

SPRING/
SUMMER
2017

CLEMSON[®]

CHEMICAL AND BIOMOLECULAR ENGINEERING

Dr. Rachel Getman Promoted to Associate Professor



Dr. Rachel Getman was recently promoted to **Associate Professor with Tenure** at Clemson. This is an important milestone for the Department of Chemical and Biomolecular Engineering, as she is the first female faculty member to receive tenure in the department, and we expect many more to follow in her footsteps.

In the science, technology, engineering, and math fields at universities across the nation, women are generally underrepresented, and Clemson is no exception. To address this issue, Clemson sought and received a **\$3.4 million grant from the National Science Foundation titled "ADVANCE: Increasing Participation and Advancement of Women in Academic Science and Engineering Careers.** With help from this grant and other initiatives, Clemson hopes to increase and retain the number of women and minority faculty members in science and technology fields.

Professor Getman has been a wonderful testament to the value and impact that women and minorities can have in the STEM fields. Since joining the Chemical and Biomolecular Engineering Department, Professor Getman has been awarded over a million dollars in research grants from the Department of Energy (EFRC) and the National Science Foundation (DMREF). Within this past year, she received the National Science Foundation Early CAREER Faculty Award and the College of Engineering and Science Dean's Faculty Fellow Award. Getman is the Area Chair of the Catalysis Division of the American Institute of Chemical Engineers, and organized 43 oral presentation sessions at the annual meeting in San Francisco last Fall. She acts as a mentor to all her students, which has resulted in several of them either authoring or being acknowledged in journal articles about their research.



Congratulations again to Dr. Rachel Getman for her promotion to Associate Professor with Tenure in the Department of Chemical and Biomolecular Engineering at Clemson. We are excited about your tenure and look forward to your future contributions to the world of engineering and science!

Dr. Sapna Sarupria Receives National Science Foundation CAREER Award

Assistant Professor Sapna Sarupria is leading a five-year project focused on using state-of-the-art molecular modeling and computer science techniques to develop new ways of preserving food, studying climate, cryopreserving organs and protecting crops. Sarupria hopes to accomplish this with a **\$503,773 CAREER award from the National Science Foundation.**



She and her team want to know more about how freezing occurs if they were able to zoom in and observe one molecule at a time. The focus will be on the "birth" of the solid phase, known as nucleation, Sarupria said.

Sarupria expects her research will begin laying the groundwork for new materials that could be added to water so that ice will grow at a specified rate and temperature. What makes her approach unique is that she will be using specialized software her team developed and Clemson's computing power to speed up sampling by more than a factor of 20. Her approach narrows down the options to the most promising materials, which can then be tested in a lab. Physically testing each possible material would take much longer and cost more.

"One approach includes using ice nucleating proteins to induce ice formation at higher temperatures, thereby reducing operating costs," she said. Sarupria's research involves collaboration with Clemson's computer science experts, allowing her team to work more efficiently. "That allows us to do more with less manpower and computer time," she said.



Also as part of the grant, Sarupria is developing new educational platforms aimed at teaching high school students, undergraduates and graduate students about materials engineering, computational materials science and working in multidisciplinary teams.

Written by Paul Alongi

MESSAGE FROM THE CHAIR



Greetings from the Chemical and Biomolecular Engineering Department at Clemson University. As Interim Chair of ChBE, I am excited to share with you some highlights from this past academic year. The year began with a reorganization of the departments on campus, leading to ChBE becoming a key member of the College of Engineering, Computing and Applied Sciences. Soon thereafter, Prof. Doug Hirt, former chair of ChBE, was appointed Associate Dean for Research in CECAS. I am also proud to announce that Dr. Rachel Getman was recently awarded tenure and promoted to the rank of Associate Professor, making her the first female faculty member (of many to come) to be awarded tenure in ChBE. Additionally, Dr. Sapna Sarupria received the highly prestigious CAREER Award from the National Science Foundation for her research related to ice nucleation, which could lead to advances in food preservation, climate prediction, crop protection, and the cryopreservation of human organs.

Our students have also made great strides this past year. A total of 76 seniors graduated with a B.S. degree in Chemical Engineering. Their ever-expanding set of experiences included study abroad, industrial work experience, and a host of athletic, musical, religious, and community outreach activities. Almost 20% of the seniors chose to take courses in Europe, most taking the Unit Operations Lab course offered at the University of Vienna, whereas others studied engineering and language in Germany. Over half of the seniors chose to get real-world engineering work experience during their time in school, 25% as co-op students and the balance as industrial interns. Still others chose to conduct undergraduate research with ChBE faculty. It is wonderful to see these students take advantage of opportunities to apply their coursework in an industrial setting before they graduate, making them even more valuable to companies upon graduation.

Not to be outdone, our graduate students have achieved incredible success this past year, and they have been active in a host of research, teaching, and educational outreach activities. Dr. Adam Klett, who graduated this past spring, received the CECAS and Clemson University Outstanding Graduate Researcher Awards for his work on lignin purification techniques, and Dr. Christine Duval, another spring graduate, received the AIChE Separations Division Graduate Student Research Award and will be joining the Chemical and Biomolecular Engineering faculty at Case Western Reserve University in the fall. I was equally happy to see many of our graduate students actively involved with the many exciting STEM educational programs offered by ChBE and other Clemson faculty. The ChBE graduate students and faculty have organized numerous STEM events for the Boy Scouts and Girl Scouts and are busy this summer offering hands-on lab experiences for over sixty girls attending the summer educational programs offered by the Women in Science and Engineering (WISE) program at Clemson.

Though this year had many highlights, next year may prove to be even more exciting. This coming fall the ChBE department will be celebrating 100 years of chemical engineering at Clemson University. We have several alumni and research events planned for November 9th, including the inaugural Dan Edie Research Lecture. We also are enthusiastic about two new faculty joining the ChBE department. Dr. Marc Birtwistle (currently at Mt. Sinai Medical Univ., B.S. Georgia Tech, Ph.D. U. Delaware) will be joining us this summer as an Associate Professor, and Dr. Jessica Kelly (B.S. U. Virginia, Ph.D. Auburn) will start later this fall as a new Assistant Professor. They both plan to continue their highly successful research focused on the development of enhanced therapies for treating brain cancer.

Throughout this year, I have had the great privilege to meet with many of our outstanding alumni and am grateful for their continued support of the ChBE department. Their support of the ChBE department has taken many forms. Some have served on our Advisory Board, others made generous financial gifts, and some were key decision makers in helping our new graduates find full time positions in industry. All of these efforts are sincerely appreciated, and we hope to celebrate them later this fall at the 100th celebration.

Best Wishes,
David

AICHE HOSTS ALUMNI PANEL



On March 8th, Clemson AIChE hosted a panel of Chemical Engineering alumni from various industries and career paths - ranging from Law, to Design, to Sales. These accomplished alumni provided undergraduates valuable insights on the real world, and described the numerous benefits provided by a Clemson Chemical Engineering degree.

Featured were Doug Haugh (Mansfield Energy), Anand Patel (Dority and Manning), Craig Sandstrom (Fluor), David Carmichael (Jacobs), Rick Sweeney (Fluor), Jeffrey DiMaio (Tetramer), and Nina Breakiron (Tetramer).



FOCUS ON ALUMNI



Few Clemson University alumni illustrate the global impact engineers have on the world as well as **Suzanne Roat**. She also happens to be a shining example of how a successful alumna can make a positive impact on their alma mater and future engineers. Her 26-year career as a chemical engineer working with oil refinery processes has taken her around the nation and world.

Roat could have forgotten Clemson, where she earned a bachelors of science in 1985. Instead, she is turning and giving back to her alma mater. Roat joined the Dean's Leadership Circle in 2014 and strategically used matching gifts to double the impact of her contributions. She co-hosted a dean's reception that same year in Houston, where she currently lives, and has made arrangements in her estate to create an endowed scholarship for engineering students in the Calhoun Honors College.

"I feel like I'm paying it forward," she said. "I was successful thanks to Clemson and the University of Tennessee, so I'm going to make sure other people are successful. I give my funds to use at the dean's discretion, and he tells me once in a while what he's doing with the funds. I'm pleased with the outcome. It's helping students who need help. They're good students but may not be financially well equipped."

Roat is now based in Houston as crude and refining strategy analyst for Chevron Downstream and Chemicals. She said that her undergraduate experience at Clemson prepared her to continue her education at the University of Tennessee, where she earned a master's degree and doctorate. All of her degrees are in chemical engineering. Roat said that one of the valuable lessons she learned at Clemson is that nobody works alone. In Unit Operations Lab, the students had to work as a team with their grades dependent on each other.

2012 alum **Ben Huffer** recently reached out to the ChBE faculty to share his current position:

"After my B.S. in Chemical Engineering from the department in 2012, I started working towards my M.S. in Nuclear Environmental Engineering which led me to my current position in Design Engineering at Savannah River Nuclear Solutions (SRNS) - the major contractor at Savannah River Site in Aiken, SC.

I wrote a term paper about the future of fusion energy in one of my graduate classes, and never would have thought I would get the opportunity to be part of such a ground-breaking international project. We just finished successfully defending the preliminary design of the Tritium Exhaust Processing (TEP) system we're working on as a part of the project - a key milestone that's been ongoing for several years.

I grabbed everyone's email currently on the faculty/staff web page who influenced me at some point during my undergraduate studies. I'm sure there were several others - some gone, etc. so feel free to share. I wanted to reach out and thank everyone for their contributions over the years and wanted to let each of you know that every once in a while one of those questionable blind squirrels who barely made it out above a 3.0 GPA is able to make a difference. This was partly in fact due to the strength of the Clemson Chemical Engineering program (FYI - my graduate Nuclear Physics classes went by with much less effort when compared to some of my undergraduate ones).

Anyway, thanks again for everything. Figured it was worth a share as my time at Clemson was invaluable. I attached a picture of the site in its current status - probably the world's biggest jigsaw puzzle. SRNS is always hiring and is competitive, so keep an eye out for us at the job fairs."



Go Tigers.
Best Regards, Ben

CLASS REUNIONS



Members of the Chemical Engineering Class of 1967 visited and toured Earle Hall in honor of their 50th Class Reunion. Pictured are Lee Bowen and Fred Ayer. Happy 50th, Class of 1967!

In May, the Class of 1963 toured the Clemson University International Center for Automotive Research (CUICAR) facility during their recent reunion. Below are Wade Ponder, Jerry Richardson, and Jim Rushton.



STAFF AND FACULTY HIGHLIGHTS

Dr. Joseph Scott recently won the **Automatica Paper Prize**, awarded by the **International Federation of Automatic Control (IFAC)**.

Automatica is a very prestigious journal in the field of automatic control, and the Automatica Paper Prize is considered to be the top “best paper” award in the field. The prize is awarded to papers that demonstrate profound contributions to control engineering or control science. Dr. Scott’s winning paper is titled “**Constrained zonotopes: A new tool for set-based estimation and fault detection.**”



President Jim Clements recognized **Bill Coburn** after graduating from the **Clemson University Staff Development Program**. Bill has completed over 150 contact hours of core curriculum study, professional development, personal development, and service activities.



Professor Amod Ogale, Professor Chris Kitchens, and staff member Diana Stamey were given a **certificate and pin** by the state of South Carolina and President Jim Clements for their many years of service.

Dr. Ogale, Dow Chemical Professor and Director of Center for Advanced Engineering Fibers & Films (CAEFF), has served on the Chemical Engineering faculty for thirty years, with a focus on processing-microstructure-property relationships of carbon fibers, polymers, and composites.



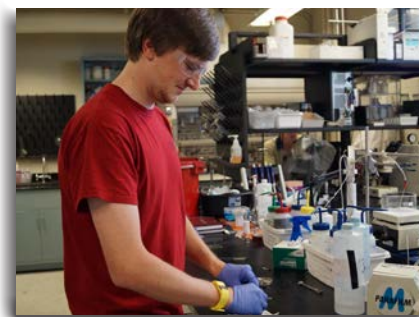
Dr. Kitchens, Associate Professor, was recognized for his ten years of service. His research interests include Nanotechnology, Surface Science, and Advanced Materials.

Diana Stamey has been a loyal member of the ChBE and CAEFF departments for thirty years. She is currently our Graduate Student Services Coordinator and Administrative Assistant.

STUDENT HIGHLIGHTS

ChBE graduate student **Robert Emmett** was awarded a scholarship by the **Science, Mathematics, and Research for Transformation (SMART) Scholarship-for-Service Program**. This prestigious award pays him a generous annual stipend along with his tuition and fees.

Bobby was assigned to the U.S. Army Communications-Electronics Research Center in Aberdeen Proving Ground, Maryland, and will have the opportunity to complete a summer internship there along with employment following completion of the program. The SMART Scholarship for Service Program allows undergraduates and graduates pursuing a degree in Science, Technology, Engineering, or Mathematics a full scholarship and employment opportunity. The goal of the SMART Program is to increase the amount of scientists and engineers in the United States Department of Defense. Candidates must demonstrate hard work and dedication to both theoretical and applied research, and the award is very selective. Last year, only twelve percent of applicants were awarded, the final number of awardees being 239. The average GPA among these 239 scholars was a 3.7.



The **Outstanding Graduate Researcher Award** is an award given to one graduate researcher across the entire University who has been recognized by faculty for having conducted exceptional research during the school year. This year’s recipient was ChBE graduate student **Adam Klett**. Adam’s work focused on the purification and fractionation of a biopolymer known as lignin for high-value applications such as carbon fibers and composites. His accomplishments include a patent-pending process to purify lignin byproducts to ppm levels of impurities while simultaneously fractionating the lignin into distinct molecular-weight fractions. He also developed a new technique utilizing electrochemical impedance spectroscopy to measure the phase-transition temperature of the polymer-solvent solution. His work resulted in a patent application, a book chapter, and multiple peer-reviewed publications. During his time as Clemson, Adam was also involved with the leadership of the Chemical Engineering Graduate Student Organization (CEGSO) and department outreach events.

STUDENT HIGHLIGHTS



Graduate student **Steven Weinman** won first place for his **GRADS** poster for the College of Engineering, Computing, and Applied Sciences. GRADS is a research poster exhibition showcasing innovative and outstanding works by Clemson's graduate students.

Jessica Zielinski was one of the winners of the **Goldwater Scholarship for 2017**. This is the premiere undergraduate award in the fields of mathematics, natural sciences and engineering. Zielinski will receive a one-year scholarship that will cover the cost of tuition, fees, books and room and board up to a maximum of \$7,500.



Lauren Gambill and Erika Arvay, two undergraduate students, were honored this Spring by the **National Science Foundation Research Fellowship Program**. Gambill was awarded and Arvay received an honorable mention.

The NSF Graduate Research Fellowship Program recognizes outstanding graduate students in NSF-supported science, technology, engineering, and mathematics fields who are pursuing research-based degrees.



Kaitlyn Scola was a semifinalist for the **Fulbright Fellowship Scholarship**. The Fulbright U.S. Student Program provides grants for scholars to live and study abroad on individually designed research projects or working as English teaching assistants. Scola proposed to conduct research in Germany on how small RNAs control pathogenesis in *Streptococcus pyogenes*.

Departmental Awards



Western S.C. Section AIChE Scholastic Achievement Award
Brandon Alverson

ChBE Senior of the Year Award
Zach McGill

ChBE Junior of the Year Award
Sallye Gathmann

Western S.C. Section AIChE Section Scholarship
Olivia Layman

AIChE Donald F. Othmer Sophomore Excellence Award
Taylor Johnson

Outstanding ChBE Graduate Researcher of the Year Award
Murtaza Shabbir-Hussain

Outstanding ChBE Graduate Teaching Assistant of the Year Award
Allison Yaguchi



Senior Chemical Engineering Major **Crystal Pee** won the **Jacquelyn Willis Anthony Award** for 2017. The award is presented to a student for distinguished service to PEER, the support network for minority students in the College of Engineering, Computing, and Applied Sciences. Crystal has been an active member of PEER since her freshman year, and this past year took on the duties of a PEER mentor.

Roque Gochez placed second in the 12th Annual **MRS and OSA Materials and Optics Poster Competition** with the poster "Magnesium Oxide: Kinetics of formation and Water Stability Enhancement."



The competition took place on March 16th.

Matthew Brabender has received a **NASA SC Space Grant Undergraduate Research Fellowship** as well as a **NASA Center Internship**. Brabender is an Undergraduate Research Assistant with Mark Blenner's research group.



Highest Freshman GPA at this year's Clemson Football Banquet. We are proud to have him as a part of our ChBE academic team, and we can't wait to see more of him in the classroom and on the field.

The Clemson Tigers won the Football National Championship after an incredible 2016 season. The team also placed second in the academic ranking of the top 25 college football teams in Time Magazine. **Carson King** knows what it took to get the Clemson Tigers to the top, as he is balancing both the workload of a chemical engineering degree and football. Carson was awarded the



ChBE graduate student **Christine Duval's** TED talk session entitled "**Rapid Fire Session: TED-sep Separations Division**" (which she presented at the Annual AIChE Meeting in San Francisco last November) was recently identified as the "**Best Paper**" in the session. She is now invited to submit a manuscript in the AIChE Journal.

CLASS OF 2017



The Chemical and Biomolecular Engineering Department would like to congratulate the Senior Class of 2017. We wish all of our graduates the best of luck in their future endeavors!



2017 Graduation Candidates - Bachelor of Science Degree in Chemical Engineering

Kevin A. Agosto	Nicholas M. Finch	Tu D. Nguyen
Brandon E. Alverson	Jordan A. Gamble	Abigail L. Nolen
Tyler E. Amos	Neil A. Gamble	Neal J. O'Sullivan
Erika C. Arvay	Ivan E. Getov	Adam W. Parler
Angela M. Bark	Alva G. Godfrey	Shanna L. Pearce
Matthew P. Barkal	Brendan M. Goetz	Elizabeth L. Price
Luke V. Bauer	Jonathan M. Gutierre	Mark C. Rasmussen
Matthew C. Bell	Zachary A. Haddock	Joseph S. Redzikowski
Beau C. Bennett	Eric B. Hair	Matthew T. Reeves
Julia C. Borglin	Zachary M. Hegarty	Cody L. Ruff
Savannah N. Bowman	Danna D. Herring	Ethan J. Ruff
Matthew D. Bryson	Austin Holder	Sangte Sang
Hussain Bukhari	Joshua J. Hollaway	Joseph R. Scarborough
David G. Burchfiel	Danielle K. Jacobs	Jansen O. Simmons
Ty Chin	Kyle C. Kwargsick	Sean A. Stewart
Eric M. Chrisler	Tori Laird	Jennings G. Stroud
Liam Christ	Jacob A. Lass	Noah E. Thompson
Stephen R. Cotty	Filip R. Leszczynski	Eliana Toro
Rebecca T. Demarco	Taryn N. Lorey	Thomas J. Vreeland
S. Nicole Demass	Madison L. Luker	Brenna C. Westbrook
Michael W. Dickinson	Zach McGill	Ashley E. Williams
James E. Dority	Shannon M. Mulkern	Meredith B. Williamson
Shelby M. Ewart	Christine M. Mullan	Owen J. Wilson
Daniel K. Faison	David D. Nasol	Tyler D. Wiseman



PHD GRADUATES



Dr. Adam Klett

Dissertation:
**"Purification,
 Fractionation, and
 Characterization of
 Lignin from Kraft
 Black Liquor for Use
 As a Renewable
 Biomaterial"**
 Advisor: Dr. Mark Thies



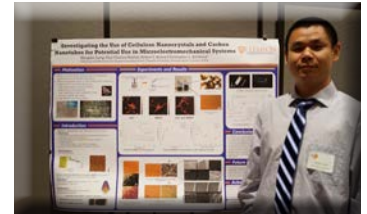
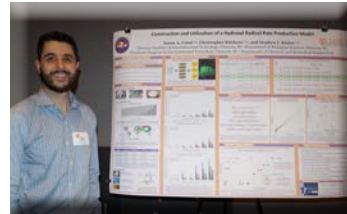
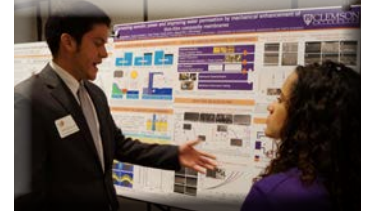
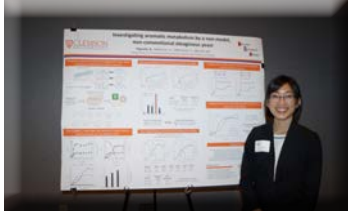
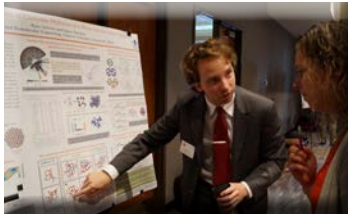
Dr. Christine Duval

Dissertation: **"Uranium-
 Selective Adsorbent
 Materials for
 Environmental Radiation
 Sensing"**
 Advisor: Dr. Scott Husson
 Current Position:
 Assistant Professor in the
 Department of Chemical
 and Biomolecular
 Engineering at Case
 Western Reserve University

ChBE GRADUATE RESEARCH SYMPOSIUM

ChBE held its annual **Graduate Research Symposium** at the Madren Center on March 5th. Our graduate students were able to share their research with their peers through poster sessions and oral presentations. Winners were:

- Ryan Defever (Best Poster)
- Allison Yaguchi (Best Poster)
- Murri Shabbir-Hussain (Best Presentation)
- Steven Weinman (Best Presentation)
- Jason Coral (Honorable Mention Poster)
- Mingzhe Jiang (Honorable Mention Poster)
- Jaime Idarraga-Mora (Honorable Mention Poster)
- Roque Gochez (Honorable Mention Presentation)



ChBE COMMUNITY OUTREACH



WISE Girl Scouts Day

Girl Scouts Day was sponsored by Lockheed Martin and hosted in collaboration with WISE and the Girl Scouts of the Midlands. This event is held annually during Engineers Week as a way to expose young middle school aged Scouts to the STEM fields. 100 Scouts came to Clemson to learn about STEM through the Chemistry, Computer Engineering, Civil Engineering, and Chemical and Biomolecular Engineering Departments.

STEM Day

STEM day is hosted through Women in Science and Engineering (WISE), which targets middle school boys and girls in the Upstate. Three workshop facilitators in Chemistry, Computer Science, and Chemical Engineering took part by introducing STEM fields to local students. The Chemical and Biomolecular Engineering Department showcased polymers through activities making glue and bouncy balls. This event exposed approximately 60 students to STEM.



WISE Summer Camp

In late June, ChBE Outreach participated in the Project WISE (Women In Science & Engineering) Summer Camp. Approximately 60 middle school girls were introduced to some of the core concepts of chemical engineering through numerous hands-on activities and demonstrations. The girls were exposed to concepts ranging from mass transfer by dissolving candy coatings, to heat transfer and thermodynamics where they created insulation for hand boilers.



CULSOC Biotechnology Camp

Clemson's Life Sciences Outreach Center hosted a Biotechnology Camp. During the camp, we taught high school students from a magnet school in Charleston, SC about filtration. The students learned about physical and enzymatic treatment of water and compared the two techniques in an activity "treating" unfiltered, organic apple juice. They also built physical filters using water bottles, rocks, sand, cotton balls, and coffee filters. They enzymatically treated the apple juice with pectinase, and then compared the resulting clarity of the solutions with a turbidometer.





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Advanced Materials
Energy, Water & Sustainability
Advanced Separations
Biotechnology & Biomolecular Engineering
Computational Chemical Engineering



Save the date...

November 9, 2017

Details will be mailed soon!

*Clemson University
Chemical and Biomolecular
Engineering Department's*

100th Anniversary!

