

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Director: Nikolaus Loening

Administrative Assistant: Amy Timmins

This major's focus is the molecular logic of living organisms. Biochemists and molecular biologists study how the collection of molecules within the cell interact to maintain and perpetuate life. The biochemistry/molecular biology major at Lewis & Clark provides students with an opportunity to pursue an interdisciplinary course of study that follows the guidelines of the American Society for Biochemistry and Molecular Biology. Students majoring in biochemistry/molecular biology devote their first years of study to mastering the basic tenets of calculus, physics, genetics, and chemistry. Upper-division coursework exposes students to current research in biochemistry and cellular and molecular biology.

The distinctive character of our program derives from the curricular goals that shape it. Faculty associated with the biochemistry/molecular biology program are proponents of a lab-rich, investigative education for undergraduates in the sciences. Opportunities for scientific inquiry are woven into the laboratory curriculum and prepare the student ultimately to undertake collaborative research projects with the faculty. To foster the ability of our students to engage independently in the scientific process, we devote class time to critically reading the primary literature. In our laboratory courses, students participate in selecting and designing their experiments. The curriculum is constructed to engage students in the scientific process and thereby facilitate the development of reflective judgment and problem-solving skills.

Students majoring in biochemistry/molecular biology are guided by sponsoring faculty from both the biology and chemistry departments. The major prepares students for careers in biomedical research, biotechnology, and genetic engineering. It is especially suitable for students seeking admission to medical or dental schools, or to graduate programs in biochemistry, cell or molecular biology, or genetics. Students majoring in biochemistry/molecular biology may not minor in biology or chemistry.

Major Requirements

A minimum of 49 semester credits in biology and chemistry, plus courses in mathematics and physics, distributed as follows:

- BIO 110 Biological Investigations
- BIO 202 Biological Core Concepts: Mechanisms
- BIO 311 Molecular Biology
- BIO 312 Molecular Biology Lab
- BIO 361 Cell Biology
- CHEM 110 General Chemistry I
- CHEM 120 General Chemistry II
- CHEM 210 Organic Chemistry I
- CHEM 220 Organic Chemistry II
- CHEM 330 Structural Biochemistry
- CHEM 335 Metabolic Biochemistry

- CHEM 336 Biochemistry Laboratory
- One elective chosen from the following:

CHEM 310	Physical Chemistry: Thermodynamics and Kinetics
MATH 255	Statistical Concepts and Methods
PHYS 390	Biomedical Imaging

- MATH 131 Calculus I
- MATH 132 Calculus II
- PHYS 141 Introductory General Physics I or PHYS 151 Physics I: Motion
- PHYS 142 Introductory General Physics II or PHYS 152 Physics II: Waves and Matter
- Honors students must complete BCMB 410 Biochemistry/Molecular Biology Seminar.

Students placing into higher-level biology, chemistry, math, and/or physics courses may have the corresponding lower-level requirements and associated credits waived by the director of the Biochemistry and Molecular Biology program.

Honors

Biochemistry/molecular biology majors who have distinguished themselves academically by earning a GPA of 3.500 or higher in the major, have completed either BIO 312 or CHEM 336, and have some prior research experience are invited in the spring of their junior year to participate in the senior thesis program. Students who accept the invitation work with a faculty advisor to develop a research project, which must be approved by faculty overseeing the biochemistry/molecular biology major. Following the experimental work, students prepare a written thesis, present their work in BCMB 410, and orally defend it during the spring semester of the senior year. Honors are awarded to those students whose thesis is judged to be meritorious and who maintain a GPA of 3.500 in the major.

Faculty

Julio C. de Paula. Professor of chemistry. Physical chemistry, biophysical chemistry, nanotechnology. PhD 1987 Yale University. BA 1982 Rutgers University.

Greg J. Hermann. Professor of biology. Developmental genetics and cell biology. PhD 1998 University of Utah. BS 1992 Gonzaga University.

Nikolaus M. Loening. Professor of chemistry, chair of the Biochemistry and Molecular Biology program. Physical chemistry, biophysical chemistry. PhD 2001, MPhil 1998 University of Cambridge. BS 1997 Harvey Mudd College.

Bethe A. Scalettar. Professor of physics, chair of the Department of Physics. Fluorescence microscopy, biophysics, optics, thermodynamics, quantum mechanics. PhD 1987 University of California at Berkeley. BS 1981 University of California at Irvine.

Sharon E. Torigoe. Assistant professor of biology. Molecular biology, biochemistry, gene expression regulation. PhD 2013 University of California at San Diego. BA 2007 Scripps College.

Norma Velázquez Ulloa. Associate professor of biology. Behavioral genetics, neuroscience, developmental biology, neurophysiology, cell biology. PhD 2009 University of California at San Diego. BS 2002 Universidad Nacional Autónoma de México.

Tamily Weissman. Associate professor of biology, codirector of the Neuroscience Program. Neurobiology. PhD 2004 Columbia University. BA 1992 Pomona College.

Pamela Zobel-Thropp. Visiting assistant professor of biology. Biochemistry, molecular biology, transcriptomics, proteomics, bioinformatics. PhD 2000 University of California at Los Angeles. BA 1993 California State University at Long Beach.

Courses

BCMB 410 Biochemistry/Molecular Biology Seminar

Content: Select topics in biochemistry and molecular biology. Students attend seminars of invited outside researchers and prepare an oral seminar on their own research or on a critical analysis of a relevant research publication.

Prerequisites: BIO 311. CHEM 330. CHEM 335 (may be taken concurrently).

Restrictions: Sophomore standing required.

Usually offered: Annually, spring semester.

Semester credits: 1.

BCMB 496 Biochemistry/Molecular Biology Senior Research

Content: In-depth laboratory inquiry into a question relevant to biochemistry/ molecular biology. Students develop a thesis proposal in association with a faculty mentor, conduct extensive experimental work to address their hypothesis, and present their analysis of their findings in a written thesis. Four credits each semester of the senior year. A deferred grade will be issued for the first semester of the yearlong series. When the full sequence is completed, the given grade applies to both semesters.

Prerequisites: None.

Restrictions: By invitation only. Senior standing required.

Usually offered: Annually, fall and spring semester.

Semester credits: 4.

BCMB 499 Independent Study

Content: Participation in a faculty-supervised research project at Lewis Clark or another research institution. Further information available from biochemistry program faculty members. May be repeated for credit.

Prerequisites: None.

Restrictions: Approval of project proposal by program and supervising faculty member and sophomore standing required.

Usually offered: Annually, fall and spring semester.

Semester credits: 2-4.