



The Passion

Chemists study the material world and its transformations through insight and experimentation. Their ideas and methods have revolutionized modern science. The study of chemistry reveals how the behavior of atoms and molecules can explain the properties and processes of matter, including living systems. As members of the most interdisciplinary science, chemists are employed in a wide range of industries. Chemistry and biochemistry play a vital role in addressing many societal issues such as the development of alternative sources of energy and new materials with applications in national security, health care, environmental remediation, and many more.

Gonzaga University's Chemistry and Biochemistry Department offers students a comprehensive introduction to chemistry that fosters personal and intellectual growth by requiring students to think critically, innovatively, and independently while developing their analytical and problem-solving skills. The Department balances technical knowledge with a broad liberal arts education, emphasizing ethics and social responsibility.

The Program

Gonzaga offers both Bachelor of Science and Bachelor of Arts degrees in Chemistry and a Bachelor of Science in Biochemistry. The B.S. in chemistry degree (62 credits), approved by the American Chemical Society (ACS), is recommended for students aspiring to attain advanced degrees in chemistry. The B.A. degree (53 credits) allows students to complete a variety of elective courses in other disciplines and is popular among students pursuing careers in the health sciences, as well as those planning careers as chemistry teachers. A 31-35 credit minor in Chemistry is also offered. The B.S. in Biochemistry degree (71-74 credits), consistent with both ACS and American Society for Biochemistry and Molecular Biology guidelines, is recommended for students aspiring to attain advanced degrees in biochemistry, molecular biology, or related disciplines.

For students interested in environmental science, the Department recommends a B. A. degree in Chemistry combined with a major or minor in Environmental Studies and supporting courses in biology and civil engineering. While Gonzaga does not offer a program in chemical engineering, students can combine a B.S. degree in Chemistry with supporting courses from the School of Engineering, followed by an M.S. or Ph.D. degree in Chemical Engineering from a post-graduate institution.

As empirical sciences, chemistry and biochemistry require extensive laboratory experimentation. Thus, Gonzaga's chemistry and biochemistry courses have both a lecture and laboratory component. Knowledgeable and dedicated faculty members teach all courses, and the program relies upon the strengths of the laboratory curriculum, the student-oriented faculty, the high academic standards of the Chemistry/Biochemistry Department, and the modern equipment for teaching and research. The completion of the 30,000 square foot addition to the Hughes Hall building in August 2003 doubled the capacity of Gonzaga's existing natural science facilities. The new addition houses all of the chemistry teaching laboratories, providing excellent modern facilities for student instruction.

Department faculty members strongly encourage students to conduct research. Seniors pursuing an ACS-approved degree complete an extensive undergraduate thesis. Students have full use of the department's most advanced equipment, including various spectrometers (nuclear magnetic resonance, mass, infrared, fluorescence, ultraviolet/visible, and atomic) and gas and liquid chromatographs.

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The Potential

Challenging coursework, dedicated faculty members, and small classes encourage students to explore all aspects of chemistry. The development of strong oral and written communication skills are key objectives of the program. The Department operates a weekly seminar series that hosts invited academic and industrial speakers throughout the year; students participate as well, presenting research and literature seminars in their senior year. Many students also develop communication skills by working as teaching assistants in our laboratory classes. An active internship program with a full-time director provides additional research and industrial opportunities for students. The Department operates an 11-week summer research program where students can work closely with Gonzaga faculty gaining experience as well as earning a competitive stipend or academic credits. Many students are members of SAACS (Student Affiliates of the American Chemical Society) and participate in local outreach activities, grade school demonstrations, and field trips to regional science facilities. All of these activities serve to accelerate professional development by helping students develop, refine, or focus career goals.

Gonzaga University chemistry and biochemistry graduates pursue careers in a wide variety of fields requiring strong backgrounds in the sciences. Recent employers of our graduates include Avista Laboratories, Bend Research Institute, Hollister-Stier, Merck, Publicity Providers Inc., and Spokane School District #81. Our graduates are also involved in service positions with the Jesuit Volunteer Corps and AmeriCorps. Approximately 60 percent of all Gonzaga chemistry and biochemistry graduates go on to graduate study, including medicine, pharmacy, and law school.

Recent Department Graduates Have Attended the Following Schools:

Chemistry Graduate School

Mayo Clinic
Northwestern University
Oregon State University
University of Arizona
University of California, Berkeley

University of California, Irvine
University of California, San Diego
University of Chicago
University of Colorado, Boulder
University of Illinois
University of Oregon
University of Utah
University of Texas, Austin
University of Washington

Medical School

Creighton University
Northwestern University
Tulane University
University of Washington
University of Wisconsin
Vanderbilt University

Industry and Other Career Paths

Teach for America
Dental School
Ferris High School (teacher)
Hollister-Stier
Bend Research
Medical Technology School
Oregon Health and Science Univ., Physician Asst. Program
Metrical
Gilead Sciences

Faculty Contacts and Specialties:

David A. Cleary, Ph.D., University of Michigan, Professor, specializes in physical and materials chemistry. (cleary@gonzaga.edu)

Matthew E. Cremeens, Ph.D., Cornell University, Assistant Professor, specializes in organic and biophysical chemistry. (cremeens@gonzaga.edu)

Jeff Cronk, Ph.D., University of California, Berkeley, Assistant Professor, specializes in biochemistry. (cronk@gonzaga.edu)

Gemma D'Ambruoso, Ph.D., University of Arizona, Lecturer, specializes in organic chemistry. (dambruoso@gonzaga.edu)

Tim Humphry, Ph.D., Utah State University, Visiting Assistant Professor, specializes in inorganic chemistry. (humphry@gonzaga.edu)

Dennis McMinn, Ph.D., University of Minnesota, Professor, specializes in analytical and organic chemistry. (mcminn@gonzaga.edu)

Eric Ross, Ph.D., University of Arizona, Assistant Professor, specializes in analytical development and application of nanoporous materials. (rosse@gonzaga.edu)

Jennifer Shepherd, Ph.D., University of California, Los Angeles, Associate Professor, specializes in organic synthesis with applications in quinone biosynthesis, anaerobic energy metabolism and drug design. (shepherd@gonzaga.edu)

Sarah Siegel, Ph.D., The Scripps Research Institute, Visiting Assistant Professor, specializes in biophysical chemistry. (siegel@gonzaga.edu)

Joanne Smieja, Ph.D., University of Minnesota, Professor and Chair, specializes in environmental applications of inorganic chemistry. (smieja@gonzaga.edu)

Tommaso A. Vannelli, Ph.D., University of California, San Diego, Assistant Professor, specializes in bioinorganic and bioanalytical chemistry. (vannelli@gonzaga.edu)

Stephen Warren, Ph.D., State University of New York at Buffalo, Assistant Professor, specializes in medicinal, bioorganic, and organic chemistry. (warren@gonzaga.edu)

Jeff Watson, Ph.D., Purdue University, Assistant Professor, specializes in biochemistry with emphasis on enzyme structure-function relationships and protein dynamics. (watsonj@gonzaga.edu)

Emeritus Faculty:

Dennis Kelsh, Ph.D., Iowa State University, Professor Emeritus. (kelsh@barney.gonzaga.edu)

Kay Nakamaye, Ph.D., University of California, Berkeley, Professor Emeritus. (nakamaye@gonzaga.edu)

A Sample of Recent Articles Published (* indicates an undergraduate student):

“Structural and Rate Studies of the Formation and Trapping of Benzynes.” Riggs, J.C.; Ramirez, A.; Cremeens, M.E.; Bashore, C.G.; Chandler, J.; Wirtz, M.C.; Coe, J.W.; Collum, D.B. *Journal of the American Chemical Society*, 130. 3406-3412 (2008).

“Direct Observation of Structural Heterogeneity in a B-sheet.” Cremeens, M.E.; Zimmermann, J.; Yu, W.; Dawson, P.E.; Romesberg, F.E. accepted. *Journal of the American Chemical Society* (Communication).

“Carbon-Deuterium Vibrational Probes of Peptide Conformation: Alanine Dipeptide and Glycine Dipeptide.” Miller, C.S.; Ploetz, E.A.; Cremeens, M.E.; Corcelli, S.A.; accepted. *Journal of Chemical Physics*.

“Identification of a Novel Bicarbonate Binding Site in Eubacterial B-Carbonic Anhydrase.” Cronk, J.D.; Rowlett R.S.; Zhang K.Y.J.; Tu C.K.; Endrizzi J.A.; Lee J.; Gareiss P.C.; Preiss J.R. *Biochemistry*, 45. 4351-4361 (2006).

“Stabilized porous phospholipid nanoshells.” Cheng, Z.L.; D’Ambruoso, G.D.; Aspinwall, C.A. *Langmuir*. 9507-9511 (2006).

“Poly (3,4-ethylenedioxythiophene)-Semiconductor Nanoparticle Composite Thin Films Tethered to Indium Tin Oxide Substrates via Electropolymerization.” Shallcross, R.C.; D’Ambruoso, G.D.; Korth, B.D.; Hall Jr., H.K.; Zheng, Z.; Pyun, J.; Armstrong, N.R. *Journal of the American Chemical Society*, 11310-11311 (2007).

“Silica Colloidal Crystals as Three-Dimensional Scaffolds for Supported Lipid Films” Ross, E.E.; Wirth, M.J. *Langmuir*, 24. 1629-1634 (2008).

“Patterned Protein Films on Poly(lipid) Bilayers by Microcontact Printing.” Ross, E.E.; Joubert, J.R.; Wysocki, R.J., Jr.; Nebesny, K.; Spratt, T.; O’Brien, D.F.; Saavedra, S.S. *Biomacromolecules*, 7. 1393-1398 (2006).

“High-speed Electro-separations Inside Silica Colloidal Crystals.” Zheng, S.; Ross, E.; Legg, M.A.; Wirth, M.J. *Journal of the American Chemical Society*, 128. 9019-9017 (2006).

“Synthesis of Unsymmetrical Alkynes via the Alkylation of Sodium Acetylides: An Introduction to Synthetic Design for Organic Chemistry Students.” J. N. Shepherd and J. R. Stenzel. *Journal of Chemical Education*, 83. 425-428 (2006).