

PENNSTATE



The Huck Institutes

OF THE LIFE SCIENCES

**Cell and Developmental Biology
Graduate Program**

Degree Requirements Booklet

Fall 2009

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Cell and Developmental Biology (CDB)

Course Requirements

Course requirements include Core Concepts in Biomolecular Science, Current Research Seminars, Benchmark Papers, the Huck Institutes' Colloquium and Ethics in the Life Sciences. Flexibility in curriculum design is a goal, so certain of these requirements may be substituted by other courses upon consultation with the CDB Chair, in order to optimize the educational experience of each student. Grading of lecture courses will be based on written examinations and, in some cases, assigned papers. The seminar and reading courses will be graded based on class participation as judged by the facilitator.

Responsible Conduct of Research Training Requirement: NEW for Fall 2009

Starting in Fall 2009, all new students in the Cell and Developmental Biology graduate program will be required to complete the online CITI (Collaborative Institutional Training Initiative) Biomedical Science Responsible Conduct of Research (RCR) training course during their first year. This online course will supplement in-class, discussion-based RCR training provided in IBIOS 591, Ethics in the Life Sciences, a 1-credit required course taken during the second year.

First year students should register at the CITI website

(<http://www.citiprogram.org/>) (select Pennsylvania State University as the participating institution) and begin the online Biomedical Science RCR course as soon as possible in the Fall semester. Students must work on their own to complete the modules and pass the on-line quizzes. All modules must be completed before the end of the first Spring semester; and a copy of the student's Completion Report must be submitted to the Program administrative office by June 15th.

Rotations/Mentor Selection

All students are required to participate in three laboratory rotations. Laboratory rotations begin in the first semester of enrollment, each consisting of a five-week period during which the student participates in small research projects in a laboratory. Prior to the beginning of the semester, the student provides the chair with a list of at least three preferred laboratories, and the chair facilitates the necessary arrangements to attempt to schedule the rotations, dependent on the prospective faculty member's willingness to provide this opportunity. At the end of the rotation period, the student provides the chair with a list of preferred laboratories and the chair will try to match the student with the best-fit laboratory.

Candidacy Exam

This exam should be taken by the end or during the student's third semester in the CDB program. The student will be assigned one scientific paper from the primary literature to read and analyze for approximately one week. The papers will be selected based upon the students' background and coursework. The analysis should involve exploring the relevant literature as well as the fundamental issues in Cell and Developmental Biology. Following this independent research the student will take an oral exam. The oral exam will be administered by at least three members of the graduate program. The overall goal of the exam is to assure that the student has an intellectual foundation in Cell and Developmental Biology. The exam is designed to evaluate basic knowledge in Cell and Developmental Biology and related disciplines as well as the students' ability to integrate this understanding to effectively evaluate experimental design, results, and the conclusions drawn. In the event that the student does not pass this exam, the student's committee will make a recommendation as to whether to offer another opportunity or to terminate the student's enrollment in the program.

Doctoral Committee

Upon successful completion of the Candidacy Examination, the student in consultation with the mentors will, as soon as possible, select a doctoral committee. The committee will consist of three members of the IGDP in CDB and one faculty member who is not a member of the IGDP in CDB. One member of the committee must be from a different department from the home department(s) of the mentor(s). This committee is responsible for

supervising the academic program and monitoring the progress of the student towards his/her degree. Doctoral Thesis Committee Composition is based on the Graduate Degree Programs Bulletin ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm)) published by the Graduate School regarding Doctoral Committees. See page 6 of this book for specific committee member guidelines.

Comprehensive Exam

The comprehensive examination will be administered by the student's Doctoral Committee. Taken within a year of the candidacy exam, it will consist of a written thesis proposal followed by an oral defense of the proposal and evaluation by the Committee of the student's knowledge of the area of research, assuring that s/he is competent in knowledge of the field to carry out the proposed studies and that s/he has developed investigation skills appropriate to planning a corpus of research. Students must be registered for classes (typically IBIOS 600) the semester they take this exam.

Recognizing the importance of communication of one's research to other scientists, even those with very different areas of interest, in academe, government and industry; after the comprehensive exam, we will have review(s) of every student's progress in a formal seminar presented to all faculty and students in the CDB Program. Such seminars will provide the student with the opportunity and need to hone their presentation skills for a diverse audience, and faculty with the opportunity to criticize and help develop these skills, other students will have a chance to discover exciting areas at other levels of study in cell and developmental biology, facilitating interactions between themselves, and importantly, a chance for the student to realistically appraise their progress over the preceding year. This seminar may be combined with the annual meeting with the thesis committee, which is required by the Graduate School.

Teaching (optional)

Students receive either a lecture, lab, or recitation class to help teach. Students also participate in the Huck Institutes teaching assistant training sessions and receive A-F grades on their transcripts from their faculty course supervisors. Please note that these grades are not computed in with the overall GPA. International graduate students must pass an English proficiency exam before any teaching duties are assigned.

Internship (optional)

After the first or second year and in consultation with the Program Chair and thesis advisor, students may spend a summer in an internship at a medical center, government laboratory, industrial environment or a non-traditional setting.

Thesis

The committee will also evaluate thesis research progress annually, determine when research is sufficient for preparation of the thesis, and pass or fail the student based on the written thesis and an oral defense. Students must follow the thesis guidelines outlined by the Graduate School.

Cell and Developmental Biology (CDB) Curriculum

Year 1 - Fall Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 592. Current Research Seminars (2)
- IBIOS 596. Independent Studies: Laboratory Rotations (3)
- BMMB 501. Core Concepts in Biomolecular Science (5)
- Fulfill prerequisites by taking appropriate courses
- Register for CITI on-line RCR course (see p.3)

Spring Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 592. Current Research Seminars (2)
- IBIOS 600. Thesis Research (3)
- BMMB541. Molecular Biology of Animal Developmental (3)
- Electives. Appropriate courses may be selected by the student in consultation with the advisor and/or CDB Chair.
- Submit CITI RCR Course Completion Report to Program Office

Summer Session

- IBIOS 595. Internship (1) (optional) or during summer of Year 2

Year 2 - Fall Semester

- IBIOS 591. Ethics in the Life Sciences (1)
- IBIOS 572. Benchmark Papers (2)
- IBIOS 600. Thesis Research (5)
- IBIOS 602. Supervised Experiences in College Teaching (1) (optional)
- Candidacy Examination

Spring Semester

- IBIOS 600. Thesis Research (9)

Summer Session

- IBIOS 600. Thesis Research (1)
- Comprehensive Examination

Years 3-5

- IBIOS 601. Thesis Preparation (0)

General Information

Courses available for all Huck Institutes' Graduate Programs

IBIOS 590. HUCK INSTITUTES' COLLOQUIUM (2) Students typically take this course in the Fall and Spring semesters of their first year. In Colloquium, students are introduced to a wide variety of topics of contemporary and future importance in the life sciences. A particular focus is placed on topics where science is likely to impact on society (and society on science). Topics are drawn from the area introduced by the speaker and can span the entire spectrum from basic research to the social, legal, moral and ethical implications of the science. A significant challenge in Colloquium is to organize and coordinate a presentation using contemporary presentation software, such as PowerPoint, in an environment in which part of the audience is present at a remote site. Students are required to attend the lectures and the dinners following the lectures. Students also participate in the group presentations during discussion sessions and submit written reports. Reports may be submitted to the co-chairs of the graduate program/option who may add them to the student's permanent record. Students receive A-F quality grades.

IBIOS 591. ETHICS IN THE LIFE SCIENCES (1) Students examine integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review. Students receive A-F quality grades.

IBIOS 595. INTERNSHIP (1, optional) For students interested in exploring academic, government, medical, law, or business corporate approaches to research. This is an external work assignment relevant to individual research or career goals. Students receive a R (satisfactory/passing) or U (unsatisfactory/failing). Only R credits are counted for credit totals. Students typically participate in an internship the summer of their first year. Contacts, positions, applications, course registration, course requirements, and grading are processed through the Eberly College of Science Cooperative Education Program (814-865-5000). Additional credits of IBIOS 595 are at the expense of the student. Interested Huck Institutes' graduate students are to discuss the opportunity with their graduate program/option chair and/or their faculty advisor to help determine the best timing for this experience.

IBIOS 596. INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 per semester pending graduate program) For students exploring potential Ph.D. projects and faculty advisors. Students receive a R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.

IBIOS 600. THESIS RESEARCH (1-9 per semester pending graduate program) For students who have been matched with a faculty advisor AND have not taken/passed their comprehensive exams. Students may receive A-F grades or R/F grades at any time. By the time students pass their comprehensive exams, up to 12 credits worth of IBIOS 600 may have the A-F quality grade.

IBIOS 601. THESIS PREPARATION (0 per semester) For those students who passed their comprehensive exams. This course appears on the transcript but does not have any grade or credit associated with it.

IBIOS 602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1) Students receive either a lecture, lab, or recitation class to help teach. Students also participate in the Huck Institutes teaching assistant training sessions and receive A-F grades on their transcripts from their faculty course supervisors. Please note that these grades are not computed in with the overall GPA. International graduate students must pass an English proficiency exam before any teaching duties are assigned.

English Requirement for International Students

The English Requirement for International students is that prescribed by the Graduate School. Depending on the graduate program, all entering international students, whether or not they hold a Teaching Assistantship, will be required to take a Test of Spoken English (TSE) which is administered by the University's Center for English as a Second Language (ESL).

Given at the beginning of fall and spring semesters, international students are required to pre-register for the TSE. The test scores from the TSE are posted on the University's Administrative Information System (AIS) computer. Below is the course of action for the various TSE score ranges.

- > 250 approved for teaching and the ESL requirement will be satisfied.

- 230-249 required to schedule and pass ESL 118G.

- 200-229 required to pass ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

- <200 required to schedule and pass with the grade of A ESL 115G, before ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

* At the end of this course, students are re-tested. Based upon these test results, students are either approved for teaching, placed in a subsequent ESL course, or asked to retake the course.

Students, who are required to enroll in ESL courses, must complete the ESL requirement by the end of the second semester of residency. Students who fail to satisfy this requirement may be terminated from the respective graduate program, at the discretion of the graduate program chair.

Safety Training Sessions / Examinations

Within the first semester of residence, all students are required to take/pass the radioisotope safety and chemical waste disposal training sessions offered at the respective campus.

Grade Point Average

Credit hours are earned only for the grades A, B, and C. However, all D and F grades are included in the computation of the grade point average. Grade points are assigned as follows:

- A = 4 (above average graduate work)
- B = 3 (average graduate work)
- C = 2 (below average graduate work)
- D = 1 (failing graduate work)
- F = 0 (failing graduate work)

Grades D and F are not acceptable for graduate credit. If a course is repeated, then both grades are used in computing the cumulative grade point average.

Unsatisfactory Scholarship

Students are required to have a minimum grade-point average of 3.0 for the doctoral candidacy examination, admission to the comprehensive examination, thesis defense, and graduation. One or more failing grades, a cumulative grade-point average below 3.0, or failing any of the examinations may be considered evidence of unsatisfactory scholarship and be grounds for dismissal from the University (see the Appendix III of the Graduate Programs Bulletin [www.psu.edu/bulletins/whitebook/\\$appendices.htm](http://www.psu.edu/bulletins/whitebook/$appendices.htm)).

Assistantships and Student Status

Students with teaching or research graduate assistantships must be registered as full time students to maintain stipend eligibility. Full time status is considered either a minimum of nine credits each fall and spring semester (pre-comprehensive exam) or XXX 601 (0 credits, post-comprehensive exam). The assistantship appointments typically originate with the department of the faculty advisor. If no faculty advisor has been identified, as likely the situation with first year doctoral students, students should consult with their respective Graduate Program Chair.

Thesis Submission and Exit Interview

Upon completion of the degree, students are to provide the Graduate Program with a paper copy of their thesis. Students also participate in both the University and Huck Institutes' Exit Interview Process. For the latter, students may meet with the Graduate Program Chair or appropriate representative.

Vacation and Sick Leave

Full-time graduate students in the Immunology and Infectious Disease Intercollege Graduate Degree Program (IGDP) who receive stipends must get permission for all absences from the laboratory. Vacation leave should be arranged with the Immunology and Infectious Disease Graduate Program Chair (1st year students) or thesis advisor (2nd year and above students). Please consult with your thesis advisor for policies in place that restrict and or regulate both vacation and/or sick leave within the individual research laboratories. Students must formalize their vacation dates in writing and in advance two (2) months notice is desirable and, to alleviate any possible confusion, vacation requests should be made in writing. The Immunology and Infectious Disease IGDP Chair or student's thesis advisor will agree or disallow the vacation request in writing within 72 hours of its submission. All other reasons for leave (i.e. sickness, maternity/paternity leave, illness of a family member etc.) also require approval from either the Graduate Program Chair (1st year) or thesis advisor (2nd year and above students). It is the student's responsibility to contact their thesis advisor or IGDP Chair when he/she is absent from the classroom or laboratory due to illness.

RESTRICTIONS: No vacations or other foreseeable leaves (maternity/paternity leave) can be taken unless approved in advance. Approval should be granted unless the leave is believed to seriously compromise the academic progress of the student; in such cases the disapproval must be confirmed by the Immunology and Infectious Disease IGDP Chair. Students will not be routinely granted vacation leave while enrolled in formal class work.

Activate Intent to Graduate

Students must present their thesis in accordance with the Penn State University guidelines as described in the THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses". Current copies can be obtained from the Thesis Office:

115 Kern Building
University Park, PA 16802
Phone: 814/865-5448

Web site: http://www.gradsch.psu.edu/gs_overview/thesisguide

At the beginning of the semester that students wish to graduate, they are to either:

- (1) access eLion via www.eLion.psu.edu, if in the PSU computer system
- or
- (2) call Graduate Enrollment at 1-814-865-1795, if not in the PSU computer system

Pre-Doctoral Research Fellowship Incentive Award

Purpose:

This incentive program is designed to catalyze the development and successful submission of competitive applications to external doctoral research fellowship programs. The Graduate School will offer an incentive award to select graduate students who successfully complete and submit a competitive external fellowship application. The award will be 2.4 percent (rounded to the nearest \$50) of the annual fellowship amount. The minimum total fellowship amount must be \geq \$10,500 per year to qualify, while the maximum incentive award is \$1,000. A student may receive only one incentive award.

Eligibility:

To be eligible for an incentive award, a student must:

1. be a full-time Ph.D. student applying for a pre-doctoral fellowship that is comparable in prestige and competitive nature to the NSF Graduate Research Fellowship and similar programs (e.g., EPA Star), and that awards a minimum fellowship stipend of \$10,500 per year (To confirm eligibility of a program, contact the Director, Office of Graduate Fellowships and Awards Administration.);
2. exhibit exemplary academic achievement and accomplishments commensurate with those qualities that would position a student to be competitive (i.e., quality indicators similar to the University Graduate Fellowship awardees, in addition to strength of the pre-doctoral fellowship application);
3. have a defined area of research interest and the support of a graduate faculty mentor who will work with him/her to develop the fellowship application, including the research project plan;
4. be willing to adhere to the necessary production schedule and meet submission deadlines for the respective sponsor.

Application Procedures:

1. **Prior** to submitting a proposal for a fellowship to the respective external sponsor, the Graduate School must be notified of the student's intent. This notice must be submitted by the sponsoring faculty member with the following:

- a completed "Intent to Submit" form that includes the signature of the sponsoring graduate faculty member;
- a statement that clearly identifies the timeline for submission.
- a summary of the pre-doctoral fellowship provisions from official program materials (i.e., advertisement for the award or description from Web site).

2. Once a completed proposal has been submitted to the funding source, the sponsoring graduate faculty member must submit the following:

- "Submission Completed" form with signatures of the faculty sponsor, the program graduate officer, and the associate dean for graduate studies of the college;
- copy of the confirmation of proposal submission from agency/foundation. Student must notify the Office of Graduate Fellowships and Awards Administration of the outcome of their proposal submission.

Deadline for Applications:

Rolling submission on a first-come, first-served basis as long as incentive funds are available during a given fiscal year. Completed nominations should be forwarded to the Office of Graduate Fellowships and Awards Administration, 313 Kern Graduate Building, University Park, PA 16802.

**This information can be found at www.gradsch.psu.edu/fellowships
Click on Funding Programs, Pre-Doctoral/NSF fellowship Incentive, nomination form**

Doctoral Thesis Committee Composition

According to the Graduate Degree Programs Bulletin published by the Graduate School regarding Doctoral Committees: ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm))

- 4 person minimum of approved PSU Graduate Faculty.
- 2 members must be inside the major and 1 member must be outside the major. Note - the outside member must be member of the approved PSU Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department. The outside member may not be a co-funded faculty from the same department, have budgetary ties, or conflict of interest (aka co-author paper) with any of the other committee members.
- A person not affiliated with PSU may be added as a special member (beyond the 4 members of the approved PSU Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean. A memo plus the individual's C.V. must be drafted with approval signature spaces for the Graduate Program Chair plus Ms. Cynthia Nicosia (Director, Graduate Enrollment).
- Have committee chair or one of the co-chairs be a member of the approved PSU Graduate Faculty. Typically this is the faculty advisor or someone in the graduate program.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School. A form letter is available for this special request.
- Need approval of 2/3 of the committee members for passing comprehensive exam and defense dissertation.
- **Need to submit paperwork 3-4 weeks prior to your scheduled comprehensive exam and defense. Please contact the appropriate staff member:**
Hershey:
Lori Coover (Neuroscience) H179 Hershey Medical Center; 717-531-1045; ljc11@psu.edu
Kathy Shuey (Genetics, IBIOS, IM, MM, MT) H133 HMC; 717-531-8982; kes6@psu.edu
Lisa Harman (Physiology) H166 HMC; 717-531-8566; lsb10@psu.edu
University Park:
Huaru Yan (Genetics) 202 Life Sciences Bldg.; 814-865-3076; huy2@psu.edu
Jean Pierce (Ecology) 101 Life Sciences Bldg.; 814-867-0371; jep32@psu.edu
Janice Kennedy (CDB, IBIOS, IM, MM, MT, NEURS) 101 Life Sciences Bldg.; 814-865-3155; jkk5@psu.edu
Deb Murray (Plant Biology, Physiology) 101 Life Sciences Bldg.; 814-865-8165; dkm9@psu.edu
- Please note- Graduate Programs may have additional committee composition criteria.

Masters (M.S.) Degree

Masters students must have a minimum of 30 credits and a 3.0 overall GPA (see Graduate Degree Programs Bulletin ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm)))

If pursuing a masters thesis option, up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 500-600 level (excluding IBIOS 600). The students select a thesis committee (upon consultation with faculty advisor), write a thesis, and defend their work.

If a Graduate Program offers a non-thesis option, graduate students should consult with their chair for details. 18 credits need to be in the major at the 500-600 level.

If pursuing a masters non-thesis option, the student must have a first authored manuscript (based on his/her research) that has been either accepted and/or published in a peer reviewed journal. 18 credits need to be in the major at the 500-600 level. The manuscript is given to at least the faculty advisor and the Option Chair for evaluation.

IBIOS 595 (Internship) and IBIOS 596 (Rotations) credits all count toward the 30 credits. However, any IBIOS 602 (Teaching) credits do not count toward the 30 credits. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending their work.

Activate Intent to Graduate

At the beginning of the semester that a student wishes to graduate

- . if in PSU's computer system: access e-Lion at www.elion.psu.edu
- if not: call 1-814-865-1795 to reach Graduate Enrollment

This publication is available in alternative media on request.

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