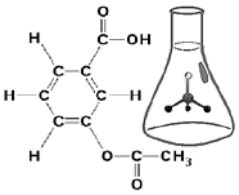
GROVE CITY COLLEGE
DEPARTMENT
OF
CHEMISTRY



Chemistry

Welcome to Grove City College's Chemistry Department!

We can offer you:

- A close-knit community of fellow students and faculty
- American Chemical Society (ACS) certified chemistry degree
- Extensive, modern instrumentation
- Active research opportunities (beginning freshman year)
- Excellent preparation for graduate school, careers in the health professions or chemical industry, and others

Find us on *Facebook* as GroveCityCollegeChemistry

GCC Chemistry Department

Internship Opportunities

Experiences outside of the classroom are important parts of career preparation. In the summer of 2019, half of our sophomores and juniors, as well as 4 freshmen, obtained internships in academic research, healthcare, and industry, including highly competitive Research Experience for Undergraduate (REU) and Summer Undergraduate Research Fellowship (SURF) positions. Their projects included:

- Computational modeling of the properties of negative ions, carried out under the direction of Dr. Falcetta at GCC,
- Caring for adults with intellectual disabilities,
- Synthesis of new carbohydrate compounds at the University of Wisconsin, toward the goal of finding new pharmaceuticals,
- Assembling and testing tanker truck lights for Betts Industries,
- Working in R&D formulations for Elanco Animal Health,
- Serving as a Medical Missions intern in Burundi, Africa, through GCC's Red Box Missions program,
- Exploring biochemical control processes in anthrax with Dr. Stauff (Biology) at GCC,
- Synthesizing small molecules that target RNA, seeking a therapy for muscular dystrophy at Scripps Research (Florida),
- Excavating and conserving a villa near Rome under the direction of GCC history professor Dr. Mark Graham, and
- Exploring the connection between DNA repair protein expression and Lewy Body Dementia at Duquesne University.

Chemistry in Community

We have a strong ACS student chapter that sponsors tutoring, seminars, and parties at faculty homes throughout the year. The on-average 15 graduates each year begin life-long friendships.

GCC Chemistry Department

Our Students' Successes

2019 Graduates

8 chemistry, 14 biochemistry majors, and 3 Chem Sec. Ed

- 5 earned ACS certified chemistry degrees
- 6 are employed in the chemical industry
- 6 are pursuing PhD's in chemistry, biochemistry, or pharmaceutics
- 1 is in Pitt Dental School
- 1 is in Doctor of Physical Therapy program at Gannon University
- 1 is working as an EMT for 2 years to prepare for a PA program
- 1 is taking a gap year, working in missions with YWAM

Other Recent Graduate Achievements

297 graduates since 2000:

- 94 chemistry, 179 biochemistry, and 24 secondary education

53 working in the chemical industry

77 are either in or completed graduate school

- (graduate schools include Harvard, Stanford, Scripps, Purdue, Texas A&M, Pitt, and Penn State). Six of these alumni with PhD's are now college professors.

64 have gone into the health professions:

- 32 to med school
- 9 to dental school
- 4 as Physicians Assistants
- 12 in pharmacy
- Two of these graduates are now faculty at the University of Pittsburgh Medical Center, one in anesthesiology and one in pharmacy.

23 are teaching in public or private high schools.

Current Research Projects

Inorganic Chemistry

Synthesis and characterization of novel transition metal complexes using phosphorus containing compounds as ligands. Students have produced new complexes with transition metals (like nickel, tungsten, cobalt and ruthenium) that have never been made before. Our X-ray Diffractometer is used as well as ^{1}H, ^{13}C, ^{31}P NMR, IR and GC-Mass Spec to identify the structures and properties of these new compounds.

Environmental Chemistry

Monitoring of natural water sources in and around Marcellus Shale gas wells. For the past ten years, various springs, wells, and ponds in Butler County, PA, have been tested to identify levels of various chemicals, including, but not limited to, methanol and ethylbenzene (tested by our GC with a Headspace sampler) as well as various anions including Cl^-, SO_4^{2-} and NO_3^- (using ion chromatography).

Organic Chemistry

The development, isolation and characterization of some novel derivatives of resveratrol and quercetin as potential anti-cancer agents. The project tests these compounds as possible chemotherapy agents on a series of cancerous cell lines that have been developed at Grove City College by colleagues in the Biology Department.

Biochemistry

The Protein Isoelectric Point (pI) is the pH at which a protein carries no net charge. Bioinformatics methods are being used to predict pI values from the pK values of the ionizable groups. Data for 2,426 protein and polypeptide sequences in a database have been used.

GCC Chemistry Department

Physical/Computational Chemistry

Temporary anions are formed when a neutral compound absorbs an extra electron. They are typically unstable, and the electron escapes in a short time (nanoseconds). The goal of this project is to model and calculate the lifetimes (length of time the electron stays attached) and stabilization energy.

Computational modeling approaches re being employed to determine where, and how strongly, heme (a small, iron-containing molecule) binds to a membrane bound protein in bacterial species and how this binding affects the function of the proteins and the viability of the bacterial cell.

Chemical reactions can occur in the solid state when the geometry of the molecules is favorable to the reaction. In certain cases, reactions occur even when the structure is unfavorable. It has been speculated that this is possible because the molecules undergo motion, even in the crystalline environment. We have been investigating one of these types of motion called pedal motion.

Analytical Chemistry

Polyethylenimine (PEI) is a cationic polyelectrolyte that is widely synthesized in both linear (L) and branched (B). While PEI is well-known in gene therapy for DNA transfection, research has shown that it also demonstrates various levels of antimicrobial activity.

We utilize a Particle Charge Detector (PCD) to analyze the cationic charge of BPEI and LPEI at different molecular weight as well as differently synthesized PEI to determine its mechanism in binding with anionic species like DNA and bacteria.

Recent Results

- 4 papers published in peer-reviewed journals in last two years.
- 20 students have presented research at national or regional ACS meetings in the last five years.

GCC Chemistry Department

Instrumentation

The American Chemical Society requires Chemistry Departments offering an ACS-certified chemistry major to have a nuclear magnetic resonance spectrometer (NMR), as well as instruments from four of five categories:

- Optical molecular spectroscopy (infrared, UV-Vis, Raman, fluorescence)
- Optical atomic spectroscopy (atomic absorption)
- Mass spectrometry (GC-MS)
- Chromatography and separations (gas and HPLC)
- Electrochemistry

Grove City's Chemistry Department installed a new **JEOL NMR** in 2016 and has instruments from ***ALL FIVE*** categories, as well as additional instruments: **Thermal Gravimetric Analyzer**, **Differential Scanning Calorimeter**, **Electron Spin Resonance Spectrometer**, **X-Ray Diffractometer, Microwave reactor, Automatic Liquid Chromatograph, and Particle Charge Detector.** All these instruments are used by students in either required or elective courses, as well as in individual research.

Majors (use the QR code on the last page to get full details)

Chemistry – our chemistry major program includes 42 hours of required chemistry classes, 10 hours of elective chemistry classes and 23 hours of related technical classes (math, physics, and computer science). Specific choices of the courses to complete the 10 elective hours can be used to earn five different concentrations: **ACS Certified, Biochemistry, Physical, Computational Modeling,** and **Synthetic**. This allows a student to demonstrate achievement in these specific areas. Our degree prepares a student to enter the chemical industry upon graduation or to continue their education to earn a graduate degree to pursue a career in research.

Biochemistry – the biochemistry major requires 55 hours of chemistry and biology classes and 19 hours of related technical classes in math and physics. Students can earn concentrations in **Health** and **Chemical Synthesis** by choosing extra classes. This degree program prepares a student for entrance to the biochemical/biotech industry, graduate study, and professional medical training (medical, dental, pharmacy, and others).

Chemistry Secondary Education – this program entails completion of 38 hours of chemistry classes, 24 hours of related technical classes (math, physics and biology), and 40 hours of education classes. Upon completion, which includes student teaching, the graduate is prepared to earn 7-12 certification to teach chemistry.

Chemistry and General Science Secondary Education – this program entails completion of 38 hours of chemistry classes, 30 or 31 hours of related technical classes (math, physics, astronomy, earth science and biology), and 40 hours of education classes. Upon completion, which includes student teaching, the graduate is prepared to earn 7-12 certification to teach chemistry and general science.

Minors

Chemistry: Other majors can complete a minor in chemistry with the completion of 24 hours of chemistry classes. General Chemistry, Analytical Chemistry, and one semester of Organic Chemistry are required. This allows students from other majors to demonstrate a level of expertise in chemistry, along with their major field of study.

Chemical Engineering: Chemistry majors can earn a minor in chemical engineering by taking six Engineering courses beyond their required chemistry courses, demonstrating coverage of basic chemical engineering principles. This minor may create opportunities for employment in the chemical engineering industry.

GCC Chemistry Department

Chemistry Department Faculty

Dr. Joseph Augspurger, Chair, Physical Chemistry
Dr. Susan Cramer, Organic Chemistry
Dr. Michael Falcetta, Physical Chemistry
Dr. Holly Guevara, Organic Chemistry
Dr. Timothy Homan, Organic Chemistry
Dr. Charles Kriley, Inorganic Chemistry
Dr. Kevin Shaw, Biochemistry
Dr. Venney Wong, Analytical Chemistry

We look forward to learning more about you, as well as your interests & goals for your college education. Please do not hesitate to contact us at any time with additional questions or with feedback about your experiences as prospective students. We value your input!

Faculty e-mail addresses and phone numbers are available on GCC's Chemistry Department web page.

Scan this QR code to go to our department webpage:
www.gcc.edu/chem