Biochemistry & Biophysics Concentration

Program Description: The Concentration in biochemistry and biophysics recognizes enduring trends in interdisciplinary science, by establishing in the curriculum a formal program of classroom and laboratory training at the interface between the physical, chemical and biological sciences. Students whose interests span this interface may wish to consider combining one of the participating majors (biology, chemistry or physics/astrophysics) with one of these concentrations. For either the biochemistry or biophysics concentration, a student must complete an interdisciplinary course of study that spans multiple natural science departments, using a detailed yet flexible curricular plans for guidance. We describe below only the most popular programs of study within the concentration. Students interested in other options, such as a concentration in both biochemistry and biophysics, should consult with one of the Concentration Coordinating Committee faculty (listed below) to design a course of study encompassing the required courses and any proposed substitutions. However, students may not obtain both a chemistry minor and a biochemistry concentration, or both a physics minor and a biophysics concentration.

We strongly encourage students with interests in the Biochemistry or Biophysics Concentrations to meet with a faculty member on the Concentration Coordinating Committee as early as possible in their first year to help coordinate their academic program across the participating departments and to plan when to take the many required courses.

More information about the concentration—including an updated list of faculty on the Concentration Coordinating Committee — can be found online at: http://www.haverford.edu/biochemistry-biophysics/

BIOCHEMISTRY/BIOPHYSICS CORE CURRICULUM (REQUIRED OF ALL):

- BIOL 200 (Cell Structure and Function; full year course).
- One semester of BIOL 300 (Laboratory in Biochemistry and Molecular Biology, cross-listed as CHEM 300) or BIOC 390 (Laboratory in Biochemical Research)
- CHEM 112 (chemical dynamics).
- One semester Mathematics course numbered 114 (calculus II) or higher.
- PHYS 101–102 or 105–106 (introductory physics), or the Bryn Mawr equivalents.

If students do not take these courses at Haverford or Bryn Mawr, they must have the substitute course(s) approved for college credit by the relevant departments. Beyond this foundation, students must take the following advanced interdisciplinary coursework:

BIOLOGY MAJOR WITH A BIOCHEMISTRY CONCENTRATION:

Biology majors seeking a Biochemistry Concentration must complete the Biochemistry/Biophysics core curriculum (see above) as well as the following additional requirements:

- CHEM 111 or 115 (both Chemical Structure and Bonding), 112 (Chemical Dynamics), CHEM 222 and 225
(Organic Chemistry)
• CHEM 304 (Statistical Thermodynamics and Kinetics) or 305 (Quantum Chemistry)
• CHEM 301 or 302 (Laboratory in Chemical Structure and Reactivity) or BIOC 390 (Laboratory in Biochemical Research).
• Two half-semester advanced courses from the following list: CHEM 351 (Bioinorganic Chemistry), 352 (Topics in Biophysical Chemistry), 357 (Topics in Bioorganic Chemistry) and 359: Topics in Protein Chemistry; majors may take topics courses multiple times with different topics
• Two half-semester courses from the following list: BIOL 301 (Genetics), 302 (Cell Architecture), 303 (Structure and Function of Macromolecules), 304 (Biochemistry: Metabolic Basis of Disease), 306 (Inter- and Intra-Cellular Communication), 308 (Immunology), 310 (Molecular Microbiology, 314 (Photosynthesis), 351 (Molecular Motors and Biological Nano-Machines); 354 (Molecular Virology), 357 (Topics in Protein Science); and other BIOL 3XX courses approved on an ad hoc basis by the coordinating committee. Students may use courses meeting concentration requirements for the biology major in lieu of one semester of Biology 300.

**BIOLOGY MAJOR WITH A BIOPHYSICS CONCENTRATION:**
Biology majors seeking a Biophysics Concentration must complete the Biochemistry/Biophysics core curriculum (see above) as well as the following additional requirements:
• MATH 121 (Calculus III) or 216 (Advanced Calculus)
• PHYS 213 (Waves and Optics), 211 (Laboratory in Electronics, Waves and Optics); half-credit course), and 301 (Advanced Laboratory in Modern Physics)
• PHYS 214 (Quantum Mechanics) or CHEM 305 (Quantum Chemistry)
• PHYS 303 (Statistical Physics) or CHEM 304 (Statistical Thermodynamics and Kinetics)
• A 300-level course in biophysics approved by the concentration coordinating committee
• Two half-semester courses from the following list: BIOL 301 (Advanced Genetic Analysis), 302 (Cell Architecture), 303 (Structure and Function of Macromolecules), 304 (Biochemistry: Metabolic Basis of Disease), and 306 (Inter- and Intra-Cellular Communication), 308 (Immunology), 310 (Molecular Microbiology, 314 (Photosynthesis), 351 (Molecular Motors and Biological Nano-Machines); 354 (Molecular Virology), 357 (Topics in Protein Science); and 371 (Toxins and Ancient Immunity). Students may use courses meeting concentration requirements for the biology major in lieu of one semester of BIOL 300.

**CHEMISTRY MAJOR WITH A BIOCHEMISTRY AREA OF CONCENTRATION:**
Chemistry majors desiring a Biochemistry Area of Concentration must complete the Biochemistry/Biophysics core curriculum (see above) as well as the following additional requirements:
• Two half-semester courses from the following: CHEM 351 (Bioinorganic Chemistry), 352 (Topics in Biophysical Chemistry), 357 (Topics in Bioorganic Chemistry) and 359: Topics in Protein Chemistry. Majors may take topics courses multiple times with different topics.
• Two half-semester courses from the following list: BIOL 301 (Genetics), 302 (Cell Architecture), 303 (Structure and Function of Macromolecules), 304 (Biochemistry: Metabolic Basis of Disease), 306 (Inter- and Intra-Cellular Communication), 308 (Immunology), 310 (Molecular Microbiology, 314 (Photosynthesis), 351 (Molecular Motors and Biological Nano-Machines); 354 (Molecular Virology), 357 (Topics in Protein Science); and 371 (Toxins and Ancient Immunity). Students may use courses meeting concentration requirements for the chemistry major in lieu of CHEM 301 or 302.
PHYSICS OR ASTROPHYSICS MAJOR WITH A BIOPHYSICS AREA OF CONCENTRATION:

Physics or Astrophysics majors desiring a Biophysics Area of Concentration must complete the Biochemistry/Biophysics core curriculum (see above) as well as two half-semester courses from the following list: two half-semester courses from the following list: BIOL 301 (Genetics), 302 (Cell Architecture), 303 (Structure and Function of Macromolecules), 304 (Biochemistry: Metabolic Basis of Disease), 306 (Inter- and Intra-Cellular Communication), 308 (Immunology), 310 (Molecular Microbiology, 314 (Photosynthesis), 351 (Molecular Motors and Biological Nano-Machines); 357 (Topics in Protein Science); and 371 (Toxins and Ancient Immunity).

Students may use 300-level biology courses meeting concentration requirements for the physics major in lieu of one or two of the six required 300-level physics courses.

CONCENTRATION COORDINATING COMMITTEE FACULTY

Karin Åkerfeldt
Professor of Chemistry

Fran Blase
Associate Professor of Chemistry

Louise Charkoudian
Assistant Professor of Chemistry

Robert Fairman
Professor of Biology

Casey H. Londergan
Associate Professor of Chemistry

Judith Owen
Elizabeth Ufford Green Professor of Natural Sciences and Professor of Biology

Robert C. Scarrow
Professor of Chemistry