



Biochemistry & Molecular Biology

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What Is Biochemistry and Molecular Biology? Why Study It?

Biochemistry and the closely related discipline of molecular biology involve the study of life processes at the molecular level and provide a chemical and physical basis to understanding all aspects of biology, from viruses to humans. Recent revolutions in genomics and bioinformatics have dramatically increased interest in understanding the biochemical and molecular biological basis of life and disease processes, such as cancer and AIDS. In addition, advances in biochemistry and molecular biology have fueled progress in drug design, forensic medicine, countering bioterrorism, and biotechnology.

Biochemistry & Molecular Biology Program

The interdisciplinary biochemistry and molecular biology program leads to either a Bachelor of Arts or Bachelor of Science degree. Based in the biology and chemistry departments, the program is administered by a committee that includes faculty from each department and one program coordinator. The program offers a flexible route to either degree option and encourages student participation in research, which may be conducted with faculty in either department. The major prepares students for future study in biochemistry and molecular biology and other related molecular life science fields such as genomics, proteomics, and bioinformatics. The major provides a strong background for students interested in the health professions and for those seeking employment in the biotechnology industry. The program's flexibility affords study abroad and outreach opportunities.

Biochemistry & Molecular Biology Curriculum

As biochemistry and molecular biology bring together fundamental principles of both chemistry and biology, the curriculum involves introductory sequences in those two departments.

Included are introduction to biological thinking, integrated biological principles, introductory chemistry, and organic chemistry. Later courses thoroughly cover key concepts and areas within biochemistry and molecular biology. The curriculum also helps students understand the value of quality information, as they gain laboratory, computational, and bioinformatics skills to contribute to this rapidly expanding field.

While the Bachelor of Arts does not require a research experience, students in the Bachelor of Science track must complete an approved research experience and one additional upper-level biology or chemistry elective.

Undergraduate Research

Because understanding the experimental basis of biochemical and molecular biological phenomena is a central program theme, students are encouraged to engage in research activities during the academic year and in the summer. The University offers stipends and housing for summer students.

As research findings are generated, students regularly present at regional and national professional meetings, which augments their overall education. Program students often publish their research with faculty in scientific literature and may help write applications for funding.

Recent student research projects have explored:

- allosteric regulation of proteins
- biosensor design
- biological mechanisms of synaptic memory function
- how protein structure dictates function
- DNA lesions and mutation
- transcription factors in body plans

- the role of small RNAs in gene regulation
- dynamic behavior of molecular systems
- molecular genetics of pathogenic bacteria
- actions of catecholamines in the immune system
- neurodegenerative diseases

While most students conduct research projects with faculty on campus, students also have conducted summer research at such institutions as MIT; the Marine Biological Laboratory in Woods Hole, Mass.; the National Institutes of Health; Johns Hopkins University; the University of North Carolina; and the University of Pennsylvania.

Facilities and Equipment

The biochemistry and molecular biology program is housed in the Gottwald Center for the Sciences and shares space and equipment with the biology, chemistry, and physics departments. These departments are well equipped for virtually every aspect of modern biochemistry and molecular biology, including fluorescence, circular dichroism, biological mass spectrometry, electron microscopy, atomic force microscopy and nuclear resonance spectroscopy, FACS, a quantitative PCR facility, and confocal microscopy. Informal partnerships between faculty in the program and various research universities and institutes around the country provide access to techniques such as X-ray crystallography, calorimetry, and advanced computational approaches.

Other Activities and Opportunities

Our Biochemistry & Molecular Biology Program is accredited with the American Society for Biochemistry and Molecular Biology (ASBMB), so graduates have the opportunity to have their degrees certified by ASBMB. The program supports a student chapter of ASBMB that helps promote biochemistry and molecular biology research, education, and outreach.

Students can share their research with their peers and faculty at the program's seminar series and/or at society conferences. The University offers funding to students for travel to present their work.

Recently, more than 70% of majors went on to graduate and/or medical programs. Graduates have continued at the Icahn School of Medicine at Mount Sinai, Oxford University, Mayo Clinic, Harvard University, the University of North Carolina, Rockefeller University, Cornell University, MIT, the University of California–Berkeley, and the University of Washington, to name a few. These graduates also included several prestigious scholarship recipients including Goldwater, Marshall, and Beckman scholars.

Faculty Areas of Specialty

- Bioinorganic chemistry
- Biosensors
- Cell biology and microscopy
- Computational biology and chemistry
- Developmental biology
- DNA replication and mutagenesis
- Gene expression
- Microbiology and virology
- Molecular neuroscience
- Organic synthesis
- Pharmacology and drug discovery



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