Department of
CHEMICAL AND BIOMOLECULAR ENGINEERING
Clemson University

DEPARTMENTAL NEWSLETTER | DECEMBER 2020

FALL

2020

DEFINED BY THE DEFINERS

Contents

Stay in touch

We want to hear from you!

E-mail: cac4@clemson.edu

Facebook: @ClemsonUniversityChBE
Instagram: @ClemsonChBE
Twitter: @ClemsonChBE

MESSAGE FROM THE CHAIR

Dear Alumni and Friends,

Greetings from the Chemical and Biomolecular Engineering Department at Clemson University. Reflecting on this past fall, I am reminded of the opening line from one of my favorite novels, *A Tale of Two Cities* by Charles Dickens: "It was the best of times, it was the worst of times, … it was the spring of hope, it was the winter of despair…". His words, written in 1859 apply equally well to our present day in Clemson and many other places around the world. In short, there were a host of troubling events that clouded our lives this past year, but I am buoyed by optimism about the vaccines and the hard work and amazing resilience of our Clemson family and others. My hope is that time and warmer weather will allow us to once again enjoy the people, places and events that bring us all joy.

In August, Clemson started with all classes online, and students were not initially allowed to live on campus. Multiple new safety protocols were implemented, and the campus generally felt like a ghost town. As fall continued, the hard work of many, including Dr. Delphine Dean (Bioengineering), Dr. Mark Blenner (ChBE), and leaders in the athletic department, helped to create a CLIA testing lab on campus that provided saliva-based virus testing for all students, faculty, and staff. This herculean effort allowed us to safely resume teaching on campus, continue our nationally competitive athletic programs, and return to our teaching and research labs so that we could better educate students and make advances in a host of areas.

In ChBE, Dr. Chris Norfolk spearheaded efforts with Drs. Thies and Roat that allowed our juniors and seniors to complete their in-person labs in a safe and shortened time-period. We also worked with students in ChBE and mechanical engineering to create 3-D rotatable CAD drawings of the unit operations lab experiments. These drawings allowed our students to create process flow diagrams of their lab equipment from the safety of their homes. It also exposed them to modern technologies that are becoming more widely used in industry, especially in companies spread across the globe. Our faculty and technical staff should also be applauded for their efforts to transition classes to an online format, enabling students to continue their education even if they were unable to safely attend classes on campus.

Finally, the world changing impacts of those involved with vaccine development and production have clearly showed that science and technology are essential to our continued success and growth as a nation and a world. It is also exciting to see that Clemson is leading many of these efforts in South Carolina.

Stay Safe and Go Tigers!
David A. Bruce
Professor and Chair, Chemical and Biomolecular Engineering

Dr. Rachel Getman Receives Murdoch Family Endowed Professorship

Article written by Paul Alongi

Rachel Getman became the first woman to receive tenure in Clemson University's Department of Chemical and Biomolecular Engineering in the same year the department celebrated a century of granting degrees.

That was three years ago. Now Getman is first through the door for another honor, one that reflects her national prominence in research, scholarship and teaching.

Getman is the first recipient of the Murdoch Family Endowed Professorship in Chemical and Biomolecular Engineering.

The professorship comes with funding that Getman said she expects to put into hiring a graduate student to help further her lab's research.

"Every person that you have doing research is an opportunity to work on and explore another problem," Getman said. "It's very helpful. I thank all those who have mentored and supported me, those who nominated me for the professorship, and the Murdoch family for their support of Clemson University faculty."

Larry Murdoch provided the endowment that made the professorship possible. Murdoch received his Bachelor of Science in chemical engineering from Clemson in 1963 before going on to graduate school at Iowa State University and a successful career, first in chemical plant operations and then the engineering and construction industry.

He has traveled the world and once lived in Europe for five years, but he hasn't forgotten what Clemson has meant to him. Murdoch said the quality and dedication of the faculty, led by then-Department Chair Charles Edward Littlejohn, Jr., inspired him and helped lead him to success.

"That's why I wanted to dedicate the endowment to recognize faculty," he said. "The quality of an educational institution really boils down to the quality of the faculty, and I know it's difficult to attract and retain good faculty. There is a lot of competition, and I just want to do a small part to help in that area."

Murdoch also said that since he began supporting the department in 2011, he has been impressed and inspired by the commitment and improvements implemented by former Department Chair Douglas E. Hirt and the current department chair, David A. Bruce.

Getman's research is helping lay the groundwork to create more efficient, more effective and less expensive catalysts. Catalysts accelerate the rate of chemical reactions and are crucial to mass-producing a vast range of products from gasoline and diesel fuel to fertilizer and plastic.

"Everything that you're touching right now has probably seen a catalyst," Getman said.

Getman's main contribution has been to develop a multiscale modeling method for quantifying thermodynamics and kinetics of aqueous phase reactions at solid interfaces.

"It's something that isn't well established in my field but needs to be to understand a large class of catalytic chemistry," she said. "To perform simulations at the molecular level is pretty challenging. You have to predict ahead of time all of the correct features that you would want to incorporate into your model. Because no one has a microscope that can look at that level and tell you what's going on, you have to use your own intuition. Usually, you're learning as you're going."

Getman's lab includes two post-doctoral researchers, five Ph.D. scholars, one master's student and one honors undergraduate. Her lab took in 11 interns over the summer when other research opportunities were cancelled because of COVID-19.

Much of her lab's work involves creating models of chemical reactions on computers and can be done virtually.

"We offered a lot of positions to give people experience doing research they wouldn't have had otherwise because of the pandemic," Getman said.

Bruce said Getman is well deserving of the professorship.

ABOUT THE MURDOCH FAMILY:

Three consecutive generations of Murdochs have graduated from Clemson University. Larry Murdoch, whose donation funded the Murdoch Family Endowed Professorship, was the second generation.

He arrived at Clemson after growing up in Abbeville County and received a Bachelor of Science in chemical engineering in 1963, a degree that he credits with preparing him for graduate school and a successful career. His father, Earle Murdoch, was the first in the family to graduate from Clemson, receiving an agronomy degree in 1929.

Three of Larry Murdoch's children also went to Clemson. Jeffrey Murdoch received a Bachelor of Science in chemical engineering in 1994 and then a Master of Science in computer science in 2000. Brian Murdoch received a Bachelor of Science in biochemistry in 1997. Lindsay Murdoch White received a Bachelor of Science in health science in 2000. A fourth generation is represented by a grandson who is a freshman starting this year.

Larry Murdoch retired from full-time work in 2014 but at 79 years old continues to work as a consultant. He and his wife, Pat, live on Greenville's Eastside.

"Dr. Getman receives funding from multiple agencies, publishes research in high-quality journals and has an excellent record of mentoring undergraduates," he said. "Clemson is better off for having her here, and I offer her my deepest congratulations for this professorship."

Getman's lab is also collaborating with O. Thompson Mefford, an associate professor of materials science and engineering at Clemson. Their work to design magnetic materials could have applications in biomedicine and electronic devices, Getman said.

"We use our methods (created in the Getman lab) to calculate magnetic properties at the molecular level and learn how we can tune those properties to optimize the material for a particular function," she said.

Getman said what she likes best about her work is helping people reach their potential and achieve their career and personal goals, a value that she sees reflected in her colleagues at Clemson.

All of the students and post-doctoral researchers who have worked in Getman's lab have been placed in positions that have closely aligned with their goals, she said.

"One of my best accomplishments is that the people who come through my group create a career goal and then they achieve it– and I can't see how there can be anything better than that as a professor," she said.

Unit Operations Laboratories Success in the Face of a Pandemic

Spring semester of 2020 may seem further in the past than it actually is. The semester started the same way one would remember every semester, with a mixture of new classes, familiar faces and places, and new challenges. Our department wouldn't find out until March that those new challenges would include adjusting our teaching and learning methods in our Unit Operations lab while students and faculty were not allowed on campus.

Our faculty were faced with the sudden dilemma of how to finish junior Unit Operations Laboratory experiments online in lieu of in person. Fortunately, 2 of 4 experiments as well as the walkthrough for the 3rd experiment had been completed in person. With students sent home for the rest of the semester at Spring Break, department head Dr. Bruce, department technicians Messrs. Coburn and Marcengill, and faculty coaches Drs. Norfolk, Roat, and Thies scrambled to figure out how to get students through the remaining 2 experiments and associated reports by the end of the semester, completely remotely.

The spring semester ended with what could best be described as triage, as last-minute adjustments to the lab schedule were forced upon us. Plans for Unit Ops in the summer semester were scrapped, and the popular Study Abroad option at The Technical University of Denmark (DTU) was also cancelled. This threatened the graduation plans of several juniors and seniors, particularly Co-Op students.

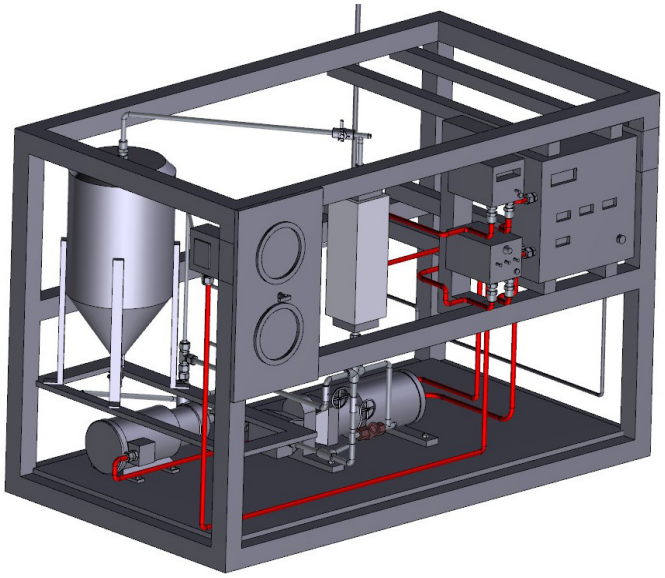
As summer progressed, it became more clear that our hopes of the pandemic lessening by the fall semester were deluded, as cases continued to surge throughout the country, especially after holiday gatherings. Starting in July, Dr. Norfolk directed the development of plans for multiple contingencies including classes fully online again, including all Unit Operations Lab classes; hybrid classes where some students would be allowed on campus; and resumption of "normal" operations with more accommodations for students physically challenged to navigate the Unit Ops Lab spaces.

With a passion for inculcating the importance of safety, especially in the Unit Operations lab, Dr. Thies wrote a letter to Provost Jones requesting in-person Unit Operations Laboratory access sooner than the planned start to on-campus classes on September 21. Dr. Thies stressed that the safety of our engineers depended not only on keeping them safe during the pandemic, but also in training them to be safe engineers in the future, and that the experience in the Lab was vital for their training. All faculty and staff involved in Unit Operations Labs endorsed the letter.

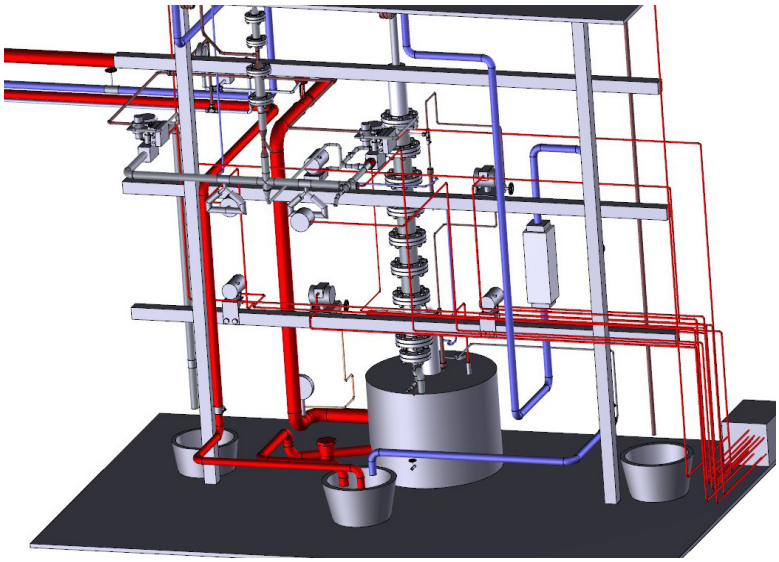
While we were not granted an early start, we were given permission to continue with in-person experiments, with appropriate testing and PPE, even if campus was closed before the completion of all experiments.

The next challenge that was faced was keeping students safe when they were in the lab. Our normal safety protocols, suitable for happier days, would not be sufficient for pandemic conditions. Face masks are currently mandatory inside all buildings on campus (and outside, when social distancing cannot be guaranteed). We also implemented temperature checks and a self-assessment at the entrance to the lab. Further, a touchless hand sanitizer station, dubbed FAST (Foot-Actuated Sanitizer for Tigers), was created and placed at the entrance to the lab.

In order to maintain distancing during the lab, our traditional three- or four-person lab teams could not all go to the lab at the same time. Instead, groups were limited to two students in the lab at a time, and we had a 'shift change' where students would change over personnel. While meeting the original intent of reducing the density of students in the lab, this also resulted in greatly increased student engagement with the lab experiments, and a new appreciation of the difficulty of writing a procedure. In the past, student participation rates varied with certain students taking a more active role than others in their group. With the rotation of students throughout the lab period, all students were forced to engage actively in the lab activities. Further, they all gained an appreciation for the level of detail and planning which must be put into a procedure that someone else, either a group member or a front-line operator, will be executing without supervision. The idea of a shift change of the student group may very well be implemented in future offerings of the Unit Ops lab course, even after the pandemic has passed.



The faculty took lessons from the spring semester and implemented them into the plans and scheduling for the fall semester. Instead of conducting experiments throughout the semester, faculty decided to emphasize hands-on lab activities and scheduled these topics into a short period of time earlier in the semester, which also had the added benefit of flexibility. As students in the course become infected or exposed to those who were, the faculty were able to rearrange the lab schedule, allowing for students to clear isolation and quarantine protocols and go into the lab at a later date. This has only been possible because of the dedication of our lab technicians, Bill Coburn and Chad Marcengill, who worked nights and weekends to make sure the Unit Operations Lab experience would be everything we promised to the students.



All of these changes were important to conducting lab in-person safely. However, the administration required all courses, including labs, be offered to students who determined that they were not able to come to campus safely. Accommodating students who would never set foot in the Unit Operations Lab, but would still be required to write procedures, analyze results, and communicate their conclusions, became a major effort.

At the suggestion of Dr. Bruce, there has been an extensive effort to create 3D models of each of experimental apparatus available in the Unit Ops lab. A graduate student in Mechanical Engineering, Mihir Kale, as well as an undergraduate in Chemical Engineering, Matt "XV" Holmes, have created these models based on the equipment on the floor. These models allow students to virtually walk around the apparatus, trace the lines, and plan their experiments. When combined with a video of the faculty discussing the experiment and equipment (a recorded 'walk through' meeting), virtual students can plan and write procedures from the safety of their own home, wherever that might be. Students were supported in this process through virtual meetings with the faculty, to answer questions.

The faculty are planning a comparison study of the effectiveness of these virtual tools. Student reports, including schematics and procedures, are available for classes in the past, which had access to the equipment and in-person walk through meetings. We intend to compare procedures generated by students with virtual tools, and those created by students with only in-person tools, to determine if students were equally able to demonstrate their mastery of the learning objectives. Our working hypothesis is that there will be no statistically significant difference between these groups of students, which would support the use of virtual tools in the learning environment. Look for our analysis in a future edition of the Journal of Chemical Engineering Education.

With all of these safeguards in place, and the adherence to the guidance of the university and other health officials, there were no documented cases of community spread that occurred in the Unit Ops Lab. While the pandemic is with us, we will continue our best efforts to safely train engineers on how to safely work in an industrial environment, and we will continue to look forward to the day that the sun shines on a mask free Clemson once more!

Welcome Aboard!

Dr. Suzanne Roat

Our department is proud to welcome Dr. Suzanne Roat back to Clemson University as a Professor of Practice.

Dr. Roat enjoyed an exciting and rewarding 28-year career working in the oil and gas sector primarily for Chevron Corporation before returning to her alma mater to teach Process Design and Unit Operations Laboratory classes.

Throughout her career, Dr. Roat leveraged her undergraduate Chemical Engineering degree from Clemson (1985) and Master of Science (1987) and PhD (1991) work focused on nonlinear optimal control (both in Chemical Engineering at University of Tennessee, Knoxville) into a full career of supply chain optimization.

When she's out of the office, Dr. Roat is enjoying more time scuba diving, including becoming a PADI-certified scuba diving instructor. She has been as deep as 114 meters and dives with a closed-loop rebreather system.

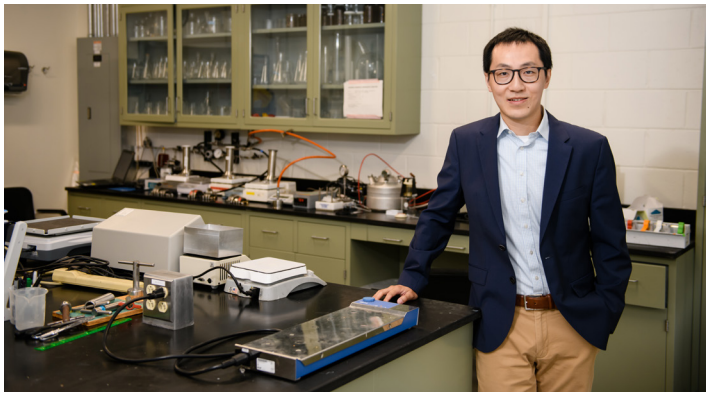
Dr. Ming Yang

Our department is proud to welcome Dr. Ming Yang to Clemson University as an Assistant Professor.

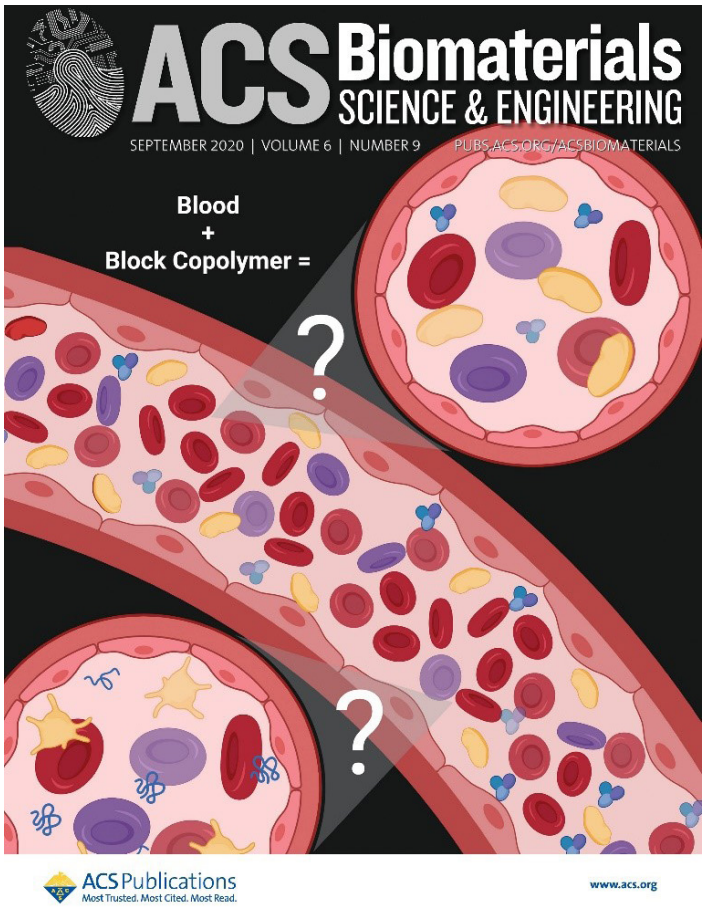
Dr. Yang is joining us from General Motors, where he worked as a Senior Researcher for several years. His research interests include Catalysis, Advanced Materials, Reaction Engineering for Energy and Environmental Applications.

Dr. Yang earned a Bachelor's degree in Chemistry from Nankai University (2007) and received his Master's in Chemical Engineering from Tianjin University (2010). Dr. Yang obtained his doctoral degree in Chemical Engineering from Tufts University (2015).

Outside of work, Dr. Yang loves soccer, sport cars, and traveling. He and his wife, Lingxi Yi, have traveled to 45 of the lower 48 states in the past 5 years!



CU-CIA Funding Leads to ACS Biomaterials Science and Engineering Journal Cover as Project Takes an Unexpected Turn



The Clemson Funded project "Towards the Creation of Biomimetic Complement Protein: Understanding Self-Assembly in Whole Blood" led **Dr. Jessica Larsen** and Honors College Undergraduate ('20) **Lauren Maghak** to an accidental discovery.

Maghak and Larsen were working to drive self-assembly of polymers around blood borne pathogens. However, their electron microscopy experiments yielded very unexpected images.

Upon further examination and with the addition of lysed controls, Maghak and Larsen began to realize that these clinically-approved polymers were causing dramatic morphological changes to blood cells. These polymers had previously been used in multiple pre-clinical nanomedicine studies that later failed upon entering clinical trials.

Their project morphed into an exploration of the effects of varying hydrophobicities of polyesters on each major blood component, summarized in their paper entitled "Intact or in Pieces? A Look at How Clinically Approved, Biodegradable Block Co-Polymers Affect Blood Components" published in ACS Biomaterials Science and Engineering in July of 2020, and highlighted on the cover. This letter can be thought of as a call for more thorough testing of polymeric materials in blood prior to clinical trials. This research culminated in an Honors Thesis in Chemical Engineering for recent Biochemistry graduate, Lauren Maghak. Maghak is now pursuing her PhD at Indiana University.

ChBE Faculty Receive URSAA Award

Dr. Rachel Getman, Ph.D.

Dr. Douglas Hirt, Ph.D.

Our department is proud to announce that Dr. Rachel Getman, Murdoch Family Endowed Associate Professor and Dr. Douglas Hirt, Professor and Associate Dean for Faculty Achievement and Strategic Initiatives were honored with the University Research, Scholarship and Artistic Achievement Award.

The University Research, Scholarship and Artistic Achievement Awards were created in 2018 to recognize Clemson University faculty who have achieved rare career milestones. Dr. Getman and Dr. Hirt were both awarded for publishing a scholarly article that has received over 1000 citations.

Leadership and Change Come Hand in Hand

Undergraduate Studies Coordinator

Dr. Amod Ogale, Ph.D.

Dr. Amod Ogale, Dow Chemical Professor of Chemical Engineering, has taken on the responsibility of the Departmental Undergraduate Studies (UGS) Coordinator.

Professor Ogale is also the Director of Center for Advanced Engineering Fibers and Films (CAEFF) and has served on the Clemson faculty for over 34 years.

He received his PhD in Chemical Engineering from University of Delaware (1986) and his Bachelor's in from the Indian Institute of Technology (IIT) Kanpur, having earned the President's Gold Medal for graduating with the highest academic honors (1982).

Professor Ogale has been honored as a FELLOW by three different professional societies for his life-time research achievements in the fields of carbon fibers, polymers, and composites: American Carbon Society (ACS), Society for Advancement of Materials and Process Engineering (SAMPE), and Society of Plastics Engineers (SPE). He was honored with Clemson University's URSAA Award in 2019. Prof. Ogale has graduated 41 MS and PhD students, mentored 8 post-doctoral fellows, published over 150 refereed papers, and been the principal investigator or co-investigator on over 50 research grants worth over $ 40 million.

ProfessorOgale is also very active in educational activities, including teaching both undergraduate and graduate courses. He has won the Graffin Lecturer Award from ACS, and the Composites Educator Award from SPE. He has taught 12 different undergraduate and graduate courses. Prof. Ogale believes in maintaining excellence in the undergraduate program and looks forward to his added responsibility as the UGS Coordinator.

Graduate Studies Coordinator

In Fall 2021, Dr. Sapna Sarupria, an associate Professor in the ChBE department, accepted the position of Department's Graduate Coordinator. In this role, Dr. Sarupria will oversee the graduate program while working closely with the graduate studies committee (GSC) comprising of Dr. Eric Davis, Dr. Jessica Larsen and Dr. Mark Roberts.

As the graduate coordinator, Dr. Sarupria wishes to continue to grow our excellence in graduate education while providing an inclusive environment that nurtures our graduate students to become exemplary members of the scientific community. In the coming months, Dr. Sarupria's goals in this role is to increase communication between faculty and graduate students, explore and implement best practices to enhance equity and inclusiveness, and to continue providing research and training opportunities for graduate students. She is excited to contribute to the department in this role and is grateful for the support she has received from her colleagues.

Dr. Sapna Sarupria, Ph.D.

Dr. Sarupria received her PhD from Rensselaer Polytechnic Institute. She finished her postdoctoral work at Princeton University before joining Clemson in 2012. Since joining Clemson, Dr. Sarupria has graduate 3 PhD students and provided 25+ undergraduates research experience in computational molecular science. She has published extensively in areas focused on rare event methods for simulations, nucleation, water at interfaces and gas hydrates. She has received several awards including the Doctoral New Investigator award by American Chemical Society Petroleum Research Fund, OpenEye Outstanding Junior Faculty Award by ACS Comp Division, Dean's Faculty Fellow by Clemson College of Engineering and Science, Award of Excellence from Clemson's Board of Trustees and the NSF CAREER award. She enjoys developing new methods for simulations and using simulations to tease out the reasons for macroscopic observations.

BEYOND THE CLASSROOM:

Dr. Jessica Larsen Helps Lead Girls' Cross Country to Victory

Meet Jessica Larsen. Athlete. Track and running competitor from middle school through graduate school. Boston qualified marathon runner. Coach. Mentor. Role model.

When you enter Larsen's office at Clemson, you'll see her trophies and medals from various races. As she quips, "mostly to remind myself that I am good at 'something.'" Recently, one of those somethings was her assistance as a coach for a local high school girls team, which won this year's state championship.

Of her involvement with the Seneca High School State Champion Team, Jessica says, "There's a man who sells insurance and has many clients in my department. He came in to talk to me about insurance one day and saw my medals and mentioned that he was coaching cross country at Seneca High School. I got plugged in first with the Track Team as a volunteer in the Spring of 2019, but was more interested in coaching cross country, so I've stuck on as an assistant cross country coach ever since. So far, I've coached two track and two cross country seasons."

The team begins practicing for cross country in the summer, as early as late May. Larsen is at every practice, every day of the week after school, and at their regular weekend competitions. "I think running is such a good metaphor for life AND for research; getting started and staying persistent is the hardest part. You win some and you lose some, but you have to show up every single day and toe the line. The hard work really and truly is what leads you to success. These kids and their families give me such a strong sense of community and connection; they love me for exactly who I am."

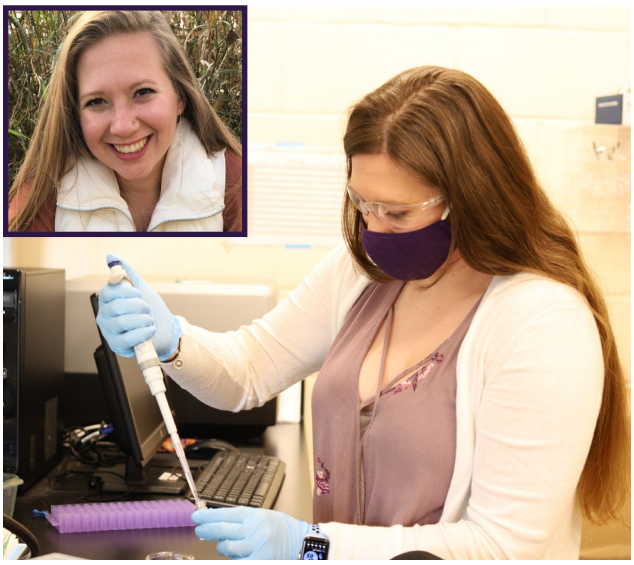
"Coaching these kids is extremely important to me. I feel as if I am showing these girls many things:

- First off, you can be a runner for your entire life. (I could still be a top seven member of their XC team based on my 5K time this year).
- Secondly, girls can grow up to do ANYTHING. They spend most of their day around teachers, which is great! But I think it's so cool that they get to see another career path; that I'm an engineer AND an athlete. They get to ask me questions about college.
- And the third and, I believe, most important thing that I feel like I get to show them, is that being 'cool' is overrated. Maybe that sounds weird, but I show up as exactly who I am and that's a good thing for young girls to see."

As to the impact coaching the Seneca team has had on Larsen's academic life, "It definitely helps me maintain a better balance in my academic life. Coaching these kids is a priority to me, which means that I have to maintain a solid schedule in order to make it work. It helps me to 'spread my worth.' I don't feel like my worth is all dependent on getting grants or putting out top research. That's important, but being a good role model and helping these girls to achieve their dreams is also a place where I put my worth. Being loved and respected by the girls and their families is a great gift."

Article gathered from the SC INBRE newsletter.

STUDENT SPOTLIGHT:



MOLLI GARIFO

Molli Garifo is a first-generation college graduate who is currently pursuing her Ph.D. in Chemical Engineering at Clemson University. While she was in middle school, Molli realized her love for engineering and in high school, she fell in love with chemistry. Even from a young age, she had the ambition and determination to become a woman in STEM. After considering other fields within engineering, Molli had become set on Chemical Engineering and enrolled in the undergraduate program at Virginia Tech. During one of her summers, she took an engineering lab course which brought her to Clemson University. She worked alongside Dr. Larsen in her lab for half of the summer and fell in love with Clemson as well as the research she was doing. At this point, she had never considered attending graduate school, mostly due to funding concerns, but Dr. Larsen informed her that most graduate students in STEM fields are paid to attend. Upon learning this, Molli began to consider continuing her education to learn more and to give herself more time to figure out her path.

Currently, Molli is conducting research in Dr. Larsen's lab on thermally responsive hydrogels. These gels are created from two polymers that are liquids at room temperature but turn into a gel when heated. The overarching goal of her research is to create hydrogels that will undergo the transformation into a gel at body temperature. To do so, she must find the perfect combination of the hydrophilic and hydrophobic polymers that she is using to compose the hydrogels. From there, she will work on perfecting the structure to ensure that it is biodegradable, non-toxic, and comfortable in the brain. Molli visualizes this technology being used for delivering chemotherapy drugs to people who have recently had brain tumors removed. She will begin to assess the loading capacity of the hydrogel for this purpose once the structure is perfected. This enables a type of directed chemotherapy that can be used to target residual tumor cells and potentially save a lot of lives, as it will lower the risk of the tumor returning from the continued replication of such cells. It also offers a way to bypass the blood-brain barrier, which has been an obstacle for scientists in the advancement of nanotechnology and similar fields. The structure will also be biodegradable, which would have no impact on the brain apart from removing the cancerous cells from the arms of the tumor.

Article written by Zoe McNelis

Undergraduate, Christopher Pierce, awarded funding through SC INBRE

Christopher Pierce, a junior undergraduate student in Chemical Engineering, was recently awarded funding through SC INBRE along with his mentor Dr. Jessica Larsen. Through the Student-Initiated Research Program (SIRP), Christopher will receive $3,000 to pursue his project, which has a basis in drug delivery, biomedicine, and neuroscience.

His project, entitled "Modulation of Polymersome Shape to Enhance Blood-Brain Barrier Uptake", will explore the effect of hydrophobicity on changing the shape of vesicular nanoparticles called polymersomes. Polymersomes have the benefits of simultaneously encapsulating hydrophilic and hydrophobic drugs, evading the immune system, and circulating for extended periods of time. Thermodynamically, polymersomes form into spherical shapes. However, materials natively internalized in cells are not generally spherical. By altering the polymersome shape into various structures, including more elongated rods and more blood-cell like stomatocytes, he aims to increase endothelial uptake to aid in transport of payloads through the blood-brain barrier.

He will develop design rules to create each shape by exploring biodegradable polymers with varying hydrophobicities and altering osmotic pressure gradients. Of the awards given, only two were given to undergraduate students and only one award was given to a student majoring in an engineering field. Congratulations to Christopher Pierce and Dr. Jessica Larsen!

CONGRATULATIONS

To Our Fall 2020 Graduates

Ph.D. Students

Dr. Cabell Lamie

Congratulations to Cabell Lamie for successfully defending his dissertation titled "Synthesis, Supercritical Fractionation, and Kinetic Modeling of Pyrene Pitch Oligomers" on November 24th.

Cabell's research at Clemson focused on developing and utilizing supercritical extraction techniques fto increase fundamental knowledge in the field of pitch research, with a focus on modeling the reaction kinetics of pitch formation and determining how the oligomeric composition effects the bulk properties of the pitch.

Cabell is continuing his career at Clemson as a Post-doctoral Researcher for Mark C. Thies, his graduate advisor. Here, he will continue his research in pitch fractionation and pass on the reins to the next pitch researcher in the Thies Research Group.

Dr. Allison Yaguchi

Allison Yaguchi successfully defended her dissertation titled "Development of Cutaneotrichosporon oleaginosus to Convert Lignin-Derived Phenolics to Oleochemicals" on November 18th and was hooded on December 16th. Her advisor is Dr. Mark Blenner.

Her research identified a novel yeast able to robustly convert an aromatic-rich waste stream, called lignin, into lipids. These microbially-derived fats can be converted into value-added oleochemicals, such as biodiesel or omega-3 fatty acids. Her findings regarding the metabolism and genetics utilized by Cutaneotrichosporon oleaginosus will enhance the body of knowledge regarding aromatic catabolism in yeast systems – an area that remains largely unexplored.

After graduating, Yaguchi will take a position at the National Renewable Energy Laboratory (NREL) in Golden, CO as a post-doctoral researcher before returning to academia as a faculty member.

Master's Students

Bryan Gutierrez

Undergraduate Students

Kyle Dunphy

Sara Edgecomb

Jena Merritt

CLEMSON AIChE

AIChE President, Alton O'Neal
Senior Undergraduate Student

CLEMSON CHAPTER AIChE OFFICERS

Vice President, **Haley Chiles**
Senior Undergraduate Student

Industrial Relations Chair, **Emily Miller**
Senior Undergraduate Student

Secretary, **Kara Bane**
Junior Undergraduate Student

Treasurer, **Shannon Ludlow**
Sophomore Undergraduate Student

Conference Chair, **Josh Chong**
Junior Undergraduate Student

SPRING UPDATES

Clemson Family,

Fall 2020 was a big change for Clemson AIChE, as many of the normal events were suspended due to the pandemic. Fortunately, some events were able to continue virtually. To fill in the communication gap between older and younger students created by the virtual environment, we held "Meet the Seniors" where underclassmen could ask the seniors questions on anything from classes to internships. We hosted presentations and recruitment events by Eastman and SRNS, where we learned more about the individual companies. The Clemson AIChE also hosted a joint meeting with the Western South Carolina AIChE, were we heard about how to improve networking and communicating in virtual environments.

In October, the Clemson Jeopardy team were runners up to NC State in the regional ChemE Jeopardy competition, a virtual makeup for the cancelled spring student regional conference. This ranking earned the team a slot in the Virtual National Student Conference ChemE Jeopardy competition, where we won the first round and were eliminated in the final round. In total, 6 students virtually attended the National Conference. We are excitedly looking forward to the regional conference in the spring, which will be hosted virtually.

So far for the Spring 2021 semester, we have already hosted a corporate presentation by SNF, where they discussed the company's work on sustainability and their opportunities for new graduates.

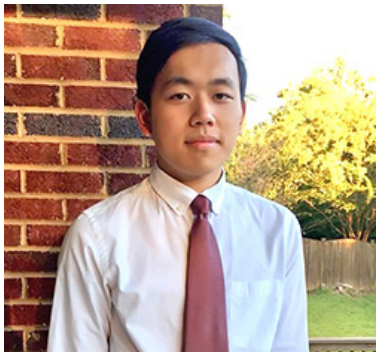
In early February, WSC AIChE will be hosting Clemson AIChE as Dr. Yang gives a presentation on his research. Later in the semester, Clemson AIChE will be hosting an industry panel where ChemE grads of various industries talk about their experiences and answer student questions. We are also looking forward to the Southern Regional Conference this spring, which will again be hosted virtually. Although in person events are still on hold, the executive team is working hard to connect the students with outside opportunities. We wish everyone a good, safe spring and are looking forward to when we will all be back in Earle Hall.

Go Tigers,

Alton O'Neal
President AICHE

CLEMSON JEOPARDY TEAM

Kara Bane
Junior ChBE Student



Josh Chong
Junior ChBE Student

Nicole Johnson
Senior ChBE Student

Spencer Temples
Senior ChBE Student

STAFF UPDATES

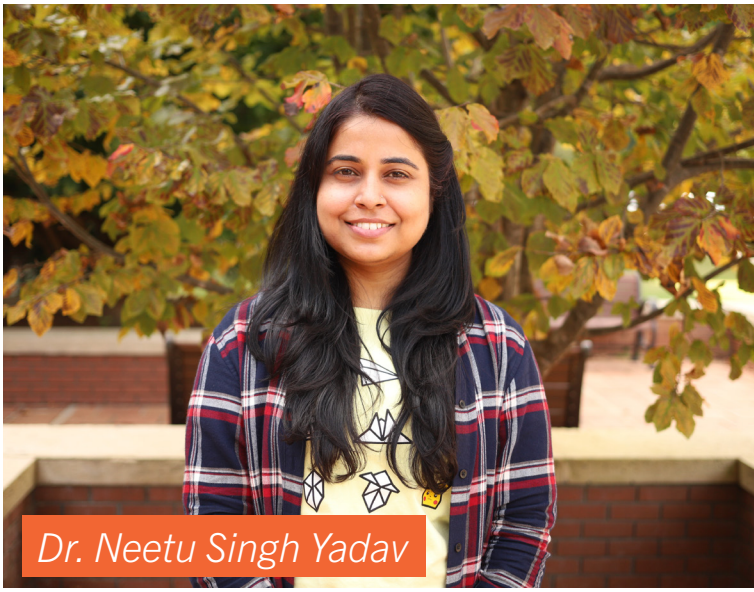
Welcome Aboard!

Dr. Manjeet Chhetri

We are proud to welcome Dr. Manjeet Chhetri to our department as a Post-Doc under Dr. Ming Yang.

"I am Manjeet Chhetri, from the Darjeeling hill station town of India. I am an electrochemist by training, and in my free time I like playing soccer and watching live EPL and Champions league matches.

I am excited to be a part of the department and hopeful that my stay here will be mutually beneficial."



Dr. Neetu Singh Yadav

Join us in welcoming Dr. Neetu Singh Yadav to our department as a Post-Doc under Dr. Sapna Sarupria.

"I am Neetu Singh Yadav, from India. I earned my PhD degree in computational biophysics from Jawaharlal Nehru University, 2019. Subsequently, I joined the Indian Institute of Technology-Delhi as a Research Associate. Currently, I am working on modeling membrane-protein interactions using Molecular Dynamics Simulations to understand the membrane lysis phenomena during phase infection.

My favorite thing about the department is its diversity and helping people. Hopefully, this COVID situation ends, and I am looking forward to seeing everyone in-person."

Caitlin Clark selected to be on Women's Commission

Undergraduate Services Coordinator, Caitlin Clark, recently applied and was selected as a Staff Representative with a three-year term on the university's Commission on Women beginning in December of the Fall semester.

As a graduate of the Women's Leadership program at Clemson University, Caitlin has always expressed an interest and drive for bringing women together, advocating women's issues, and taking an active role in women-led initiatives around campus.

She hopes that her experiences as a staff member and an Alumna of the univeristy will aid in her ability to accurately represent the women in our community as she serves on the Events and Programming Committee.

Caitlin is very excited to start this new chapter of her time at Clemson and hopes to have a lasting impact on the Clemson community.

THANK YOU TO OUR 2020 DONORS!

BUSINESSES, CORPORATIONS, FOUNDATIONS, & TRUSTS

Bank of America Charitable Gift Fund
BASF Corporation
Benevity for Citgo
Charities Aid Foundation of America
Chevron
Eastman Chemical Company
Equitrans Midstream Foundation
ExxonMobil Foundation
FIDELITY CHARITABLE GIFT FUND (DAF)
Fluor Foundation
Ingevity
Jacobs Engineering Foundation
L. B. Bowen Inc.
Midland Area Community Foundation
Pfizer Foundation (YourCause)
R E and M Solutions Inc.
Raymond James Charitable
Shell Oil Company Foundation
The Blackbaud Giving Fund
The Blackbaud Giving Fund for Chevron
The Blackbaud Giving Fund for Duke Energy Foundation
Water Environment Association of South Carolina

FAMILIES & INDIVIDUALS

Mr. & Mrs. Wayne F. Addy
Lt. Col. & Mrs. Richard L. Almeida, Jr.
Dr. & Mrs. Kenneth Kanayo Aniunoh
Mr. Donald William Baxter, Jr.
Mr. & Mrs. Harry Earl Beasley, Jr.
Ms. Sue C. Beebe
Mr. & Mrs. William Carl Bernat
Dr. & Mrs. Uwe Beuscher
Mr. Cameron J. Bodenschatz
Ms. Anne Renee Boudreaux
Mr. & Mrs. James Wesley Bracken
Ms. Gail Brackett
Mr. & Mrs. Walter A. Bumgarner
Mr. David Gentry Burchfiel
Mr. Moa-Tseng William Chien
Ms. Barbara E. Cocke
Dr. & Mrs. Andrew Pickens Collins
Dr. Elizabeth Cordes & Mr. Roger L. Cordes, Jr.
Mr. & Mrs. James Daniel Cover III
Mr. & Mrs. John William Coyle
Mr. & Mrs. John Cromer
Mr. & Mrs. William W. Culler
Ms. Suzan Curler
Mr. George Michael Daugherty
Mr. & Mrs. Austin Dial Devaney
Ms. Allison Brooks Domhoff
Mr. & Mrs. Mark Allan Edling
Dr. & Mrs. James Leon Edwards, Jr.
Mr. & Mrs. Roy Norman Eissmann
Mr. & Mrs. John Elsey
Mr. & Mrs. James H. Erskine III
Mr. & Mrs. Stephen Q. Ferguson
Mr. & Mrs. Mark R. Fisk P.E.
Mr. & Mrs. Edward Eugene Ford III
Mr. & Mrs. Matthew Alexander Fourspring
Mr. & Mrs. John Bowles Frazer
Mr. & Mrs. Ken D. Frick
Mr. M. Craig Garner, Jr.
Mr. & Mrs. Edward J. Greene
Ms. Lisa D. Gibson
Mr. & Mrs. Larry Nichols Goff
Dr. & Mrs. John Reeves Grubbs, Jr.
Mr. & Mrs. David Briggs Grubbs, Jr.
Mr. Jeffrey J. Gude
Mr. & Mrs. Billy Raye Hamm
Mr. M. Najdat Hanano
Mr. & Mrs. Clifton Hattaway
Mr. & Mrs. Fitz Lee Hardin III
Mr. & Mrs. Jeffrey Scott Harding, P.E.
Mr. & Mrs. Hunter Sells Harris III
Dr. & Mrs. Eric Lynn Haseltine
Ms. Dorothy M. Helms & J. Marshall Colcord
Mr. & Mrs. Edward Charles Henne, Jr.
Mr. & Mrs. Clinton A. Herring
Dr. Priscilla June Hill
Mr. Joel W. Hoard
Ms. Anne Hoppmann
Mr. & Mrs. Gene Lee Hortz
Dr. & Mrs. James Richard Hunter
Mr. & Mrs. Chip Hurst
Mr. Mark Davis Ingram
Mr. & Mrs. William Lawrence Jackson, Jr.
Mr. & Mrs. Mark D Jackson
Mr. James Kelly Jennings
Mr. & Mrs. Samuel Thomas Johnson III
Mr. David A. Jones
Mr. & Mrs. William Emmitt Jones
Mr. Lawson Scott Kendrick
Mr. Edward J. Khoury
Mr. & Mrs. Terence Rudolph Kinard
Mr. & Mrs. Lawton Edward Kizer III
Mr. & Mrs. Walter House Knox III
Mr. & Mrs. Wesley Lael Kosin
Mr. & Mrs. Frank Hamilton Lamson-Scribner III
Mr. & Mrs. Charles Craig Leopard
Mr. William Charles Lewis IV
Mr. Clifton J. Lewis
Dr. & Mrs. John Monroe Little, Jr.
Mr. & Mrs. Louis Ligon Martin III
Mr. & Mrs. Thomas L. Martin
Mr. J. Michael McCabe
Mrs. & Mr. Karen F. McGuire
Mr. Rex Meade
Mr. & Mrs. Stephen Melsheimer
Mr. & Mrs. Rey Mia
Mr. & Mrs. Jack Harris Mitchell III
Ms. Brandi Brayboy Mobley
Dr. & Mrs. Gary N. Mock
Mrs. Marcia P. Morrell
Mr. & Mrs. Albert L. Moses
Mr. & Mrs. Lawrence Murdoch
Mr. & Mrs. Christopher Young Murray
Mr. Jonathan M. Nason
Mr. & Mrs. George Wesley Newcomb
Mr. & Mrs. Michael D. Newman
Mr. & Mrs. C. David David Norman
Mr. & Mrs. Theodore McGeachy Northrop
Mr. Robert James Pappas
Mr. & Mrs. Ralph Pinnock, Sr.
Mr. & Mrs. Wade Ponder
Ms. Gloria Prevost
Mr. Ralph Scott Radford
Mr. & Mrs. Benjamin David Rainey
Mr. Jerry Grant Richardson
Dr. Richard Wayne Rice
Ms. Julie Renee Robinson
Mr. & Mrs. David Boyce Robbins
Ms. Susan Marie Rob
Ms. Sara Rogers
Mr. & Mrs. Jeffrey Wyatt Rosenlund
Dr. & Mrs. James Dennis Rushton
Mr. & Mrs. Treyton Eric Ryder
Dr. & Mrs. Charles Gaylord Sandell
Dr. Deborah Ellen Savage, Ph.D. & Mr. Timothy Woolf
Mr. Michael Scardato
Mr. & Mrs. William Bruce Scherler
Mr. & Mrs. George Frederick Schladensky, P.E.
Dr. & Mrs. William Rodney Schofield, P.E.
Mrs. & Mr. Kara Sexton Shealy
Mr. & Mrs. Donald Robert Sheeley
Mr. & Mrs. Ronald Buford Sheppard
Dr. Rebecca Shuler & Mr. Charles Shuler, Jr.
Mr. & Mrs. Junius Reid Smith III
Dr. Joseph Rectenwald & Ms. Dyan Michelle Spinnato
Mr. & Mrs. William Herman Spitzer
Mr. & Mrs. John Richard Stamey
Mr. & Mrs. Joseph C. Stanfill
Mr. John Stelling III & Mrs. Victoria Herring
Mr. William David Stephens, P.E.
Ms. Kimberly Wingard Sumner
Mr. & Mrs. Henry Wedemeyer Theiling, Jr.
Dr. & Mrs. Brian Wesley Thompson, M.D.
Mr. & Mrs. Alfred Dudley Tolson
Ms. Christine Mary Turner
Mrs. Deborah M. Varga
Mr. & Mrs. Winston Earl Wallace, Jr.
Drs. Dibbon Walters IV & Dr. Keisha Walters
Mr. & Mrs. Johnnie James Walters
Mr. & Mrs. Dan Watt
Mrs. Laura Bauerle Weaver
Mr. Gary James Wells, Jr. & Ms. Elizabeth Endler
Mr. & Mrs. Andreas Westergaard III
Mr. & Mrs. Bobby Williams
Ms. Ashley Elizabeth Williams
Mr. Timothy N. Wolf
Mr. & Mrs. Frederick Gilland Wolfe
Mr. & Mrs. Silas Y. Wong
Mr. & Mrs. Larry Walker Wyatt
Mr. & Mrs. James Allen Yanacek
Mr. & Mrs. James Carl Young, Jr.