

Chemistry



EMORY

L A N E Y
GRADUATE
S C H O O L



Emory's doctoral program in Chemistry offers a research oriented education that draws on an outstanding faculty and excellent research facilities in four major areas of concentration.

Chemistry faculty engage in cutting edge research, often in collaboration with faculty from related disciplines across the University. In addition to the traditional disciplines of chemistry, we have strong research programs in interdisciplinary areas including biomaterials, organometallic chemistry, medicinal and bioorganic chemistry, bioinorganic chemistry, and various collaborations of computational chemistry with each of these areas. Chemistry at Emory is a thriving research community, working on the frontiers of the field with state-of-the-art techniques and equipment.

Areas of Concentration

Organic

Research in organic chemistry at Emory University addresses a broad array of fundamental problems and includes investigations at the frontier of organic synthesis, medicinal chemistry, bioorganic chemistry and materials science. Specific research areas include the discovery of new reactions including the invention of new methods for asymmetric catalysis, the development of novel strategies for the total synthesis of a wide array of bioactive natural products, the design of new organometallic reagents and catalysts, and the development of potent new medicinal agents.

Research at Emory University is carried out in a dynamic environment that includes collaborations with researchers in the Medical School and the Emerson Center for Scientific Computing to further our understanding of molecular reactivity in organic, organometallic and biological systems.

Inorganic

The research interests of the faculty in the division of inorganic chemistry include such disparate areas as organometallic chemistry, catalysis, bioinorganic chemistry, and nanomaterials chemistry. Specific research areas include novel nanomaterial synthesis, small molecule activation, organometallic catalysis and energy-related research. Members of the division routinely employ a wide variety of synthetic techniques and spectroscopic methods including NMR spectroscopy, electrochemistry, electron paramagnetic spectroscopy, Mössbauer spectroscopy, and calorimetry.

DISCOVER

the unexpected

The division works in close collaboration with the Emory University Center for X-ray Crystallography, which is equipped with two state-of-the-art small molecule diffractometers and an additional instrument dedicated to powder samples. Division members routinely collaborate with other divisions within Chemistry and with a variety of departments across campus, including the Medical School, the Emerson Center for Scientific Computing and the Physics Department.

Biomolecular

Researchers in the biomolecular chemistry group at Emory address problems at the interface of chemistry and biology. Our investigations of the chemical interactions that determine the specificity and control of biological processes are highly interdisciplinary, involving synergistic combinations of organic synthesis, biochemistry, genomics, molecular biology, protein engineering, as well as molecular modeling and structure determination utilizing a wide range of biophysical techniques.

Inspired by our discoveries in the world of natural biomolecules, our studies also reach beyond existing diversity. Harnessing the power of Darwinian evolution in the laboratory, researchers in the biomolecular group are spear-heading the field of synthetic biology which encompasses the creation of novel biocatalysts with tailored properties, assembly of biosynthetic pathways, as well as the production of biomimetic sensors and materials.

Our research is assisted by the latest in robotics and analytical instrumentation. The Center for Fundamental and Applied Molecular Evolution provides access to high-throughput sample analysis while departmental instrumentation enables structural & biophysical studies.

Physical

Physical chemists at Emory perform experiments and calculations to get at the heart of the structure, reactivity, dynamics and energetics of matter. We study a wide range of systems, from interstellar ions to solar cells to cell membranes, through precise measurements and advanced calculations. The data produced are converted into the concepts that shape how chemists see the world and into ideas for tomorrow's technology.

Most graduate students in our program specialize in either experimental or computational work, although a few participate in both. Studying experimental p-chem at Emory allows you to work with state-of-the-art instrumentation (in research group labs and in the department's Instrument Centers) studying gas-phase molecules and clusters, nano-structured materials, and biomolecular complexes. Theoretical/computational research at Emory draws on the resources of the Emerson Center for Scientific Computation. Students use advanced quantum and classical computational methods modeling structure as small as 5 atoms or as large as 10^5 , and learn to develop new methods to investigate a broader range of structures.

Research Facilities

The research conducted by Chemistry faculty and graduate students is possible only with the use of sophisticated techniques and equipment. We have a number of excellent facilities:

- THE EMERSON CENTER provides high performance computing and scientific software for the Emory community.
- THE MASS SPECTROMETRY CENTER provides mass spectrometry services, including high resolution Electron Impact and high resolution Fast Atom Bombardment to provide conformation of elemental composition.
- THE NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY RESEARCH FACILITY provides extensive, state-of-the-art facilities in NMR.
- THE INTEGRATED MICROSCOPY AND MICROANALYTICAL FACILITY provides comprehensive microscopy services for Emory's College of Arts and Sciences, Winship Cancer Center, and the School of Medicine.
- THE X-RAY CRYSTALLOGRAPHY CENTER provides a variety of X-ray facilities primarily used by the Emory Chemistry Department.

We also have a dedicated and extensive chemistry library, located Chemistry program building.

Curriculum

Coursework

Students generally take a full load of courses during their first year, and some special topics courses during the second and third year. Some courses may be taken in other science departments, including biochemistry and biological sciences, physics, and mathematics and computer science. Our website explains the coursework requirements for each of the areas of concentration, at www.chemistry.emory.edu/graduate/courses.html.

Research Rotation Program

In fall 2002, the Emory University Chemistry Department Graduate Program introduced a research rotation program for first-year students. Early in their first year, students learn about the ongoing research projects available, and then they design a rotation that takes them through two or three labs during their first year. This program has proven to be extremely popular with our students, who uniformly stated that it was helpful to work in two or three laboratories prior to making the final decision on a research advisor.

Cumulative exams

During the first two years, students are asked to take cumulative examinations which test their knowledge of the current chemical literature and general problem-solving abilities in the department's areas of concentration (biomolecular, inorganic, organic, physical chemistry).

Qualifying Examination (2nd Year Report)

In fall semester of the second year, graduate students prepare a research report and present their progress to date to a committee of three faculty members. Satisfactory completion of the exam qualifies the graduate student as a Ph.D. candidate. The faculty committee continues to meet with the student at least once per year to ensure that the student is making good progress in research and in his/her intellectual and career development. Furthermore, these meetings provide our students a regular opportunity to showcase their research accomplishments to faculty and their peers.

Seminar

Our department hosts several visiting scientists from academia and industry each week, presenting highlights of research advances from laboratories outside of Emory. In addition, each Emory graduate student is expected to present one seminar focusing on current topics in the literature. After their second year in the program, students present a seminar on their own research each year.

Research proposal

During the fourth year, students must prepare an original research proposal on a topic unrelated to the research ongoing in their advisor's laboratory.

Teaching

During the first year, graduate students assist the faculty in teaching undergraduate laboratory or lecture courses offered in the chemistry department. Teaching is a degree requirement for all Emory University doctoral students as part of the Teaching Assistant Training and Teaching Opportunity (TATTO) program, which includes an intensive five-day teaching orientation program in late August prior to the first semester of graduate school. Teaching responsibilities require no more than 8-10 hours per week, so that a graduate student can focus primarily on his or her own education and research.

Dissertation

The major requirement for a Ph.D. degree at Emory is the preparation and defense of a dissertation which makes an original and significant contribution to existing knowledge in chemistry. The dissertation is presented in a public seminar and a private defense with the student's committee. Most Emory chemistry graduate students complete their dissertation within 5 years of entering graduate school.

Our curriculum and degree requirements are explained in some detail on our website, at www.chemistry.emory.edu/graduate/degree_requirements.html.

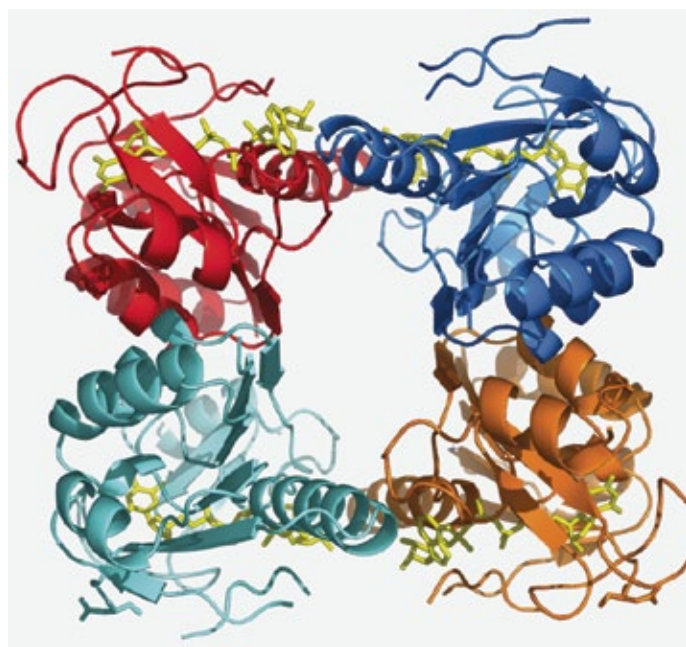
Students

Emory's graduate program in chemistry consists of approximately 150 graduate students, and we admit approximately 30 students each fall semester. The current student body comes from 23 states representing all regions of the United States, as well as a dozen foreign countries. The graduate student body is evenly split by gender, and minority students comprise approximately 10% of our current students.

All students offered admission receive stipend support as teaching or research assistants and full tuition scholarship. A number of special fellowships are available for top applicants.

Our program is large enough to have critical mass in most areas of chemistry, while still intimate enough for most of the students to know each other. Pi Alpha, the chemistry graduate student organization, sponsors several department-wide parties each year. In addition, a summer river rafting trip has become an annual Emory tradition involving several dozen graduate students, faculty, and staff.

Emory Ph.D. chemists hold distinguished faculty positions at a variety of excellent colleges and universities throughout the United States and several foreign countries, and are also very well represented in the chemical industry.



Faculty

We have a faculty of 30. Please visit the faculty page of our website, where you will find a complete list of the Chemistry faculty, and links to individual faculty pages with information about research interests, links to research groups, and more. Go to www.chemistry.emory.edu/faculty.

DR. DAVID LYNN is the Chair of the Department of Chemistry. He is an internationally-recognized researcher and teacher in the general areas of molecular recognition, bioorganic chemistry and chemical biology. Dr. Lynn's group works to understand the structures and forces that enable supramolecular self-assembly, how chemical information can be stored and translated into new molecular entities, and how the forces of evolution can be harnessed in new structures with new function.

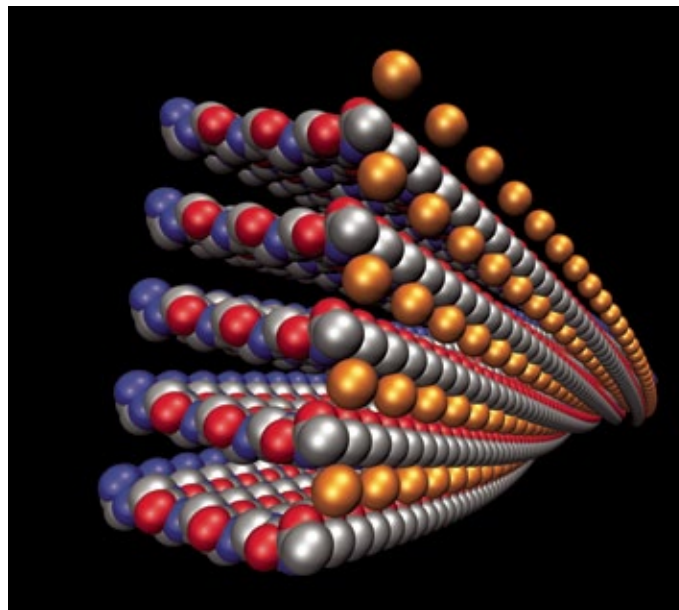
DR. JAMES KINDT is the Director of Graduate Studies. Dr. Kindt's group uses computer simulation and formal theory to study biophysical processes, including the fascinating phenomenon of molecular self-assembly: the spontaneous and reversible aggregation of molecules into a wide variety of structures.

DR. BRIAN DYER is the Associate Director of Graduate Studies. His research group employs advanced spectroscopic methods coupled with computer simulations to study protein dynamics in protein folding and enzymatic reactions, and to develop bio-inspired photocatalysts for solar water splitting and hydrogen production.

Contact information

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RECRUITMENT AND ADMISSIONS

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Atlanta, GA 30322

404-727-6028 (ask for the Chemistry program)
Fax: 404-727-4990

<http://www.graduateschool.emory.edu>
<http://www.chemistry.emory.edu>