



## MOLECULAR AND CELLULAR BIOPHYSICS

### MOLECULAR AND CELLULAR BIOPHYSICS 2013–2014

The Molecular and Cellular Biophysics PhD (MCB) program provides opportunities for doctoral studies in the interdisciplinary field of biophysics. Participation of faculty from the Departments of Biological Sciences, Chemistry & Biochemistry, and Physics & Astronomy enhances the strength and breadth of our program by incorporating cross-disciplinary and collaborative approaches to research. The MCB PhD program is centered on research activities that coincide with faculty experience and expertise. Areas of research in the MCB program include cellular physiology, developmental dynamics, protein folding and aggregation, protein network analysis, signal transduction cascades, synthetic biology, systems biology and the development of novel imaging techniques. Projects at the interface of traditional disciplines of physics, biology and chemistry as well as methods of mathematical analysis and computer modeling are particularly encouraged.

The MCB PhD program offers both a core foundation in biophysical theory and practice yet provides flexibility and individualized attention such that students with diverse scientific backgrounds will have the opportunity to be trained in molecular and cellular biophysics. During their first year in the program, students conduct lab rotations, take a year-long course sequence that covers foundations of molecular and cellular biophysics and take additional graduate courses to supplement their undergraduate training. At the end of their first year, students will join the lab in which they will conduct their thesis research.

Students with strong quantitative undergraduate backgrounds (e.g., undergraduate degrees in physics, chemistry, mathematics, computer science/engineering) who desire to apply these skills to various biological problems, as well as students with a background in cell or molecular biology with a solid foundation in mathematics and physics are particularly encouraged to apply. Financial aid is usually offered in the form of Graduate Teaching or Graduate Research Assistantships, which cover tuition costs and provide a stipend for living expenses.

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UNIVERSITY of  
DENVER

Molecular and Cellular Biophysics

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MCB PhD program Steering Committee

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[www.du.edu/nsm/departments/  
molecularandcellular/index.html](http://www.du.edu/nsm/departments/molecularandcellular/index.html)

## DEGREE REQUIREMENTS

### Doctor of Philosophy

Graduate studies in the program are highly individualized; programs should fit each student's unique needs and interests. Students are required to perform original, publishable research and to present a thesis based on research to the faculty of the molecular and cellular biophysics program.

A student qualifies for the PhD degree after demonstrating growth as an independent investigator—identifying a significant research question; proposing a hypothesis or model to answer the question; testing the hypothesis with appropriate experiments; and writing a dissertation acceptable to the department.

The structure of the PhD program in Molecular and Cellular Biophysics is as follows:

- required core courses and elective courses during the first year
- required lab rotations during the first year
- required seminar/special topics courses during the second year
- qualifying exams first year and second year
- thesis research second year to completion

The degree requires 90 credit hours approved by the program steering committee. Required courses in the first year include BIOP 4100 Foundations of Biophysics, BIOP 4150 Cellular Biophysics, CHEM 3130 Chemical Systems III, and two or three lab rotations (BIOP 4993 Lab rotation). During the second year three quarters of "Topics in Biophysics" (BIOP 4210) are to be taken. In addition, during the first two years electives can be chosen from existing 3000 or 4000 level courses in the Division and must be chosen with consultation and the approval of the Steering committee. This use of electives is critical given the interdisciplinary nature of this PhD program and scientific discipline and the fact that incoming students will come from a range of disciplines in the physical sciences and life sciences.

The remainder of the credit hours required for the degree may include BIOP 4992 Directed Study or BIOP 4995/5995 Independent Research. Additional requirements:

- successful completion of research rotations during the first year
- maintaining a minimum GPA of 3.0
- passing performance in the qualifying examinations
- attendance at departmental seminars and the presentation of one seminar per year
- completion of a research dissertation of publishable quality
- successful oral defense of the dissertation

A complete description of the program's official requirements and details of qualifying examinations are available at

<http://www.du.edu/nsm/departments/molecularandcellular/index.html>

## FACULTY

### Joseph Angleson

Associate Professor  
PhD, Biochemistry  
Baylor College of Medicine

### Scott Barbee

Assistant Professor, Biological Sciences  
PhD, Cell and Developmental Biology  
University of Colorado Health Sciences Center

### Todd Blankenship

Assistant Professor, Biological Sciences  
PhD, Molecular Biology  
Princeton University

### Kingshuk Ghosh

Assistant Professor, Physics and Astronomy  
PhD, University of Massachusetts, Amherst

### Gareth Eaton

Professor, Chemistry and Biochemistry  
PhD, Massachusetts Institute of Technology

### Sandra Eaton

Professor, Chemistry and Biochemistry  
PhD, Massachusetts Institute of Technology

### Michelle Knowles

Assistant Professor, Chemistry and Biochemistry  
PhD, University of Oregon

### Daniel Linseman

Assistant Professor, Biological Sciences  
PhD, Pharmacology  
University of Michigan

### Dinah Loerke

Assistant Professor, Physics and Astronomy  
PhD, University of Goettingen, Germany

### Nancy Lorenzon

Assistant Professor, Biological Sciences  
PhD, Anatomy and Neurobiology  
University of Tennessee Health Sciences Center

### Martin Margittai

Assistant Professor, Chemistry and Biochemistry  
PhD, Freie Universität, Berlin

### David Patterson

Professor, Biological Sciences  
PhD, Microbiology  
Brandeis University

### Scott Pegan

Assistant Professor, Chemistry and Biochemistry  
PhD

### Sean Shaheen

Associate Professor, Physics and Astronomy  
PhD, University of Arizona

## COURSE DESCRIPTIONS

### **BIOP 4100 Foundations in Biophysics (3 qtr. hrs.)**

Focus of the course is on application of basic physics principles to the study of cells and macromolecules. Topics include diffusion, random processes, thermodynamics, reaction equilibria and kinetics, computer modeling. Must be admitted to the MCB PhD program or related graduate program with instructor approval.

### **BIOP 4210 Current Topics in Biophysics (2 qtr. hrs.)**

This is a seminar course that focuses on current primary literature in the fields of molecular and cellular biophysics. This is the first of a three course, year-long sequence.

### **BIOP 4992 Directed Study (1 to 10 qtr. hrs.)**

### **BIOP 4993 Lab Rotation (2 to 9 qtr. hrs.)**

Lab rotation in Molecular and Cellular Biophysics before students pass the first phase of their qualifying exam.

### **BIOP 4995 Independent Research (1 to 9 qtr. hrs.)**

Independent research in Molecular and Cellular Biophysics before students pass the first phase of their qualifying exam.

### **BIOP 5991 Independent Study (1 to 10 qtr. hrs.)**

### **BIOP 5995 Independent Research (2 to 9 qtr. hrs.)**

### **BIOP 6991 Independent Study (1 to 10 qtr. hrs.)**

### **BIOP 4150 Cellular Biophysics (3 qtr. hrs.)**

Biophysical approaches to understanding cell function. We emphasize the various experimental approaches that biophysicists use to study basic cellular processes, including a variety of fluorescence images, optical and electrophysiological techniques.

### **BIOP 6992 Directed Study (1 to 5 qtr. hrs.)**

### **BIOP 6995 Independent Research (1 to 10 qtr. hrs.)**

## For More Information

A complete description of the program's official offerings and requirements is available from the department at <http://www.du.edu/nsm/departments/molecularandcellular/index.html>.

The University of Denver is an Equal Opportunity institution. We admit students of any race, color, national and ethnic origin to all the rights, privileges, programs and activities generally accorded or made available to students at the University. The University of Denver does not discriminate on the basis of race, color, national and ethnic origin in administration of our educational policies, admission policies, scholarship and loan programs, and athletic and other university-administered programs. University policy likewise prohibits discrimination on the basis of age, religion, disability, sex, sexual orientation, gender identity, gender expression, marital status or veteran status. Inquiries concerning allegations of discrimination based on any of the above factors may be referred to the University of Denver, Office of Diversity and Equal Opportunity.