Graduate Program in Biology

Graduate Mission

The mission of the Department of Biology graduate program is to provide outstanding education and theoretical/laboratory research training to graduate students in the overlapping areas of Cell and Dev. Biology, Evolution, Genetics, and Neurobiology. Our goal is to ensure that graduating students have the credentials to be accepted into nationally recognized laboratories for post-doctoral work and ultimately to be placed in worthwhile positions of their choice in academia, industry, or research institutes.

Admission Processes and Criteria

Students are encouraged to apply to the graduate program through advertising in Peterson's Graduate Guide, GradSchools.com, Google.com, use of ETS (GRE) mailing lists, and participation in graduate program recruiting fairs. The Graduate Recruitment and Admissions Committee (GRAC) decides on the admission of each applicant based on six factors: 1) GPA (at least 3.0 on a 4.0 scale), 2) GRE scores (V+Q of at least 1200 with an AW of at least 3.0), 3) letters of reference, 4) statement of interest/purpose, 5) TOEFL score (for international applicants; at least 100 ibt, 250 cbt, or 600 pbt), and 6) research experience. The minimum course requirements are: one semester of Calculus, two semesters of Organic Chemistry (or one semester of Organic Chemistry and one semester of Biochemistry), two semesters of College Physics, and the equivalent of 20 semester hours of Biology course work. An expense-paid visit in mid-February is offered to qualified applicants currently residing in the U.S. This visit allows the faculty to interview the prospective students and allows the students to see our facilities, meet our faculty and graduate students, prior to deciding which university to attend (decision due by April 15). There is no significant correlation between entering GPA and time to degree (TTD) of PhD, for MS and time to withdrawal. However, there is a trend that lower GPA trend to withdraw earlier and take longer for PhD completion. Better criteria than the GPA need to be found to select successful PhD students. Appendix I lists the number and distribution of student applicants. We receive many more applications from foreign students but we concentrate our efforts on attracting students residing in the US. Appendix II lists the scores of graduate students on entry by year.

We have begun to recruit under-represented minorities through an active participation in AGEP (Alliance for Graduate Education and Professoriate). This will be a critical component of future training grant applications (such as IGERT and T32).

Appropriate Program Size

Research in biology is laboratory- or field-work intensive. To win and retain federal or private funding, a research group must publish on average two high quality, primary data publications per year for each NSF or NIH grant. One such paper requires two to eight authors depending on the sub-discipline. Internationally competitive research programs in our department usually consist of 5-7 people: two or more technicians, two or more graduate students, and one or more post-doctoral associates. This implies that there must be at least two graduate students in a principle investigator (PI)’s laboratory to meet minimal expectations to be competitive at national and international levels. If the minimal number of graduate students per active laboratory is 2 and TTD is 6 years, as a department with 25 active labs (Appendix III) we must maintain a steady state of at least 50 students. At present we have 41 Biology PhD students, four of whom are still rotating, and 10 interdisciplinary program students. Our students take on average of 6.3 years (past 20 years) to earn a PhD. Thus, we must admit about 10 students a year to maintain the minimal number required for our active research laboratories (assuming minimal withdrawals).

Financial Commitments

Our graduate students are offered a guaranteed stipend of $23,500 plus tuition and fees with the condition they are making satisfactory progress toward the PhD degree. MS students are rarely accepted; those that are receive the COGs stipend, $16,575 for a 50% academic year appointment, or $20,258 for a 50% fiscal year appointment plus a partial tuition scholarship. These levels of support for PhD and MS students are in the median range of other Midwestern universities and equivalent to the guarantees offered by the interdisciplinary PhD programs and by the UI Medical School basic science departments.

Entering students have three laboratory rotations during the first academic year; they are supported for rotations by funds from the Graduate College (SIFs) and CLAS, unless they enter a laboratory directly without rotation (paid by research grants or external fellowships). After the first nine months, entering students affiliate with a laboratory and are thereafter supported by research grants, external fellowships, or TA-ships. Graduate students are crucial to our success in research and our goal is thus to support most of our PhD students with research funds or fellowships. The present distribution of student support is:

<table>
<thead>
<tr>
<th>Source of Support</th>
<th>Fall ‘08</th>
<th>Spring ‘09</th>
</tr>
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<tbody>
<tr>
<td>Grant supported</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>TA-ships</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>External fellowships</td>
<td>3</td>
<td>2</td>
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Since extramural grant dollars support a major part of our graduate student research effort, one measure of the vitality of our program is yearly income from grants. There are about 150 universities rated nationally in our emphasis areas. The ratings are aggregates and the University of Iowa ranks between the 50th and 30th percentile, depending on field (data from 2000, see http://www.phds.org/rankings/). Using national ranking as a criterion, we compete with approximately 75 other universities for the same pool of students seeking admission to a graduate program at the national level. Much of this competition is from medical school-based programs. We have managed to retain a significant portfolio of grants. Appendices IV and V provide itemized data on grants and grant dollars expended each year, currently $4.5 million.

Mentoring and Development of Students

There are four phases in the development of our graduate students. Each semester the PI in whose lab the student is based is required to complete a report detailing the student’s progress; the report is then discussed with (and signed by) the student. The thesis committee also meets a minimum of once per year to monitor progress and provide feedback to the student. This year, the department implemented a modified graduate program that aims to shorten the TTD, decrease the attrition rate and dismiss unsatisfactory students earlier through constant monitoring of their accomplishments.

1) During the nine months laboratory rotation phase, students choose three faculty members whose interests coincide with those of the student. The cohort of all new students enrolls in a Fundamental Genetics seminar course, an intensive “Research Methods and Theory” course, and takes a 1-2 sh colloquium course in each of their first two semesters. This practice is designed to create an atmosphere of mutual support, an important aspect to the success of our students.

2) Once in a laboratory, students meet regularly with the PI on an individual basis, participate in laboratory-wide research meetings and journal club, and communicate informally with other laboratory members. Additionally, students form a thesis committee composed of five faculty members of whom at least three and no more than four must be members of the department. The students are required to pass a qualifying exam during the summer after the first year.

3) Toward the end of the Spring semester of the second year, students will start the comprehensive exam which involves the preparation of a research grant proposal. The student must orally defend the proposal before the thesis committee.

4) After passing the comprehensive exam, the students will continue their research, take seminar courses, and fulfill the TA requirement. The yearly evaluation by their thesis advisors and yearly meeting with their thesis committee are mandatory. It is expected they will finish writing their thesis work at the end of the 5th year, present it, and pass the oral exam early in the 6th year.

Curriculum and Program

We offer 4 PhD tracks: Cell and Developmental Biology, Evolution, Genetics, and Neurobiology. The curriculum is specifically designed to enable the student to complete the degree in 5 to 6 years, which is similar to the requirements and TTD of departments at other Midwestern Research Institutions. Recognizing that the critical component of the PhD degree in Biology is laboratory work, the course requirements are optimized to spent time and energy in the laboratory. All lecture-based course work (outlined below) is completed within the first two years. In addition, students must take graduate-level seminar/writing courses during the remaining years in residence. Following the completion of the comprehensive examination at the end of year 2, the remaining 3 to 4 years in residence emphasize original research. The typical program of required courses is the following:

1) Research Methods and Theory (002:207) 2 sh. This course typically starts three weeks prior to the start of classes and ends in four weeks. It is designed to introduce incoming students to the variety of technologies, data base search, and research ethical training with which they should be familiar with to be productive during the rotation period.

2) Biology Colloquium (002:200) 2 sh. This course is taken for two consecutive semesters. They consist of oral discussions and written reports based on topics introduced by external speakers in the department’s weekly seminar series.

3) Fundamental Genetics (002:128 and 002:228) 4 sh. A section of this course is designed for first-year graduate students.

4) Advanced Courses: Two 3-4 sh courses for total of 6-8 sh taken during the first two years in residence.

5) Advanced courses in the field of specialization as determined by the thesis committee.

6) Seminar Courses. PhD students are required to take at least two 2-sh seminar courses (one of which is a scientific writing course) prior to taking the comprehensive examination, and two 2-sh seminar courses until the PhD is obtained. Each of these courses must have a writing and oral presentation component.

Time to Degree and Completion

The average TTD is 6.35 years. The percent completion rates for the years 1996 -2001 based on a population of 82 students is listed below (2001 is the most recent year for which full data can be gathered). A time to PhD of 6 years is reasonable for our student
population and is similar to the national average in Biology. The degree completion rate is important because it reflects a return on our investment. Nurturing students who do not have the intellect, skills, or desire to complete the program will not improve our reputation or contribute to our research efforts (see list of publications in Appendix VII). Our new graduate program includes a qualifying exam at the end of the first year; students who do not pass this exam will be dismissed from the program. We also take a positive approach to decrease the time to degree by providing an intensive training program from the beginning. A 4-week intensive “Research Methods and Theory” course starts immediately after the new students arriving on campus. An assessment test and a comprehensive exam are given before and after this class. Students enter the 2-semester 3-lab rotation program, and after each rotation, an oral presentation of their research results will be given to the department. At the end of the rotation year students are proficient in presenting 12-minute scientific presentations and discussing data openly. Both TTD and % of students earning a degree compares well with other CLAS departments but not with CCOM departments. The higher undergraduate teaching load of CLAS faculty compared to CCOM faculty may contribute to this discrepancy.

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<thead>
<tr>
<th></th>
<th>PhD</th>
<th>27</th>
<th>32.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>31</td>
<td>37.8% (entered as PhD students)</td>
<td></td>
</tr>
<tr>
<td>No Degree*</td>
<td>24</td>
<td>29.3%</td>
<td></td>
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* includes students who were dismissed due to poor grades or withdrew for various reasons such as thesis completion in another program.

**Program Outcomes** (see Appendices VI and VII for data)

**Honors:** We have had some success in honors competition: Robert Finney, 1985; Judith Stoll, 1989; Jeff Engel, 1997; Qin Wang, (D.C. Spriestersbach runner-up, awarded the Graduate Dean's Distinguished Dissertation Award), 2001; Salil Lachke, 2005.

**Placement:** Appendix VI details the placement of graduate PhD students who obtained degrees in the last 10 years. Postdoctoral placement is excellent: most students enter high profile laboratories. We view this as reflecting our strong reputation for excellence in training and education of our successful graduate students. Our percentage of postdoctoral placement in research is in the range of CCOM and on average much higher than CLAS, which has a stronger bias toward teaching (34% compared to 8% in Biology).

**Publications:** Appendix VII Publications are a measure of success in biology. Our graduate students are publishing research articles prolifically and in high impact journals: some articles have been cited more than 100 times. The total publication of all students is 152 and the average publication per post-comps PhD student is 2.6. Good publication record of a graduated PhD student seems to relate to the placement in research rather than teaching positions of our graduate students (78% and 8%, respectively).

**Overall Evaluation and future needs**

We are one of approximately 75 research universities with ranked biology departments. With achieving excellence in mind, we have reorganized our program to further improve our standing. Biology has seen a shrinking from 39 to the current number of 28 faculty. Continued hiring of new faculty with active research programs to replace vacating positions is necessary to reach our goals. We have moved toward stringent admission requirements for incoming graduate students, balancing high quality with numbers sufficient not to compromise our research portfolio. We need to continue to improve the quality of chosen applicants by recruiting students at the theoretical/experimental interface. We predict that that should translate into a higher degree of completion rate and reduce TTD. Increasing the emphasis on laboratory work experience at admission should smooth the transition to laboratory work and its unique requirements, resulting in both higher retention rates and decreased TTD. We plan to compare students trained with the new curriculum with those of the old curriculum in three years to evaluate whether or not our changes move students in the right direction as intended.

Our primary need continues to be funding to replace the former “Block” allocation which has been used exclusively to support our incoming students during their first nine months as rotation students. The amount of funding required depends on incoming student numbers: funding 6 students will cost $187,000 annually. We are applying for external funding sources for rotation students, but it will take some time to become self-sufficient. We encourage students to apply for extramural support including NSF and NIH student awards. We are also seeking training grants: a T32 proposal is being prepared for submission in 2010 and in 2012, an IGERT proposal was selected by NSF for entering competition by the end of 2009. We anticipate that our recent changes in the curriculum will result in a shorter TTD and an earlier elimination of weak graduate students to reduce the large percentage of students exiting without a degree, with a MS degree, or switch to other programs.

The overall assessment of our program indicates that we are, with respect to performance of graduate students, on a par with CCOM programs, and with respect to TTD and % completion, we are on a par with other CLAS departments. Our strength is in the PhD students that do complete our program; almost 80% obtain excellent postdoctoral research positions. This is a testament to the quality of our faculty, reflected in our extramural portfolio of grants and our publication record.