Chemistry & Biochemistry

Chemists study the material world and its transformations through insight and experimentation. 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 issues in society, such as developing alternative sources of energy or new materials that have applications for national security, health care, environmental remediation, and many other areas.

THE PROGRAM

The Department of Chemistry and Biochemistry offers Bachelor of Science degrees in chemistry and biochemistry and a Bachelor of Arts degree in chemistry. There are two different options available for an American Chemical Society (ACS) approved Bachelor of Science (B.S.) degree, one in chemistry and one in biochemistry. The ACS approved degree tracks are recommended for students interested in pursuing a graduate degree in chemistry (63 credits) or biochemistry (70 credits). There are also two non-ACS approved degrees, a Bachelor of Science (B.S.) degree in biochemistry (69 credits), and a Bachelor of Arts (B.A.) degree in chemistry (53 credits). The non-ACS approved B.S. biochemistry degree has a larger biology emphasis, and is better suited for students seeking a broad background in both biochemistry and molecular biology. The Bachelor of Arts (B.A.) is offered for students seeking a strong background in chemistry, but with less specialization than the Bachelor of Science program. A minor in chemistry is also offered.

For those interested in teaching chemistry at the secondary level, the Department suggests the B.A. degree along with the teacher certification program of the School of Education. For students interested in environmental science, a B.A. degree combined with a minor in Environmental Studies and supporting courses from biology and civil engineering is recommended. Gonzaga University does not offer a program in chemical engineering. Students interested in chemical engineering should consider combining a B.S. degree in chemistry with supporting courses from the School of Engineering and Applied Science and an M.S. or Ph.D. degree in Chemical Engineering from another institution.

As empirical sciences, chemistry and biochemistry require extensive **laboratory experimentation**. Thus, most of Gonzaga's chemistry and biochemistry courses have both a lecture and laboratory component. Knowledgeable and dedicated faculty teach all courses. The program is built on a strong laboratory curriculum, student-centered faculty, high academic standards, and modern equipment for teaching and research.

Department faculty members strongly encourage students to conduct **research**. Seniors pursuing a B.S. 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, inductively-coupled plasma, circular dichroism, and atomic) and gas and liquid chromatographs.

Challenging coursework, dedicated faculty members, and small classes encourage students to explore all aspects of chemistry. Developing strong oral and written communication skills is a key objective of the program. The Department hosts a weekly seminar series that invites academic and industrial speakers to campus 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 **undergraduate research program** with a full-time research coordinator provides additional research and industrial opportunities for students. The Department operates a 10-week summer research program in which students can work closely with Gonzaga faculty and gain research experience while earning a competitive stipend or academic credit. Many students are members of the Science Club and Science in Action! and

participate in local outreach activities, grade-school demonstrations, and field trips to regional science facilities. All of these activities accelerate students' professional development by helping them develop, refine, and focus their career goals.

OUTCOMES

Gonzaga chemistry and biochemistry graduates pursue careers in a wide variety of fields requiring strong backgrounds in science, problem-solving, and analysis. Recent graduates have taken jobs, for example, in actuary work, chemical sales, pharmaceutical research and development, medical technology, and teaching. Our graduates are also involved in service positions with the Jesuit Volunteer Corps and AmeriCorps. Approximately 60% of all Gonzaga chemistry and biochemistry graduates go on to graduate study, including medical, dental, veterinary, pharmacy, physician assistant, and even law school.

THE PEOPLE

Faculty members are committed to their students, providing knowledgeable guidance, clear instruction, and enthusiasm for their subject area. They hold regular office hours and serve as advisors and mentors, guiding students along their chosen personal career paths.

SAMPLES OF FACULTY & STUDENT RESEARCH

*GU Chemistry faculty denoted in *italics*; GU undergraduate co-authors in **bold**

Om, N.P., Peterson, C.A., Snavely, M.E., Brown, T.C., TecleMariam, A.F., Campbell, J.A., Blake, A.M., Schneider, S.C. and *Cremeens, M.E.* (2017). "Antimicrobial peptides interact with peptidoglycan." Journal of Molecular Structure, 1146: 329-336.

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Shepard, R., Brozell, S.R. and *Gidofalvi, G.* (2015). "The representation and parameterization of orthogonal matrices." Journal of Physical Chemistry A. 119: 7924-7939.

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Rowley, J.G., **Do, T. D.**, *Cleary, D.A.* and Parkinson, B.A. (2014). "Combinatorial discovery through a distributed outreach program: Investigation of the photoelectrolysis activity of p-type Fe, Cr, Al Oxides." Applied Materials and Interfaces, 6(12): 9046-9052.

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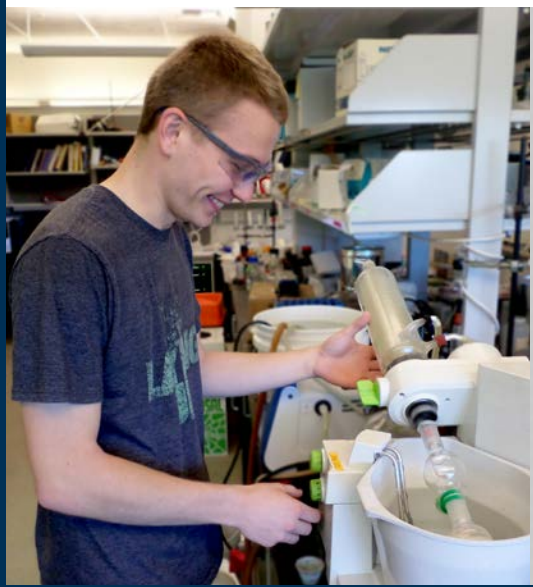
Schwarz, B.H., Driver, J., Peacock, R.B., Dembinski, H.E., Corson, M.H., Gordon, S.S. and *Watson, J.M.* (2014). "Kinetic characterization of an oxidative, cooperative HMG-CoA reductase from *Burkholderia cenocepacia*." Biochimica et Biophysica Acta. 1844:457-464.

Gonzalez, J.D., Levonyak, N.S., Schneider, S.C. and *Cremeens, M.E.* (2014). "Using infrared spectroscopy of a nitrile labeled phenylalanine and tryptophan fluorescence to probe the a-MSH peptide's side-chain interactions with a micelle model membrane." Journal of Molecular Structure. 1056-1057:7-12.



GRADUATE SCHOOL

Chemistry

- Mayo Graduate School
- Northwestern University
- Oregon Health & Science 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
- Johns Hopkins School of Medicine
- Loyola University Chicago
- Northwestern University
- Tulane University
- University of Washington
- University of Wisconsin
- Vanderbilt University

Gidofalvi, G. and Mazziotti, D.A. (2014). "Molecule-optimized basis sets and Hamiltonians for accelerated electronic structure calculations of atoms and molecules." Journal of Physical Chemistry A. 118:495-502.

Stumetz, K.S., Nadeau, J.T. and *Cremeens, M.E.* (2013). "Potential Non-adiabatic Reactions: Ring-opening 4,6-Dimethylidenebicyclo [3.1.0]hex-2-ene derivatives to aromatic reactive intermediates." Journal of Organic Chemistry. 78:10878-10844.

Warren, G.L., **Do, T.D.**, Kelley, B.P., Nicholls, A. and *Warren, S.D.* (2012). "Essential considerations for using protein-ligand structures in drug discovery." Drug Discovery Today. 17(23-24): 1270-1281.

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Warren, G.L. and *Warren, S.D.* (2011). "Chapter 16: Scoring Drug-Receptor Interactions." In Drug Design Strategies: Quantitative approaches. Eds. David J. Livingstone and Andy Davis. Royal Society of Chemistry Publishing. 440-457.

Hickert, A.A., Durgan, A.C., Patton, D.A., Blake, S.A. and *Cremeens, M.E.* (2011). "A B3LYP investigation of the conformational and environmental sensitivity of carbon–deuterium frequencies of aryl-perdeuterated phenylalanine and tryptophan." Theoretical Chemical Accounts. 130:883-889.

Smieja, J.A. (2011). "Household water treatments in developing countries." Journal of Chemical Education. 88:549-553.

Ross, E.E., **Mok, S.W.** and **Bugni, S.R.** (2011). "Assembly of lipid bilayers on silica and modified silica colloids by reconstitution of dried lipid films." Langmuir. 27:8634-8644.

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Murphy, K., **Kubin, Z.J.**, *Shepherd, J.N.* and Ettinger, R.H. (2010). "Valeriana officinalis root extracts have potent anxiolytic effects in laboratory rats." Phytomedicine. 17:674-678.

Smieja, J.A, D'Ambruoso, G.D. and Richman, R.M. (2010). "Art and chemistry: Designing a study-abroad course." Journal of Chemical Education. 87:1085-1088.

D'Ambruoso, G.D., Ross, E.E. and McGrath, D.V. (2009). "Site-isolated, intermolecularly photocrosslinkable, and patternable dendritic quinacridones." Chemical Communications. 22:3222-3224.

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Employers

- Avista Laboratories
- Bend Research
- Brooks
- Gilead Sciences
- Jubilant HollisterStier
- Merck
- Metrical
- Milliken & Company
- Pacific Northwest National Laboratories
- Publicity Providers Inc.
- Spokane School District #81
- Teach for America

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