Integrated Biology, PhD

The Department of Biology's graduate programs in integrated biology (iBio) emphasize original research and developing the skills essential for publishing and communicating research findings to the scientific community. Research programs in the department cover many areas of the biological sciences: cell biology, developmental biology, ecology, evolution, genetics, and neurobiology. Graduate study in the department provides students with a broad understanding of these basic areas.

Newly admitted graduate students are assigned a temporary advisor and together they discuss the student's educational background to formulate a first-semester study plan before registration. The programs allow each student to tailor coursework to their own research interests. Students may be advised to take specific coursework in order to enhance their background in certain areas.

During the first year, students whose preparation in chemistry, genetics, mathematics, or physics is insufficient may need to remedy deficiencies by taking appropriate coursework.

Entering students typically will have taken the following courses: two semesters of organic chemistry, or one semester of organic chemistry and one semester of biochemistry; one semester of calculus; two semesters of college physics; and 20 s.h. of coursework in biology, including genetics.

Students with bachelor's degree outside the biological sciences may request modification of certain area requirements. The Graduate Affairs Committee decides whether portions of the requirements may be waived.

Learning Outcomes

Graduates will:

- master the skill of reading, understanding, and summarizing primary literature across a variety of biology subdisciplines, demonstrating effective scholarly communication in the process;
- explain in writing the experimental rationale, articulate the central hypothesis, and outline the major investigative steps that will be undertaken in a student's primary area of research;
- orally communicate established scientific concepts as well as ongoing research hypotheses, experimental design, and results to a wide array of audiences using established scientific communication norms;
- master in-depth pedagogical concepts through advanced lecture courses and engage in a vertically integrated critical analysis of a single topic over many levels of basic biology;
- learn and implement field-specific experimental processes, techniques, and data analyses in a responsible manner consistent with current bioethical protocols;
- establish networking connections within the scientific profession, from peers to established, independent researchers; and
- become a research subproject leader (evidenced by publication/meeting presentation/grant submittal) within the context of a research group.

Requirements

The Doctor of Philosophy program in integrated biology requires a minimum of 72 s.h. of graduate credit. Students must maintain a cumulative grade-point average of at least 3.00.

New PhD students typically go through three laboratory rotations with different faculty during their first semester (August-December). Students with existing mentors in the Department of Biology may also seek to directly affiliate with that laboratory. Students consult with their temporary advisor and prospective faculty research sponsors before identifying their preferences for research rotations. Based on their rotations, they choose a laboratory affiliation for their thesis late in the first semester.

During the first year, students are required to enroll in BIOL:5512 Readings in Genetics in the fall semester and the 2 s.h. course BIOL:6298 Concepts, Models, and Systems in Biology (COSMOS) Seminar in the fall and spring semesters. BIOL:6298 introduces students to multiple levels of biological analysis and provides them with significant opportunities to hone their skills in written and oral communication. At the end of the first year, students take a qualifying exam that consists of essay questions based on major themes in biology. Students must perform satisfactorily on this exam in order to continue in the program.

During the first two years, students must enroll in at least two advanced lecture courses (or courses approved by the Graduate Affairs Committee)—one elective and one approved data informatics or statistics course.

Prior to the comprehensive examination, students also take BIOL:6188 Seminar: Writing in Natural Sciences and a seminar course with significant writing and oral presentation components.

The comprehensive examination is taken in the summer of the second year in residence. Students prepare a National Institutes of Health/National Science Foundation-style grant application on their planned thesis work and orally defend this work in front of a review committee. They must demonstrate knowledge of biology fundamentals and the analytic and synthetic skills necessary to become creative, independent scientists. Once they complete the coursework and proficiency requirements and pass the comprehensive examination, students may be admitted to full candidacy for the PhD.

Following the comprehensive examination, students must take at least two additional seminar courses (2 s.h. each). Seminar courses from other departments may be approved by the Graduate Affairs Committee in consultation with the faculty advisor to satisfy the requirement.

Students must serve as teaching assistants for at least two semesters in order to develop and demonstrate teaching proficiency. The first teaching semester takes place during the spring of a student's first year and is preceded by extensive departmental training in effective teaching skills.

The department also offers career seminars that explore types of employment outside of academic research, including teaching careers and other topics.

The program culminates in students' preparation of a dissertation based on original independent research. Students must pass a final examination that covers the thesis and its specialized field before the PhD is awarded.
Visit the iBio Graduate Program website for more detailed information about the PhD program.

**Combined Programs**

**PhD/MD**

Students may work toward the Doctor of Medicine degree and a PhD in integrated biology in a combined degree program offered by the Carver College of Medicine and the Graduate College. Applicants must be admitted to both programs before they may be admitted to the combined degree program. See the Medical Scientist Training Program (Carver College of Medicine) in the catalog.

**Admission**

Application materials for the graduate program must be uploaded to the university’s Office of Admissions website. These are reviewed by the Department of Biology Graduate Recruitment and Admissions Committee. For detailed instructions, visit Graduate Admissions Process on the integrated biology graduate program website.

Applicants must hold a valid BA or BS from an accredited institution. They should supply official transcripts from each undergraduate and graduate institution they have attended. The Graduate Record Examination (GRE) General Test is not required for admission, but if students wish to have their results considered they must include their verbal, quantitative, and analytical writing scores.

Successful applicants for graduate admission typically have a grade-point average of at least 3.00 (on a 4.00 scale). The admissions committee also considers letters of recommendation, the personal statement, and other appropriate criteria, especially prior research experience.

Although most applicants will have completed undergraduate programs in biology, the department also considers applicants with backgrounds in related sciences, provided they have taken the required coursework. Students with bachelor's degrees in other areas may need to register as nondegree students and complete the equivalent of the department’s bachelor’s degree program prior to consideration for admission. Nondegree students may be asked to complete chemistry, physics, and calculus in addition to the biology courses listed in the undergraduate program. Nondegree students should consult the department’s graduate program administrator before applying.

Review of applications typically begins by Dec. 1; visit the iBio Graduate Program website for updated application information and instructions. Applications are reviewed on a rolling basis until available slots for the interview weekend (typically held in late February) are filled.

Applicants must meet the minimum admission requirements of the Graduate College; see the Manual of Rules and Regulations on the Graduate College website.

**Financial Support**

All graduate students making satisfactory progress toward the PhD receive stipend and tuition support from non-University of Iowa fellowships and from teaching assistantships or research assistantships available through individual research grants administered by faculty members or by the university. First-year PhD students are supported by department fellowships during the research rotation period and by teaching assistantships during the spring semester. Offers of admission include information about offers of financial support.

**Career Advancement**

The graduate program in integrated biology prepares students for careers in academic research, science education, industry, government, and a variety of other careers in which their scientific expertise can be used.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

**Academic Plans**

**Sample Plan of Study**

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

**Integrated Biology, PhD**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Academic Career</strong></td>
<td></td>
</tr>
<tr>
<td>Any Semester</td>
<td>72 s.h. must be graduate level coursework;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>graduate transfer credits allowed upon approval.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>More information is included in the General Catalog and on department website.</td>
<td></td>
</tr>
<tr>
<td>First Year</td>
<td>Qualifying Exam</td>
<td>0</td>
</tr>
<tr>
<td>Any Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>BIOL:5412</td>
<td>Fundamental Genetics - Graduate Lecture</td>
</tr>
<tr>
<td></td>
<td>BIOL:5512</td>
<td>Readings in Genetics</td>
</tr>
<tr>
<td></td>
<td>BIOL:6199</td>
<td>Research: Biology</td>
</tr>
<tr>
<td></td>
<td>BIOL:6298</td>
<td>Concepts, Models, and Systems in Biology (COSMOS) Seminar</td>
</tr>
<tr>
<td></td>
<td>BIOL:7270</td>
<td>Principles of Scholarly Integrity</td>
</tr>
<tr>
<td></td>
<td>Advanced lecture elective or data informatics course</td>
<td>3</td>
</tr>
<tr>
<td>Spring</td>
<td>BIOL:5110</td>
<td>Practicum: College Teaching for Biology Teaching Assistants</td>
</tr>
<tr>
<td></td>
<td>BIOL:6199</td>
<td>Research: Biology</td>
</tr>
<tr>
<td></td>
<td>Advanced lecture elective or data informatics course</td>
<td>3</td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>BIOL:6199</td>
<td>Research: Biology</td>
</tr>
<tr>
<td></td>
<td>BIOL:6298</td>
<td>Concepts, Models, and Systems in Biology (COSMOS) Seminar</td>
</tr>
</tbody>
</table>
Advanced lecture elective or elective course\textsuperscript{d} & 3 \\
\textbf{Spring} &  \\
BIOL:6188 & Seminar: Writing in Natural Sciences & 2 \\
BIOL:6199 & Research: Biology & 10 \\
Advanced lecture elective or elective course\textsuperscript{d} & 3 \\
\textbf{Hours} & 15 \\
\textbf{Summer} &  \\
Comprehensive Exam \textsuperscript{e} &  \\
\textbf{Third Year} &  \\
\textbf{Fall} &  \\
BIOL:6199 & Research: Biology & 3 \\
BIOL:6298 & Concepts, Models, and Systems in Biology (COSMOS) Seminar & 1 \\
\textbf{Hours} & 4 \\
\textbf{Spring} &  \\
BIOL:6199 & Research: Biology & 1 \\
\textbf{Hours} & 3 \\
\textbf{Fourth Year} &  \\
\textbf{Fall} &  \\
BIOL:6199 & Research: Biology & 3 \\
BIOL:6298 & Concepts, Models, and Systems in Biology (COSMOS) Seminar & 1 \\
\textbf{Hours} & 4 \\
\textbf{Spring} &  \\
BIOL:6199 & Research: Biology & 2 \\
Final Exam \textsuperscript{f} &  \\
\textbf{Hours} & 4 \\
\textbf{Total Hours} & 75 \\

\begin{itemize}
\item a Students who take coursework to make up for undergraduate deficiencies (e.g., physics, biochemistry, or fundamental genetics) may not count that coursework towards the degree requirements.
\item b Students must complete specific requirements in the University of Iowa Graduate College after program admission. Refer to the Graduate College website and the Manual of Rules and Regulations for more information.
\item c Taken at the end of first year.
\item d Work with faculty advisor to determine appropriate elective coursework.
\item e Comprehensive Exam requires current session enrollment.
\item f Dissertation defense.
\end{itemize}