

A graduate program

Quantitative Biology

Objectives

The quantitative biology program is designed to enhance the student's capacity for independent research in subjects at the interface of the physical and life sciences. By completing the quantitative biology curriculum, students gain expertise in applying quantitative physical/chemical modeling and experimental techniques to solving important problems in biomedical research.

How to Obtain the Additional PhD Specialization

The quantitative biology specialization is available only to students enrolled and working toward the PhD degree in one of the six participating graduate programs: biochemistry, biophysics and structural biology, chemistry, molecular and cell biology, neuroscience, and physics. Individuals who want to obtain a PhD degree with a specialization in quantitative biology should apply to one of the participating PhD programs as described in the relevant section of this *Bulletin*. Enrolled PhD students who want to obtain the quantitative biology specialization should contact their PhD program's graduate program chair or quantitative biology liaison for further information. Students wishing to obtain the specialization are advised also to contact one of the quantitative biology co-chairs for information about participating in the noncurricular educational activities of the quantitative biology program.

Faculty Advisory Committee

Jeff Gelles, Co-Chair
(Biochemistry)

Jané Kondev, Co-Chair, Liaison to Physics PhD Program
(Physics)

Irving Epstein, Liaison to Chemistry PhD Program
(Chemistry)

Bruce Goode, Liaison to Molecular and Cell Biology PhD Program
(Biology)

Dorothee Kern, Liaison to Biophysics and Structural Biology PhD Program
(Biochemistry)

Eve Marder, Liaison to Neuroscience PhD Program
(Biology)

Christopher Miller, Liaison to Biochemistry PhD Program (on leave 2008–2009)
(Biochemistry)

Requirements for the Specialization to the Degree of Doctor of Philosophy

Students must complete all requirements for the degree of Doctor of Philosophy in the program in which they are enrolled. In addition, students must successfully complete three of the following four courses: QBIO 110a, QBIO 120b, BCHM 102a, and PHYS 105a.

Courses of Instruction

(100–199) For Both Undergraduate and Graduate Students

QBIO 110a Numerical Modeling of Biological Systems

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Prerequisite: MATH 10a and b or equivalent.

Modern scientific computation applied to problems in molecular and cell biology. Covers techniques such as numerical integration of differential equations, molecular dynamics and Monte Carlo simulations. Applications range from enzymes and molecular motors to cells. Usually offered every year.
Mr. Hagan

QBIO 120b Quantitative Biology Instrumentation Laboratory

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Focuses on optical and other instruments commonly used in biomedical laboratories to make quantitative measurements in vivo and in vitro. Students disassemble and reconfigure modular instruments in laboratory exercises that critically evaluate instrument reliability and usability and investigate the origins of noise and systematic error in measurements. Usually offered every year.
Mr. Gelles

Cross-Listed Courses

BCHM 102a

Quantitative Approaches to Biochemical Systems

BCHM 104b

Physical Chemistry of Macromolecules

CHEM 147b

Mass Spectrometry

COSI 230a

Topics in Computational Biology

NBIO 136b

Computational Neuroscience

PHYS 105a

Biological Physics