

# Undergraduate Research

## The Department of Chemistry and Biochemistry



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NORTHERN ILLINOIS  
UNIVERSITY

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The NIU Department of Chemistry and Biochemistry *strongly encourages* all chemistry majors to participate in undergraduate research. A minimum of one semester, 2 credit hours, of supervised research is required for students completing the professional emphases in chemistry (emphasis 1) and biochemistry (emphasis 5). Students fulfill this requirement by taking CHEM 498/499H.

To enroll in CHEM 498/499H, please follow these steps:

1. **Discuss your interest in research** with your departmental advisor. Your advisor will likely introduce the idea of research very early-on during your first advisement session.
2. **Find a research project** and faculty research advisor by reviewing the descriptions below and talking to the professors you know, whom you've enjoyed for a class, or whose research projects are of interest to you.
3. **Discuss and make an agreement** with your faculty research advisor on project requirements necessary to earn credit. Typically 3 hours of lab equals 1 hour of credit.
4. **Obtain agreement/registration form** from secretary in the department office, Faraday Hall 319.
5. **Return completed form** to the secretary, who will then register you for CHEM 498/499H.

In addition to the research experience, you can expect to learn how to use e-library, attend seminars of fellow students, and deliver a capstone seminar during the course of CHEM 498/499H.

### Faculty Research Interests

**Gary M. Baker** - *Biochemistry and Web Technology*. Evaluation of new generation drugs, especially those with Market Research profit projections, through review and presentation of relevant scientific literature. Development of online portal resource areas that will integrate into Teacher Education programs across campus.

**David S. Ballantine** - *Analytical Chemistry*. Development of microsensor technologies and chromatographic methods in chemistry; automation and interfacing of analytical instruments with computers for data collection and reduction; interaction of solutes and solvents.

**Jon W. Carnahan** - *Analytical Mass and Optical Spectroscopy*. Application and development of analytical atomic and mass spectrometry for elemental and molecular determinations; development of new instruments using acousto-optics (AO) technology.

**Elizabeth R. Gaillard** - *Biophysical Chemistry*. Chemical mechanisms of disease related damage in the human eye and other biological tissue and development of protocols to reduce/eliminate damage. Interaction of ionizing and non-ionizing radiation with human tissue, particularly the eye. Projects tend to be multidisciplinary and can accommodate a wide variety of interests in chemical and biological research.

**Thomas M. Gilbert** - *Computational Chemistry*. Computational modeling of molecules and reactions relevant to organic, inorganic, and biochemistry, with special focus on heteroatom-containing systems, transition metal complexes, and photofilters present in primate eyes.

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## Faculty Research Interests (continued)

### NIU Department of Chemistry and Biochemistry

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**Oliver Hofstetter** - *Biochemistry*. Development of new analytical techniques using antibodies as detection and separation agents for biologically interesting or important chiral compounds. This research combines immunology, analytical chemistry, protein chemistry, and molecular biology.

**James R. Horn** - *Biochemistry and Biophysical Chemistry*. Exploring the nature of protein/protein and protein/small molecule interactions, molecular recognition, protein engineering, and drug design.

**Narayan S. Hosmane** - *Organometallic/Bioboron Chemistry*. Synthesis and chemistry of cage and nanostructured materials of boron and carbon with transition metals, lanthanides, and main-group elements. The primary applications for such materials are catalysis of polymer formation, selective removal of radioactive material ions from nuclear waste, and boron neutron capture therapy (BNCT) for cancer.

**Dmitry V. Kadnikov** - *Organic Chemistry and Chemical Biology*. Design and synthesis of novel small molecules to investigate molecular-level mechanisms of cellular processes, particularly gene transcription; and to explore new strategies of disrupting the signaling pathways involved in cancer proliferation.

**Douglas A. Klumpp** - *Organic Chemistry*. Synthetic and mechanistic organic chemistry, particularly reactive chemical intermediates. Chemistry of reactive electrophilic systems; asymmetric synthesis; polymer functionalization and metal-chelating polymers; pyrolysis; fuel chemistry; agrochemicals.

**Chhiu-Tsu Lin** - *Physical Chemistry and Nanoscience*. Development of better materials through chemical techniques. Designing and fabrication of materials for specific applications using nanograin thin films, nanocrystalline ceramics, coatings, and sol-gels.

**Victor V. Ryzhov** - *Bioanalytical Mass Spectrometry*. Application and development of mass spectrometry-based methods for studying proteins; biological applications of gas-phase ion chemistry.

**Kui Shen** - *Organic and Biological Chemistry*. Applying synthetic organic chemistry and synthetic protein chemistry to the solution of biological problems. Students receive training in organic synthesis, recombinant protein expression, ligand/inhibitor design, instrumental analysis and/or cellular biology.

**Lee S. Sunderlin** - *Mass Spectrometry, Thermochemistry, Reaction Dynamics*. Flowing-afterglow mass spectrometry to measure bond strengths and reaction rates for ions in the gas phase, including systems important in atmospheric chemistry, hypervalent systems, and organometallic catalysis.

**Petr Vanýsek** - *Analytical Chemistry*. Properties of interfaces and in particular their electrochemistry (e.g., corrosion in metals).

**Tao Xu** - *Physical Chemistry and Nanoscience*. Nanoscale materials for energy application, Interfacial charge transport in nanomaterials.

**Qingwei Yao** - *Organic Chemistry*. Development of new methods of organic synthesis, particularly of cyclopentanes. Many natural compounds contain these five-membered rings at their cores, but reproducing them in the laboratory remains one of the most challenging organic syntheses.

**Chong Zheng** - *Physical and Computational Chemistry*. Materials science and theoretical biophysical/solid state chemistry. We are trying to find new materials with novel properties such as superconductivity, magnetoresistance, molecular magnetism, and electronic devices.