COMPUTATIONAL BIOLOGY (PHD)

Graduate School

Program Website (https://cals.cornell.edu/computational-biology/)

CIP: 26.1104 | **HEGIS:** 0419.00 | **NYSED:** 29598

Graduate Field

Computational Biology (https://catalog.cornell.edu/graduate-school/computational-biology/)

Program Description

Computation has become essential to biological research. Genomic databases, protein databanks, MRI images of the human brain, and remote sensing data on landscapes contain unprecedented amounts of detailed information that are transforming almost all of biology. The computational biologist must have skills in mathematics and computation as well as in biology. A key goal in training is to develop the ability to relate biological processes to computational models.

The field provides interdisciplinary training and research opportunities in a range of subareas of computational biology involving topics such as DNA and protein databases, protein structure and function, computational neuroscience, biomechanics, population genetics, and management of natural and agricultural systems.

Students majoring in computational biology are expected to obtain a broad, interdisciplinary knowledge of fundamental principles in biology, computational science, and mathematics. But because the field covers a wide range of areas, it would be unrealistic to expect a student to master each facet in detail. Instead, students choose from specific subareas of study: they are expected to develop competence in at least one specific subdomain of biology (i.e., genetics, macromolecular biology, cellular biology, organismal biology, behavioral biology or ecology) and in relevant subareas of computational science and mathematics.

Students are supervised by field faculty drawn from sixteen departments.

Concentrations

- Computational behavioral biology
- Computational biology
- Computational cell biology
- Computational ecology
- Computational genetics
- Computational macromolecular biology
- Computational organismal biology

Program Information

- Instruction Mode: In Person
- Location: Ithaca, NY
- Minimum Credits for Degree: 135

Program Requirements

- Minimum Semesters for Degree: 10

Graduate School Milestones

- Responsible Conduct of Research Training: Required
- Open Researcher and Contributor ID (ORCID): Required
- Student Progress Reviews (SPR) begin: Second Year
- Examination for admission to candidacy (A Exam): Spring of third year
- Defense of Dissertation (B Exam): Spring of fifth year

Field Specific Milestones

- One semester of teaching assistantship required

Course Requirements

Additional course requirements may be set by the student's Special Committee. Program specific requirements that apply to all students are included below.

- BIOMG 7510 Ethical Issues and Professional Responsibilities, completed in the first fall semester

University Graduation Requirements Requirements for All Students

In order to receive a Cornell degree, a student must satisfy academic and non-academic requirements.

Academic Requirements

A student's college determines degree requirements such as residency, number of credits, distribution of credits, and grade averages. It is the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing their chosen program of study. See the individual requirements listed by each college or school or contact the college registrar's office (https://registrar.cornell.edu/service-resources/college-registrar-directory/) for more information.

Non-academic Requirements

Conduct Matters. Students must satisfy any outstanding sanctions, penalties or remedies imposed or agreed to under the Student Code of Conduct (Code) or Policy 6.4. Where a formal complaint under the Code or Policy 6.4 is pending, the University will withhold awarding a degree otherwise earned until the adjudication process set forth in those procedures is complete, including the satisfaction of any sanctions, penalties or remedies imposed.

Financial Obligations. Outstanding financial obligations will not impact the awarding of a degree otherwise earned or a student's ability to access their official transcript. However, the University may withhold issuing a diploma until any outstanding financial obligations owing to the University are satisfied.

Learning Outcomes

- Fundamentals: Demonstrated mastery of fundamental concepts, theory, and methodology in areas of biology, computer science, and mathematics relevant to the chosen specialty.
- Breadth: Demonstrated broad knowledge of theory and research across several sub-disciplines in computational biology.
- Originality: Demonstrated the ability to independently conduct, document, and defend original research having the potential to

produce new biological insights and/or improved computational methods.

- Communication: Demonstrated proficiency in oral and written presentation of results appropriate for a career in advanced research in government or industry, or advanced research and/or teaching at a college or university.
- Literacy and Outreach: Demonstrated broad knowledge of the scientific literature relevant to the specialty area, including awareness of recent advances, active areas of research, and open questions. Students should also have demonstrated the ability to participate in the broader research community outside of Cornell, through meetings, conferences, individual collaborations, or other interactions.
- Ethics: Demonstrated the ability to follow established ethical standards for the field, pertaining to topics such as (but not limited to) recognition of prior scholarship, acknowledgment of intellectual and material contributions to research, falsification of data, appropriate handling of human and animal subjects and of hazardous materials, and respectful and fair treatment of students and co-workers of diverse backgrounds.
- Teaching: (For those entering a teaching profession) Demonstrated the ability to communicate complex idea and methods in terms students can understand, to grade and comment effectively on student work, to lead discussions effectively, and to plan an effective course in the field.
- Career Progress: Demonstrated significant progress toward future career goals, or found employment, if desired.