OVERVIEW

The central focus of the graduate program in Biochemistry and Molecular Biophysics (BMB) is the relationship between biological form and function at a fundamental level. This newly organized program provides students with an integrated and interdisciplinary approach to graduate education. The faculty in the BMB Graduate Group are unified by a common interest in understanding biological phenomena at the quantitative, mechanistic or molecular level, drawing on modern biochemical, biophysical, chemical and physical methods. The graduate program trains students in the scientific concepts and methods necessary for conducting basic research and its application to medicine. The program is designed to prepare students for careers as independent investigators.

The strength of the program resides in its unusually broad combination of faculty interests and disciplines. Faculty members are drawn from several departments within the Medical School (including Biochemistry and Biophysics, Physiology, Medicine, Pharmacology, Radiology, and Cell and Developmental Biology); from the Schools of Dental and Veterinary Medicine; from the School of Arts and Sciences (Biology, Chemistry, and Physics); and from affiliated research institutes such as the Wistar Institute and the Fox Chase Institute for Cancer Research.

Research areas of members of the BMB Graduate Group include

- Regulation of metabolism.
- Elucidation signaling mechanisms and pathways that result in physiological events, such as sensory transduction, cell division, death and control of the cell cycle.
- Determination of protein, RNA, DNA and virus structures.
- Protein and enzyme folding, function design and engineering.
- Regulation, transport and processing of RNA.
- Structure and function of membranes, including ion channels, gates, pumps and pores.
- Enzyme structure and function
- The mechanism of gene regulation, including transcription, replication, and recombination events, and generally the mechanism of protein recognition of specific sites on DNA.
- The molecular basis of immunology.
- Study of protein assemblies and the basis of specific protein-protein interactions.
- Molecular basis of energy transduction, including contractility, bioenergetics and photosynthesis.
- Development of novel high-resolution magnetic resonance and optical imaging methods.

Faculty in the Biochemistry and Molecular Biophysics Graduate Group typically use a combination of biochemical, biophysical, chemical and physical methods to unravel these complex biological events. These methods include:

- High resolution spectroscopies, including optical, infrared, fluorescence, phosphorescence, pump-probe spectroscopies
- X-ray diffraction
• Microscopy, including electron, optical and fluorescence microscopy
• Nuclear magnetic and electron paramagnetic spectroscopy.
• Optical and magnetic imaging.
• Theoretical methods and computer simulations.
• Quantitative kinetic measurements using radiolabels, hydrogen exchange, stop flow and other methods.
• Electrokinetic methods such as electrophoresis, conductance measurements and patch clamping
• Peptide, nucleic acid and organic synthesis methods.
• Thermodynamic analysis using calorimetry and temperature and chemical denaturation.
• Molecular biology techniques such as cloning and high level expression of proteins

Biochemistry and biophysics is a rapidly developing area of biomedical sciences. New techniques, methodologies, and information continue to evolve at an ever-increasing pace. The graduate program in Biochemistry and Molecular Biophysics is designed to produce the next generation of scientists who will advance the frontiers of biological and medical science.