



**The Huck Institutes**  
OF THE LIFE SCIENCES

**Genetics Graduate Program**  
**Degree Requirements Booklet**  
**Fall 2014**

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### **Introduction**

This handbook has been compiled as an aid for graduate students and faculty in the Intercollege Graduate Program in Genetics at Penn State's University Park campus. It contains current information and degree requirements for the Graduate Program in Genetics.

In some cases, the degree requirements are specific to the Genetics Program. Additional University requirements can be found in The Penn State Graduate Degree Program Bulletin and the Thesis Information Bulletin.

### **Degree Programs**

The Intercollege Graduate Program in Genetics is committed to excellence in genetics research and scholarship as well as the professional development of our students. The PhD degree is "conferred in recognition of high attainment and productive scholarship" in genetics. The Genetics program does not admit students for a MS degree. The MS is available to PhD students who choose for whatever reason not to continue with a PhD. The MS degree program is designed to develop research expertise and technical proficiency in genetics.

### **Responsibilities of the Student, Thesis Advisor and Student's Committee**

It is the student's responsibility to ensure that the regulations and requirements of the Graduate School and Genetics Program are met. Thesis advisors and graduate committees have a responsibility for the judicious timing of meetings and examinations and provide important guidance. The Genetics office will provide student profiles to the student and advisor as necessary. It is the responsibility of the student and advisor to review and provide updated information for these profiles.

## **Rotations and Advisor Selection Process**

The selection of the faculty advisor is one of the most important decisions a student will make. Our rotation program allows incoming students to work with several faculty members before making this choice. Laboratory rotations allow students to assess several opportunities for doctoral thesis research and explore new areas with the diverse field of Genetics. The Department Chair is responsible for advising first year rotation students through their initial course of study. To ensure that each student experiences the breadth of research opportunities within the program, incoming students will participate in 3 laboratory rotations (each rotation lasts 5 weeks). Every opportunity will be provided for students to select these rotations on the basis of their own interests. After completing three rotations, the students will select a thesis laboratory. The potential mentor must guarantee four additional years of support. The program also allows for a student to be admitted directly into the laboratory of a participating faculty member who has guaranteed a full five years of support. In this case, laboratory rotations are not applicable. However, the Genetics Program still has the responsibility for academic oversight of such a student.

## **Requirements for the Doctor of Philosophy (PhD) degree in Genetics**

The Doctor of Philosophy degree is conferred on students in recognition of high attainment and productive scholarship in genetics.

### ***The PhD student must achieve:***

- A minimum grade point average of 3.0
- At least 15 credits of genetics courses
- At least 3 credits in Statistics

The student is evaluated for breadth and depth of scholarship by means of two examinations, the Candidacy Examination and the Comprehensive Examination. All PhD students are required to prepare and formally defend a thesis involving independent research. This section of the website details the various requirements and formats for examinations for PhD students in Genetics Program.

### ***Doctoral Committee***

After completing the Candidacy Examination, an official Doctoral Committee can be formally appointed by the Graduate School. This committee typically consists of four or more active members of the Graduate Faculty. At least one member of the committee must be from outside the Genetics Program. The Chair of the Doctoral committee cannot be the student's advisor.

Following the Candidacy Exam, the advisor should submit the names of the Doctoral Committee to the Genetics Program Office for processing of the required paperwork.

### ***English Competency***

Candidates for the PhD degree in Genetics are required to demonstrate high level of competence in the use of the English language. This competence includes reading, writing, and speaking as part of the language and communications requirements for the PhD.

The English competency of all students entering the PhD program during or after the Fall 1992 semester must be evaluated by the Genetics Program. The Graduate School requires the program to formally attest to a student's English competency before the comprehensive exam can be scheduled. In order to meet this objective, graduate programs are expected to have mechanisms to evaluate and improve the English competency of both international and domestic students.

As an initial evaluation for international students at University Park from non-English speaking countries, these students will take the American English Oral Communicative Proficiency Test administered by the University's Department of Applied Linguistics. Arrangements to take this exam can be made by the student through the Instructional Development Program, 1 Sparks Building. Based on the results from this exam, students may be required to complete one or more special English classes (SPCOM 114G, 115G, 116G).

All students (domestic and international) will be evaluated for their writing competence as part of their Candidacy Exam. The written portion of this exam is taken in advance of the oral portion of the exam. The appropriate use of English will be evaluated by the student's advisor and one other member of the Candidacy Committee. If the performance is not acceptable, the student will be directed to additional English Composition courses (i.e. ENGL XXXG). In this case, the student will be reevaluated by his or her formal Doctoral Committee.

To evaluate speaking competence, all students will be evaluated in formal-prepared situations based on their presentations in Colloquium 590. The seminar chair will provide the student's advisor a written evaluation of the student's performance, strengths, and weaknesses based partly on audience evaluation and on the evaluation of Genetics faculty. A second evaluation will be made by Candidacy Committee during the oral portion of the Candidacy exam. If the student and advisor feel that the evaluation of oral competence during the candidacy will be unduly stressful, a separate portion of the exam can be designated for oral evaluation. If the student does not demonstrate acceptable competence based on the above evaluations, the student's major professor will be responsible for providing mechanisms for improving these skills. Possible scenarios include: frequent verbal critiques of assigned professional papers, presentations in laboratory meetings and additional presentations in Colloquium 590. Members of the student's Doctoral Committee are asked to help evaluate and attest to progress of the student.

The student's advisor will notify the Program Chair in writing when the student has met the English Competency requirement. The Program Chair will then notify the Graduate School.

### ***Candidacy Exam***

Purpose, timing and administration of the candidacy examination for University-Park-based PhD students in the Genetics program.

#### **Purpose of the exam**

The candidacy exam serves to verify that the student has mastered the basic body of knowledge that is expected of PhD candidates. The formal purpose for the exam is to determine whether the student has earned admission to candidacy, and can hence begin a period of research aimed towards a PhD thesis. In Genetics, the candidacy serves as a formal introduction of the student to his/her committee, and allows the committee to assess the capabilities of the student. It also can identify deficiencies that can be corrected by course work or independent study. It is anticipated that preparation for the candidacy exam will provide students with a renewed grasp of basic concepts that will serve as a strong foundation for subsequent research and training in Genetics. Finally, the candidacy serves as one mechanism for evaluating the student's English competency.

#### **Scheduling the exam**

The University regulation is that a student cannot take the candidacy exam before completion of 18 credits after the Baccalaureate. The University requires that the exam be taken within three semesters after admission to the program (excluding summers). Hence, a student admitted in the Fall of 2011 should take the exam either in Summer 2012 or Fall 2012.

The Genetics Program candidacy exam includes both written and oral components as described below. Because the exam will be generated and administered by the student's candidacy committee, the first step is for each student and his/her advisor to establish this committee. Once the committee is established, students should see Deb Murray in 101 Life Sciences Building to initiate the candidacy paperwork at least a week before the examination.

#### **Formulation of the candidacy committee**

The candidacy committee is normally composed of five faculty members including the thesis advisor. Often the same group will eventually serve as the thesis committee. The Chair of the candidacy committee may not be the thesis advisor and must be a tenured faculty member in the Genetics Program. All committee members may be Genetics Program faculty, however at least one committee member must be from outside the home department of the student's advisor. The composition of the committee must be approved by the thesis advisor and the Program Chair.

### **Guidelines for administering the exam**

The candidacy evaluation will involve a take-home written exam followed by an oral examination in committee as described below. The student will schedule the oral exam at a time that is compatible with the schedules of the committee members.

### **Written Exam**

The written exam is an open-book take home exam. The student will choose to answer 5 of 8-10 essay questions. Students are required to work independently and will have 48 hours to complete the exam.

To generate the written exam, the Committee Chair will solicit questions from the committee (2 or 3 from each member). The goal is to determine whether the student has a solid understanding of core and relevant concepts in Genetics; the questions should be selected accordingly. The questions should be straightforward and provide a clear sense of what is being asked. After the questions are reviewed by the Chair and thesis advisor, the Chair will choose 10 questions to be included in the exam, 2 questions per committee member. Students will answer 1 question per committee member. A copy of these questions should be sent to the Genetics Program office for our files.

The written exam may be taken at any time agreed upon by the student and Committee Chair. However, prior to scheduling the written exam, the student should contact the committee to schedule the date and time of the oral exam and then reserve a room for this purpose. The oral exam should be scheduled at least one week after completion of the written exam and before the end of the calendar year. The Genetics program office should be notified by email of the date and time of the oral and written exams.

The Committee Chair will send an electronic copy of the exam to the student. The student will complete the exam with each answer as a separate file and return it 48 hours later. After the exam is completed, it will be distributed to the committee for review prior to the oral exam (committee members should have at least 1 week to review the completed exam).

### **Oral Exam**

The oral exam will take place at least one week after completion of the written exam. The oral exam may build on the written exam and also extend more broadly to any core and relevant concepts in Genetics. Prior to the exam, students are encouraged to talk with their committee members regarding their preparation for the candidacy evaluation.

## **Reporting the Results**

After completion of the candidacy exam, the Committee Chair will send the completed the Candidacy Exam Form to Deb Murray in 101 Life Sciences Building. For international students, this should include a written statement attesting to the student's English Competency. The Program Chair approves the candidacy exam paperwork before it is forwarded to the Graduate School. The committee may provide a written statement with recommendations for additional studies as a condition of passing the student. After review, a copy of the notification will be sent to the student by the Program Chair.

## ***Comprehensive exam***

Purpose, timing and administration of the comprehensive exam for University-Park-based PhD students in the Genetics program.

### **What is the purpose of a comprehensive exam?**

Successful completion of the comprehensive exam indicates that the student has a solid background in the area in which he or she chooses to specialize. It marks the watershed from taking courses to being a full-time researcher. The exam allows the committee to thoroughly examine the student's preparation for thesis research.

### **When does a student take the comprehensive exam?**

Generally the comprehensive exam is taken when a student has finished all course work and is ready to focus on thesis research. This is typically after their second year, and students are strongly encouraged not to delay taking the comprehensive past their third year. In order to take the comprehensive exam, the student is required to have passed their candidacy exam and to have maintained a 3.0 grade point average. The student must also be registered full or part-time in the semester that their comprehensive exam will be administered. The exam is officially scheduled by the Graduate School at the request of the Genetics Program Chair. Three weeks notice is required.

### **Who administers the comprehensive exam?**

The comprehensive exam is given by the student's Doctoral Committee.



**What is the format of the comprehensive exam?**

The student must prepare a formal research proposal and distribute it to members of the committee prior to the oral exam. The proposal may either cover the student's thesis work. Details of format can be worked out by the committee. The oral portion of the comprehensive exam provides an opportunity for the student and committee to thrash out the ideas of the student's proposal. Part of this process of defending the proposal will naturally test the student's familiarity with the literature and the basic foundations of the science.

**Who grades the comprehensive exam?**

The comprehensive is not given a letter grade. Two-thirds of the Doctoral committee must agree that the student has passed the exam, and this information is relayed to the Genetics Program Office and the Graduate School for official entry into the student's record.

**What are the requirements of the student after completion of the comprehensive?**

The student must keep the committee informed of his/her progress on an annual basis. If an annual meeting is not held, the student must individually contact each committee member.

The thesis advisor should be consulted in planning regular meetings of the committee. Although annual meetings with the committee are encouraged, they are not required. At the discretion of the committee, the student may be required to submit an annual written progress report.

### ***Final oral examination***

Recommendations for Genetics PhD students on preparation for this examination.

#### **Preparation**

It is highly recommended that all students meet with their thesis committee at least six months in advance of their planned graduation date. It is the responsibility of the student, in consultation with the thesis advisor, to provide a detailed review of research progress, future plans and a time table for completing the final thesis. Typically, the student will present this to the committee in the form of an oral presentation.

After reviewing the student's progress and plans, the committee will form a recommendation regarding any remaining requirements for completing the degree. After the doctoral candidate has satisfied all other requirements for the degree, and upon recommendation of the thesis committee and advisor, the Program Chair will ask the Graduate School to schedule the final examination.

Normally, at least three months must elapse between the comprehensive and final oral examinations.

The student, in consultation with the thesis advisor and the Genetics Program, is required to meet all graduation requirement deadlines as indicated in the Graduate School Academic Calendar. These include deadlines for:

- Activating the "Intent to Graduate" on ELion (early in the final semester)
- Submitting a draft thesis for format review by the Graduate School Thesis Office
- Completing the final examination and final thesis submission.

A major aspect of the final examination should be an oral thesis defense. Prior to the final examination, the last draft of the thesis should be approved by the advisor and distributed to the thesis committee (preferably two weeks in advance of the final examination).

The format of the thesis must conform to strict guidelines determined by the Graduate School and the thesis submission must comply with Graduate School deadlines.

**The following points may be used as guidelines for evaluation**

1. Is the research original?
2. Are proper experimental designs, appropriate techniques, and interpretation of results described in the thesis?
3. Is the candidate able to defend the methods, findings, and conclusions of the research?
4. Is the candidate sufficiently knowledgeable of the literature to place his or her contribution in proper context?
5. Is the thesis research worthy of publication? (students are highly encouraged to publish thesis work)

The decision of the committee will be reported to the Program Chair and to the Graduate School on the forms provided by the Graduate School.

**After the thesis defense**

Following successful completion of the final thesis incorporating any revisions required by the committee, the thesis is signed by the committee and forwarded to the Program Chair for final approval.

## **Requirements for Masters of Science (MS) degree in Genetics**

The Genetics program is a PhD program. However, some PhD students may elect to stop their course of study and complete a MS degree. A common misconception is that a MS is required before getting a PhD; this is not the case.

The requirements for an MS in Genetics must be completed within 8 years of starting study. The requirements are:

1. A minimum grade point average of 3.0
2. A minimum of 30 graduate credits must be earned, of which 20 must be from Penn State, and up to 10 credits of graduate work may be transferred from another institution.
3. At least 18 credits must be at the 500-600 level (this includes up to 6 thesis research credits for a letter grade—thesis research credits past that should receive an “R” grade)
4. At least 12 credits must be non-research credit courses chosen from the list approved by the Genetics Program including Genetics 590 Colloquium for at least two semesters
5. At least 3 credits in statistics
6. A thesis is required of all M.S. students. There is no requirement for a final defense of the M.S. thesis, but students are encouraged to make a formal presentation of their thesis research. This presentation is not an exam. Usually an MS thesis is a report of work done in the advisor’s laboratory, but it is also acceptable to write a critical review of an important question in the field (non-research thesis). The University has strict requirements on thesis format, and students are advised to get a current copy of the Thesis Information Bulletin online or from the Graduate School Thesis Office, 303 Kern Graduate Building before commencing with writing.

### ***Appointment and of the Advisor and the thesis Committee***

The advisor for an MS degree is usually the student’s PhD advisor and every effort will be made to maintain the student advisor relationship. The MS thesis committee will consist of the student’s advisor and a reader, who is a Genetics Faculty member and the Program chair. Acceptance of a final MS thesis will be determined by a simple majority vote. The student and the advisor can suggest committee members, but the final composition must be approved by the Program Chair. A change in advisor or in the composition of the committee can be requested, but these changes require the approval of the Program Chair or the Genetics executive committee if the student is advised by the Program chair.

### ***Duties of The MS thesis advisor and committee.***

The advisor is charged with reviewing the draft MS thesis and ensuring that it is in final form prior to distribution to the committee. The committee’s duties are to evaluate the thesis and ensure that it meets the standard of scholarship necessary for the MS degree. Acceptance of a final MS thesis will be determined by a simple majority vote.

## **Curriculum**

University-Park-based PhD students in the Genetics program are required to take at least 15 credits of approved genetics courses. MS students are required to take at least 12 credits.

### ***Required courses for PhD students***

- Genetic Model Systems (GENET 597A)
- Participation in the Genetics Colloquium (GENET 590) for four semesters.
- Molecular Evolution (BIOL 405) or Population Genetics (BIOL 428) or an acceptable substitute course.
- Core Concepts in Biomolecular Science (BMB 597A) or Molecular Biology of the Gene (BMB 400)

Additional courses may be recommended by the student's thesis committee.

### ***Elective courses***

Elective courses cover diverse topics in Genetics and the Life Sciences and are selected in consultation with the thesis advisor from a large number of relevant courses offered by departments and programs across the university. Students often select courses which are offered by the departments of Biology, Biochemistry and Molecular Biology, Veterinary and Biomedical Sciences, Anthropology, and Statistics and affiliated with research centers of excellence in Comparative Genomics and Bioinformatics, Disease Dynamics, Cell and Developmental Biology, Molecular and Cellular Neuroscience, Molecular Toxicology, Plant Biology and the Institute for Molecular Evolutionary Genetics.

### ***Responsible Conduct of Research Training Requirement***

Students in the Genetics 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 IBIOS 591, Ethics in the Life Sciences, a required 1-credit course typically taken during the first semester. 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 register for the online CITI RCR course as soon as possible in the Fall semester. To register, go to the Penn State SARI website, Online Training Program page (<http://www.research.psu.edu/training/sari/program>) where you will find instructions and a link for the CITI Program website (<http://www.citiprogram.org/>). Select Pennsylvania State University as the participating institution and register for the CITI Biomedical Sciences course. Students must work on their own to complete the course modules and pass the on-line quizzes. All modules must be completed by the end of the first Fall semester; and a copy of the student's Completion Report must be submitted to the Program administrative office before January 15th.