference or other electronic means. Under these circumstances, permission from the Graduate School must be made at least three weeks in advance of the exam.

The Final Exam and Enrollment

A student must be enrolled during the semester that the final exam is scheduled, even during the summer sessions. If a student is a graduate assistant and plans to take the final exam during the summer, he or she may apply to the Graduate School Tuition Assistance Program. The deadline for this application can vary by year but is usually around March 31. Please consult the current Graduate School Calendar for the exact date.

To satisfy the Graduate School's enrollment requirement, you only need to be enrolled for one credit. However, you should consider any funding or visa stipulations regarding enrollment that may take precedence. During the summer sessions, you may enroll for one credit in either session to satisfy the enrollment requirement. This enrollment will be good for the entire summer, until classes start in the fall, allowing the final exam to be scheduled more easily.

The Final Exam, Thesis Deadlines and Graduation

Each semester, the Graduate School determines a deadline by which a final examination must have been passed in order to graduate in that same semester. The exact date varies by semester and can be found on the Academic Deadlines site on the web (see Appendix I).

In addition, there are a series of deadlines issued by the Thesis Office before which you must submit various drafts of your thesis. These deadlines are published in the Thesis Office Calendar, which can be found by visiting the link listed in Appendix I.

Distribution of the Thesis Final Draft

Copies of the thesis final draft should be distributed to all the doctoral committee members at least two weeks prior to the scheduled examination! The timely distribution of the thesis copies is very important, as your committee members must be allowed time to critically read and examine your thesis before the final oral exam.

Failure to allow your doctoral committee members two weeks to read the thesis final draft could result in a delay of the final oral examination!

The thesis copies provided to the doctoral committee should be in final draft form with respect to style and content. They should have all appropriate notes, illustrations, bibliography, tables, etc.

Evaluation of Examination Performance

The possible results are:

PASS – A favorable vote of two-thirds of the committee members is required for a student to pass the final oral examination.

FAIL – The student has the option to retake the final oral examination one time at a date no later than 90 days following the first examination.

FAIL WITHOUT RE-EXAMINATION OPTION – This decision results in the termination of the student from the Plant Biology Ph.D. degree program.

The results of the exam will be reported to the Graduate School and to the Program Chair on forms provided by the Graduate School. The Chair of the Doctoral Committee is responsible for forwarding the appropriately signed examination reports to the Huck Graduate Programs Office. The results of the final examination will be entered into your official record once the Graduate School has received them.

The Doctoral Thesis

Completion of a Ph.D. in Plant Biology entails the acceptance of a thesis as indicated by the signatures of the doctoral committee and the Program Chair on the Doctoral Approval Page. The thesis must also meet the editorial standards of the Graduate School so that it constitutes a suitable archival document for inclusion in the University Libraries.

All doctoral students must submit their theses electronically. For information on preparation and submission of theses electronically, visit: <https://etda.libraries.psu.edu>. The thesis (in PDF or WORD files) must be uploaded to the eTD website by the announced submission deadline for the semester. In some cases, the thesis advisor may request a bound copy of the thesis. All costs for thesis typing, illustrations, and reproduction, as well as binding of the thesis (if applicable) are borne by the student.

Recommended Schedule for the Ph.D. Degree

Students are expected to attend the weekly Plant Biology Seminar series and are encouraged to attend other seminars that are of interest to them. During summer sessions students are expected to pursue thesis research and participate in regional, national, or international scientific meetings as appropriate.

This brief outline describes a typical course of study. Specific details will vary depending on an individual student's advisor and committee recommendations. Please use the Ph.D. Checklist found in Section VI, Appendix II, to keep track of your individual progress.

Prior to First Semester

- Discuss course of study with Program Chair during Orientation
- Complete the CITI online RCR course, and submit the Course Completion Report to Huck Graduate Programs Office, or via e-mail to Deb Murray at dkm9@psu.edu, by 12:00 noon, August 24, 2015 (See Page 15, Section II).

First Semester

- Take formal coursework:
 - PLBIO 512: Plant Resource Acquisition and Utilization (4 credits)

PLBIO 515: Plant Cell Biology (2 credits)

PLBIO 590: Colloquium (1 credit)

PLBIO 596: Individual Studies (1 credit)

MCIBS 591: Ethics in the Life Sciences (1 credit); may be taken in Second Semester

Appropriate English courses (international students)

- Identify potential areas for thesis research

Second Semester

- Take formal coursework:

PLBIO 513: Integrative Plant Communication and Growth (4 credits)

PLBIO 514: Plant Ecophysiology (2 credits)

PLBIO 516: Plant Molecular Biology (2 credits)

PLBIO 590: Colloquium (1 credit)

PLBIO 596: Individual Studies (1 credit); if continuing with laboratory rotations

MCIBS 591: Ethics in the Life Sciences (1 credit); if not taken in First Semester

PLBIO 600: Thesis Research (1 – 9 credits); if thesis advisor chosen in first semester

Other courses as recommended by thesis advisor or Program Chair

Appropriate English courses (international students)

- Select and appoint a permanent thesis advisor (or by the end of summer)

Third Semester

- Continue to take formal coursework, if necessary
- PLBIO 600: Thesis Research (1 – 9 credits)
- Complete candidacy examination, if not completed in previous summer
- Establish a doctoral committee (recommended)
- Hold Program Planning Meeting (recommended):
- Write a detailed proposal of research to be undertaken
- Submit proposal to doctoral committee for approval
- Prepare for comprehensive examination

Fourth Semester

- Finalize balance of formal coursework
- PLBIO 600: Thesis research (1 – 9 credits)
- Hold Program Planning Meeting (recommended; if not completed in Third Semester)
- Schedule and complete comprehensive examination (recommended)

Fifth and Later Semesters

- PLBIO 600: Thesis Research (1 – 9 credits), if comprehensive exam not passed
- PLBIO 601: Ph.D. Dissertation (0 credits), if comprehensive exam was passed in a previous semester
- Present research seminar in Plant Biology Seminar series (recommended)
- Write thesis and prepare manuscripts for submission to journals
- Schedule public seminar and final oral defense of the dissertation with the doctoral committee

SECTION IV: THE MASTER OF SCIENCE DEGREE IN PLANT BIOLOGY

The Master of Science in Plant Biology is research oriented. The objectives are to enhance understanding of an area of science beyond the baccalaureate level and to attain scientific research skills. M.S. candidates are considered novice researchers and may require considerable guidance in choosing and executing their thesis research projects. However, upon completion of the M.S. degree, students should have developed some capacity for independent research. The M.S. degree is usually completed in two years, including course work and writing an M.S. thesis based on the student's research.

Graduate School Requirements

To earn an M.S. in Plant Biology, you must complete a minimum of 30 credits. At least 20 of these credits must be earned at the University Park campus. These credits are broken down as follows:

- A minimum of 12 credits of course work in the major area at the 400 or 500 level
- A minimum of 18 credits at the 500 or 600 level, including at least 6 credits of thesis research
- A minimum of six credits in minor (if minor is selected)
- Final examination and thesis

Plant Biology Program Requirements

The Plant Biology Program requirements for an M.S. degree are contained within the Core Courses heading of Section II.

Transfer of Credits

You may transfer a maximum of 10 credits of previous graduate course work to Penn State. All transfer credits must have been earned at accredited institutions within five years of the first registration at Penn State. Credits earned to complete a previous M.S. degree may not be applied toward a second M.S. at Penn State. Forms for transfer of credit may be obtained from the Huck Graduate Programs Office or from Graduate Enrollment Services in 114 Kern Building. The student's academic advisor, the Program Chair and the Director of Graduate Enrollment Services must approve any transferred credits.

Written Diagnostic Examination

As part of the core courses for any degree in the Plant Biology Program, all students must enroll in two tutorial courses, PLBIO 512 and PLBIO 513. A member of the Plant Biology Program faculty coordinates each of these courses. Students are presented with advanced lectures in central areas of plant biology and prepare four written solutions to problems per semester, which form a dossier of papers that will constitute the written diagnostic examination for the M.S. degree. The papers are evaluated weekly for ability of the student to reason, demonstrate understanding and knowledge of a subject, creativity, and quality of written and oral presentations.

At the end of the respective semesters, the faculty coordinator will present a summary and evaluation of the student's progress to the Program Chair, who will then decide if the student has passed the written diagnostic examination.

Appointing a Master of Science Committee

Committee Structure

The M.S. committee must have at least three members chosen from the Plant Biology Program Faculty. The committee will consist of a Chair and two additional members. Your advisor will serve as the Chair of the committee. A second representative should be from your major area of interest and the third person should be from a related area of study. A list of faculty members may be found at <http://www.huck.psu.edu/content/graduate-programs/plant-biology/faculty>.

With the approval of the Program Chair, you may appoint a person from outside the Plant Biology Program as part of your committee. In this case, the person will be appointed as an Outside Field Member and will serve as a fourth person on the committee. The Outside Field Member must participate in the final exam and must sign the exam documents and the final thesis.

The duties of the advisor and the committee for the M.S. program are to assist the student in planning a program of study, and to guide and encourage the student toward excellence in the chosen field. They will administer the final oral examination and approve the thesis.

Appointing the Committee

Appointing a Master of Science Committee is an internal process, done through the Huck Graduate Programs Office. To assemble a committee, you should meet with the desired faculty members to determine if they are willing and able to serve.

After getting verbal agreements, you should contact the Office with the names of your committee members, indicating in what capacity each will serve, so that the committee appointment papers can be prepared. This may be done in person, by telephone or by e-mail.

When you receive the appointment sheet from the Office, you should sign it and then gather the signature of each of your committee members. It is your responsibility to get the signatures, and the appointment cannot be made until the sheet is fully signed. The appointment sheet must then be returned to the Huck Graduate Programs Office for final processing. The Program Chair will make the formal appointment of the committee members by memo.

Changes in Committee Membership

For various reasons, it may occasionally become necessary for you to make changes to the committee membership. To make any changes to an appointed committee, contact the Huck Graduate Programs Office. To add a member, you will have to inform the Office of the name of the person and in what capacity he or she will serve. A new appointment sheet must be prepared, but you will only need to get the signature of the new member. This sheet must be returned to the Office for final processing. To remove a member, contact the Office so that a memo can be drafted.

Program Planning Meeting

When you have assembled your committee, you should schedule a Program Planning Meeting to discuss and approve your plan of study and your thesis proposal. The Program Planning Meeting should be held no later than your second semester of residence. Prior to your meeting, you should contact the Huck Graduate Programs Office with the date of your meeting so that your Thesis Proposal Cover Sheet can be prepared (See Appendix V).

At least one week before your meeting, you should distribute a copy of your thesis proposal to your committee members. The thesis proposal should include a brief literature review, a hypothesis being tested, your objectives and the procedures you plan to use. The proposed research will be discussed and any recommendations or changes should be added to the thesis proposal. If a new draft is required, it should be completed within one month of the original meeting. The committee will indicate its approval of the thesis proposal by signing the cover

sheet. The cover sheet and a copy of the proposal must be returned to the Huck Graduate Programs Office.

Intent to Graduate

In order to graduate, you must have your name placed on the graduation list for the appropriate semester. This is accomplished by notifying the Graduate School of your “Intent to Graduate”, which can be done through eLion at <https://elion.psu.edu>. There is a deadline to file the Intent to Graduate, and it falls early in each semester. The deadline cutoff date varies by semester and can be accessed over the Web or by calling the Huck Graduate Programs Office. When you believe that you will be ready to graduate, it is best to file your intentions with the Graduate School. It is *much* easier to remove your name from the graduation list than to get it added on after the deadline!

Final Oral Examination

On completion of the academic program and thesis, the M.S. committee will administer the Final Oral Examination. This exam will determine the student’s ability to defend the methods, findings and conclusions of the thesis, and also determine the student’s ability to relate the research findings to the pertinent literature.

Before you schedule your Final Oral Examination, you should confer with your Committee Chair to ascertain that your thesis research is essentially complete. You will also need to contact the Program Chair to confirm that all other requirements for the M.S. degree have been met.

You should then consult with all your committee members and choose a mutually agreeable date and time. It is also up to you to reserve a meeting location. When everything is decided upon, you should contact the Huck Graduate Programs Office with this information. The exam must be scheduled at least two weeks in advance of the desired date.

Distribution of the Thesis Final Draft

Copies of the thesis final draft should be distributed to all the committee members at least two weeks prior to the scheduled examination! The distribution of the thesis copies is very important, as your committee members must be allowed time to critically read and examine your thesis before the final oral exam.

A favorable vote of two-thirds of the committee members is required for passing the final oral examination. The Committee Chair must present the results of the examination to the Program Chair in writing immediately after the exam. The M.S. final examination may not be combined with the candidacy examination for the Ph.D.

The Master of Science Thesis

Completion of a Master of Science degree in Plant Biology entails the acceptance of a thesis as indicated by the signatures of the Thesis Committee and the Program Chair on the Master’s Approval Page. The thesis must also meet the editorial standards of the Graduate School so that it constitutes a suitable archival document for inclusion in the University Libraries.

Masters’ theses must be submitted electronically. For information on preparation and submission of theses electronically, visit: <https://etda.libraries.psu.edu/>. The thesis (in PDF or WORD files) must be uploaded to the eTD website by the announced submission deadline for the semester. In some cases, the thesis advisor and thesis committee members may request a bound copy of the thesis. All costs for thesis typing, illustrations, and reproduction, as well as binding of the thesis (if applicable) are borne by the student.

Recommended Schedule for the M.S. Degree

The brief outline below describes a typical course of study. Specific details will vary depending on an individual student's advisor and committee recommendations. Students are expected to attend the weekly Plant Biology Seminar series and are encouraged to attend other seminars that are of interest to them. During summer sessions students are expected to pursue thesis research and participate in regional, national, or international meetings as appropriate.

Please use the M.S. Checklist found in Section VI, Appendix III, to keep track of your individual progress.

Recommended Schedule for the M.S. Degree

Prior to First Semester

- Identify a general area of interest and identify the thesis advisor
- Complete the CITI online RCR course, and submit the Course Completion Report to Huck Graduate Programs Office, or via e-mail to Deb Murray at dkm9@psu.edu, by 12:00 noon, August 24, 2015 (See Page 15, Section II).

First Semester

- Take formal coursework:
 - PLBIO 512: Plant Resource Acquisition and Utilization (4 credits)
 - PLBIO 590: Colloquium (1 credit); may be taken in Second Semester
 - MCIBS 591: Ethics in the Life Sciences (1 credit); may be taken in Second Semester
 - PLBIO 600: Thesis Research (1 – 9 credits)
 - Other courses as recommended by advisor
 - Appropriate English courses (international students)
- Develop a plan of study in conjunction with advisor
- Identify an area for thesis research in conjunction with advisor

Second Semester

- Take formal coursework:
 - PLBIO 513: Integrative Plant Communication and Growth (4 credits)
 - PLBIO 590: Colloquium (1 credit), if not taken in First Semester
 - MCIBS 591: Ethics in the Life Sciences (1 credit); if not taken in First semester
 - PLBIO 600: Thesis Research (1 – 9 credits)
 - Other courses as recommended by advisor
 - Appropriate English courses (international students)
- Identify members of the M.S. thesis committee
- Schedule a Program Planning Meeting to discuss and develop a specific thesis topic and plan of action for its completion
- Develop a plan of study
- Discuss progress made in coursework and any additional courses the committee feels are necessary
- Submit a detailed thesis proposal to the thesis committee before the end of the second semester
- Begin working on thesis paper as early as appropriate

Third Semester

- PLBIO 600: Thesis Research (1 – 9 credits)
- Take formal coursework, if necessary
- Continue with work on thesis

Fourth and Later Semesters

- PLBIO 600: Thesis Research (1 – 9 credits); not required for the final semester
- Continue formal coursework as required to complete plan of study
- Complete thesis
- Present a research seminar in the Plant Biology Seminar series
- Schedule final examination with committee

SECTION V: PLANT BIOLOGY COURSE OFFERINGS

The following is a list of courses offered by the Plant Biology Program:

PLBIO 512: Plant Resource Acquisition and Utilization (4 credits)

Advanced study of plant resource acquisition and utilization considering molecular, physiological, and whole plant perspectives through lectures and problem solving

PLBIO 513: Integrative Plant Communication and Growth (4 credits)

Advanced study of plant communication, growth, and development considering molecular, physiological, and whole plant perspectives through lectures and problem solving

PLBIO 514: Modern Techniques and Concepts in Plant Ecophysiology (2 credits)

An intensive introduction to concepts of plant ecophysiology and modern techniques used in this field

PLBIO 515: Modern Techniques and Concepts in Plant Cell Biology (2 credits)

An intensive introduction to concepts of plant cell biology and modern techniques used in this field

PLBIO 516: Modern Techniques and Concepts in Plant Molecular Biology (2 credits)

An intensive introduction to contemporary molecular biology methods as applied to the study of plants

PLBIO 590: Colloquium (1 – 3 credits)

PLBIO 596: Individual Studies (1 – 9 credits)

PLBIO 600: Thesis Research (1 – 15 credits)

PLBIO 601: Ph.D. Dissertation, full-time (0)

PLBIO 610: Thesis Research, off campus (1 – 15)

PLBIO 611: Ph.D. Dissertation, part-time (0)

SECTION VI: APPENDICES

Appendix I – Table of Useful Web Sites

<u>Plant Biology Program</u>	101 Life Sciences Building
Plant Biology Program Web Site	http://www.huck.psu.edu/content/graduate-programs/plant-biology
<i>Check here for Program news, updates, information and events</i>	
Plant Biology Program Listserv® addresses	
List includes <i>all</i> faculty, students and other interested people	L-Plant-Biology-Superlist@lists.psu.edu
List includes Plant Biology <i>faculty only</i>	L-Plant-Biology-Faculty@lists.psu.edu
List includes Plant Biology <i>students only</i>	L-Plant-Biology-Students@lists.psu.edu
<u>The Graduate School</u>	114 Kern Building
The Graduate School Home Page Graduate Enrollment Services	http://www.gradsch.psu.edu http://www.gradschool.psu.edu/about-us/office-of-graduate-enrollment-services
<i>Important resources and information about the Graduate School and its programs</i>	
“Graduate Degree Programs Bulletin”	http://www.psu.edu/bulletins/whitebook
<i>Online edition of the Bulletin, check for all Graduate School information and requirements</i>	
Graduate Calendar and Academic Deadlines	http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/
<i>A listing of academic deadlines for current and future semesters.</i>	
Fellowships and Student Financial Aid	http://www.gradsch.psu.edu/fellowships/programs.html
<i>Applications and information about funding opportunities.</i>	
<u>The Thesis Office</u>	115 Kern Building
“The Thesis Guide” (PDF format)	http://www.gradschool.psu.edu/index.cfm/current-students/etd
<i>Online edition of The Thesis Guide. Contains editorial requirements for Graduate Theses</i>	
Thesis Office Calendar	http://www.gradschool.psu.edu/current-students/etd/thesisdissertationperformance-calendar/
<i>Check here to find the thesis deadlines for the current semester</i>	
<u>Office of the University Registrar</u>	112 Shields Building
Registrar’s Office Home Page	http://www.registrar.psu.edu
<i>Check here for information on registration, transcripts and grades</i>	
Registration Instructions	http://www.registrar.psu.edu/registration/registration_index.cfm
<i>Detailed instructions on how to register for courses</i>	
Schedule of Courses	http://schedule.psu.edu/
<i>A listing of all the courses being offered at Penn State</i>	
<u>Office of the Bursar</u>	103 Shields Building
Bursar’s Office Home Page	http://www.bursar.psu.edu
Billing Due Dates	http://www.bursar.psu.edu/duedates.cfm
Rapid refund request forms	http://www.bursar.psu.edu/forms.cfm
<i>Information on tuition, fees, semester bills, due dates room & board and more</i>	
<u>eLion</u>	https://elion.psu.edu
<i>Online course registration, access transcripts, grades and more</i>	
<u>Graduate and Professional Student Association</u>	315 Hub-Robeson Center
GPSA Home Page	http://gpsa.psu.edu/

APPENDIX II: Ph.D. DEGREE CHECKLIST

Please use this checklist to keep track of your progress.

Requirement or Action	Timeframe or Deadline	Notes and Instructions	Completed
Discuss course of study	Huck Graduate Programs Orientation	Program Chair will describe the curriculum and important issues concerning graduate study.	
Obtain a copy of Plant Biology Student and Faculty Handbook	Huck Graduate Programs Orientation	Also available online at the Plant Biology Program website	
Register for and take CITI online RCR course	Before or during Huck Graduate Programs Orientation; must submit the Completion Report to Huck Graduate Programs Office by noon August 24, 2015.	Students must work independently to complete the modules and pass the online quizzes.	
Take PLBIO 512: Plant Resource Acquisition and Utilization	Must take during first Fall Semester	Term papers for this course form the basis of the candidacy examination.	
Take PLBIO 513: Integrative Plant Communication and Growth	Must take during first Spring Semester	Term papers for this course form the basis of the candidacy examination.	
Take PLBIO 514: Plant Ecophysiology	Must be completed by the end of second year	One of three modules of the jumpstart course. May be taken in any sequence.	
Take PLBIO 515: Plant Cell Biology	Must be completed by the end of second year	One of three modules of the jumpstart course. May be taken in any sequence.	
Take PLBIO 516: Plant Molecular Biology	Must be completed by the end of second year	One of three modules of the jumpstart course. May be taken in any sequence.	
Take all other required courses: PLBIO 590, PLBIO 596 and MCIBS 591	Must be completed by the end of first year	MCIBS 591 may be taken in either the first Fall or the first Spring Semester.	
Appoint permanent Advisor	After completing laboratory rotations; no later than the end of the summer before the second Fall Semester	Contact Huck Graduate Programs Office with this information.	
Take the Oral Candidacy Exam	Must pass by the end of second Fall Semester	Paperwork needed! Signatures required! Contact Huck Graduate Programs Office with date, time, location, and names of all candidacy panel members. Allow 2 days.	
Appoint Doctoral Committee	After passing oral candidacy exam and formulating a thesis research plan	Paperwork needed! Signatures required! Contact Huck Graduate Programs Office with names of committee members. Return form to Office with all signatures.	
Hold Program Planning Meeting	Within two semesters after passing candidacy exam (recommended)	Committee meets to approve thesis research proposal. Pick up Thesis Proposal cover sheet from Huck Graduate Programs Office. Allow 2 days.	
Submit approved Thesis Proposal	Immediately after thesis research proposal is approved by doctoral committee	Paperwork needed! Signatures required! Return copy of Thesis Proposal with signed cover sheet to Huck Graduate Programs Office.	
Schedule and take Comprehensive Exam	After completing almost all the required course work	Paperwork needed! Signatures required! Entire committee must be present. Contact Huck Graduate Program Offices with date, time and location. Student responsible for reserving room. This exam is scheduled by Huck through the Graduate School. Allow three weeks!!	

Schedule and present research seminar(s) in the Plant Biology Seminar series	After obtaining a substantial amount of results in thesis research. Additional seminars may be given later, if warranted.	Consult with thesis advisor the timing of seminar; schedule the seminar with the coordinator of the Plant Biology Seminar series.	
Activate Intent to Graduate	Early in desired semester; deadline varies by semester	Done through eLion at https://elion.psu.edu	
Schedule and take Final Oral Exam and give a public thesis seminar	Schedule when ready to defend thesis. Must pass before deadline for graduation in same semester; deadline varies by semester.	Paperwork needed! Signatures required! Entire committee must be present. Contact Huck Graduate Programs Office with date, times and locations of public seminar and oral exam. Student responsible for reserving room. This exam is scheduled by Huck through the Graduate School. Allow three weeks!!	
Distribute copies of thesis final draft to committee members	Two weeks prior to final oral examination		
File Thesis for format review	During semester of defense; deadline varies by semester	File with Thesis Office, 115 Kern Building.	
Submit Thesis electronically to the Graduate School.	After thesis has incorporated changes required by doctoral committee and by Thesis Office	In some cases, thesis advisor may request a bound copy of thesis.	

APPENDIX III: M.S. DEGREE CHECKLIST

Please use this checklist to keep track of your progress.

Requirement or Action	Timeframe or Deadline	Notes and Instructions	Completed
Discuss course of study	Huck Graduate Programs Orientation	Program Chair will describe the curriculum and important issues concerning graduate study.	
Thesis Advisor appointed	Prior to or soon after arrival		
Obtain a copy of Plant Biology Student and Faculty Handbook	Huck Graduate Programs Orientation	Also available on-line at the Plant Biology Program website	
Register for and take CITI online RCR course	Before or during Huck Graduate Programs Orientation; must submit the Completion Report to Huck Graduate Program Office by noon August 24, 2015.	Students must work independently to complete the modules and pass the online quizzes.	
Take PLBIO 512: Plant Resource Acquisition and Utilization	Must take during first Fall Semester	Term papers written for this course constitute part of the written diagnostic exam.	
Take PLBIO 513: Integrative Plant Communication and Growth	Must take during first Spring Semester	Term papers written for this course constitute part of the written diagnostic exam.	
Accumulate at least 30 graduate credits, including all other required courses (PLBIO 590 and MCIBS 591)		A minimum of 18 credits at the 500 or 600 level, including at least 6 credits of thesis research; at least 12 credits in course work at the 400 or 500 level	
Appoint M.S. Thesis Committee; three members needed	By the end of first Spring Semester	Paperwork needed! Signatures required! Contact Huck Graduate Programs Office with names of committee members. Return form to Office with all signatures.	
Hold Program Planning Meeting	During first Spring Semester	Committee meets to approve thesis research proposal. <u>Pick up Thesis Proposal cover sheet from Huck Graduate Programs Office. Allow 2 days.</u>	
Submit approved Thesis Proposal to Program Chair	Immediately after thesis research proposal is approved by committee	Paperwork needed! Signatures required! Return copy of Thesis Proposal with signed cover sheet to Huck Graduate Programs Office.	
Notify Graduate School of Intent to Graduate	Early in desired semester; deadline varies by semester	Done through eLion at https://elion.psu.edu	
Schedule Final Oral Exam	When ready to defend thesis; must pass before deadline for graduation in same semester; deadline varies by semester.	Paperwork needed! Signatures required! Entire committee must be present. Contact Huck Graduate Programs Office with date, time and location. <u>Student responsible for reserving room. Allow two weeks!!</u>	
Distribute copies of thesis final draft to committee members	Two weeks prior to final oral examination		
File Thesis for format review	During semester of defense; deadline varies by semester	File with Thesis Office, 115 Kern Building.	
Submit Thesis electronically to the Graduate School.	After thesis has incorporated changes required by doctoral committee and by Thesis Office	In some cases, thesis advisor may request a bound copy of thesis.	

**Annual Student Evaluation
The Huck Institutes of the Life Sciences
Graduate Programs**

Name of Student: _____ Advisor(s): _____

Current Degree Program : _____ Degree Sought: _____

Academic Year: June 2015-May 2016

Evaluation of Student Performance

	Poor 1	Below Average 2	Average 3	Above Average 4	Superior 5	Comments
Thesis Research						
Analytical and Problem Solving						
Thoroughness in Completing Tasks						
Ability to Work Well With Others						
Motivation						
Perseverance						
Integrity						
Work Ethic						

Student has passed candidacy YES NO, not taken yet NO, failed
If not taken yet, when will it be taken? _____ Date If failed, will 2nd exam be allowed? YES NO

Student has passed the comprehensive examination? YES NO, not taken yet NO, failed
If not taken yet, when will it be taken? _____ Date

Thesis Committee Has Been Appointed YES NO
If not, when do you anticipate the committee will be appointed? _____ Date
When did the student last meet with the committee? _____ Date
If no meeting has been held in the last year, has one been planned? YES NO

Please feel free to comment further (on the back) on any of the above evaluation criteria and to make recommendations for the upcoming year.

Advisor Signature Date

Student Signature (I acknowledge receipt of this evaluation) Date

Students can provide written comments in response to this review, a copy of which will go to the chair of the program and the advisor.

Please return one signed copy to Huck Graduate Program Staff, 101 Life Sciences Bldg., by June 15, 2015

APPENDIX V: THESIS PROPOSAL COVER SHEET -
SAMPLE

<Student's Name>
Doctoral Candidate

Intercollege Graduate Degree Program in Plant Biology

Thesis Proposal
Approved <Insert Date>

Committee Members _____

Signature _____

<First name>, Chair and advisor, major field

<Second name>, co-advisor (if applicable), major field

<Third name>, major field

<Fourth Name>, major field

<Fifth Name>, related area

<Student Name>, doctoral candidate

APPENDIX VI: THESIS RESOURCES

<p>Information on thesis requirements and submission, forms, payment of thesis fee, graduate workshop registration, Graduate School Commencement, eTD (electronic theses and dissertations):</p> <p style="text-align: center;">Thesis Office 115 Kern Building University Park, PA 16802</p> <p>Phone: (814) 865-5448 Fax: (814) 863-4627 E-mail: gradthesis@psu.edu Web sites: https://etda.libraries.psu.edu http://www.gradsch.psu.edu/current/thesis.html</p>	<p>Information on scheduling doctoral exams, appointing or changing doctoral committees, completion of Graduate School requirements, letters of certification:</p> <p style="text-align: center;">Graduate Enrollment Services 114 Kern Building University Park, PA 16802</p> <p>Phone: (814) 865-1795 Fax: (814) 863-4627 E-mail: gswwww@psu.edu http://www.gradschool.psu.edu/about-us/office-of-graduate-enrollment-services</p>		
<p>Transcripts, diplomas, official name change, student records, change of address:</p> <p style="text-align: center;">Office of the University Registrar 112 Shields Building University Park, PA 16802</p> <p>Phone: (814) 865-6357 Fax:(814) 865-6359 E-mail: registrar@psu.edu Web site: http://www.registrar.psu.edu</p>	<p>PSU thesis software for MS Word, eTD technical support, CAC training and seminars:</p> <p style="text-align: center;">Center for Academic Computing 215 Computer Building University Park, PA 16802</p> <p>Phone: (814) 863-2494 E-mail: helpdesk@psu.edu Web site: https://etda.libraries.psu.edu</p>		
<p>Thesis copying and binding services:</p> <p style="text-align: center;">Multimedia & Print Center 101 Hostetter Business Services Building University Park, PA 16802</p> <p>Phone: (814) 865-7544 Web site: http://www.multimediacprint.psu.edu</p>	<p>Review/approval of the use of human subjects, vertebrate animals, bio-hazardous materials or radioisotopes:</p> <p style="text-align: center;">Office for Research Protections Suite 205, The 330 Building University Park, PA 16802 Phone: (814) 865-1775 Fax: (814) 863-8699 Web site: http://www.research.psu.edu/orp</p>		
<p>Thesis-quality paper, information on freelance thesis typists, appointments with Graduate Writing Center:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <p style="text-align: center;">Graduate and Professional Student Association 315 Hub-Robeson Center University Park, 16802</p> </td> <td style="width: 50%; border: none;"> <p>Phone: 814-865-4211 Fax: 814-865-3033 E-mail: gpsa@psu.edu</p> </td> </tr> </table>		<p style="text-align: center;">Graduate and Professional Student Association 315 Hub-Robeson Center University Park, 16802</p>	<p>Phone: 814-865-4211 Fax: 814-865-3033 E-mail: gpsa@psu.edu</p>
<p style="text-align: center;">Graduate and Professional Student Association 315 Hub-Robeson Center University Park, 16802</p>	<p>Phone: 814-865-4211 Fax: 814-865-3033 E-mail: gpsa@psu.edu</p>		