Bowdoin’s chemistry program provides a rigorous pre-professional education for students who intend to pursue a career in science. The tradition of combining its primary teaching role with an ongoing and exciting research program has long been a hallmark of the department. The department is committed to the development of students as investigators who have been challenged to think critically and independently. This development takes place in a supportive atmosphere where teaching and research partnerships are formed and faculty and students work together in common pursuits.

All members of the department are actively engaged in research, and special opportunities for students exist in the areas of organic synthesis, marine environmental chemistry, molecular recognition, chemical biology, enzyme chemistry, photochemistry, low temperature spectroscopy, and high resolution mass spectrometry. The department has gained national prominence through its innovative program in microscale organic chemistry.

The department offers twenty-one courses and seminars during the academic year. Class size in introductory courses averages forty; advanced courses usually have fewer than ten students. More than twenty students a year participate in independent projects, and between twenty and forty chemistry and biochemistry majors graduate each year.

The Academic Program

Students majoring in chemistry take an introductory chemistry course, Chemical Analysis, Organic Chemistry I and II, Inorganic Chemistry, Physical Chemistry I and II, Physical Chemistry Laboratory, and either Biochemistry and one additional 300-level course or two courses at the 300 level or above, such as Instrumental Analysis, Advanced Organic Chemistry, Advanced Inorganic Chemistry, Chemical Biology, Environmental Fate of Organic Chemicals, and Independent Study. Majors are also required to take Introductory Physics I and II, Differential Calculus, and Integral Calculus. Many students complete a senior independent research project as part of their major program.

The department encourages students to round out the chemistry major with a summer of research and relevant courses in other departments, depending on individual needs. These might include electives that provide extensive opportunities for writing and speaking, or courses concerned with technology and society.

The department works with the biology department to offer students an interdisciplinary major in biochemistry, which includes a core sequence of eight courses in biology, chemistry, and biochemistry, in addition to courses in mathematics and physics. The major also requires three additional courses in biology, chemistry, or physics. The department also offers interdisciplinary majors in chemical physics, and geology and chemistry, and participates in the coordinate major with the Environmental Studies Program.

The minor consists of five chemistry courses.

Independent Research

The department encourages chemistry and biochemistry students to engage in student-faculty research during the academic year and summer. The majority of department majors earn honors by completing two-semester research projects and then reporting their work in formal honors papers. Many other majors who do not pursue honors also undertake independent research. Students work with their faculty advisors in planning, executing, and reporting their investigations. The department stresses the importance of independent research work, especially at the senior level, and believes that these hands-on experiences provide a more realistic exposure to science than can be gained from coursework alone.

In addition to opportunities offered during the academic year, many students participate in research projects, either during the academic year or as part of their senior independent research project.
in summer research. The department’s summer program is structured to introduce important elements of research, and students are given varied opportunities to communicate their results through papers, research talks, and poster presentations.

Facilities

The chemistry program is conducted in the Druckenmiller Science Center complex, completed in 1997, which also houses the departments of biology and geology. This building contains modern laboratories for instruction and student/faculty research, computer labs, classrooms, and faculty offices. A central feature is a large atrium used for student research symposia and as a space where students can gather to study and work collaboratively.

Hatch Science Library is adjacent to Druckenmiller/Cleaveland Hall. The library has an excellent collection of books and journals and is equipped with terminals for online database searching of chemical abstracts and other scientific databases using Web of Science and ScFinder Scholar.

Faculty

Richard D. Broene, professor of chemistry, B.S. (Hope), Ph.D. (California–Los Angeles), is an organic chemist who specializes in organometallic-mediated organic synthesis, selective polymerization, and new synthetic methodologies. Professor Broene is chair of the department.

Ronald L. Christensen, James Stacy Coles Professor of Natural Sciences, A.B. (Oberlin), A.M., Ph.D. (Harvard), is a physical chemist who specializes in photobiology, organic photochemistry, and low temperature electronic spectroscopy.

Danielle H. Dube, assistant professor of chemistry and biochemistry, B.A. (Cornell), Ph.D. (California–Berkeley), specializes in chemical biology, biochemistry, and organic chemistry, and focuses on using chemical tools to target, alter, and understand glycosylation.

Jeffrey K. Nagle, professor of chemistry, B.A. (Earlham), Ph.D. (North Carolina), is an inorganic chemist who specializes in inorganic photochemistry, metal-metal bonding, and electron transfer.

David S. Page, Charles Weston Pickard Professor of Chemistry and Biochemistry, B.S. (Brown), Ph.D. (Purdue), is an environmental analytical biochemist who specializes in pollution biochemistry and toxicology and the fate and effects of hydrocarbons and other pollutants on marine communities.

Elizabeth A. Stemmler, professor of chemistry, B.S. (Bates), Ph.D. (Indiana), is an analytical chemist who specializes in negative ion mass spectrometry, ion-molecule reactions, and analytical applications of MALDI-FTMS.

Dharni Vasudevan, associate professor of chemistry and environmental studies, B.S. (Massachusetts Institute of Technology), M.S., Ph.D. (Johns Hopkins), is an environmental chemist who focuses on the mechanisms by which organic and inorganic compounds interact with mineral surfaces in soil and aquatic environments.

Laura Foster Voss, assistant professor of chemistry, B.S. (Colorado College), Ph.D. (California–Los Angeles), is a physical chemist who specializes in heterogeneous atmospheric chemistry, nonlinear optical spectroscopy, and optical trapping.

Chemistry

Honors Projects

Recent research projects completed by students in the department include:

- An Activated Amid Route to Chromosomes
- The Influence of Molecular Structure on Sorption of Cationic Amines to Aluminosilicate Clay Minerals
- Determination of the Neuropeptides Present in Crustacean Midgut and Eyestalk Tissues Using MALDI-FTMS
- Improving Selectivity of Linear α-Olefin Products by Cobalt Catalysis: Synthesis of Phosphobenzene as a Cobalt Ligand
- The Development of Derivatization and Enzymatic Reactions for the Detection and Sequencing of Neuropeptides in Crustaceans by Matrix Assisted Laser Desorption/Ionization Fourier Transform Mass Spectrometry
- Chemical Analyses of Activity Residues in a Maya Marketplace
- The Effect of Limited Protein Mobility on the Protein Folding Dynamics of Cytochrome c: Folding within Sol-Gel Glasses
- The Development of a Microscale Tissue Extraction and Delipidation Procedure for the Analysis of Crustacian Neuronal Tissues Using Matrix-Assisted Laser Desorption/Ionization-Fourier Transform Mass Spectrometry
- Folding and Unfolding Pathways of Ferrous Myoglobin within Sol-Gel Glasses

Each year, visiting instructors replace faculty on sabbatical leaves and add their own specialties to the department’s offerings. Instructional support staff for the department includes Judith C. Foster, A.B. (Brown), M.Sc. (Rhode Island), director of laboratories and laboratory instructor in chemistry.

Rene L. Bernier, B.S. (Maine), laboratory instructor in chemistry, laboratory support manager, and manager of the Science Center.

Martha B. Black, B.S., M.S. (Massachusetts Institute of Technology), laboratory instructor in chemistry.

Beverly G. DeCoster, B.S. (Dayton), laboratory instructor in chemistry.

Colleen T. McKenna, B.A. (Southern Maine), laboratory instructor in chemistry.

Paulette M. Messier, A.B. (Maine–Presque Isle), laboratory instructor in chemistry.

After Bowdoin

The major program prepares students for many career paths after graduation, including the profession of chemistry, graduate studies in other branches of science, medicine, secondary school teaching, and many fields in the business world. Typically, between 30 and 40 percent of Bowdoin’s chemistry majors have gone on to study at graduate institutions including Yale, Massachusetts Institute of Technology, Stanford, Cal Tech, Colorado, Indiana, North Carolina, and Oxford. A similar percentage of students enters health-related professional schools, with the remaining students pursuing professional careers.