Chemistry

Haverford's chemistry department serves students who are pursuing chemistry for a variety of professional reasons or simply to increase their knowledge of the natural sciences. There is a growing need for educators, lawyers, entrepreneurs, policy makers and scientists in diverse fields to have a solid understanding of chemical principles.

Haverford has a Chemistry Major program that provides preparation for careers in science, medicine, law, business, and primary and secondary education. About one third of Haverford's chemistry majors enter top-ranked graduate programs leading to a Ph.D., and another third enter medical school after graduation. The remaining third of Haverford's chemistry majors usually elect to take jobs after graduation and obtain challenging and rewarding positions as teachers, laboratory scientists, and information specialists, among other professions.

Curriculum

Haverford offers both a Major and a Minor in Chemistry. The curriculum is approved by the American Chemical Society (ACS) and students may obtain an ACS-certified degree in chemistry. The major requirements are flexible enough that students are able to study abroad for one or two semesters if they so desire. Typically, several junior chemistry majors study abroad each year. Chemistry majors can design a program directed toward interdisciplinary areas of study, such as chemical physics, computational chemistry, materials science or biological chemistry, or to one of the traditional areas: organic, physical, or inorganic chemistry. One-third to one-half of all chemistry majors also obtain an Area of Concentration in Biochemistry. Majors may also pursue a Concentration in Scientific Computing or in Environmental Studies.

Courses in General and Organic chemistry serve several purposes. First, they provide a broad introduction to the discipline as one of the liberal arts. They also serve as a foundation for both the chemistry and biology majors, and they provide the four semesters of chemistry laboratory experience required for medical school admission. The department offers a variety of entry points into the introductory courses, depending on a student's preparation from high school.

The intermediate- and upper-level chemistry courses are taught by faculty members in their areas of expertise. The formal laboratory component of the upper-level curriculum consists of a year-long "Laboratory in Chemical Structure and Reactivity," nicknamed "Superlab" by our students. In this course, junior chemistry majors work together in multi-week projects adapted from the current chemical research literature that teach them the timely and relevant areas of inquiry in the discipline as well as the many techniques used in modern chemical research.

Research is the characteristic activity of chemists, and Haverford's Chemistry Department believes that students should be involved in research as part of their chemical education. A senior research thesis is required of all chemistry majors. Research allows students to discover and develop creativity and independence, which are not always brought out in the well-structured programs of the formal courses. Students at any level of the curriculum can obtain research experience through paid summer internships or by enrolling in research tutorial courses during the academic year, and a number of majors do both. Typically, the chemistry faculty offers about twenty-five to thirty paid research positions per summer. Chemistry majors who wish to work elsewhere for the summer are quite successful at securing summer research positions in university, government and industrial chemical laboratories.

The William Pyle Philips Distinguished Visitor Program brings chemists of international distinction to Haverford every year for one or two-day visits. Some Philips visitors have been Nobel laureates in Chemistry. Students have many opportunities, typically including a dinner during which they meet with the Philips visitors to talk about chemistry research and professional career paths.

Facilities

The chemistry department moved into the new east wing of the Marian E. Koshland Integrated Natural Sciences Center in the summer of 2001. The new space provides ample, well-ventilated instructional laboratories and separate laboratories designed to support student-faculty research. The Koshland Center was designed to encourage interdisciplinary interactions among both students and faculty, and has included since its completion in 2002, computer clusters, a machine shop, a library and a large study area, each serving all of the departments in the natural science division.

The department maintains state-of-the-art research instrumentation that is used in both the research and in the teaching laboratory courses. Students learn to use these instruments in the introductory courses, and then they use them frequently in the Superlab courses and in their research. A few examples of the instruments and facilities used by students are:

- two Bruker nuclear magnetic resonance (NMR) spectrometers used to determine the structure of molecules,
- an Applied Biosystems automated peptide synthesizer,
- a laser laboratory with several different lasers and detection systems used for spectroscopy and fast (nanosecond) kinetic studies of molecules in gas and solution phases,
- a GPC Difftech Powder X-ray Diffractometer, and
- an Agilent Liquid Chromatograph/Mass Spectrometer.

The operation of the teaching and research laboratories is aided by three staff members: **Joanne Brown**, the department budget administrator; **Kathy Dostal**, the instructional laboratory supervisor; and **Carl Aronson**, our instrument specialist.

The Faculty

Typically two to six students work in each faculty member's laboratory during any given semester or summer. Student and faculty research in the department is currently supported by grants from the National Science Foundation, the National Institutes of Health, the Howard Hughes Medical Institutes, and several other sources. Students and faculty from the chemistry department publish their research findings in top tier peer-reviewed journals.

Karin S. Åkerfeldt
Bioorganic Chemistry: delineating structure function relationships in proteins; protein design.

Frances Rose Blase
Synthetic Organic Chemistry: synthesis of medically-relevant natural products.

Casey Londergan
Biophysical Chemistry: observing protein dynamics by vibrational spectroscopy.

Terry L. Newirth
Organic Chemistry: mechanistic chemistry related to food science.

Alexander J. Norquist
Materials Chemistry: crystal growth of organically templated transition metal oxides.

Robert C. Scarrow
Bioinorganic Chemistry: Synthetic chemical models of the role of metal ions in the oxygenation and hydrolytic reactions catalyzed by metalloenzymes.

Joshua Schrier
Theoretical Chemistry: electronic, optical, and mechanical properties of nanostructures.

Helen K. White
Environmental Chemistry: investigating sources, sinks and cycling of organic compounds in the environment.

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Revised 6/10/09