

Chemistry

“With One Course, we are free to choose lab activities for their educational value rather than for their ability to fit within a more artificial time constraint. It is hard to overstate the importance of this fact, and it is a key advantage in teaching science.”

Craig Teague, Associate Professor of Chemistry

In the Cornell College Department of Chemistry, students develop both practical skills in research and the critical thinking skills necessary for an accurate understanding of the scientific issues our society faces.

The chemistry department has been certified by the American Chemical Society for the professional training of chemists at the undergraduate level, which is uncommon for a small college. In addition to a traditional major in chemistry, Cornell offer an ACS-certified major, a teaching major, and joins with the biology department to support a biochemistry and molecular biology major.

The curriculum emphasizes a broad view of chemistry and its relationship to other disciplines. Majors are strongly encouraged to engage in research projects at Cornell or other institutions to help them become active, engaged scientists.

On campus, students have the opportunity to work in small groups with faculty mentors during the Cornell Summer Research Institute. Department faculty are all professional scientists with meaningful and varied research interests, and they treat students as full partners in the process, giving them an experience much like that of a graduate school research lab.

BENEFITS OF ONE COURSE AT A TIME

Cornell's small class sizes and One Course At A Time curriculum allow classes to become tight learning communities, with plenty of time for group activities and class discussions. Each course has a dedicated lab available all day, every day, so students

are never rushed to finish experiments in a narrow time frame.

Professors also customize lab time for each course. For example, in some of the introductory chemistry courses, there is typically a lecture in the morning with lab two afternoons a week. Other courses may be taught in more of a workshop format, where a short lecture leads immediately to the lab to get some practical experience with the topic. Students in organic chemistry lab enjoy a full block immersion in the lab.

In addition, other difficult courses such as calculus or physics never interfere with chemistry, and chemistry majors get to apply themselves fully in all their nonmajor courses. Students never have to worry about multiple exams in one day, and professors have the flexibility to give untimed exams to test deeper knowledge.

CURRICULUM HIGHLIGHTS

As the culmination of the degree program, each chemistry major completes a portfolio of work, consisting of four of the five items below:

- A laboratory report from an advanced chemistry course
- A report from an independent laboratory research experience
- A detailed proposal for carrying out original chemical research
- A literature review and critique on a current topic in chemistry
- A video of the student's oral presentation from an advanced chemistry course or research experience, with written commentary

Cornell chemistry majors have the opportunity to work with our most sophisticated lab equipment beginning their sophomore year, which differs from many other chemistry programs. This

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Faculty Bios & Courses

JEFF CARDON *Professor of Biology and Chemistry*

Teaches courses in biology and chemistry, including Cell and Molecular Biology, Biochemistry, Microbiology, and courses in organic chemistry. Recent research with students has focused on energy utilization in the yeast *S. cerevisiae*, which may shed light on biological causes of obesity in humans. Ph.D. in Molecular Biology, University of California, Los Angeles.

CHARLEY LIBERKO *Professor of Chemistry*

Teaches courses in organic chemistry, Chemical Principles I & II, and nonmajor courses such as Chemistry of Artists' Materials. His research with students is concerned primarily with organic dyes and the relationship between structure and optical properties. Ph.D. in Organic Chemistry, University of Minnesota.

BRIAN NOWAK-THOMPSON *Associate Professor of Biology and Chemistry*

Teaches introductory and advanced classes in chemistry and biology with an emphasis in biochemistry. Students in his lab study the production of bacterial metabolites that inhibit plant pathogens. The bacteria producing these metabolites are sometimes used in place of agricultural pesticides to manage plant disease. Ph.D. in Biochemistry and Biophysics, Oregon State University.



practice with top-of-the-line tools provides valuable experience for future endeavors and gives students an advantage when applying for graduate schools or jobs.

Equipment and date of purchase

- Nuclear magnetic resonance (NMR) spectrometer, Bruker Avance 400 (2015)
- X-Ray fluorescence spectrometer, Thermo Niton XL3t (2014)
- Atomic absorption spectrometer, Perkin Elmer AAnalyst 200 (2013)
- FT-IR spectrometer, Thermo Nicolet iS5 (2011)
- Scanning tunneling microscope, Nanosurf (2011)
- Gas chromatograph/mass spectrometer, Agilent 5975/6850 (2008)
- ICP-Emission spectrometer, Perkin Elmer Optima 1200 DV (2008)
- Raman spectrometer, DeltaNu (2008)
- Luminescence spectrometer, Perkin Elmer LS 55 (2006)
- BioRad low pressure chromatography system (2006)
- High performance liquid chromatograph, Agilent 1100 (2002)
- UV-Visible spectrophotometers, various (2003-2013)

SUMMER RESEARCH

Students work closely with Cornell faculty members on collaborative research projects during the Cornell Summer Research Institute. Chemistry faculty have ongoing research projects with students on topics such as:

- Impact of human diet on ion channel function in order to predict and control drug side effects.
- Organic dyes, focusing on the relationship between structure and optical properties
- Bacterial metabolites that inhibit plant pathogens and may serve as an alternative to agricultural pesticides.
- Room temperature ionic liquids as a means for separating and capturing carbon dioxide.
- Energy utilization in a yeast that may shed light on causes of human obesity.

Students typically present the results of their research at the Cornell College Student Symposium or at regional or national meetings of the American Chemical Society.

Many students apply for research opportunities at other institutions. Students have recently completed research experiences at Oak Ridge National Laboratory, Rutgers University, the University of Oregon, Iowa State University, University of Nebraska, Baylor University, Los Alamos National Laboratory, the University of Pittsburgh, the University of Arizona, the University of Minnesota, Missouri State University, and the University of Illinois.

INTERNSHIPS & FELLOWSHIPS

Students have the opportunity to apply their classroom training to real-world problems through internships and fellowships. These can happen during the summer or the academic year and can last from four to eight weeks. Students have recently completed internships or fellowships at Integrated DNA Technologies in Coralville, Iowa; Rockwell Collins in Cedar Rapids, Iowa; State Hygienic Laboratory in Coralville, Iowa; the Chief Medical Examiner's Office in New York City; and AbbVie in Lake County, Illinois.

AFTER CORNELL

Many chemistry majors go on to Ph.D. programs, while other graduates find employment in a range of fields.

ALUMNI CAREERS

Research technologist in biophysics, Northwestern University, Evanston, Illinois (Class of 2014)

Lab technician, Manchester Environmental Laboratory, Yakima, Washington (Class of 2014)

Research technician, Leprino Foods, Denver, Colorado (Class of 2013)

Research technologist, Medical College of Wisconsin, Milwaukee, Wisconsin (Class of 2013)

Quality control scientist, Zoetis, Charles City, Iowa (Class of 2013)

Biocatalyst technician, Gevo, Centennial, Colorado (Class of 2011)

Applications specialist, Genecor, Cedar Rapids, Iowa (Class of 2010)

Medical laboratory scientist, the Mayo Clinic, Rochester, Minnesota (Class of 2009)

Forensic scientist and chemist, the Nebraska State Patrol Crime Laboratory, Lincoln, Nebraska (Class of 2009)

GRADUATE SCHOOLS ATTENDED

Ph.D., chemistry, Columbia University (Class of 2015)

Ph.D., chemistry, University of Washington (Class of 2015)

Ph.D., chemistry, University of Oregon (Class of 2013)

Ph.D., pharmacy, University of Minnesota (Class of 2013)

Ph.D., chemistry, Northwestern University (Class of 2013)

Ph.D., chemistry, Massachusetts Institute of Technology (Classes of 2012 and 2009)

Ph.D., chemistry, University of Iowa (Class of 2010)

JAI SHANATA *Assistant Professor of Chemistry*

Teaches courses in Organic Chemistry, Chemical Principles I and II, and an advanced topics course in pharmacology and chemical biology. He and his students apply physics and chemistry to biological models to study how components of human diet, including cholesterol, fatty acids, and drugs, impact ion channel function. The long-term goal is to predict and control drug side effects and off-target effects. Ph.D. in Chemistry, California Institute of Technology.

CINDY STRONG *Professor of Chemistry*

Teaches courses in analytical chemistry, inorganic chemistry, and Chemical Principles I & II. She and her students pursue research projects in bioinorganic chemistry and analytical chemistry. Ph.D. in Chemistry, California Institute of Technology.

CRAIG TEAGUE *Associate Professor of Chemistry*

Teaches courses in physical chemistry, Chemical Principles I & II, and other courses. In partnership with the Oak Ridge National Lab in Tennessee, his research with students explores methods of separating and capturing carbon dioxide, particularly using room temperature ionic liquids. Ph.D. in Chemistry, University of Illinois at Urbana-Champaign.