Department of
CHEMICAL AND BIOMOLECULAR ENGINEERING
Clemson University

DEPARTMENTAL NEWSLETTER | JUNE 2021

SPRING/SUMMER 2021

WELCOME BACK, TIGERS

Contents

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MESSAGE FROM THE CHAIR

Greetings, Alumni and Friends

I am pleased to say life is beginning to return to normal in Clemson. The closing days of the past spring semester felt like the final miles of a long drive to a well-anticipated destination. In this case, the destination was seeing the warm smiles of my colleagues and our students. It was also wonderful to be able to dine at some of the new restaurants in town and see local shops reopen and thrive with returning shoppers. Simply being able to converse in person (without a mask) with everyone in the department and the community was a welcomed change.

Current plans for fall will certainly involve health precautions, but we all hope students and alumni will once again be able to interact with one another on campus in ways that define the Clemson Experience. Though none of us are quite sure how virial variants and a need for vaccine boosters may impact our plans for the coming academic year, I am comforted by the level of planning occurring at the university and feel confident that we are well prepared for many different possibilities.

Summer has also brought a wealth of construction around town and on campus. Within Earle Hall, our classrooms are all being upgraded with state-of-art computing and communications equipment, and the auditorium is being remodeled to include new seating and improved accessibility. Around town, the sound of construction cranes and large equipment are everywhere with new off-campus housing and stores being erected to handle the growing student body at Clemson (projected to be more than 4700 new undergraduates this fall).

Finally, I want to share news about a retirement in the department. Terri McAllister, the office manager for ChBE, will be retiring in early July of this year. Her outgoing personality, attention to detail and genuine concern for everyone in ChBE helped make her an essential part of the department for over a decade. She was also the primary point of contact for many of our alumni, and I am thankful she has agreed to work part-time during the coming year to help train and educate her replacement about the technical aspects of her job as well as highlight the individuals with whom she interacted that are so important to the department. We wish Terri and her husband, Bob, well as they visit with family and travel in the coming months.

We are planning to restart our pre-game tailgate celebrations in front of Earle Hall this fall, so if you are in town on game day, please stop by and visit with old friends and meet some of our newest students.

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

MARC BIRTWISTLE AWARDED GRANT TO IMPROVE CANCER PATIENT TREATMENT

Marc Birtwistle, associate professor, is receiving the NIH, NIGMS R35 Maximizing Investigators' Research Award for Established Investigators.

This grant will award Birtwistle with a total of $1.86 million for his research on Mechanistic Pharmacodynamic Modeling for Drug Combination Responses. Birtwistle's research combines experiments and computational modeling to understand better how cancer cells respond to drugs and drug combinations.

Most cancer patients are treated with drug combinations, but every cancer is different, and predicting how a particular cancer will respond to a certain drug combination is not yet possible. Generating systematic experimental data to address this problem in a brute force manner is infeasible because the sheer number of potential drug combinations is too high.

"A vision for my lab is that mechanistic computational models of how cells respond to drugs, similar to models we use to describe chemical processes, can help inform pharmaceutical and medical industry design choices like drug combinations, such as how simulation is used in most industries to help guide design choices," Birtwistle said.

This award provides flexible funding to support his lab over the next five years. Specifically, it will support three project areas. Two of these build on the foundational work that generated the most comprehensive mechanistic model to date of how human cells regulate cell proliferation and death — two key processes that are dysregulated in cancer.

Initially, Birtwistle's lab will focus on the largest set of data known for a single human cell system that includes responses to eight anti-cancer drugs with varied mechanisms of action. His team will assess the ability of their model to account for the totality of this data, predict how combinations of these drugs work and learn what next steps are needed to meet our overall vision.

Later, his team will use the largest known set of single anti-cancer drug response data (Cancer Cell Line Encyclopedia — 24 drugs in over 000 cancer cell lines) to understand how well their mechanistic models of cell proliferation and death apply across multiple cancer types.

Lastly, Birtwistle's lab will apply their novel experimental approach, which they recently developed, called MuSIC (multiplexing using spectral imaging and combinatiorics) to screen combinations of genes for their impact on cell proliferation and death. Single gene screens are established, but it is not yet possible to screen large numbers of genes that when disrupted together, may have different effects than when disrupted alone. Such "genetic interaction" is widespread in cancer but is not well understood due to a lack of efficient study techniques. Such phenomena are intricately connected to drug combination responses.

Thanks to the funding that he was awarded, Birtwisle's research will go a long way towards helping cancer patients.

DEVASTATING BRAIN DISEASE TARGETED IN NEW RESEARCH

Dr. Jessica Larsen (center) works in her lab with Ph.D. students Molli Garifo and Mark Pitman.

Jessica Larsen of Clemson University has seen the awful toll GM1 gangliosidosis takes on its young victims.

While in graduate school at Auburn University, Larsen began working with a 1-year-old boy as part of her research and watched as the rare brain disease ravaged his body, causing seizures and withering his muscles. The boy made it to 4 years old — the upper range of his life expectancy — before succumbing to the disease.

"It provided this massive motivation that we need to be doing something better," said Larsen, now an assistant professor of chemical and biomolecular engineering at Clemson.

Larsen will have her chance. A new research project she is leading is aimed at finding new ways to diagnose GM1 gangliosidosis so doctors can better determine the progression of the disease and offer the most effective treatment for its symptoms.

Larsen is receiving a $515,989 CAREER award from the National Science Foundation to fund her work.

"This is one of the nation's highest honors for junior faculty members, and Larsen is highly deserving," said David Bruce, chair of the Department of Chemical and Biomolecular Engineering. "I offer her my deepest congratulations. She and her team are well positioned to conduct impactful research, advance education and address unmet needs in a crucial area of health innovation."

GM1 gangliosidosis is an inherited disorder that progressively destroys nerve cells in the brain and spinal cord, according to the National Institutes of Health (NIH). The disorder affects 1 in 100,000 to 200,000 newborns, Larsen said.

Symptoms can be treated, but there is no known treatment that slows the progression of the disease.

GM1 gangliosidosis is caused by mutations in GLB1, a gene that gives the body instructions to make an enzyme called beta-galactosidase, according to the NIH. Other enzymes become highly active in a futile attempt to make up for the missing beta-galactosidase, Larsen said.

The enzyme resides in compartments of cells called lysosomes. In healthy people the lysosomes act like a stomach, breaking down molecules, including GM1 ganglioside, Larsen said. But in patients with the disorder, the lysosomes are malfunctioning, preventing the GM1 ganglioside from breaking down.

Over time, this accumulation becomes toxic in tissues and organs, particularly the brain, and leads to the destruction of nerve cells, according to the NIH.

"We're trying to figure out with this CAREER award why that is happening and what that has to do with the progression of the disease,"she said. "We're looking at things we know happen throughout neurodegeneration, and we're seeing if we can correlate some of these things with this overactive mechanism."

Researchers then want to use what they learn to create a tool that diagnoses GM1 gangliosidosis and helps measure its progression, Larsen said. The research could also one day be used to develop new ways of delivering drugs to treat the condition, she said.

The project gives several undergraduate and graduate students a chance to conduct research in a field where they can see the impact they have.

“Being able to say you’re doing something to help these children gives a deep sense of meaning and drive,” Larsen said. “I think that’s a big part of why my students work so hard.”

The research also shows students the role chemical engineers can play in the medical field, she said.

Among those students is Bipin Paruchuri, a Ph.D. student who helped lay the groundwork for the CAREER award and will continue working on the project for his dissertation. He hopes to become a university faculty member after graduation.

“This is definitely a very good foundation for my future research as a faculty member,” Paruchuri said. “This is a new technology that can be applied to many different applications in drug delivery.”

Also as part of the CAREER award, Larsen plans to start a new educational program inspired by the distrust of science she saw emerge in South Carolina during the COVID-19 pandemic.

The problem, she said, is that people may not know where to find reliable scientific information, and they may not trust the information they do find.

To counteract the knowledge gap, Larsen is developing a program aimed at helping high school science teachers introduce civic scientific literacy into their classrooms.

It starts with Clemson undergraduates. They will participate in literature reviews, journal clubs and weekly discussions over a year to increase their scientific literacy. Then they will then begin to create an educational module to teach what they learned to high school teachers.

Those teachers will conduct research in Larsen’s lab and participate in workshops that teach them to integrate the techniques they learned into their classrooms. Chris White, a Clemson instructor of Teaching and Learning, will help develop the workshops.

Larsen is calling the program CoME and SEE SC, an acronym for Combating Misinformation through Education and Scientific Experiential Exposure in South Carolina.

“We hope that our program will increase student and teacher confidence in the reliability of scientific information by increasing knowledge of the scientific process,” she said.

Jessica Larsen (center) accepts her Commission on Women award with Clemson University President Jim Clements and Lori Dickes, commission chair.

The CAREER award is one of two major honors Larsen received during the spring semester of 2021. She also received an Outstanding Woman Award in the faculty category from the Clemson University Commission on Women.

The award “annually honors individuals who have made outstanding contributions to improve the status of women,” according to the commission’s website.

“It felt validating,” Larsen said of the award from the commission. “I’ve been fighting pretty hard for women in chemical engineering and for changes in culture that can address issues with women.”

Larsen has had 45 undergraduates working in her lab over the last three years with 33 of them women. She is also a cross country coach at Seneca High School, and this girls’ team has won state three times in a row.

Article written by Clemson News
May 10, 2021

CHRIS NORFOLK WINS PROVOST'S AWARD FOR TEACHING WITH TECHNOLOGY

Article written by Clemson News
April 29, 2021

Chris Norfolk, a senior lecturer in the Department of Chemical and Biomolecular Engineering, won the Provost Award For Outstanding Teaching With Technology.

When the pandemic hit, Norfolk made quick use of technology to adapt to social distancing. He created computer and 3D-printed models to help teach his students and keep them on track to graduation.

Robert Jones, executive vice president for academic affairs and provost, said the award is well deserved.

"Dr. Norfolk did an excellent job of using technology to enhance his teaching at a critical time for the University and its students," Jones said. "The high ratings he has received from students and the laudatory remarks from them and his colleagues are a testament to the effectiveness of his efforts. I offer him my deepest congratulations on this award."

"For those familiar with Norfolk's teaching, it's just the latest way he has stood out. He has long been known as one of the most dedicated educators in the Department of Chemical and Biomolecular Engineering," said the chair, David Bruce.

"Chris helps students learn chemical engineering concepts after hours and on weekends, he takes class materials to injured students in the hospital, and he creates custom educational plans for students with significant handicaps or disabilities," Bruce said. "His care for the 'whole student' is beyond comparison."

Spencer Temples, who has taken three classes with Norfolk and serves as a teaching assistant under him, said the senior lecturer has demonstrated a pattern of helping his students in any way he can.

"As a testament to this, our group emailed him in a panic at the end of last semester on a Sunday afternoon and he met with us via WebEx 10 minutes later," Temples said. "Going above and beyond all expectations has simply become normal operating procedure to him."

Among Norfolk's duties is running the department's learning labs for juniors and seniors.

"We're one of the only labs I know of that is doing labs in-person for everyone who wants to come and do it," he said. "That requires us to be flexible in what we are doing and how we can keep people safe."

For those who can't attend in person, Norfolk came up with an alternative.

He worked with two students to build 3D, computer-aided design models of lab equipment, similar to those used in industry. Students are able to rotate the interactive models as they learn how to plan experiments.

Norfolk said he will continue using the models in the course, even when the pandemic subsides and students return to the lab.

Among the courses Norfolk teaches is CHE 3190, a course on engineering materials. A major topic in the course is the arrangement of atoms to form crystals and how those arrangements affect material properties.

It can be difficult to visualize, so Norfolk created models that he 3D printed. He started off using his personal 3D printer, but it quickly became clear it was too big of a project to do at home.

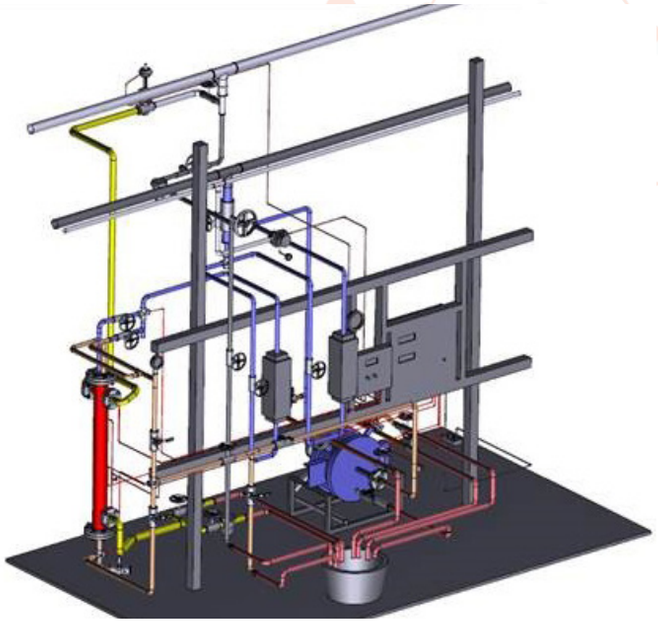
Norfolk worked with the Watt Family Innovation Center to complete the printing in its Makerspace.

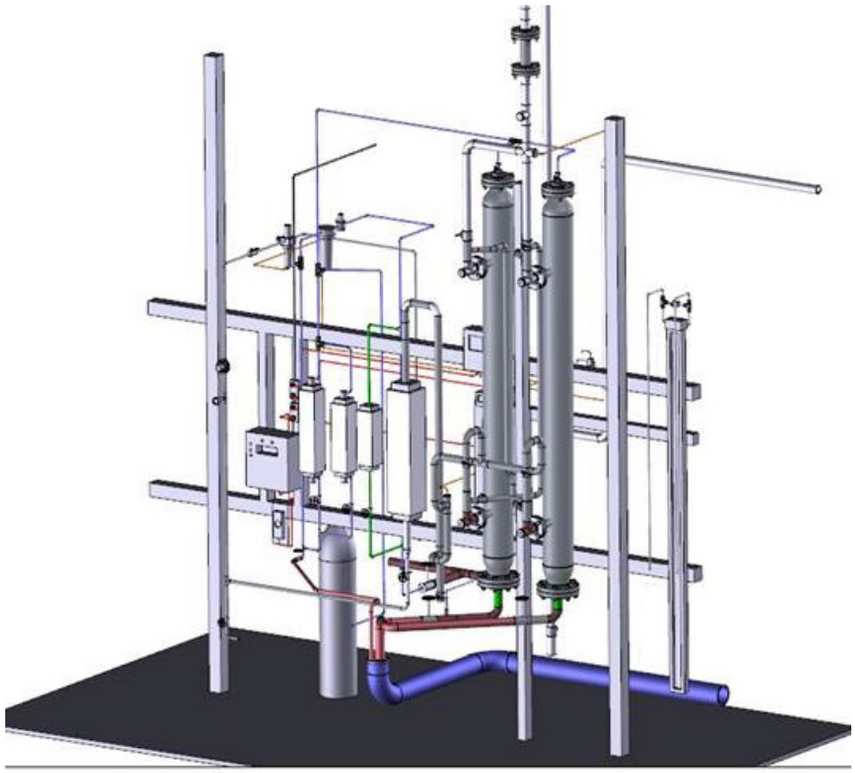
“I ended up borrowing all of their 3D printers while they were shut down for winter holiday to create approximately 500 individual pieces which I allow students to borrow while they are registered in the class,” he said.

When students lose or break a model, Norfolk asks them to replace it. That means students must learn how to 3D print independently, an added bonus, Norfolk said.

Each model Norfolk has created so far is one color and shows one type of atom. But now he is also creating models of alloys that contain several colors representing different types of atoms, such as when carbon is added to iron to make steel. On that project, he is enlisting the help of Machining and Technical Services in the College of Engineering, Computing and Applied Sciences.

For Norfolk, teaching at Clemson is a way of paying back the University for helping lay a foundation for





his life. Clemson is where he received a Bachelor of Science in chemical engineering in 2000 and met his wife, Noelle, who received a Bachelor of Science in graphic communications and now works in real estate in Greenville. The couple now have a 13-year-old daughter, Ava, who is in 8th grade.

After Clemson, Norfolk attended Notre Dame, where he received a Master of Science and Ph.D., both in chemical engineering.

He worked as a postdoctoral researcher at the U.S. Army Research Laboratory in Maryland before returning to the Upstate, where he worked from 2005-13 as a program director for the South Carolina Research Authority.

He has been teaching at Clemson since 2006, starting as an assistant adjunct professor. Norfolk made the jump to full-time lecturer in 2014. He credited the Office of Teaching Effectiveness and Innovation with helping him improve his teaching.

Norfolk said what he likes best about teaching is the relationships with students and helping them find their directions in life.

“Before I joined the University, I was in the defense industry, and that fit really well for me because my dad was military and his dad was a World War II vet,” he said. “I really enjoyed feeling like I was helping and part of something important. I think teaching is the same way. I feel like I’m saving the world by training the best generation of engineers possible.”

Ewa Chukwu and Luis Morales are undertaking a thermocatalytic approach in the project entitled "Catalysis for Clean Manufacturing". Their research seeks to optimize the selective reduction of CO2 to value-added carbon-based chemicals as building blocks for various industrial processes. Also pictured is Lindsay Molina.

STUDENT RESEARCHERS IN CATALYSIS TO TACKLE GREENHOUSE GAS EMISSIONS AND TO PRODUCE CLEAN ENERGY

Four student researchers engaged in catalytic materials and reaction engineering research at Ming Yang's group have been recently recognized by the university and external funding agencies for their ongoing research work aiming to tackle climate change and harvest clean energy.

Luis Morales and John Yeager, junior undergraduate students, were recently accepted into Clemson's 2021 Summer Creative Inquiry program and given the accompanying Undergraduate Research Award (CI & UR Award). Morales and Yeager, through both thermocatalytic and electrocatalytic approaches, will investigate how chemical engineers can significantly cut CO_2 greenhouse gas emissions by turning the CO_2 into value-added products through cost-effective environmentally benign catalytic reactions.

Case Sandor, senior undergraduate student, is a recipient of the Undergraduate Student Award from South Carolina NASA Space Grant Consortium. The agency funded Sandor for 400 hours of research to develop catalytic materials and electrochemical reactors that can convert CO_2 in crew cabins into renewable fuels so as to empower deep space exploration. Sandor will also participate in outreach/public engagement activities during his award period enabling him to advocate for research and science to the general public.

Ewa Chukwu, a first-year international Ph.D. student, has been selected to participate in the Student Program at the 2021 ARPA-E Energy Innovation Summit sponsored by the US Department of Energy. The 2021 Student Program will include the top graduate-level students, an engaging panel discussion regarding possible careers in energy, a Meet & Greet to speak with energy industry representatives and many opportunities to learn about cutting-edge energy initiatives.

Congratulations to each student! Full speed ahead!

Case Sandor and John Yeagar are working on the project entitled "Catalysis for Carbon-Neutral space Exploration", to produce propulsion fuel molecules through cathode reactions and life-supply O2 through anode reactions in separated streams.

TERRI MCALLISTER ANNOUNCES RETIREMENT

The Department of Chemical and Biomolecular Engineering is wishing Terri McAllister a Happy Retirement! She is retiring July 9th, after nearly 12 years of dedicated service to our department. McAllister started in 2009 as the office manager and has been responsible for the day-to-day office operations of the department.

Over the years, her duties included keeping track of departmental financials, payroll, hiring students, faculty and staff, supervising the staff and student services, newsletters and related media, organizing special events and acting as a liaison to our alumni.

As far as events, she counts the 100th Anniversary of Chemical Engineering celebration on campus in 2017 as her greatest accomplishment, as well as the Clemson receptions she organized and hosted at the AIChE Annual Meetings held in San Francisco, Minneapolis, Pittsburgh and Orlando over the last several years. And she will always have a soft spot for Homecoming and Alumni Reunions she helped organize, in which she had the distinct privilege to meet many of our valued alumni and create lasting friendships.

Asked what she will miss most after she leaves Clemson, and she said "the people in this department."

"*The students in this department give me hope for the future, as they are so grounded and brilliant. I am also totally amazed and proud of our faculty. The lives they have touched with their knowledge and the cutting-edge research that goes on quietly and impactfully behind our doors in Earle Hall, which is second to none, will take this department far into the future. And last but not least, my best friends — the staff in this department; they are so dedicated and devoted to the students and faculty, as they work tirelessly to make the department a better and friendly place to be each day.*"

McAllister plans on using her extra time after retirement to travel with her husband, Bob, in their RV and touring the United States, as well as boating, hiking and golfing. She also hopes to be able to spend more time with her daughters and grandchildren.

When asked if she had any advice to leave us, she said "*smile — even if you are having a bad day. You never know how important that smile will be to the next person you meet and how it will impact your own day as well as theirs.*"

DEPARTMENT UPDATES

WE WELCOME ANDREW POLING, OUR NEW ACCOUNTANT

Our department is proud to welcome Andrew Poling to Clemson University as an accountant / fiscal analyst. Andrew has been working for Clemson since October 2020 as the accountant for Industrial Engineering and will split his time between the two departments.

Previously he worked for Tech 24 and the Colonnade Group. Poling earned a Bachelor's degree in Economics (2016) from Clemson University and a Master of Business Administration degree from Clemson University (2019).

Outside of work Andrew enjoys traveling, concerts, sports and hiking.

Congratulations to the CLASS OF 2021

Graduate Students

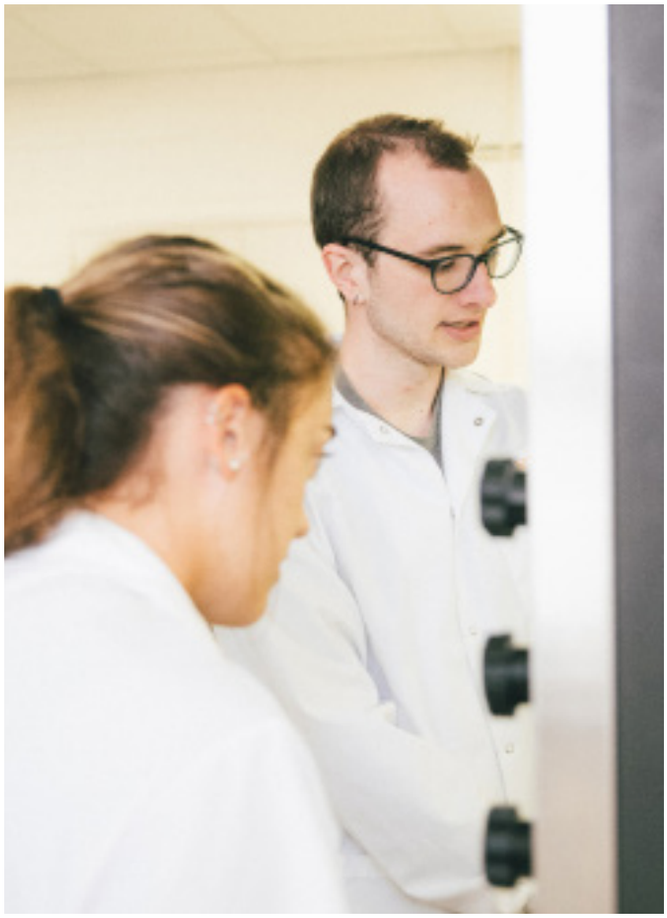
Ding, Junhuan, Ph.D.

Undergraduate Students

Amidon, Peyton M.
Andersen, Alexander M.
Arevalo, Kathleen
Barfield, Jacob W.
Beck, Camille R.
Brackett, Carson D.
Brown, Austin E.
Buchmann, Garrett E.
Burns, Jacob T.
Burr, Joshua A.
Cain, Nicholas D.
Chen, Miao
Chiles, Haley J.
Comport, Kimberley A.
Cook, Lauren E.
Criss, Holly C.
Crum, Celine E.
Epperson, Michael D.
Fletcher, Chase W.
Flores, Mallory M.
Franaszek, Nicole M.
Fratini, Christian
Freihofer, William
Garrett, Kyle C.
Giles, Jefferson T.
Gimena, Mikkel
Gladden, Eric
Griffith, Colt R.
Hansen, Magdalina S.
Hasenoehrl, Claire M.
Holder, Cory A.
Holmes, Matt
Humphries, Rebecca L.
Hutter, Samantha E.
Jackson, Coulter G.
Johnson, Kenetra K.
Johnson, Nicole G.
Jones, Elijah S.
Kelle, Rudolfs L.
Kullmann, Kevin R.
Lake, Emily M.
Laughlin, Frances C.
Lee, Alesandra J.
Levenkron, Marissa A.
Light, Weston S.
Liquois, Ray
Lopez, Steven R.
Martin, Calvin S.
McDaniel, Andrew T.
McElveen, Tyler L.
Messick, Lucas J.
Mika, Andrew A.
Miller, Emily T.
Mitchum, Camren A.
Miyasato, Evan A.
Montano-Munguia, Antonio
Nelson, Claire L.
O'Neal, Alton D.
Perri, Joshua
Quance, Garrett
Ramos Rodriguez, Jose E.
Robinson, Candace N.
Russell, Jarrett W.
Shealy, Jack E.
Singleton, Elizabeth C.
Spitz, Jessica S.
Steele, Jacob A.
Stokes, Devin B.
Stratton, Robert E.
Summer, Lea
Temples, Spencer C.
Turner, Donovan C.
Ward, Shayne F.
Waud, Emily
White, Brady A.
Williamson, Andrew

MARK PITMAN AWARDED SEED GRANT

Article written by undergraduate, Zoe McNelis



Mark Pitman is a third-year Ph.D. student in the Chemical and Biomolecular Engineering Department and works under the supervision of Jessica Larsen. Recently, Pitman was awarded an Early Exploration and Development (SEED) grant from Clemson University to support his research efforts. These grants are awarded to students to support the initiation of a new research project or fund the completion of a project. In Pitman's case, the award will allow him to begin a new research project focused on advanced biomaterials.

The project Pitman proposed involves developing polymer biomaterials with desirable properties that can help reduce nerve degeneration caused by spinal injuries. There are a wide variety of biomaterials that have been used for this purpose, but to-date they have largely been designed with specific key functions in mind, but failed to address other physical properties important to the function of the biomaterial.

This is why Pitman wants to observe different types of biomaterials used to treat spinal injuries beyond the qualities of the materials themselves and look into how they operate in the human body. By picking single target qualities, prior studies ignored other interactions between the body and the treatment materials. Furthermore, there are also issues of people not applying some of the basic principles of both biology and material science to these interactions, which adds another layer of difficulty to the issue.

Pitman was thankful to receive this grant and be given the opportunity to pursue this project. As this is a developing branch of research in the Larsen lab, Pitman decided to apply for the grant so he and his colleagues could purchase the necessary equipment to study these materials. This was an amazing and reassuring experience for Pitman to have his idea recognized as worthy of pursuing and a beneficial addition to his research.

JAMES FOSTER EARNS INNOVATION AWARD

James Foster earned the Innovations in Nuclear Technology R&D Award presented by the DOE's Office of Nuclear Energy and West Texas A&M University. He won the award for publishers from universities who make less than $600 million in R&D expenditures for his paper titled "Functionalized polymer thin films for plutonium capture and isotopic screening from aqueous sources."

The award is a $1500 personal cash prize Foster plans to utilize for educational expenses and recognition in their newsletter.

ChemE Learning Assistance Workshops

In the Fall of 2020, three students from the Chemical Engineering Graduate Student Organization (CEGSO) initiated a free tutoring service called 'ChemE Learning Assistance Workshops' (CLAWs). As envisioned by Dyllan Rives, Zachariah Pittman and Varun Gopal, the goal of this program was to make educational assistance available virtually for 3rd grade-12th grade students across the state whose educational progress may have been hampered by the COVID-19 pandemic.

In the spring of 2021, tutoring sessions were held every Tuesday and Thursday from 5-7 p.m. EST.

Students received assistance for a wide variety of subjects, including, but not limited to, science and mathematics. To date, the program has helped assist seven students from the contributions of eight tutors for a total of 86 hours of tutoring.

The tutoring experience has been rewarding for CEGSO members, while working towards filling education gaps for multiple students. CEGSO predicts this program will be of value during the summer and the next academic year and plans to continue its efforts.

The program organizers will then provide additional details regarding registration. The program was initiated through CEGSO's Outreach Program with guidance from Eric Davis.

STAR MODEL VIDEO CONTEST WINNERS

ChBE students, all sponsored by Scott Husson, participated and placed in the STAR Model Video Contest hosted by the Rutland Institute. The goal of the videos were to introduce and explain the STAR Decision-Making Model. Students' videos were required to walk the audience through every step of the model and include relatable examples for their fellow college students. Cash prizes were awarded to the top 3 videos and the sponsoring faculty who prompted the contest to those students or teams.

The goal of the Rutland Institute for Ethics is to "encourage discussion on campus, in business and in the community about how ethical decision-making can be the basis of both personal and professional success."

1st place
Evan Miyasato, Senior

2nd place
Claire Hasenoehrl, Senior

3rd place
Will Burnette, Senior

GRADUATE STUDENT AWARDS

OUTSTANDING GRADUATE RESEARCHER AWARD

Ph.D. student, Xiaohong Zhang was selected as the 2021 Outstanding Graduate Researcher Award recipient from College of Engineering, Computing and Applied Sciences (CECAS). Each year, this award is given to a graduate researcher who has excelled at conducting and disseminating the results of their research. The winner is selected by a faculty committee with members from every department in the college.

Advised by Rachel Getman, Zhang conducted computational research on catalytic phenomena that occur at liquid-solid interfaces. She developed a multiscale sampling method for calculating the free energy of adsorbed species at liquid/solid interfaces. This new method leverages both computational accuracy and cost. She also developed a method for modeling the rate of diffusion of catalytic species as well as their adsorption to solid catalyst surfaces, providing quantitative information for these processes that can be used to develop kinetic models for more complex reaction systems.

Zhang also defended her dissertation in May and accepted a position as a data scientist at Analytics IQ in Atlanta in July.

Honorable Mention Graduate Researcher Award

Sagar Kanhere

Advised by Amod Ogale, Sagar Kanhere has worked on several research projects during his time here at Clemson. He is credited with numerous publications and has also presented at multiple international conferences.

In addition to his experience as a researcher, Kanhere is known as a 'go-to' leader by his research team and peers.

GRADUATE SYMPOSIUM AWARDS

1st Place Poster Presentation

Caleb Arp

"Inferring Effective Interphase Properties in Composites Reinforced with Randomly Distributed Spherical Particles"

2nd Place Poster Presentation

Nicholas Gregorich

"Elucidating the Network Structure and Transport Properties of Lignin-Poly(vinyl alcohol) Composites Hydrogels Containing Fractionated Lignins"

Ph.D. Students, Nicholas Gregorich and Molli Garifo

FIRST EVER VIRTUAL GRADUATE SYMPOSIUM

The department graduate symposium occurred on April 13 of this year after not having a symposium in 2020 due to the pandemic. Planning a research symposium was a major hurdle for Nick Gregorich, Molli Garifo and Mark Pitman. The CEGSO board devised an idea to utilize Google Sites for displaying the posters virtually. These personalized Google Sites allowed students to upload a poster, abstract and photo of themselves to the internet in an easy to view format. In an effort to virtually mirror an in-person poster symposium, the students sat in individual zoom rooms for a virtual question and answer period while faculty and students could jump from room to room and view the students with their posters.

Zoom links were set up for each person so judges were able to enter a Zoom call and discuss the students' posters with them. A Google Form was also set up for the judges to input their scoring. For the oral presentations, there was one Zoom link every participant was able to join and give their presentation. The symposium was an overall success.

The department would like to extend our thanks to our Ph.D. students for their leadership as well as the graduate student coordinator, Diana Stamey. We would also like to thank the faculty members who dedicated their time to serve as judges for the event.

2nd Place Poster Presentation

Graham Tindall

"Purification and Fractionation of Hybrid Poplar Lignin Using Aqueous Ethanol Solutions"

1st Place Oral Presentation

Molly Wintenberg

"Effects of Low Dose Ionizing Radiation on Microorganisms for Creating Inconspicuous Biosensors"

2nd Place Oral Presentation

Jiarun Zhou

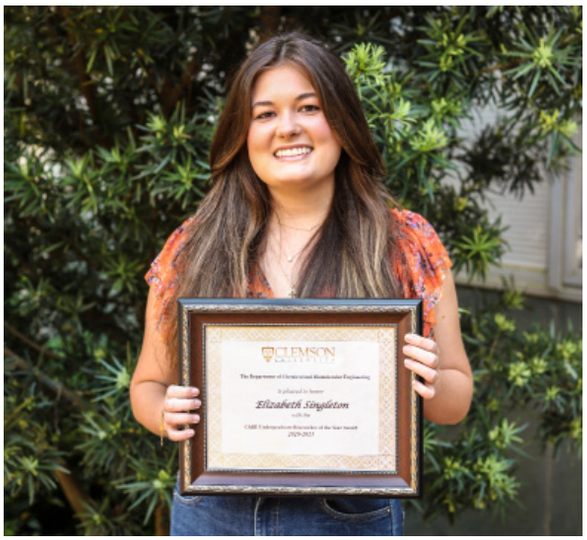
"Investigating the effect of water on the various surface adsorption sites of the multivalent ions"

3rd Place Oral Presentation

James Foster

"Development of Functionalized Ultrafiltration Membranes for the Capture and Isotopic Screening of Plutonium in Water"

UNDERGRADUATE STUDENT AWARDS



OUTSTANDING UNDERGRADUATE RESEARCHER OF THE YEAR

Elizabeth Singleton, a spring graduate, was voted as the Outstanding Undergraduate Researcher of the Year by our faculty based on her recommendation from Jessica Larsen.

Elizabeth conducted research persistently during her time at Clemson to develop novel CT imaging agents and led her team in animal studies to test out the applicability of that nanoparticle system. She has been a part of two funded proposals and wrote a research article based on those results. She was a very active team member on Jessica Larsen's research team.

CHBE OUTSTANDING SENIORS OF THE YEAR

Kathleen Arevalo and Spencer Temples, both spring graduates, tied as this year's Outstanding Seniors.

Kathleen Arevalo has maintained a high level of academic achievement during her time at Clemson. In 2019, she had been named the Outstanding Junior of the Year.

Spencer Temples was nominated by Mark Thies and was highly praised as an undergraduate researcher and high-achieving student.

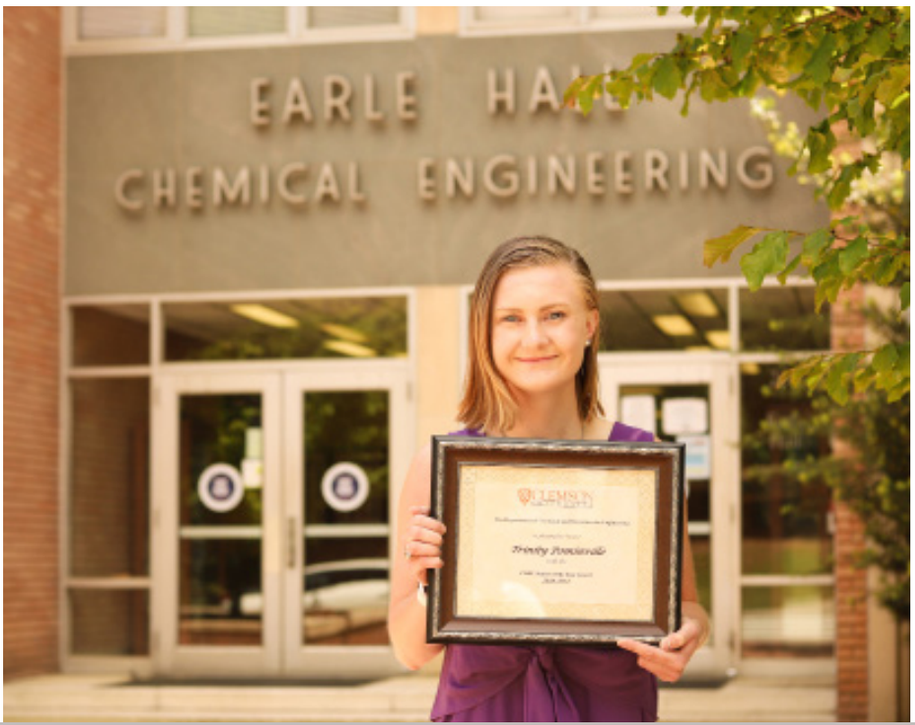
CHBE OUTSTANDING JUNIOR

Trinity Pominville was selected as the Departmental Outstanding Junior of the Year.

She was selected for this award for her academic achievement by upholding the highest scholastic average in her class.

Pominville is also the recipient of the 2021 Intel SWE Undergraduate Scholarship for the 2021-2022 academic year. Over 1500 applications were reviewed for the $5,000 scholarship.

"I am beyond honored and grateful for the Society of Women Engineering selection. This organization and the Clemson chapter have shown me the incredible value in the community of women who are engineers and the true privilege of being a woman in the engineering field," Pominville shared.



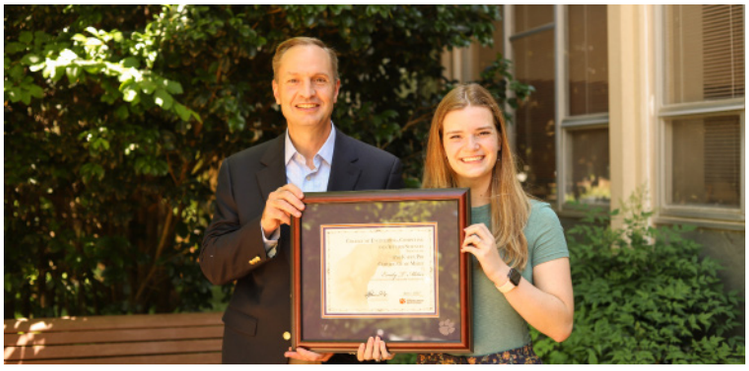
SENIOR AWARDED PHI KAPPA PHI CERTIFICATE OF MERIT

Emily Miller, a May ChBE graduate, received both this year's Phi Kappa Phi Certificate of Merit and the Western S.C. Section AIChE Scholastic Achievement Award.

In order to receive the Phi Kappa Phi Certificate of Merit, the student must be a graduating senior with a GPA of 3.4 or above and have made noteworthy contributions in areas such as leadership, service and creative endeavors to his or her department, college and Clemson University.

Miller has shown her devotion to leadership and service with her involvement in Engineers Without Borders for four years, her participation in the Eureka program and Creative Inquiry. She has also earned departmental honors.

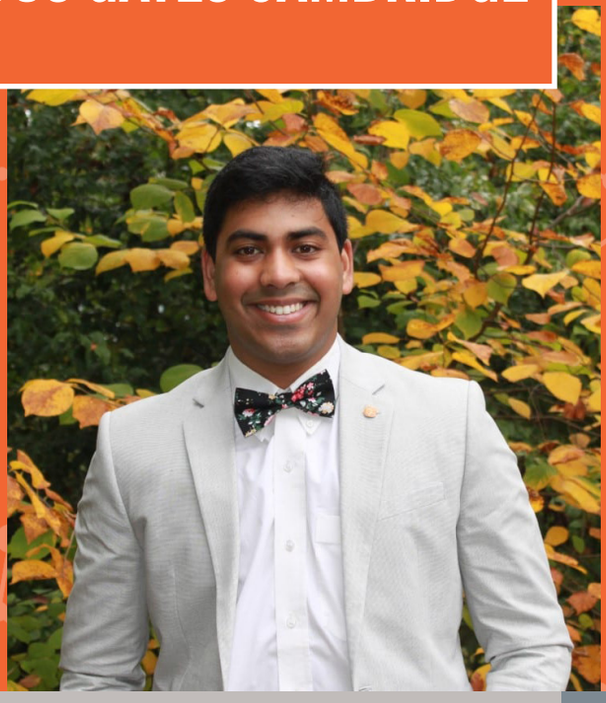
When Emily was notified she had been selected for this honor, she had this to say —



"To be honest, I was very surprised when I found out I was selected for this award.It feels like just yesterday that I was a freshman sitting in CHE 1300 trying to wrap my head around recycle loops and purge streams! To me this award not only reflects my hard work, but also the time and effort the ChBE faculty and staff have invested in me over the past four years. I am incredibly grateful for all of the advice and encouragement (and coffee) that has helped me realize my full potential, inside and outside of the classroom."

CLEMSON SENIOR WINS PRESTIGIOUS GATES CAMBRIDGE SCHOLARSHIP

For the first time ever, a Clemson University student has been named a Gates Cambridge Scholar, one of only 24 chosen nationwide for the prestigious postgraduate award.



Venkata "Anish" Chaluvadi, an Honors College senior majoring in materials science and engineering, was chosen for his academic accomplishments as well as his leadership and commitment to improve the lives of others.

Chaluvadi has been a member of Rachel Getman's research group for the past four years. Getman describes Chaluvadi as being a student who "is able to bridge the communication gap between materials scientists and chemical engineers, as well as between experimentalists and computationalists."

Read more about Chaluvadi's amazing accomplishment by visiting Clemson News at **news.clemson.edu**.

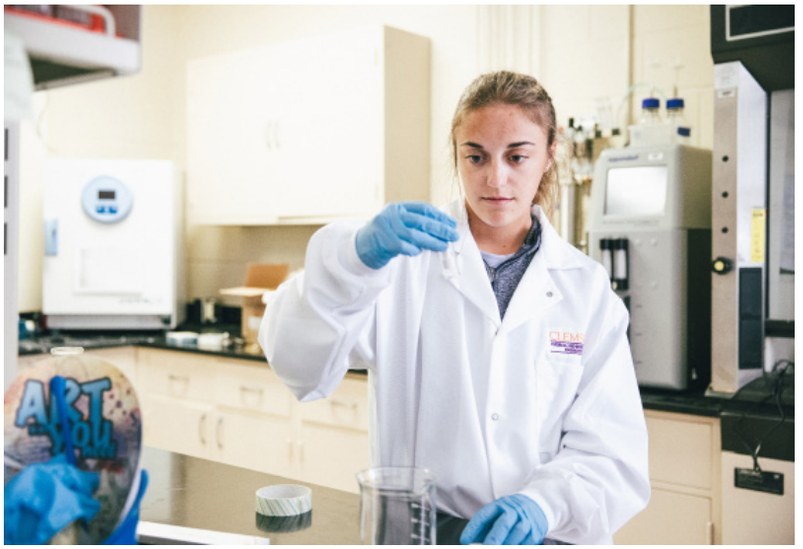
WHAT ARE OUR UNDERGRADUATES WORKING ON THIS SUMMER?

LARSEN'S LAB — GRACE ANDERSON

Grace Anderson, a junior undergraduate researcher for Jessica Larsen, is working on an SC BioCRAFT funded project this summer. The overarching goal of Anderson's project is to improve the current standard of care for brain tumors.

Cancerous cells left adjacent to the removed tumor account for 96% of recurrent tumors, providing motivation for immediate local drug delivery to that area while helping the tissue to heal. Preventing tumor resurgence and healing the brain tissue post-surgery can be performed simultaneously using thermally responsive hydrogels.

Anderson is working to create polymers that are liquid at room temperature and gel up at body temperature, encapsulating and delivering a drug slowly over time.



DAVIS'S LAB — JADEN STUTTS and ALANA LESUER

This summer, undergraduate researchers Jaden Stutts and Alana LeSuer are working in Prof. Davis's lab on highly interdisciplinary projects encompassing polymer science, energy storage and delivery and membrane-based aqueous separations.

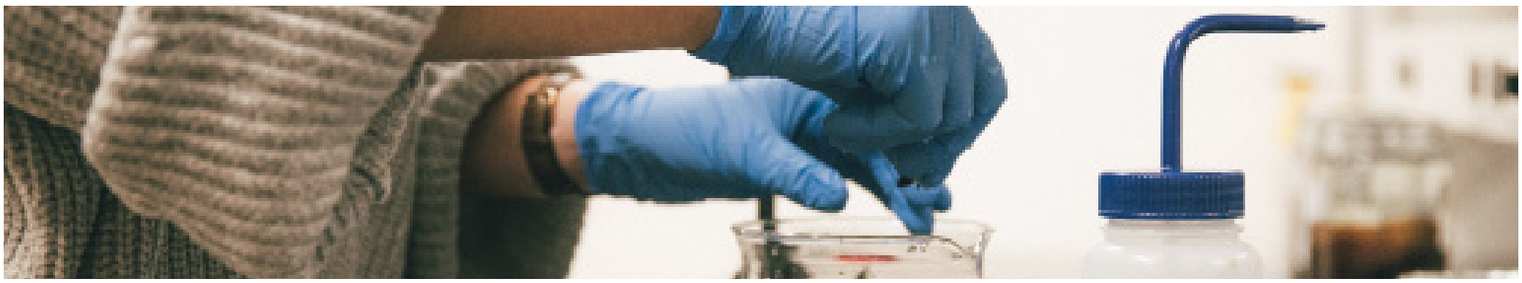
Stutts, a rising Junior who joined the lab in Spring 2020, is currently working towards completing her Departmental Honors Thesis on a project centered around the fabrication and characterization of poly(hydroxyethylmethacrylate) (pHEMA) and lignin soft composites (i.e., composite hydrogels), which have potential applications in biotechnologies such as wound dressing and drug delivery.

While prevalent in biomedical research, hydrogels comprised primarily of pHEMA are not mechanically robust and suffer from degradation issues, limiting their implementation in many applications. With the introduction of lignin, an abundant biopolymer that is a byproduct of the pulp and paper industry, they are able to tune both the mechanical and transport properties of the soft composites, creating materials with tailored functionality. Along with altering various synthesis parameters, Stutts will also investigate how the properties of the composite hydrogels change depending on the source of the lignin — e.g., hardwood or softwood.

LeSuer, a rising Senior in the program, is working with graduate student, Xueting Wang, in Prof. Davis's lab on a project involving ionomer (i.e., polymers containing a fixed charge along the backbone) nanocomposites for use in vanadium redox flow batteries. Redox flow batteries, which can be thought of as large car batteries, have emerged as a promising electrical grid-scale energy storage technology due to their scalability.

However, the current state-of-the-art ionomer used to separate the liquid electrolytes in the battery suffers from issues related to electrolyte crossover, reducing the efficiency and lifetime of the battery. To address this issue, LeSuer will work to fabricate and characterize ionomers containing functionalized nanoparticles that have shown promise at addressing issues related to electrolyte crossover without compromising the attractive properties of these ionomer membranes.

Specifically, LeSuer will be synthesizing sulfonated poly(ether ether ketone) membranes containing silica nanoparticles with a wide range of surface functionalities. By varying the concentration and surface functionalization of the nanoparticles, the ion transport properties of the membranes can be significantly altered, ultimately leading to membranes with better performance properties than the current benchmark ionomers.



Both Stutt's and LeSuer's work are funded by a summer research grant through the Clemson University Creative Inquiry Program, as well as through an external grant from the Materials Assembly and Design Excellence in South Carolina (MADE in SC) Program titled, "*Closing the Gap of Underrepresented Minorities and Women in Polymer-Related Research*".

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