

Biochemistry

Oberlin College offers excellent undergraduate training in biochemistry, molecular biology, and related fields. Upon graduation, students with such training are well positioned to begin graduate studies, to pursue professional education in medicine, dentistry, or veterinary medicine, or to obtain immediate employment in research laboratories or in the biotechnology industry. The biochemistry major incorporates all of the undergraduate science courses expected by medical schools.

The biochemistry major is offered by the Department of Chemistry and Biochemistry. The major emphasizes a strong background in chemistry as a preparation for the investigation of the molecular aspects of biology; and all of the courses in the major, except mathematics, have laboratory components.

Students also can seek training in biochemistry and molecular biology through majors in biology, chemistry, and neuroscience. Each of these majors offers greater depth and breadth in its own discipline but must be supplemented for adequate training in biochemistry or molecular biology. Biology and neuroscience major programs must be supplemented with additional coursework in chemistry, mathematics, and physics. The chemistry major program must be supplemented with coursework in biology and biochemistry. Separate information sheets describe the biology, chemistry, and neuroscience majors.

A brief tour through the biochemistry major. There are three entry points into the chemistry part of the biochemistry major. (1) Most potential biochemistry majors start by taking Oberlin's year-long general chemistry course. (2) Students with high scores on a chemistry placement examination (given during first-year orientation) can start with a separate one-semester general chemistry course. Students with Chemistry AP scores of 3 or higher can start with either the one-semester general chemistry course or the second semester of the one-year course. (3) Students with Chemistry AP scores of 4 or 5 can skip general chemistry altogether and start with organic chemistry.

There are two entry points into the biology part of the biochemistry major. (1) Most potential biochemistry majors start by taking either organismal biology or the course on genetics, evolution and ecology. (2) Students with Biology AP scores of 5 can skip introductory biology and start with cell and molecular biology once they have credit for general chemistry.

Student biochemistry majors take four one-semester courses in different subdisciplines of chemistry: analytical, inorganic, organic, and physical chemistry. These courses are available in any order. Two of them make use of prerequisites beyond general chemistry: the analytical chemistry core course requires one semester of college-level calculus, and the physical chemistry core course requires second-semester college calculus and a year of college-level physics. All four courses have laboratory as well as classroom components.

The heart of the biochemistry major is composed of courses in bio-organic chemistry, cell and molecular biology, and biochemistry. The bio-organic chemistry course is an unusual second semester of organic chemistry that focuses entirely on the organic chemistry of biologically important substances. Both bio-organic chemistry and cell and molecular biology are prerequisite courses for the one-semester biochemistry course. All three courses have laboratory components.

Many biochemistry majors pursue their interests beyond the major requirements, taking additional intermediate and advanced courses in chemistry and biology, taking additional courses in other sciences and mathematics, serving as laboratory teaching assistants, attending talks and often meals with outside researchers, and participating in research with Oberlin College faculty members.

Chemistry and biochemistry faculty members as teachers. Oberlin College chemistry and biochemistry faculty members take their teaching seriously. They treat students as individuals, and they use a variety of teaching techniques to help students learn to think productively and critically in the classroom and in the laboratory. Faculty members regularly

refine and revise their teaching materials and methods, and many courses involve extensive, Oberlin-originated materials. The laboratory manuals for all courses in the department are locally written, as is the textbook for the bio-organic chemistry course.

Chemistry and biochemistry faculty members as research mentors for Oberlin College students. Research participation is an excellent way for students to consolidate the chemistry and biochemistry that they have learned in courses. The department encourages all its majors to gain research experience at Oberlin or elsewhere. Research students work as junior colleagues with faculty members on the faculty members' on-going research projects. Some students engage in experimental research as early as their first Winter Term at Oberlin, although most student researchers are juniors or seniors. Each summer, about a dozen students are paid for full-time research activities. All the department faculty are active in research. Many faculty publications have student co-authors. The department's faculty members who do biochemical or biochemically related research and samples of their recent publications are listed at the end of this document. A full list of faculty members in the Chemistry and Biochemistry Department is available in the information sheet on chemistry, and the information sheets on biology and neuroscience should be consulted for listings of biology and neuroscience faculty members who do research in areas of molecular biology.

Departmental facilities. Chemistry and biochemistry laboratories in the new Science Center are well equipped with sophisticated instruments and computers. A list of departmental instruments is part of the chemistry information sheet. In addition to the departmental equipment described there, the biochemistry course laboratory is equipped with a refrigerated high-speed centrifuge and several rapid electrophoresis instruments.

Chemistry and Biochemistry Department Faculty Who Do Biochemical or Natural Products Research

Five of the nine continuing faculty members in the

Department of Chemistry and Biochemistry do biochemical or natural products research.

JASON M. BELITSKY, Assistant Professor (B.A., Amherst, 1997; Ph.D., California Institute of Technology, 2002), teaches general chemistry, biochemistry, and chemical biology. He does research on synthetic analogs of the human pigment eumelanin and their use in environmental remediation. He uses techniques from organic and biochemistry as well as atomic absorption spectroscopy.

WILLIAM H. FUCHSMAN, Professor (B.A., Harvard, 1963; Ph.D., Johns Hopkins, 1967), teaches general chemistry, bio-organic chemistry, and cancer biochemistry. He does research on the catalytic properties of hemoglobins and related proteins, including plant hemoglobins. He uses the techniques of ultraviolet/visible spectroscopy, isoelectric focusing, and kinetics.

MANISH A. MEHTA, Assistant Professor (A.B., Wabash, 1986; Ph.D., Yale, 1990), teaches general chemistry and physical chemistry. He does research on the effects of solvent on peptide secondary structure. He uses the techniques of experimental solid-state nuclear magnetic resonance and computational quantum chemistry.

ROBERT Q. THOMPSON, Professor (B.A., Wooster, 1978; Ph.D., Michigan State, 1982), teaches general chemistry, analytical chemistry, and forensic chemistry. He does research on the analysis of explosives residue and on the analysis of the spicy components of hot peppers. He uses the techniques of solid phase extraction and liquid chromatography.

REBECCA J. WHELAN, Assistant Professor (B.A. Lawrence University, 1996; Ph.D., Stanford University, 2003), teaches general chemistry and analytical chemistry. She does research on the detection of protein markers for ovarian cancer by antibodies and by single-stranded DNA. She uses the techniques of the polymerase chain reaction, capillary electrophoresis, and surface plasmon resonance spectroscopy.

Recent Biochemical and Natural Products Research Publications by Faculty and Students*

N.C. Craig, W.H. Fuchsman, and N.N. Lacuesta*,
“Investigation of Model Cell Membranes with Raman
Spectroscopy. A Biochemistry Laboratory Experiment,”
Journal of Chemical Education, **2003**, *80*, 1282-1288.

M.A. Mehta, E.A. Fry*, M.T. Eddy*, M.T. Dedeo*, A.E.
Anagnost*, and J.R. Long, “Structure of the Alanine Dipeptide
in Condensed Phases Determined by ¹³C NMR,” *Journal of
Physical Chemistry*, **2004**, *108*, 2777-2780.

A. Nelson, J.M. Belitsky, S. Vidal, C.S. Joiner, L.G. Baum, and
J.F. Stoddart, “A Self-Assembled Multivalent
Pseudopolyrotaxane for Binding Galectin-1,” *Journal of the
American Chemical Society*, **2004**, *126*, 11914-11922.

R.Q. Thompson, K.W. Phinney, L.C. Sander, and M.J. Welch,
“Reversed Phase Liquid Chromatography and Argentation
Chromatography of the Minor Capsaicinoids,” *Analytical and
Bioanalytical Chemistry*, **2005**, *381*, 1432-1440.

R.Q. Thompson, M.J. Pennino*, M.J. Brenner*, and M.A.
Mehta, “Isolation of Individual Capsaicinoids from a Mixture
and Their Characterization by ¹³C NMR Spectrometry,”
Talanta, **2006**, *70*, 315-322.

R.J. Whelan and R.N. Zare, “Single-Cell Immunosensors for
Protein Detection,” *Biosensors and Bioelectronics*, **2003**, *19*,
331-336.

*Oberlin student co-authors

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