

It's All About Chemistry



CHEMISTRY

Assistant Professor of Chemistry Doug Beussman sees St. Olaf College as an ideal place to study chemistry. The high-quality professors, the advanced equipment available to students and the college's commitment to undergraduate research to create an invigorating environment for students to explore chemistry and its connections to other disciplines.

IT'S A FACT: We are 5th among 217 baccalaureate liberal arts colleges nationwide in the number of graduates who go on to earn Ph.D.s in chemistry.

"Prior to joining the faculty at St. Olaf, I was on the faculty at a large research-oriented university," explains Beussman, a 1992 St. Olaf graduate who teaches analytical chemistry, instrumental analysis, bioanalytical chemistry and forensic science. "While there were more instruments at the university, undergraduates never got a chance to actually use the state-of-the-art equipment in their labs. This is definitely not the case at St. Olaf. Our equipment is here to be used by the students. This gives them an edge in securing future positions."

St. Olaf has a long and distinguished history as a source of top-flight chemists. The American Chemical

Society consistently identifies St. Olaf as one of the most prolific sources of chemistry majors in the country.

Chemistry students interact closely with professors in small classes, during laboratory work and through hands-on research projects. St. Olaf offers bountiful opportunities for students to engage in cutting-edge research throughout the year.

In 2005, Assistant Professor Greg Muth collaborated with Summer Science researchers on biochemistry and bio-organic chemistry research projects, including one on gene regulation that used interdisciplinary techniques from biochemistry, microbiology, genetics, cell biology and bioinformatics.

More than half of the college's chemistry majors have either a second major or a concentration in subjects from biology and math to art, music, psychology and Spanish. Many also take advantage of study abroad programs, either during January Interim or for a full semester.

One global opportunity is Medicinal Chemistry in Jamaica. Students travel to Kingston, Jamaica, for an international conference on medicinal and natural-product chemistry. They also work in the academic research labs of the University of the West Indies on the isolation and characterization of a biologically active natural product from an indigenous Jamaican plant.

Model Chemist

Our chemistry professors earn many awards for their excellence in education. Bob Hanson, a professor

[continued]

MAJOR
Chemistry

www.stolaf.edu/depts/chemistry



"Our nationally recognized chemistry program prepares students for a wide variety of careers in research, industry, the health profession, education and business. Chemistry students also have opportunities to consider the relationship between chemistry and other fields, including environmental science and biology."

—Mary Walczak
Associate Professor of Chemistry





GREEN CHEMISTRY

Green, or sustainable, chemistry took hold in the early 1990s when initiatives set forth by the Environmental Protection Agency forced industries to minimize the impact of chemical processes on the environment. Now, the St. Olaf Chemistry Department is taking a proactive and innovative approach to a more sustainable future by incorporating "green chemistry" into its curriculum thanks to a \$500,000 grant from the W.M. Keck Foundation.

A green chemistry program for the Synthesis Laboratories, created by Professor of Chemistry Gary Spessard and 30 St. Olaf chemistry students, was implemented in 2003. The pilot classes employed green chemistry principles such as the use of water-based and non-toxic chemicals. Students in the pilot sections performed chemical transformations parallel to students using the traditional approach. But they used a more efficient process that generated less waste. A significant benefit was that they did not conduct their experiments inside fume hoods that are designed to limit exposure to hazardous fumes associated with chemical experiments and are energy intensive to operate. "We now use green chemistry experiments throughout all lab sections of the organic laboratory," says Spessard.

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of chemistry, developed "Data-Driven Chemistry," a method of teaching and learning based on the idea that chemistry is fundamentally a data-oriented subject. Students work in groups to build clear, concise models of atomic and molecular structure strictly from the data presented. Hanson can often be found chatting with students at lunch in Stav Hall or the Cage or hosting groups of students who study in the nook outside his office.

"We get talking about some concept or another, and pretty soon a few more students join the group, and all sorts of interesting interactions are going on. It's really fun to be a part of," says Hanson. "I invariably walk away with new ideas about some course that I'm putting together or some new way to convey a tricky concept. It's a win-win situation and I think students know that," Hanson adds.

The same could be said about majoring in chemistry at St. Olaf. ■

BY THE NUMBERS

From 1995 to 2004, an average of 40 students a year graduated with chemistry degrees from St. Olaf.

Of these graduates:

- ▶ **26% entered graduate school**
- ▶ **34% entered medical or other professional schools**
- ▶ **13% began a career in industry**
- ▶ **4% started teaching**

Cool Classes

Chemistry of Life's Beginning

What elements went into the formation of our solar system? Which molecules played a role in creating the diversity of life on Earth? While studying the structure and function of molecules common to living organisms, students ponder answers to fundamental questions about how life got started in our universe.

Forensic Science

It's the stuff of *CSI*: hair analysis, drug screening, arson investigation, and DNA and fingerprint analysis. Students explore the fundamentals of forensic science by learning from actual case studies and the option of a lab, where experiments highlight forensic techniques used to collect and analyze evidence. In addition to learning the science itself, students grapple with the ethical issues that arise from recent developments in technology.



"The Chemistry Department continues to be committed to teaching and to providing research opportunities to students. My chemistry professors were my mentors, and they reinforced my interest in taking on the questions with as-yet-unknown answers. We learned the thrill of discovery in the classroom and in the laboratory. I have continued my interest in clinical and laboratory research while caring for patients largely as a result of what I first learned at St. Olaf."

— Doug Hanto '73, M.D., Ph.D.,
Boston Chief, Division of Transplantation,
Beth Israel Deaconess Medical Center;
Chair, Ethics Committee,
American Society of Transplant Surgeons;
Lewis Thomas Professor of Surgery,
Harvard Medical School

NEW INSTRUMENTS

The St. Olaf Chemistry Department has rich instrumentation resources. From its remote-access 400 MHz Nuclear Magnetic Resonance Spectrometer (NMR) to its Liquid Chromatograph-Mass Spectrometer and numerous UV-Visible spectrometers, students use instrumentation beginning with their first lab courses.

Laboratory Robot

Students compare the advantages and disadvantages of using a laboratory robot (pictured left) for chemical analyses. They must decide which tasks they want the robot to perform and then program it to safely complete these tasks. Modeling real-life scenarios, students must decide if they would replace a human worker with a robot.

Robotic Nuclear Magnetic Resonance Spectrometer

Available to students 24/7 via a web-based interface from any computer on campus, the NMR's remote access feature is unique at an undergraduate institution. It helps users determine the basic structure of an unknown compound and analyze its physical properties.

Electronic Resonance Molecular Beam Spectrometer

Records magnetic properties of cell nuclei. The work it supports recently earned Physics Professor Jim Cederberg the American Physical Society's annual Prize for Research in an Undergraduate Institution.

Gas Chromatograph Mass Spectrometer

Analyzes components at a molecular level.



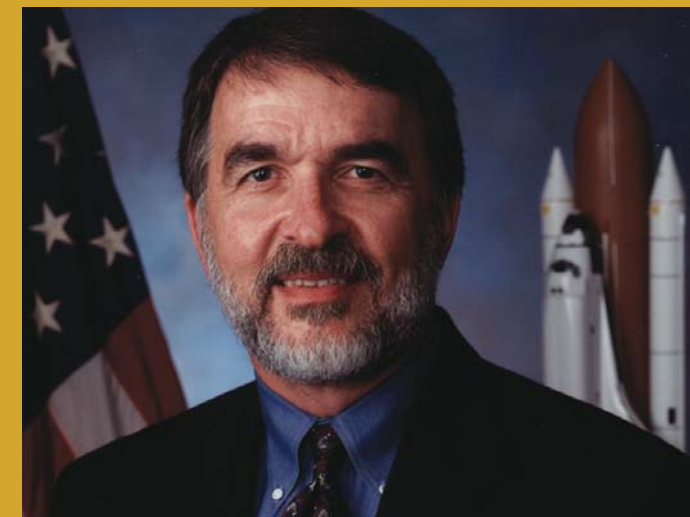
"The equipment at St. Olaf is here to be used by the students. This gives them an edge in securing future positions. They have not just learned how an instrument works; they have actually used it."

— Douglas Beussman, Assistant Professor of Chemistry

Cosmic Thinker

NASA's Doug Blanchard '67 helps keep astronauts safe and healthy far from home.

If you dream of one day going to Mars, be sure to clear your calendar: Even the most optimistic estimates suggest that a round-trip journey will take at least 18 months. And you'll have more than cabin fever to deal with on the trip. Scientists are still trying to determine how astronauts can successfully contend with bone loss, muscle loss and radiation exposure while they're in transit.



Such concerns are the day-to-day reality of Doug Blanchard '67, assistant director of Space Life Sciences at NASA's Johnson Space Center in Houston, Texas. "My job is to make sure that we have a healthy and able crew on the space station and the space shuttle."

Trained as a geochemist, Blanchard spent 25 years in the planetary science organization before moving to space life sciences. For nine years he was a lunar sample curator, where he took care of moon rocks, cosmic dust and meteorites recovered from Antarctica. During his tenure, scientists discovered what they believed to be fossil remains in a Martian rock, suggesting that life once existed on Earth's closest neighbor. Their work suddenly became front-page news. Pundits and politicians weighed in on what it meant.

Blanchard believes his education as a chemistry major at St. Olaf helped prepare him for some of the big questions his work brings up. "St. Olaf exposed me to the world of ideas, of philosophy and art," he says. "At the time, we were just starting to talk about manipulating DNA and I was thinking of becoming a chemical engineer. I believed that decisions about DNA needed to be made in the full context of history and music and the arts. I look back at my St. Olaf years and marvel about how much the veil lifted."