



At Kansas, our approach to graduate education appeals to students with goals that range from teaching at colleges and universities to conducting research in university or industrial settings. We offer a variety of emphasis areas from bioanalytical to organic and natural products to bioinorganic and organometallic to theoretical and laser chemistry. Our students can look forward to personal development in an atmosphere that emphasizes progress, from collaboration and mentorship with an adviser to independent scholarship. If this program fits your needs and plans for the future, we invite you to join us.

Forward-Looking Research Programs

The department's research programs and faculty members place it at the leading edge of scientific research. In addition to strong programs in the four traditional areas of chemistry, interdisciplinary programs in bioanalytical, bioinorganic, bio-organic, and biophysical chemistry encompass topics such as neurochemistry, picosecond laser spectroscopy of biomolecules, and enzyme catalysis. Studies in molecular dynamics, supramolecular chemistry and molecular recognition, ultrafast laser kinetics and spectroscopy, electroanalytical chemistry, theory of molecular relaxation, and biosensor design are among the many research opportunities.

KU's Center for BioAnalytical Research (CBAR), Kansas Institute for Theoretical and Computational Science (KITCS), and Kansas Center for Advanced Scientific Computing (KCASC) allow graduate students to conduct interdisciplinary research with other departments such as medicinal chemistry, molecular biosciences, pharmaceutical chemistry, physics and astronomy, and mathematics.

Doctoral Degree

The Ph.D. degree in chemistry is awarded for mastering a specialty field in the discipline, learning methods of chemical investigation, and completing a substantial piece of original research. The degree is intended to prepare the research specialist.

Distribution Courses

Introductory graduate courses in analytical, inorganic, organic, and physical chemistry are offered during the fall semester. New graduate students must take courses in three different areas, which include the four areas of chemistry above as well as bio-

chemistry on occasion. Students are encouraged to join a research group as early as possible.

Research Skill

Students develop one of the following research skills through independent study or course work: computer science, bibliography of chemistry, electronics methods, German, French, Russian, Japanese, or other skills relevant to chemical research.

Cumulative Examinations

The cumulative examination program helps graduate students develop effective approaches to research and keep abreast of scientific literature by simulating problems encountered in research. Successful completion of four examinations by the end of the fourth semester is considered sufficient evidence of a student's development in this area.

Research Proposals and the Comprehensive Examination

After completing the course program, the research skill, and the cumulative examinations, the student prepares proposals for investigating new and independent research problems. The student defends these proposals before a faculty committee at the comprehensive examination.

The Thesis

Under the direction of a faculty member or members, each student conducts an original research project, summarized in a thesis. The student is free to choose his or her own research adviser. Thesis research is the most significant aspect of a student's preparation for a chemistry career.

Master's Degree

In addition to the Ph.D. degree, the department offers the Master of Science (M.S.) degree for students who want a less extensive graduate program in chemistry. This program, usually completed in two years, omits the intensive course concentration required for the Ph.D. and requires a more modest research project and thesis. The M.S. is particularly attractive for students who do not plan a career in basic chemical research but who want to work in a closely related field.

Student Profile

More than 97 graduate students currently are enrolled in the chemistry department, and the department usually has about 45 postdoctoral stu-



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dents. Many other students pursue graduate degrees in related areas of medicinal chemistry, pharmaceutical chemistry, biochemistry, and geochemistry, making a community of more than 200 chemistry-oriented research students.

Admission

To apply for admission to the graduate program, a student must submit a completed Graduate School application, two transcripts, Graduate Record Examination scores, and three recommendations for the program from individuals familiar with the applicant's academic background and abilities. International students must supply scores from the Test of English as a Foreign Language (TOEFL) examination or the Test of Spoken English (TSE). Applications must be received by April 1 to be considered for enrollment in the fall. Contact the graduate admissions committee or any faculty member listed in this brochure at

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Online Graduate School application: www.graduate.ku.edu

The University of Kansas prohibits discrimination on the basis of race, color, religion, sex, national origin, age, ancestry, disability, veteran status, sexual orientation, marital status, and parental status.

Facilities

The department's research facilities offer a wide range of modern instrumentation and an extensive research support organization, the Molecular Structures Group (www.msg.ku.edu/~msg). Major instruments include six mass spectrometers with capabilities such as laser desorption (MALDI), high resolution, GC-MS, LC-MS, MS-MS, triple quadrupole and time of flight; six NMR spectrometers from 600-300 MHz, with an 800 MHz instrument arriving in 2004; Bruker X-ray diffractometers for single crystal and powder analysis; and an advanced FT-Raman spectrometer. Other general equipment includes Fourier transform infrared spectrophotometers, several other infrared and UV-VIS spectrophotometers, other nuclear magnetic resonance instruments, and automated spectropolarimeters. Individual research groups also have acquired state-of-the-art equipment necessary to enhance their research programs.

In addition, the Kansas Center for Advanced Scientific Computing maintains an SGI/Cray Origin 2000 supercomputer that is available for large-scale computational chemistry projects.

Specialized research support facilities in Malott Hall include an electronics shop, an instrument design laboratory, a molecular graphics laboratory, a biochemical research services laboratory, a glassblowing shop, a machine shop, and a staffed maintenance facility.

The Anschutz Library contains more than 300,000 volumes covering chemistry, biology, geology, pharmacy, and physics. The library is equipped for computer searching (e.g., CAS online) of the important commercial data bases in the sciences.



CHEMISTRY

The University of Kansas

Faculty Members and Research Areas

Mikhail V. Barybin, Assistant Professor, Ph.D., Univ. of Minnesota. Inorganic chemistry: organometallic and inorganic synthetic methodology, molecular design and supramolecular architecture of new organometallic ensembles with unusual and potentially useful physicochemical properties, electron delocalization in low-valent organometallic and inorganic systems, magnetism.

David R. Benson Jr., Associate Professor, Ph.D., Univ. of California–Los Angeles. Organic chemistry: bio-organic and bioinorganic chemistry, de novo protein design, hemoprotein structure and function, peptide conformation.

Cindy L. Berrie, Assistant Professor, Ph.D., Univ. of California–Berkeley. Physical and analytical chemistry: surface science, scanning probe microscopy, nanoscale patterning, biomolecule interactions.

Andrew S. Borovik, Professor, Ph.D., Univ. of North Carolina–Chapel Hill. Inorganic chemistry: molecular design of inorganic complexes and catalysts, bio-organic chemistry, supramolecular and polymer chemistry, organic chemistry of peptides.

Kristin Bowman-James, Professor, Ph.D., Temple. Inorganic chemistry: biomimetic and supramolecular chemistry, design and synthesis of selective receptors or ions (particularly anions) of biological and environmental relevance, synthesis of structural and functional models for metalloproteins with emphasis on those with multimetallic active sites.

Daryle H. Busch, Roy A. Roberts Distinguished Professor, Ph.D., Univ. of Illinois. Inorganic chemistry: transition metal coordination chemistry; bioinorganic chemistry focused on dioxygen, its reduction products, and their interaction with metal complexes; environmentally benign oxidation catalysis by transition metal compounds; supramolecular chemistry, especially new materials derived from advanced molecular topologies.

Robert G. Carlson, Professor, Associate Chair, Ph.D., MIT. Organic chemistry: organic synthesis, natural products, highly strained ring systems, photochemistry and bioanalytical chemistry.

Shih-I Chu, Watkins Distinguished Professor; Director, Kansas Center for Advanced Scientific Computing, Ph.D., Harvard. Physical chemistry: quantum chemistry, reaction dynamics, multiphoton and nonlinear optical processes in intense laser fields, nonlinear dynamics and chaos, many-body resonances, density functional theory, atomic and molecular astrophysics.

Heather R. Desaire, Assistant Professor, Ph.D., Univ. of California–Berkeley. Analytical chemistry: mass spectrometry, development of tandem mass spectrometry as a tool for structural characterization of drugs and their metabolites; using mass spectrometry for quantitative analysis of isomeric compounds, including diastereomers and enantiomers; methods development and bio-analytical applications.

Robert C. Dunn, Associate Professor, Ph.D., Univ. of California–San Diego. Analytical chemistry: optical spectroscopy/microscopy, fiber optics, optical sensors, single molecule spectroscopy, model membranes, ion channels.

Richard S. Givens, Professor, Ph.D., Univ. of Wisconsin–Madison. Organic chemistry: mechanistic organic photochemistry, applications of photochemistry—photoremovable protecting groups, “caged compounds,” and photostitching.

Paul R. Hanson, Associate Professor, Ph.D., Univ. of Minnesota. Organic chemistry: organic synthesis, synthetic methods development to novel phosphorus and sulfur motifs, transition metal catalyzed reactions, synthesis of biologically significant molecules and polymers.

Joseph A. Heppert, Professor; Director, Center for Science Education, Ph.D., Univ. of Wisconsin–Madison. Inorganic chemistry: catalysis, metathesis, polymers, stereospecific reactions, hydrogen bonding, liquid crystals, inorganic/organic hybrid materials. Science education: effect of inquiry in science laboratory instruction, effect of research on effectiveness of K-12 science instruction, attrition at the university/community college transition.

Peter M. Hierl, Professor, Ph.D., Rice Univ. Physical chemistry: rates and mechanisms of gas-phase ion-molecule reactions, molecular beams, mass spectrometry, ion-molecule reactions.

Carey K. Johnson, Associate Professor, Ph.D., Iowa State Univ. Physical chemistry: time-resolved and single-molecule laser spectroscopy, chemical and biophysical dynamics probed by ultrafast time-resolved laser spectroscopy, reorientational dynamics in solution.



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Krzysztof Kuczera, Associate Professor, Ph.D., Polish Academy of Science, Warsaw. Physical and theoretical chemistry: molecular dynamics simulations, statistical mechanics and quantum chemistry of biological molecules.

Brian B. Laird, Associate Professor, Associate Chair, Ph.D., Univ. of California–Berkeley. Physical chemistry: phase transitions, interfaces, amorphous systems, general liquid state theory in homogeneous fluids, algorithms for molecular simulation.

Cynthia K. Larive, Professor, Ph.D., Univ. of California–Riverside. Analytical chemistry: bioanalytical and environmental applications of LC/NMR, the use of NMR diffusion measurements to measure chemical equilibria and to characterize polydisperse samples, functional group characterization, metal complexation and aggregation properties of humic substances.

Craig E. Lunte, Professor and Chair, Ph.D., Purdue. Analytical chemistry: monitoring living systems, micro-separation techniques, electrochemistry, electrochemical detection for liquid chromatography and capillary electrophoresis, drug transport, pharmacokinetics, anticancer drugs.

Helena C. Malinakova, Assistant Professor, Ph.D., Illinois Institute of Technology. Synthetic organic chemistry: development of methodology for total synthesis of natural products, transition metal mediated C-C bond formation, asymmetric synthesis, cascade reactions, metal-induced C-H bond activation.

Mario Rivera, Associate Professor, Ph.D., Univ. of Arizona. Bioanalytical chemistry: NMR spectroscopy, electrochemistry, recombinant DNA methodology and structural biochemistry aimed at understanding structure-function relationships in heme containing proteins and at elucidating the mechanism of oxygen activation at heme active centers.

Janet Bond Robinson, Assistant Professor, Ph.D., Univ. of Iowa. Science education, emphasis chemistry: professional development of graduate teaching assistants, effective learning environments for chemistry students, assessment of and practice in authentic problem solving.

Ward H. Thompson, Assistant Professor, Ph.D., Univ. of California–Berkeley. Theoretical physical chemistry: reaction dynamics, quantum dynamics, energy transfer, reactions and spectroscopy in condensed phases and biological systems, solvent effects.

Jon A. Tunge, Assistant Professor, Ph.D., Columbia Univ. Organic chemistry: asymmetric catalysis, transition metal-mediated synthesis, transformations of C-H bonds, reaction mechanisms, combinatorial chemistry.

George S. Wilson, Higuchi Distinguished Professor of Chemistry and Pharmaceutical Chemistry, Ph.D., Univ. of Illinois. Analytical chemistry: structural effects on cytochrome electron transfer, redox biochemistry, implantable biosensors, flow injection immunochemistry.

Financial Support

Essentially every graduate student receives financial support while pursuing the graduate degree. Undergraduates from many departments take chemistry courses each semester, and our need for graduate teaching assistants is high. Also, faculty members are active in pursuing research support, which allows their students to be paid from research grants as research assistants. Currently, T.A.'s receive tuition waivers, a substantial savings.

The department is dedicated to supporting Ph.D. students for up to five years and M.S. students for up to three years for completion of their degree requirements. Most students are appointed as T.A.'s when they first arrive. When they join research groups, students typically hold a combination of T.A. and R.A. appointments, depending on individual groups and available funds.

In addition to T.A. and R.A. support, several types of fellowships and traineeships are available. Detailed information can be obtained when you apply. Fellowships for summer support are available in the department through contributions from various endowment and industrial sources.

The University

The University of Kansas is a major educational and research institution with 29,000 students and 2,100 faculty members. KU includes the main campus in Lawrence; the Medical Center in Kansas City, Kansas; the KU Edwards Campus in Overland Park; a clinical campus of the School of Medicine in Wichita; and educational and research facilities throughout the state. KU has 14 major academic divisions: the College of Liberal Arts and Sciences, the Graduate School, and the Schools of Allied Health, Architecture and Urban Design, Business, Education, Engineering, Fine Arts, Journalism and Mass Communications, Law, Medicine, Nursing, Pharmacy, and Social Welfare. Visit KU's Web site, www.ku.edu.

Research is an integral part of the university's educational process. KU has more than 40 special research facilities, in addition to those in individual departments and schools. KU receives more than \$243 million a year for research in science, technology, the social sciences, and humanities. The National Science Foundation classifies KU as a major university receiving substantial research support. The Carnegie Foundation classifies KU as a research-extensive doctoral insti-

tution, a classification given to the top research universities.

Library collections contain more than 3.8 million printed volumes and many microforms, manuscripts, maps, and photographs. Watson Library houses most of KU's general collections in the social sciences and humanities. Scholars from all over the world use the Kenneth Spencer Research Library's valuable collections of rare and historic material. The Anschutz Library houses science collections as well as mathematics, geography, and the T.R. Smith Map Collection. An online catalog provides computer access. At the Medical Center, the Archie R. Dykes Library for Health Sciences and Clendening History of Medicine Library are major resources for health professionals. In Kansas City, the Linda Hall Library is available for research in engineering and the sciences.

The university belongs to the American Association of Universities, a select group of higher education institutions in the United States and Canada. Members are chosen on the basis of national significance in graduate studies and research. In 2002-03, the university awarded 243 doctoral degrees in 60 academic areas.

KU offers visits from distinguished lecturers, scholars, and artists; concerts, recitals, and chamber music; theatre and ballet performances; classical, popular, and experimental films; and special exhibitions in the Helen Foresman Spencer Museum of Art and the Natural History Museum and Biodiversity Research Center. The Lied Center of Kansas, a 2,020-seat performing arts hall, offers a series of concerts and shows that bring outstanding performers to the KU campus each year. There are sports for spectators and participants with exciting Big 12 athletics, intramurals, and extensive recreational facilities.

KU's main campus occupies 1,000 acres on and around Mount Oread in Lawrence, a community of more than 80,000 among the hills of eastern Kansas. Lawrence offers shopping areas, malls, restaurants, entertainment, and recreational facilities near campus or on bus routes. Near Lawrence, there are four lake resort areas for boating, fishing, and swimming. Metropolitan Kansas City with its international airport, professional sports, ballet, opera, concerts, night spots, galleries, museums, and festivals is about 45 minutes away by interstate highway.

To request a copy of the *Graduate School Catalog*, call (785) 864-9036, or send e-mail to graduate@ku.edu.