The faculty in the Department of Chemistry and Biochemistry at the College of Charleston wish you all a Happy New Year! This has been a year of transition. With the retirement of Dean Michael Auerbach, the School of Science and Math has a new Interim Dean, Sebastian Van Delden. With the retirement of President Glenn McConnell, the College is waiting to welcome our new president Dr. Andrew Hsu, an aerospace engineer by training who has been serving as the provost at University of Toledo. Our Provost, Dr. Brian McGee, has also announced his departure to become President of Quincy University. In the meanwhile, faculty members in the Department of Chemistry and Biochemistry have been working to improve our curriculum, to enhance student learning, to establish better relationships with area industry, and to create avenues of success for our students---through undergraduate research, international study, internships, scholarships, and post-graduate study.

Some of our current, former and retired faculty and their spouses: Rick Heldrich, Jay Forsythe, Neal Tonks, Matt Cory, Robin Overby, Wendy Cory, Pam Riggs-Gelasco, Andy Gelasco, Rich Lavrich, Rita Donato, Jason Overby, Amy Rogers, Laura Wyatt, Brooke Van Horn, Katrina Doig, Marion Doig, Jenn Fox, Rich Himes, Mike Giuliano, Lina Forconi, Henry Donato, Justin Wyatt, Marcello Forconi.
Faculty Highlights:

**Dr. Rick Heldrich** officially retired from the College of Charleston in December 2017 after 35 years of service to the College. Dr. Heldrich made undergraduate research a priority throughout his career at the College, having worked with ~50 students over the years on synthetic organic chemistry projects. He served as the first Director of Undergraduate Research at the College of Charleston from 2002-2007. In that role, he created the framework for the College’s Office of Undergraduate Research and Creative Activities, a major step towards institutionalizing undergraduate research at the College. Dr. Heldrich also served twice as Interim Chair of the Department. Dr. Heldrich is still teaching organic chemistry post-retirement for the department and he is still mentoring students in the research lab.

*Scenes from the retirement reception for Dr. Rick Heldrich: Left: Bob Nasbaum (Geology) and Rick Heldrich. Right: Beth Meyer-Bernstein (Biology), Mike Auerbach (SSM), Mike Giuliano, Andrew Gelasco, and Jason Overby*

The Department hired **Dr. Rich Himes** as an Instructor in Fall 2018. Dr. Himes earned his PhD at Purdue University and moved to Charleston after his post-doctoral position at Johns Hopkins. His training is in the area of organometallics and bioinorganic chemistry but more recently he has transitioned to medicinal chemistry, serving as the Chief Scientific Officer of startup companies Neuroene and Lydex Pharmaceuticals, both MUSC affiliated companies. Dr. Himes is involved in the synthesis and testing of lead compounds for the treatment of Parkinson’s, epilepsy, and leukemia. Dr. Himes is already working with our students on this research at MUSC.

**Dr. Jennifer Fox** and **Dr. Brooke Van Horn** were both awarded tenure and promotion to Associate Professor in 2018 and 2017, respectively. They both work tirelessly with our undergraduate students in their research labs. Dr. Fox studies the intricate network of proteins and cofactors necessary to assemble the electron transfer protein complexes of the mitochondria. Dr. Van Horn builds biodegradable polymers that can deliver drug cargo with the goal of exploiting these constructs to advance medical treatments. **Dr. Neal Tonks** was promoted to Senior Instructor in 2018. Dr. Tonks continues to facilitate contacts in local industry by working with area companies Kemira and Innovative Resource Management. He also pursues his own research on the synthesis of biologically compatible bio-based drug delivery systems and bio-based polyurethane foams. Dr. Tonks is active in the South Carolina Section of the American Chemical Society and received their 2018 Distinguished Service Award.

**Dr. Dave Boucher** was awarded the Gordon Jones Distinguished Achievement Award in the School of Science and Math for his outstanding mentorship of undergraduates and productive research. In 2018, he published four papers with seven different undergraduate authors. **Dr. Forconi** spent a semester on sabbatical in Italy studying mechanistic aspects of enzyme catalysis and he also is serving as Associate Chair. **Dr. Wendy Cory** has been analyzing pharmaceuticals that have been on the International Space Station in a new collaboration supported by funding from NASA. She has also transformed our Chem 112 lab (Gen Chem II) curriculum to be a classroom undergraduate research experience (CURE). **Dr. Pam**
Riggs-Gelasco received a superior rating for post-tenure review in 2018 and has been serving as Department Chair since 2012. She was awarded the American Chemical Society Local Section Outreach Volunteer of the Year for the South Carolina Section. Dr. Amy Rogers is working with students to determine the structure-function relationship of NO synthase and she serves as the faculty advisor for the student chemistry service fraternity, Alpha Chi Sigma. Dr. Kristin Krantzman was awarded a superior ranking in her post-tenure review in 2017. She is exploring a new area of computational chemistry with a biological emphasis after her recent sabbatical with Yaroslova Yingling in the Department of Materials Science Engineering at North Carolina State. Dr. Rich Lavrich has published several papers in the last two years on microwave spectra that include seven undergraduate coauthors. Dr. Lavrich’s research student was awarded a prestigious Goldwater Scholarship. Dr. Jason Overby celebrated the release of the Third Edition of one of the top selling general chemistry texts, Atoms First (Burdge and Overby). He developed a new accelerated Honors Chemistry course in collaboration with the Honors College. Dr. Jim Deavor continues his work in administration as the School of Science and Math’s Associate Dean; he will be stepping down from that role and returning to teaching full time later this year.

Dr. Kate Mullaugh has published several papers on the environmental fate of silver nanoparticles with her three research students. She also launched the Department’s first international study abroad course in Costa Rica. Dr. Mike Giuliano has received substantial grant support through the State of South Carolina’s NIH-INBRE program for his structural research on neuropeptides. Two of his research students have been recognized by the Goldwater Scholar program, one as an honorable mention and one as a scholarship winner. Dr. Jay Forsythe has published several papers with his research students using mass spectrometry to study prebiotic chemistry. He is leading a department wide grant effort to procure a new LCMS instrument from the National Science Foundation. Dr. Tim Barker has also been active publishing with undergraduates on his work that seeks mechanistic understanding of new synthetic routes in organic chemistry. He has been teaching the Synthesis and Characterization course and is the steward of our 400 MHz NMR procured through the NSF.

The Department is still home to emeritus faculty members Dr. Marion Doig and Dr. Clyde Metz who teach biochemistry and computational chemistry, respectively. Dr. Gamil Guirgis, University Professor of Science and Math, continues to teach and work with undergraduates in his research lab, studying the structure and conformation of silicon-containing small molecules. The Department is blessed with many talented adjunct faculty members who faithfully help deliver our curriculum, including several alumni of the College-- Professors Chandra Potter, Amanda Jones, Craig Bachman, Jeff Tomlinson, and Thomas McFadden. In the 2019 semester, we also have Professors Betsy Gailbreath, Thu Lesher, Nadee Lokupitiya, Rich Salinaro, Tom Morinelli, Blaine Groat, Phil Robinson, Stephanie Boussert, Farah Jafri, Craig Bachman, Andy Gelasco, Michael Cohen, Tom Cuff, William Veal and Lisa Barker on the teaching faculty.

Staff: The Department has a fantastic staff who help everything run seamlessly. Each semester requires the coordination of some 80-100 sections of courses, which includes ~20 unique lab curricula. Our instrument manager, Dr. Stephanie Boussert, maintains the department’s research and academic lab instruments and provides training to students in courses and research. Mr. Jeff Tomlinson (an alumnus of the Department) has been our office manager for many years and helps us maximize every lab resource and budget dollar. He is joined in the office by Ms. Shauna Kendrick, our new administrative assistant. The stockroom and lab prep are overseen by Dr. Phil Robinson and Ms. Catherine O’Laughlin (an alumna of the Department).
Alumni Highlights-Centers for Disease Control:
Chemistry and Biochemistry alumni are finding their niche at the Centers for Disease Control and Prevention. Over the past year, six alumni have been working at the Center for Disease Control and Prevention in Atlanta, using their skills to improve human health. Dr. Wendy Cory and Dr. Pam Riggs-Gelasco were able to travel to Atlanta to catch up with them in their labs. Here is what they are up to!

Taylor Domenick (Class of 2015) was an ORISE (Oak Ridge Institute for Science and Education) Fellow at the CDC during the summer of 2018. She worked in the Emergency Response Branch, helping to develop a method for the detection of human exposure to mycotoxins, secondary metabolites produced by fungi that have the potential of infecting food sources. She used liquid chromatography coupled with tandem mass spectrometry to establish a targeted LC/MS/MS workflow for several different mycotoxins in urine. Taylor is currently a Ph.D candidate at the University of Florida, working under the direction of Dr. Richard A. Yost.

Dr. Matthew Keller (Class of 2010; PhD University of Georgia) is an ORISE postdoctoral fellow on the Influenza Genomics Team. Dr. Keller is developing nanopore sequencing for the study and surveillance of influenza A viruses. His work entitled “Direct RNA Sequencing of the Coding Complete Influenza A Virus Genome” published in Nature Scientific Reports describes the first RNA genome sequenced in its original form. Dr. Keller also played a critical role in the development and deployment of a rapid and portable influenza A virus sequencing pipeline. Their team performed real-time sequencing and generated actionable public health knowledge through real-time phylogenetic and amino acid comparisons to stockpile candidate vaccine viruses.

Alex Doty (Class of 2015) is currently working on a method to detect exposure of the US population to trans fatty acids through dietary consumption. High amounts of trans fat consumption has been linked to coronary heart disease, a disease that leads to 370,000 deaths annually in the United States. Alex measures the concentration of several fats in plasma or serum by GC-MS analysis and is working to develop methods for the rapid screening of trans fats.

Lidoshka Marc (Class of 2014) has been working as an ORISE Fellow since June of 2017. She supports the Toxin and Influenza group by working to improve the quality of vaccines and to decrease the time required to deliver seasonal and pandemic vaccines to the global public. She uses a method called isotope dilution mass spectrometry (IDMS) to quantify the amount of antigenic hemagglutinin and neuraminidase in influenza vaccines and virus matrices by analyzing isotopically labeled peptides using...
liquid chromatography and a triple quadrupole mass spectrometer. She recently applied this method to the Zika virus, opening up a potential avenue for IDMS to be used on a broader array of viruses.

**Dr. Candice Z. Ulmer** (Class of 2012; PhD University of Florida) is an Associate Service Fellow working as a Clinical Research Chemist in the Clinical Chemistry Branch within the Division of Laboratory Sciences (DLS) and National Center for Environmental Health (NCEH). Dr. Ulmer aims to improve diagnosis and treatment of endocrine diseases by developing improved methods of detection of protein hormone biomarkers. Utilizing immunocapture, clinical analyzer, and high-resolution mass spectrometric techniques, she is refining methods of reference detection to improve clinical laboratory tests of hormones such as anti-müllerian hormone, follicle stimulating hormone (FSH), and luteinizing hormone (LH).

**Keith Morgenstern** (Class of 2015) works in the Clinical Chemistry Branch (CCB) of the Division of Laboratory Sciences (DLS) at the CDC. Keith’s primary focus has been on the development of quantitative mass spectrometry (MS) methods for the analysis of influenza vaccines. He too uses isotope dilution mass spectrometry (IDMS) method to more accurately quantify the amount of viable, immunologically active hemagglutinin (HA) in vaccines. This IDMS method uses a targeted bottom-up proteomics approach, incorporating the multiple reaction monitoring (MRM) capabilities of a triple quadrupole MS to selectively quantitate specific HA peptides with isotopically labeled peptide standards.

**Alumni Highlights-Chemistry of Brewing and Wine:**
The Department has worked to create a curriculum in brewing science to support Charleston’s growing microbrewery and distillery industry. **Dr. Michael Cohen** (adjunct faculty) and **Dr. Jason Overby** now offer a lab course, Chemistry of Alcohol, that teaches skills that are beneficial for students pursuing careers in vineyards, distilleries, and breweries, all industries with a need for scientists. The course complements Chemistry of Wine taught by Dr. Cohen. Several area breweries---Holy City, Palmetto, and Revelry---have offered tours and their expertise to the students in the course and several students have found internships through these relationships. As students have been completing these courses, it has prompted some to pursue a career in brewing or oenology. Here are a few of these students!

**William Wittich,** Class of 2017, got interested in brewing through the alcohol curriculum and an internship at Holy City Brewing while at CofC. After graduation, he enrolled in the Versuchs- und Lehranstalt für Brauerei (VLB) Brewmaster course in Berlin, a six-month intensive program on the science of brewing. He has since moved to San Francisco and works at 21st Amendment as a brewer. 21st Amendment has a semi-automated operation with a 100 barrel brewhouse that produces the wort, the
sweet liquid of malt extract that will be fermented with yeast into beer. Everyday duties include checking pH and plato (sugar content) of the brew in progress, dosing hops, centrifuging finished beer and manipulating temperature, pressure, and cell concentrations of fermenting beer. He is currently looking at graduate programs in biotechnology to get more training in the engineering and design of formulations and processes.

Kevin Restificar, Class of 2014, moved to New York to work as an assistant brewer at a small brewpub where he learned about microdistillation and molecular gastronomy. He took his first internship in the wine industry in Adelaide, South Australia where he focused on vineyard management and basic cellar and lab work; he also took a viticulture and oenology course at the University of Adelaide. Upon returning to the US, he worked at a winery in Maryland, performing cellar work, grape processing, and lab work. In Washington DC, he has been learning about the sales side of the business working as an account manager for a distributor in the region. He also works at a craft distillery that makes whiskey and has been a beverage consultant for DC area restaurants.

Caroline Gilmer, Chemistry minor (’18) and former research student of Drs. Fox and Forconi, is currently pursuing a Masters of Science in Brewing and Distilling with Entrepreneurship at Heriot-Watt University in Edinburgh, Scotland. While attending CofC, Caroline took courses at the interface of biochemistry and biology, including social science courses in sustainability and entrepreneurship. After taking the Chemistry of Alcohol course, she saw a way all of these interests could come together. Heriot-Watt’s program focuses not only on the various components of the industry, but also places an emphasis on the importance of science and environmental challenges. For her dissertation, she hopes to research different wild yeast strains for brewing purposes, skills that harken back to yeast genetics she explored in the department. She also looks for points of intervention within the industry for more sustainable practices. Caroline feels she found her niche where all of her passions can come together and she credits her diverse liberal arts coursework at the College for leading her there.

Brynn Keenan, Class of 2014, worked at Holy City Brewing in Charleston after picking up an interest in brewing in the Chemistry of Alcohol class. She moved to Colorado where she was hired as the Lab Manager and QA for Left Hand Brewing. She recently resigned her position there to start her own company, BrewLytic Software and Consulting, where she develops data management software for microbreweries and consults on analytical development.
Catherine Dadmun, Class of 2018, was a Chemistry/French double major and spent a semester abroad in La Rochelle, France, studying the history and economics of French wines and Cognac. Her Honors Bachelor’s Essay was written in French on the Molecular Chemistry of Aromas and Flavors of Organic Wines in France. While at CoC, Catherine participated in an NSF-funded undergraduate research program in the Food Science Department at Virginia Tech. She is now pursuing a master’s degree in Food Science at Cornell where she is studying the evolution and distribution of anthocyanins in red hybrid wines.

Alumni Connections:
This past spring, the Department hosted its first Industry Mixer at the Department. We invited chemists and HR personnel from Charleston area companies to a Happy Hour in our building, gave tours, and provided an opportunity to mingle with students, faculty, and each other. We had ~30 outside guests representing 16 different companies in the Charleston area. It was fun to see chemistry alumni in that group: Skip Comer ('11), Kim McDonough ('11), Everett Crews ('80), Scott Baker ('93), Nora Rudolph ('17), Kimber Amweg ('13), Sean Flanagan ('14), Steven Holshouser ('11), and Nate Birkemeyer ('15). Companies represented at the event include High Purity Standards, GEL, Charles River Labs, Kemira, Innovative Resource Management, Ingevity, Guild Bioscience, Ellutia, EMSL, Alcami, FirstString Research, Neuroene, Evonik, Warren Lasch Conservatory, Solvay, and O2si.

In Fall 2017, Dan Biggerstaff ('81) returned to campus to deliver a seminar for seniors describing the operations at his Charleston-based company, O2si. In Fall 2018, the Department welcomed Brandi Hudson, Class of 2011, who gave a seminar on her work at Relay Therapeutics in Cambridge. Melanie Rubin ('16) and Alexis Violette ('16) visited our students in our Chemistry and Biology Freshmen Learning Community to give advice on pathways to medical school.

International Study:
Dr. Kate Mullaugh and Dr. William Veal (School of Education and adjunct faculty in Chemistry) launched our first study abroad course in Spring of 2018. The team took seven students to the Costa Rican rain forest to study aspects of environmental chemistry through water sampling. The group utilized the University of Georgia’s field station campus located in the rain forest. The Department is also partnering with University of Aalen to create opportunities for students to study chemistry while participating in an overseas experience. The Department will welcome the first student from University of Aalen in April, a master’s student who will work with Dr. Jay Forsythe.
Students collecting water samples; the group included Dr. Kate Mullaugh and Dr. William Veal who led students Jabbarrius Ervin, Dominique Maldonado, Lyndsey Prosser, Abigail Reeves, Abigail Stratton, Tiffany Vereen, and Kristen Weeks.

National Awards:
Each year, the College of Charleston can submit four applications from students studying science and math to be considered in a nationwide competition for a Barry M. Goldwater Scholarship. The Goldwater Scholarship is awarded to juniors or seniors nationwide who intend to pursue research in the natural sciences, mathematics, or engineering. In recent years, the Department of Chemistry and Biochemistry has had five Goldwater Scholars, including a rare award of three students from a single department in one year. Nationally, about 200 awards are made each year and for 2017/18, three Chemistry and Biochemistry students received an award, Alyssa Johnson (’18), Alex Schwartz (’18), and John Cobb (’19). They joined Nathan Adamson (’15) and Brenna Norton-Baker (’15) as awardees from the Department from 2014 and 2013, respectively. Five other students from the Department of Chemistry and Biochemistry have been recognized with Honorable Mentions in this competition, Corey Seacrist (’13), Lucien Jay (’18), Katelyn Kraichley (’19), Eveline Hok (’17), and Carson Reed (’15).

Our graduates who are pursuing PhDs have been submitting applications for NSF Graduate Fellowships. Madeline Gordon, (’15), was awarded an NSF graduate fellowship in 2018 for her graduate work at Berkeley, joining Brenna Norton-Baker (’15) who received a fellowship in 2016 for her work at UC-Irvine and Andrew Khahil (’11) who received his award in 2014 at the University of Wisconsin. Three other CofC chemists were given honorable mentions in the very fierce 2018 competition, Michael Hollerbach (’17), Alexandra Schwartz (’18), and Travis Varner (’16). There were 12,000 applicants for these awards.
Graduation:
Fifty-one Chemistry/Biochemistry majors graduated in 2017 and 2018. Some of these alumni are pursuing graduate research at Oregon (x 2), Georgetown, Johns Hopkins (x 2), Akron, Oregon State, Kansas, Tennessee (x 2), Virginia (x 2), UNC (x 3), Delaware, Villanova, Emory (x 3), Clemson, Cornell, Florida, and Vanderbilt (x 2). Others are pursuing a career in medicine or pharmacy at MUSC, Loyola, Colorado, High Point, UNC, and the Mayo Clinic. Still others are pursuing a career in industry, working at companies like Charles River Labs, Kemira, Mazor Robotics, and Alcami. Fourteen (27%) of the graduating seniors of ’17 and ’18 published papers in scientific journals from their work at CofC. The Class of 2018 included Erin Day, winner of the College’s Alexander Chambliss Connelly Award for the “most unselfish contribution to the student body” and Evan Bailey, winner of the College’s Bishop Robert Smith Award, the highest honor the College awards for a student “with exceptional leadership and academic excellence”. Congrats to all of our graduates making their mark on the world.

The Department by the Numbers:
• 90%: Percentage of 2017-18 graduates who participated in research.
• 114: Number of summer undergraduate research experiences offered in 2016-2018.
• 88%: Percentage of roster faculty who mentored summer research from 2015-2018.
• 69%: Percentage of graduates who pursued post-graduate education from 2008-2015.
• 30%: Percentage of graduates who pursued a PhD or Masters in Science from 2008-2015.
• 17%: Percentage of graduates who pursued an MD or DDS from 2008-2015.
• 80%: Percentage of graduates scoring above 50th percentile on the Major Field Test from 2012-2018
• 7: Number of students participating in our first international course in chemistry
• 8: Number of students who took our first offering of Bioanalytical Chemistry
• 30: Number of students (or alumni) who published a paper with their mentor in 2017 and 2018.
• 1102: Number of students who have participated in a semester long research experience in our Classroom Undergraduate Research Experience in Chemistry 112.
Give to What You Love

The College of Charleston is currently running their annual “Give to What you Love” campaign. We hope you will consider designating a gift to the Department of Chemistry and Biochemistry, foundation fund R318. Needs in the Department include both funds for undergraduate research and scholarships for students. Scholarship funds help us to provide extra support and incentive for talented students to choose the College of Charleston and our program of study. Research funds help us support the ~40 students we host in our labs every summer. We know that research experiences are a major factor in student success upon graduation, whether graduates seek employment in industry or matriculation in medical school and graduate school. In the summer, the students are immersed in a research community, during which research literature is read, ideas are generated, data are collected and presented, papers are written, and lifetime friendships are made. Every fall, the department supports the travel of roughly 30 students to the annual Southeast Regional Meeting of the American Chemical Society so that the students can present their work to an audience of professional chemists. The faculty view undergraduate research as among the most important, the most transformative, and the most rewarding teaching that we do.

Providing these experiences is expensive.

As an alumnus or friend of the department who knows the impact of our program, we hope you will consider making a donation today to the R318 Chemistry account through the College of Charleston Foundation. You can write a check to the College of Charleston Foundation designating our R318 fund or donate online at https://giving.cofc.edu/donate, designating “Other” and then Chemistry Fund R318.

Keep in touch!
The Department has a Facebook page, “Chem and Biochem at the College of Charleston.” We are also on Twitter as CofC Chem & Biochem (@CofCChem). Follow us to get all the latest happenings in the department. We would love to hear what you have been doing since leaving the College, whether it is starting a new position at a company, getting married, etc. Email us at ChemAlumni@cofc.edu or email the department chair at gelascop@cofc.edu.

On behalf of the faculty and staff in the Department of Chemistry and Biochemistry,

Pamela Riggs-Gelasco
Professor and Chair