

RESEARCH REPORT

Board of Trustees
January 2021



Dear Board of Trustees Members,

First of all, I hope you and your loved ones remain healthy as the world continues to battle the COVID-19 pandemic. I trust you enjoyed a restful holiday season with your loved ones, and I want to wish you all a healthy and prosperous new year.

While the pandemic has created many challenges, our research enterprise continues to move forward, and I have some exciting news to share: In December, the U.S. Department of Energy awarded a contract for an alliance that includes Clemson to manage the Savannah River Nuclear Laboratory near Aiken. Clemson has a long history of working with the Savannah River National Lab, and this new contract is sure to unlock unique new research and education opportunities for Clemson faculty and students, while offering valuable workforce development for the state. You can read more about this historic endeavor on [page 5](#).

In fact, Clemson faculty have earned several high-value awards in the past several months, including \$16 million to support the development of autonomous military vehicles, \$5 million to conduct specialty crop research, and \$3 million for teacher development support. View details on our top awards on [pages 29-31](#).

While our research enterprise grows, so does our reputation. Clemson faculty, students and alumni are earning significant national and international recognition. Clemson professor Aleda Roth had a national research award named in her honor ([see page 14](#)). Two Clemson Science graduates were named among the nation's 12 rising stars by Chemical & Engineering News ([see pages 8-9](#)). Professor Hala Nassar is one of just four professionals from across the country to be named a 2020 Fellow by the Council of Educators in Landscape Architecture ([see page 8](#)). These are just a few examples of the high praise awarded to Clemson faculty, students and graduates. Read more on [pages 8-15](#).



While this news is exciting, we continue monitor potential disruptions in research activity due to COVID-19. As Clemson welcomed back students in the fall semester and again this spring, our research enterprise is not immune from the side effects of COVID-related operational changes. We are comparing research metrics before COVID-19 to metrics during the pandemic and can report that awards and proposals remain strong ([see pages 21-23](#)). That said, there are disruptions and we are still trying to quantify their impact. While some faculty members and students continue to work in labs and offices, for example, others still can't access off-campus sites that are essential for their research. Schools, hospitals and other community sites have limited access and in-person interaction still. Some faculty members and students have missed important travel opportunities and events. I have highlighted some of the COVID-19 impacts to research activity on [page 24](#). We are not alone in this. I have been meeting regularly with my peers through the Association of Public and Land Grant Universities (APLU) and the Council of Government Relations (COGR), as well as with the funding agencies. We are continuously providing information and presenting a strong case for federal support for university research that would help us ease the effects of COVID-19.

Our researchers, meanwhile, have responded admirably to the need for innovations in COVID-19 testing, tracing, treatment, protective equipment, social programs and so much more. As you may recall, I shared some [examples of COVID-19 research](#) when the Research and Economic Development Committee met in September. For our January meeting, I invited Delphine Dean, the Ron and Jane Lindsay Professor of Bioengineering, to provide an overview of new innovations in COVID-19 testing, time permitting ([see page 17](#)). Additionally, I have invited students to discuss research conducted as part of a COVID Challenge that is generating commercial interest. You can read about these projects on [pages 18-20](#).

While we monitor COVID-19's impact on research, we continue to see positive signs in our research metrics:

- Preliminary FY2021 competitive research expenditures were \$45 million through the end of the second quarter ([see page 27](#)).
- Research awards were up 38 percent through the second quarter of FY2021 compared to the same period a year ago ([see page 28](#)).

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- Clemson faculty have earned eight major research awards valued above \$2 million this fiscal year, bringing \$46 million in new research funding to the university.
- Proposal submissions remain strong, reaching \$377 million through the second quarter of FY2021 ([see page 32](#)). That's a 29 percent increase from the same period a year ago.

Our research enterprise has posted tremendous growth since 2016 and has done so with great efficiency. Consider the increases in our per capita output; that is, research expenditures and awards per tenure and tenure-track faculty ([see pages 38-39](#)). We have increased productivity at a much greater rate than we have expanded our footprint. To analyze efficiency, we also compare ourselves to our peer institutions, which we define as public Carnegie R1 universities without medical schools. When reviewing research enterprises at those universities, we see that institutions with higher levels of expenditures (greater output) have larger faculty bodies and/or more available space ([see pages 40-41](#)). This suggests that Clemson is operating efficiently and near its research capacity. Carnegie is expected to release its next classification in early 2022 ([see page 6](#)), and we will continue to monitor Clemson's performance among our peers.

Finally, I would like to close by encouraging you to read more about the accomplishments of our faculty members in the Focus on Faculty section ([see pages 42-63](#)). These detailed descriptions of their work reminds me of what research is all about: generating and disseminating new knowledge to improve the world. As I read their stories and learn of their passion for scholarship, I become increasingly excited about our future.

Respectfully submitted,



Tanju Karanfil, Ph.D., PE, BCEE, IWA Fellow

Vice President for Research, Clemson University

TABLE OF CONTENTS

1. RESEARCH NEWS
2. COVID-19 IMPACT
3. RESEARCH METRICS
4. RESEARCH EFFICIENCY
5. FOCUS ON FACULTY



NOTE: Click the colored tabs at the bottom of each page to navigate to the executive summaries for each section, as well as to the letter from the vice president for research.



RESEARCH NEWS

This section highlights the latest research news.

Executive Summary

- The Department of Energy awarded a contract for Battelle, Clemson University, Georgia Tech and others to manage the Savannah River National Laboratory ([see page 5](#)).
- Clemson remains on track to maintain its Carnegie R1 status. The Carnegie Classification is expected to be released in early 2022 ([see page 6](#)).
- Clemson hired an executive director to lead the Dominion Energy Innovation Center ([see page 7](#)).
- Clemson faculty, students and alumni have earned significant national and global recognition:
 - » Professor Hala Nassar is one of just four professionals from across the country to be named a 2020 Fellow by the Council of Educators in Landscape Architecture ([see page 8](#)).
 - » Two Clemson graduates were named among the nation's 12 rising stars in engineering ([see pages 8-9](#)).
 - » Clemson professor Aleda Roth had a national research award named in her honor ([see page 14](#)).
 - » Numerous examples are provided on [pages 10-15](#).

Savannah River National Lab

 **Clemson University will collaborate with Battelle, Georgia Tech and other institutions on \$3.8 billion management contract at the national lab.**

The Battelle Savannah River Alliance (BRSA) Team, which includes Clemson University, was selected by the Department of Energy to manage one of the country's premier environmental, energy, and national security research facilities — the Savannah River National Laboratory (SRNL).

Clemson University will play an important role on the team to nurture cutting-edge innovation, education and workforce development that will be a boon for South Carolina and the entire region.

Employing approximately 1,000 staff, SRNL conducts research and development for diverse federal agencies, providing practical, cost-effective solutions for the nation's environmental, nuclear security, energy and manufacturing challenges. As the U.S. Department of Energy's (DOE's) Environmental Management Laboratory, SRNL provides strategic scientific and technological support for the nation's \$6 billion per year waste clean-up program.

“This is a historic day for Clemson University and our partner universities. We are eager to build upon our relationships at the Savannah River National Laboratory, which will allow us to unlock unique new research and education opportunities for Clemson faculty and students, while serving the state. I'd like to thank Battelle for its leadership and congratulate the entire team on the exciting pursuits to come,” said James P. Clements, Clemson University president.

BSRA is led by and wholly owned by Battelle, one of DOE's leading laboratory management contractors. The BSRA Team includes five universities from the region—Clemson University, Georgia Institute of Technology, South Carolina State University, University of Georgia, and University of South Carolina—as well as small business partners, Longenecker & Associates and TechSource.

The contract includes a five-year base with five one-year options. The estimated value of the contract is \$3.8 billion over the course of 10 years if all options are exercised.

Battelle currently has a management role at seven DOE national labs including Pacific Northwest National Lab, Brookhaven National Lab, Oak Ridge National Lab, National Renewable Energy Lab, Idaho National Lab, Los Alamos National Lab and Lawrence Livermore National Lab. It also operates the National Biodefense Analysis and Countermeasures Center for the Department of Homeland Security.



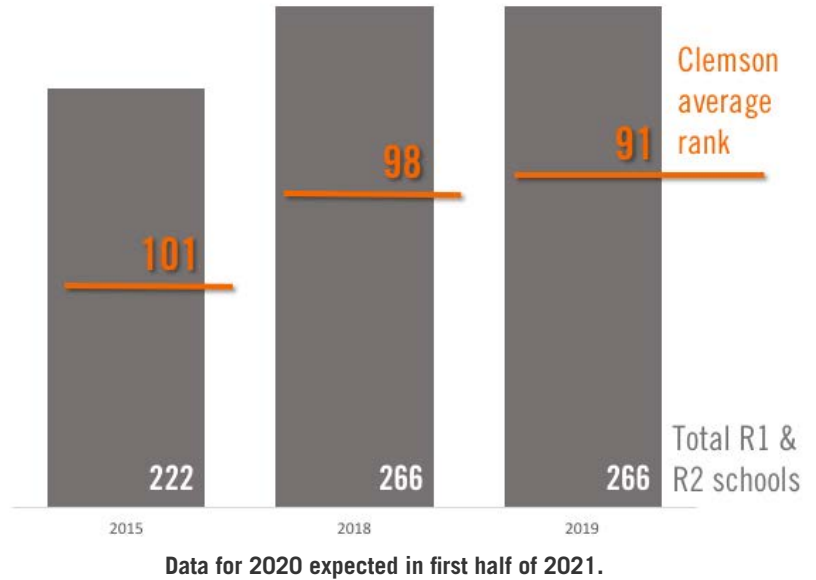
Clemson researchers collect soil samples as part of a nuclear waste project conducted in collaboration with the Savannah River National Laboratory.

Carnegie R1

→ Carnegie Classification to be released 2022

Carnegie is expected to release its latest classification in early 2022. Given Clemson’s progress in the metrics tracked by Carnegie (see chart below), the R1 designation is likely to be reconfirmed.

Carnegie does not rank schools, but the Division of Research has been analyzing Clemson’s performance in Carnegie metrics to estimate its position among Carnegie institutions. Based on that analysis, Clemson’s average rank among Carnegie peers has improved since 2015 (see chart at right).



TRACKING CARNEGIE METRICS

The table below charts Clemson’s performance from 2018 to 2020 among the 10 metrics Carnegie tracks. Clemson has improved in all but two metrics since 2018, when the last Carnegie Classification was released. That classification included Clemson as in R1 institution. Data for the upcoming classification has been submitted. Carnegie is expected to release its classification in 2022.

Metrics	Clemson 2018	Clemson 2020	Δ Metric 2018-2020
Science & Engineering Expenditures	\$145M	\$165M	↑ \$20M
Non-Science & Engineering Expenditures	\$49M	\$54M	↑ \$5M
Postdoc & Non-Faculty Researchers	111	162	↑ 51
PhD Humanities	8	7	-1
PhD Social Sciences	20	25	↑ 5
PhD STEM	170	156	-14
PhD Other	33	55	↑ 22
Per Capita Science & Engineering Expenditures	\$159K	\$173K	↑ \$14K
Per Capita Non-Science & Engineering Expenditures	\$53K	\$56K	↑ \$3K
Per Capita Postdoc & Non-Faculty Researchers	0.122	0.170	↑ 0.048

Dominion Energy Innovation Center

→ New Executive Director ready to take EIC to next level

Meredyth Crichton, formerly of GE Energy, has joined Clemson University as executive director of the Dominion Energy Innovation Center (EIC) in North Charleston.

Crichton has worked with GE in various capacities since 2007 and most recently managed the company's onshore wind test labs, including one electrical and two mechanical test facilities with a staff of approximately 50 engineers and technicians. The testing facilities support new product introduction as well as fleet support and problem resolution.

Among other leadership roles at GE, Crichton also led a global organization of 60 design engineers dedicated to developing world-class gas turbine, steam turbine, and generator accessory systems for new products. The team explored and executed opportunities for new product design for mechanical systems, fluid systems, and gas turbine electrical instrumentation.

"Meredyth brings a wealth of experience in renewable energy and is poised to lead innovation at EIC to a new level," said Tanju Karanfil, Clemson vice president for research.

The Dominion Energy Innovation Center houses the Duke Energy eGRID, an electrical grid simulator, and the world's most advanced wind-turbine drivetrain testing facility capable of full-scale highly accelerated mechanical and electrical testing of advanced drivetrain systems for wind turbines. The two labs are linked and allow researchers to work on some of the technical challenges that need to be overcome to widen the use of renewable energy, such as wind and solar power. The Dominion Energy Innovation Center is located at the Clemson University Restoration Institute's (CURI) campus at the former U.S. Naval Base in North Charleston.

Crichton said the innovation center's vision statement is: "Driving innovation in the Renewable Energy Industry and Energy Systems with high quality data for our customers and research."



Meredyth Crichton



The Dominion Energy Innovation Center houses the world's most advanced wind-turbine drivetrain testing facility.

National, Global Recognition



Clemson faculty, students and alumni are earning significant recognition and prestigious awards. Recent examples are highlighted in this section.

Hala Nassar, a professor of landscape architecture at Clemson University, is one of four professionals from across the country to be named a 2020 Fellow by the Council of Educators in Landscape Architecture (CELA). Nominated by the CELA Academy of Fellows and Board of Directors, Fellows are recognized for their lifetime accomplishments in teaching, scholarship and service.

“It is truly humbling to be nominated and elected by landscape architecture educators nationwide for the highest level of recognition by the Academy,” said Nassar. “I feel deeply honored to be inducted into the class of 2020 Academy of Fellows, joining many educators I have such a deep respect for.”

Nassar’s professional achievements span her career and the globe. One of her most notable projects took place in Luxor, Egypt. Working alongside Clemson students in partnership with Ain Shams University, they developed a master plan to restore and rejuvenate the Karnak and Luxor temple complexes, as well as the Avenue of the Sphinxes and surrounding city.

The success of this work led to additional opportunities, and as a result she spearheaded a formal agreement between Clemson, Ain Shams University of Egypt and the Huazhong Agricultural University of China to form the World Design Studio in 2019. Through the program, professors and students from each institution tackle some of today’s most pressing environmental and cultural issues through design. [READ MORE](#)



Nassar

Not one but two Clemson University College of Science graduates have been named to Chemical & Engineering News’ prestigious Talented 12 Class of 2020, which honors a dozen rising stars who “are solving some of science’s toughest problems.”

Among the 12 C&EN honorees are Robert J. Gilliard Jr., a Clemson graduate from Hartsville who is currently an assistant professor and director of undergraduate research in the University of Virginia’s department of chemistry; and fellow Clemson grad Wendy Lee Queen, who is an assistant professor of chemistry and chemical engineering at the Ecole Polytechnique Federale de Lausanne (Switzerland) in the Institute of Chemical Sciences and Engineering.



Robert J. Gilliard Jr.

At Virginia, Gilliard currently leads a research team of 14 and directs a synthesis-based research program focused on inorganic chemistry and materials research.

In the Talented 12 article about Gilliard, C&EN

continued on next page

National, Global Recognition

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described him as a scientist who “jostles the impossible in a myriad of ways, such as using main-group alternatives for traditional transition-metal catalysts, which tend to be pricey and toxic.”

Gilliard started out as an engineering major at Clemson. However, while chemistry wasn't Gilliard's first interest, he said he was successful in his chemistry classes and became intrigued by the opportunity to do research in the chemistry department as an undergraduate.

“After hearing from friends about undergraduate research at Clemson, I built up the courage to knock on the door of Professor Rhett Smith and ask him if I would be able to join his research lab,” said Gilliard. “Professor Smith turned out to be an excellent mentor, and the research training I received in the Smith group at Clemson is the reason I was so excited to continue my education. I started graduate school with years of experience in air-sensitive chemistry, several publications, and an appreciation for both organic and inorganic chemistry.”

Smith said it was obvious from the beginning that Gilliard is a “generational talent.”

“He is an exceptionally hard-working and insightful chemist,” said Smith, a professor in the College of Science's department of chemistry. “During his time in my research group, he presented at many international conferences and was a co-author on several scientific journal articles.”

Like Gilliard, Queen did not begin her collegiate career focused on chemistry.

“Growing up, I was always drawn more toward things like creative writing,” said Queen, who hails from Seneca, S.C. “However, once I started college, I was far from certain of what I wanted to do. I guess I kind of felt like the sky was the limit, and that made it difficult for me to choose a major.”

C&EN described Queen as having “staked her claim on the vast frontier offered by metal-organic frameworks (MOFs). By filling this landscape with polymers, Queen makes composites that can capture all manner of molecules with the goal of cleaning up air and water and extracting valuable metals like gold from waste streams.”

Queen came to Clemson as a graduate student after receiving her Bachelor of Science in chemistry at Lander University. She went on to complete her Ph.D. at Clemson. Queen said she will always be appreciative of the “professional support and grooming” from her Ph.D. advisor Shiou-Jyh Hwu.

For his part, Hwu said he was fortunate to be able to contribute to Queen's educational pursuits.

“Wendy was recognized as a self-motivated student and an overachiever by her peers and faculty,” said Hwu, a professor in the chemistry department. “She impressed us with her exceptional scholarship, for which she was twice a recipient of the Outstanding Graduate Research Award and once of the Departmental Research Incentive Award at Clemson.”

The Talented 12 program is in its sixth year and was created by C&EN magazine to recognize extraordinary young researchers who are inspiring the next generation of chemists.



Wendy Lee Queen

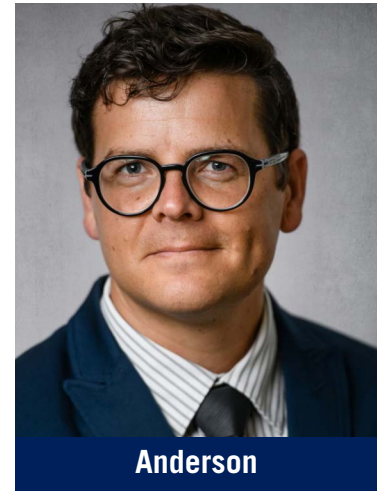
National, Global Recognition

The U.S. Department of Education awarded a Fulbright-Hays Group Project Abroad Grant to two educators at Clemson University to further build global service-learning and engagement opportunities in India for students and faculty.

Clemson is committed to providing students with experiences that prepare them for what comes next, ensuring they have the skills to partner with colleagues from around the world to address pressing global challenges of the 21st century. Kyle Anderson, senior director of Clemson's Office of Global Engagement, and Sarah Winslow, senior associate director of the Clemson University Honors College, want students to engage in "fair trade" learning, a balanced way of working alongside global collaborators so that knowledge and benefits are shared by all.



Winslow



Anderson

As the recipients of this grant, Anderson and Winslow will work closely with Melissa Hawkins, program coordinator of the Honors College, and Andrew Pyle, associate professor in the Communication Department, to develop global learning programs with the South Carolina Governor's School for Science and Math (GSSM). This collaboration will help to expand global commitment and outreach in India at both organizations.

"The proposed project grew out of strategic planning efforts at both Clemson and GSSM, as global engagement is an established priority for both of our institutions," said Winslow, who is responsible for Honors College curriculum development, student engagement and experiential learning. "It will support our efforts to develop an innovative Honors College curriculum and enhance engagement opportunities, benefitting institutions throughout the state of South Carolina."

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Honors students in Bhutan

The Upstate alone includes more than 450 international businesses from over 30 different countries. A number of those companies are from Asia, particularly India, Japan and China. This grant will help Clemson strengthen global learning outside of Western Europe and Latin America, preparing students for "a more Asian future."

"If we look at what's happening in the Upstate – who's investing in our state, and we look at some of the biggest economies in the world and those countries that are rising in terms of global power, those are a lot of places where we want to be more engaged," Anderson

said. Getting this grant is going to allow educators from Clemson and the partnering SC institutions to go to India together to learn and create units for the classrooms, and to build experiential learning programs for the university. It has the potential to be really impactful." [READ MORE](#)

National, Global Recognition

Recent College of Science graduate Erin Mihealsick has been awarded the 1897 Fellow Scholarship, which is sponsored by The Honor Society of Phi Kappa Phi. The prestigious scholarship of \$35,000 is annually presented to the top applicant in STEM.

Mihealsick, who received dual Bachelor of Science degrees in both genetics and biochemistry, is a graduate of the spring class of 2020. The scholarship money will help fund her upcoming graduate education.

“Being awarded this fellowship confirms that not only have I chosen the right field for me but that I’m able to succeed. It’s easy to start questioning yourself about being able to make it through in this field, but receiving encouragement and rewards such as this help keep you motivated,” said Mihealsick, a native of Oak Ridge, Tennessee. “This award will also hopefully allow me to be more competitive for future applications and opportunities.”

Mihealsick has been involved in research since high school and has spent most of her time at Clemson in a lab. Her competitiveness in these awards, she claims, is largely due to the experience and opportunities provided by Clemson. She has also been accepted for the Amgen Scholars Program at Duke University and has won numerous other awards, including Outstanding Junior/Senior in the College of Science, and a Goldwater Scholarship at the national level.

Mihealsick credits her mentor Kerry Smith as being a strong influence in helping her to realize her graduate school potential.

“Dr. Smith has given me the freedom to conduct research at the graduate level while also providing support and mentorship whenever I needed it,” Mihealsick said. “He has encouraged me to pursue scholarships and competitive research programs while constantly being available to write a letter of rec or edit drafts of applications.”



Mihealsick



McDonald

Killian McDonald, a 2018 graduate of Clemson University, was awarded a prestigious Knight-Hennessy Scholarship, which will fully fund the cost of attending Stanford University Law School.

A former Undergraduate Student Government president, McDonald earned her bachelor’s degree with a double major in political science and women’s leadership at Clemson.

McDonald was one of 76 students selected from thousands of applicants worldwide to receive the Knight-Hennessy scholarship, which Stanford University created to prepare a new generation of leaders dedicated to public service.

“It’s like a dream come true,” McDonald said. “It’s beyond amazing.”

McDonald, 24, will begin her three-year law program at Stanford in August with the hope of eventually working as a civil rights attorney.

“I really want to come back home and make a difference in South Carolina,” said McDonald, a Columbia native. “I really care about social justice issues in the South. This scholarship is geared toward students who want to be leaders and make a difference.”

National, Global Recognition

A Clemson University faculty member has earned a prestigious Spencer Foundation Grant to study how rural school leaders navigate communities to improve educational equity. According to Daniella Sutherland, assistant professor in Clemson’s College of Education, the research is the first of its kind to study this issue specifically in rural schools.

Sutherland and three Clemson graduate students will interview 15-20 educational leaders in multiple South Carolina schools, three schools in West Virginia and three schools in Vermont. Erin McHenry-Sorber, associate professor of higher education at West Virginia University, will lead data collection in West Virginia and collaborate on data collection in Vermont. The research team is currently working on data collection in Upstate and Lowcountry schools as well as schools along the I-95 corridor, which has historically been characterized by poor, rural schools faced with inequitable school funding and poor student achievement.



Sutherland

“Very little work has been done to understand the specific challenges rural leaders encounter and the strengths they can utilize as they try to create equitable schooling practices,” Sutherland said. “We hope to aid educators in the specific states we’re studying, certainly, but we hope that the lessons learned through this research can apply to any rural area across the country.”

Sutherland said rural school leaders operate in a “fishbowl” where they are often highly visible as leaders in their communities. Rural schools are often the heart of rural communities, as well as one of the primary public institutions accessible, which means more community members are connected to the school.

That connection can be a strength, but it also comes with heightened scrutiny of the educational leaders, who are automatically recognized as community leaders. They are more visible, and what they do is noticed and felt by the community. However, Sutherland said these leaders’ positions are often more at risk because of the nature of rural communities.

The research team hopes to research the expectations and pressures community members have for their school leaders around different aspects of equity—including racial, socio economic and issues around intellectual disabilities—and how rural school leaders navigate those expectations.

“We actually call our study ‘We’ll be Fired’ because that is often the perception of rural school leaders,” Sutherland said. “If they do something that goes against community beliefs or expectations, communities are often quicker to remove them from their positions.”

Sutherland said the research team is prioritizing building trust with rural community members in order for them to feel comfortable telling the researchers about their experiences and expectations about equity—or inequity—in the schools. This is why researchers are starting in communities where research team members have known connections to the schools.

Sutherland and graduate students Jacquelyn Williams, Tomiko Smalls and Amber Lange have extensive knowledge and experience with rural schools in the areas where they are conducting research, which will help them build connections in the communities and among school leaders.

“The primary value and significance of this kind of research are the resulting supports for rural educational leaders, whether they come in the form of interventions, strategies or professional development,” Sutherland said.

National, Global Recognition

Clemson University's Angeline Close Scheinbaum has been recognized by the Advertising Research Foundation as the recipient of one of its 2020 Great Minds Awards.

Close Scheinbaum is the Dan Duncan Professor of Sports Marketing in the College of Business. She specializes in consumer psychology, integrated brand promotion and sponsorship in the contexts of sport and online consumer behavior.

Established in 2006, the Great Minds Awards recognize leaders across the advertising and marketing research industry. Scheinbaum has served as a reviewer for more than 20 author teams for the Journal of Advertising Research (JAR) and has served on the journal's Editorial Review Board since 2017. Her specialization is primarily reviewing projects related to sports marketing, integrated brand promotion and social media.



Scheinbaum

Professor Scheinbaum received the Journal of Advertising Research's Best Reviewer Award which, according to John Ford, editor in chief, "goes to an individual who has made an excellent contribution to the quality of peer-reviewed papers by providing in-depth, constructive reviews in a consistent and timely manner."

The Advertising Research Foundation has been the standard-bearer for quality in research on advertising, media and marketing since 1936. Its best practices and industry knowledge have benefited its 400-member companies many times over.

"The Journal of Advertising Research is a scholarly, double-blind, peer-reviewed publication recognized by academics for its rigorous research that is relevant to both theory and management," Close Scheinbaum said. "It's especially an honor to be recognized by one's peers."

The ARF publishes the Journal of Advertising Research, which is read by practitioners in advertising and marketing research, students and faculty members, at more than 5,000 universities in 127 countries. The quarterly-published journal is a research and development publication in areas of marketing, including media, advertising and communications. It promotes effective practice by combining business-orientated academic research with expert learning from leading marketers.

The Production and Operations Management (POM) Journal recently announced it has established a biennial award in Aleda Roth's name to recognize outstanding research in service operations management. Roth is a professor of management in the College of Business.

Beginning in 2022, the "Aleda Roth Best Service Operations Management Paper Award" will be presented every other year to the best research paper published in POM's service operations department.

Roth's distinguished career has been decorated with awards, which isn't something she's pursued, rather they've found their way to her.

"I love research and it's always something I've really worked hard at. This recognition is especially humbling and probably one of the most prestigious I've received, given the award is being established in my name," the Burlington Industries Distinguished Professor of Supply Chain Management said.

continued on next page

National, Global Recognition

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“Hopefully, and more importantly, those who receive it will look at what I did in opening some doors and improving the quality of our lives through research.”

She is an internationally recognized empirical scholar and thought leader in manufacturing and service operations strategy. Her research is motivated by and examines theoretical and practical explanations of how firms can best deploy their operations, global supply chains, and technology strategies for competitive advantage, sustainability, and public well-being.

Roth is among the most influential authors in her respective areas of expertise, according to an analysis of the most frequently cited author/researchers within the business management discipline. Year in and out, she is ranked among the highest of her peers in research worldwide.



Roth

Roth has received more than 100 research and teaching awards since receiving her doctorate in 1986. In more than 200 publications (110 in refereed journals), her work ranks No. 2 as a leading author globally among all papers published in the four premier journals in her field from 2001-2015; in the top 1 percent of Production and Operations Management scholars in the U.S.; in the top 2 percent, published in the Journal of Operations Management; and 7th worldwide in service-management research. According to Google Scholar, her work received more than 17,500 citations.



Brahma

One of electrical engineering’s high honors is going to a Clemson University alumnus who returned to his alma mater as a professor specializing in how to protect the electrical grid and other power systems from disturbances that can lead to blackouts.

Sukumar Brahma was elevated to Fellow of the Institute of Electrical and Electronics Engineers (IEEE), a professional society with 419,000 members. Less than 0.1% of voting members are selected annually for this elevation.

IEEE cited Brahma’s “contributions to power system protection with distributed and renewable generation.”

“It’s an honor to have my work noticed by my peers,” Brahma said. “Recognition as Fellow is especially significant. There are a lot of talented people on the list of Fellows, and I’m humbled to have my name on it. I thank all who have supported me and those who nominated me.”

Brahma received his Ph.D. in electrical engineering from Clemson in 2003, left to build his career and returned in 2018 as the Dominion Energy Distinguished Professor of Power Engineering.

His peers have credited him with a number of career accomplishments.

As a Ph.D. student, Brahma conducted some of the seminal research into protecting distribution systems with a large penetration of distributed generation. His work initiated a discussion that led to

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National, Global Recognition

continued from previous page

changes in the pertinent standard.

In 2011, Brahma became the first to publish a comprehensive fault location method for distribution systems with a high penetration of distributed generation. The method does not require any measurements except at the generation terminals.

Brahma was also among the first researchers to investigate accurate phasor-domain short-circuit models of renewable sources. He provided comprehensive insight into the behavior of different types of wind turbine generators and developed a validated short-circuit model for each type.

Brahma extended this work to explore protection issues in microgrids fed by renewable sources.

At Clemson, Brahma plays a crucial role in teaching students the basics of electrical power engineering and how to apply what they have learned to utilities' systems, a major industry need.

By studying power system protection under Brahma, students are well positioned to help incorporate solar, wind and other renewable energy into the grid.



Mears

SME, a professional organization that supports manufacturing, named Clemson's Laine Mears one of the 20 most influential professors in smart manufacturing.

The organization cited the THINKER program, a Clemson University graduate program that has helped shine a global spotlight on Mears and provides a snapshot of what advanced manufacturing could look like in the years to come.

"I was really surprised when they contacted me, and I was really surprised when I saw who the other 19 were," Mears said. "I know a lot of those people, and they are doing fantastic work."

THINKER launched in fall 2018 with \$3 million from the National Science Foundation's Research Traineeship program. Mears, the BMW SmartState Chair in Automotive Manufacturing, is THINKER's founder and continues to serve as its leader.

As part of the program, students and faculty conduct cutting-edge research into advanced manufacturing with a heavy emphasis on how human workers interact with machines.

Many of those machines are connected to the internet and are generating massive amounts of data. At the same time, human workers are starting to wear devices that also generate data and are connected to the internet.

All that data going back and forth over the internet opens a host of new possibilities for machines and human workers to communicate and work more effectively with each other. It could make manufacturing more efficient and— for humans— more enjoyable.

For Mears and his team, it's a research opportunity. Their projects range from developing new manufacturing processes to creating wearable devices that give workers feedback to improve quality.

Sixteen students enrolled in THINKER in its first two years and three who participated have graduated. The name of the program is an acronym for Technology-Human INtegrated Knowledge, Education and Research.



COVID-19 IMPACT

This section highlights COVID-19 research and provides an overview of the pandemic’s effect on the research enterprise.

Executive Summary

- Clemson’s expanded CLIA lab is helping to process more COVID-19 tests ([see page 17](#)).
- Students have provided working solutions to the COVID-19 pandemic through the Clemson COVID Challenge ([see pages 18-20](#)).
- The Division of Research is monitoring the pandemic’s impact on research activity:
 - » Proposal submissions and research awards remain strong, while research expenditures have decreased slightly ([see pages 21-23](#)).
 - » Despite the positive metrics, faculty report disruptions as community partners adjust operations, face-to-face interaction remains limited, and necessary safety precautions such as lab occupancy limits strain research activity. We have compiled a list of disruptions reported by faculty ([see page 24](#)).



In May, with COVID-19 cases on the rise in South Carolina, Clemson University faculty raced to develop saliva-based COVID-19 tests that would be less intrusive than nose-swab testing and would produce quick results. The experiment worked.

By August, they had purchased the university’s first set of PCR machines and worked with the S.C. Department of Health and Environmental Control to set up Clemson’s first Clinical Laboratory Improvements Amendment (CLIA) certified, high-complexity diagnostics test lab on campus.

“On Sept. 25, we ran our first set of about 200 COVID clinical tests, which were reported to DHEC,” said Delphine Dean, the Ron and Jane Lindsay Family Innovation Professor of Bioengineering. “By Thanksgiving, the lab was running most of the COVID-19 tests for the university, about 3,000 tests a day.”

In the late fall, the Clemson CLIA lab received a significant \$6.9 million investment from Gov. Henry McMaster and the State’s Joint Bond Review Committee through the Coronavirus Aid, Relief, and Economic Security Act.

The CLIA Lab relocated to larger space in Sistine Hall, added 14 pipetting robots and 11 more PCR machines. Now, they can handle 9,000 tests each day.

In addition to testing for the University, the CLIA lab processes about 500 tests for the community each day and supports testing at other local colleges.

“This is critical as the COVID-19 rate in the communities surrounding the university continue to soar,” Dean said. “While the Clemson University positive test rate is ~2%, the community positive test rate from our sites is ~10% and the reported positive test rate from DHEC is over 20%.”

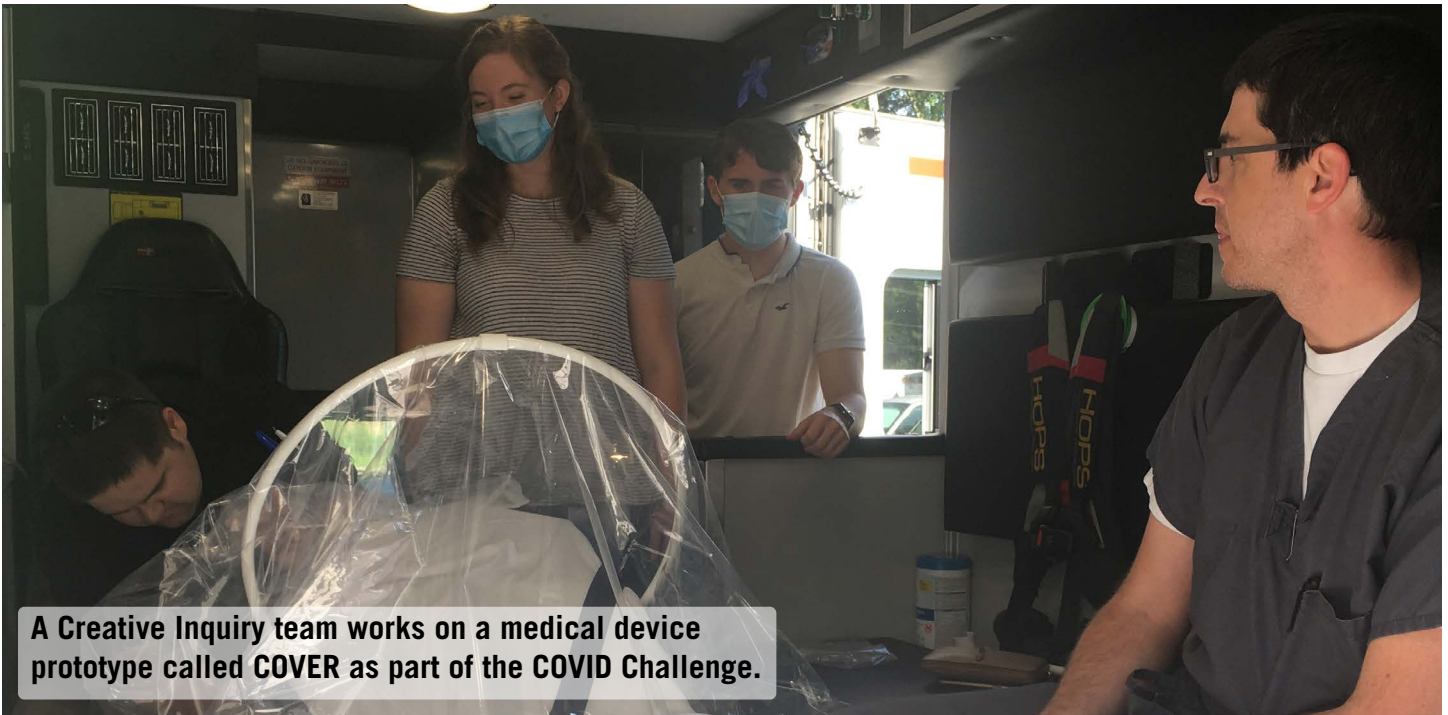
Beyond providing testing for the university and surrounding community, this clinical lab is a unique resource at Clemson. The lab is a great training resource and has been used as an innovation hub by other Clemson faculty seeking research funds.

“We have close to 50 undergraduate interns who work to help collect and intake samples and are learning about clinical testing processes,” Dean said. “The lab is staffed primarily by some 30 graduate student lab technicians. They are gaining valuable experience and will be qualified to hold higher level clinical lab positions, such as technical director positions, upon graduation.”

9,000
tests can be
processed daily

\$6.9M
in CARES Act
funding received

80
students are
working in the lab



A Creative Inquiry team works on a medical device prototype called COVER as part of the COVID Challenge.

Clemson COVID Challenge

Hundreds of undergraduate students accepted the challenge to battle the COVID-19 pandemic this summer through an innovative research project spearheaded by Creative Inquiry and Delphine Dean, the Ron and Jane Lindsay Family Innovation Professor.

The [Clemson COVID Challenge](#) is a summer virtual research and design opportunity that began in May. Teams of students worked with faculty mentors and graduate students to identify problems and propose new ideas and solutions. In mid-June, students submitted a pitch video of their ideas and competed for the opportunity to see their projects possibly continue to implementation.

For the COVID Challenge, more than 400 undergraduate students worked with 97 faculty/staff and 32 graduate student mentors to form 82 teams. The teams represented a wide range of academic disciplines and institutions, including Clemson, University of South Carolina, College of Charleston, Furman University, the Medical University of South Carolina (MUSC), Prisma Health, Winthrop University, and Wofford University. Most of the teams included a mix of students and mentors from different institutions, which has already helped to spur some new statewide collaborations.

Each team had a month to craft their plan. The program provided some initial small funding for supplies to prototype or test ideas. The program also featured weekly Zoom Seminars for professional development. The teams then submitted three-minute videos to pitch their projects. Projects covered a wide range of topics and were grouped into five categories: Communication; Education; Healthcare/Technology; Policy/Economy/Logistics; and Society/Community.

More than
500
students and
mentors participated

82
teams pitched ideas
via 3-minute videos

80
volunteers from
academia and
industry judged
entries

continued on next page

Clemson COVID Challenge

continued from previous page

Thanks to one project, Prisma Health is now closer to implementing a “COVER” device to protect health care providers performing medical procedures on COVID-19 patients. Senior bioengineering majors Amanda LeMatty and Robert Falconer began developing a device with Bioengineering professor John DesJardins after Prisma had address concerns over a lack of available personal protective equipment (PPE) for medical workers.

To address this, the team developed the Covering for Operations during Vital Emergency Response, known as the COVER device. The COVER is a low-cost, portable isolation chamber that fits over the torso of a patient and uses directed airflow and filtration to create a barrier between

the patient and the surrounding clinical environment. This prevents the spread of COVID-19 and other respiratory illness. The device is constructed with materials easily found at an average hardware store.

The team has been finetuning prototypes since March 2020. In partnership with Prisma and Clemson faculty, they have conducted flow testing, particulate testing, and clinical usability surveys to ensure the efficacy and ease of use of the COVER. The current model costs less than \$250 to produce and can be used multiple times, lowering the cost per usage to less than \$15. Prisma Health currently has multiple COVER devices in use at its Emergency Department and continues to provide feedback on its design.

The COVER project earned third place in the COVID Challenge, first place in the InnoVision Awards COVID-19 Response: Technology Research Category, and an honorable mention in the Engineering World Health Design Competition. InnoVision is a non-profit organization that fosters the growth of South Carolina’s innovation economy and recognizes leadership, innovation and technological excellence.

Both LeMatty and Falconer plan to pursue their PhDs after graduating in May. LeMatty hopes to one day establish a nonprofit organization to serve as incubator for global health innovations. Falconer plans to pursue a career in the design of point-of-care diagnostics.



The COVER device creates a barrier over patients and filters air to protect against the spread of respiratory illness. The product is in use at Prisma Health.



Amanda LeMatty and Robert Falconer

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Clemson COVID Challenge

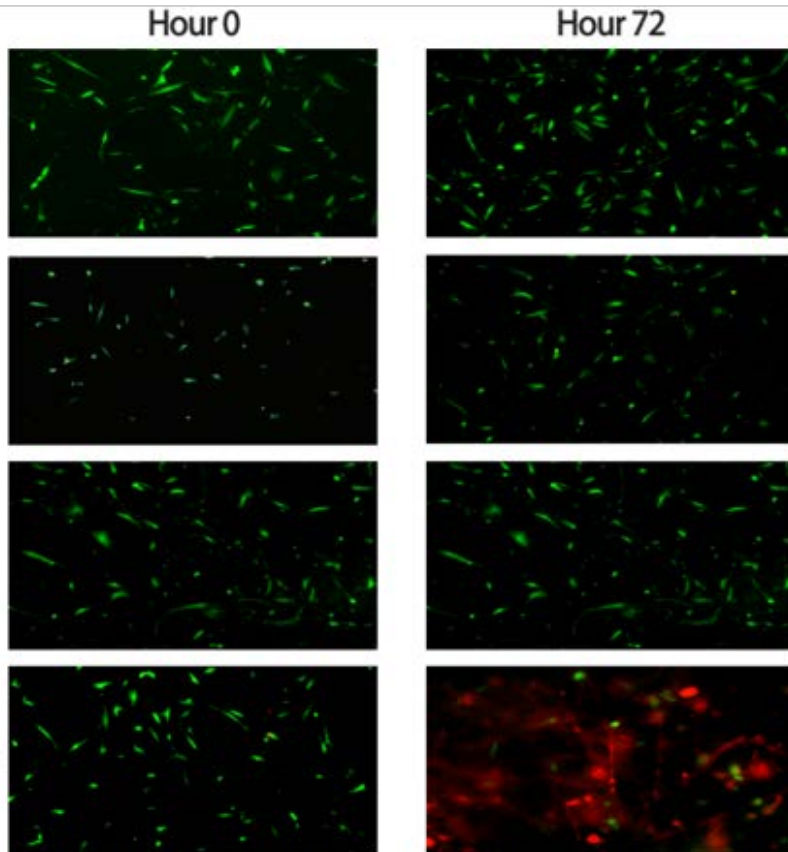


Figure 3: Cells were stained using live/dead kit. Cells images were taken under 4X objective. Green fluorescence depicts live cells, red fluorescence shows dead cells.

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Another COVID Challenge project spawned targeted treatments for COVID-19 or other diseases.

While COVID-19 mortality rates globally remain low, mortality rates for patients put on ventilators is around 43 percent.

To improve treatment, a team of Clemson students and faculty developed the Radiologically Enabled Anti-Covid-19 Targeting System (REACTS). REACTS uses a particle, or radiosensitizer, that increases the effect of radiation in a small region around it. A nebulizer is used to deliver these particles to the lungs, where antiviral peptides attach the particles to the viruses. A small, safe dose of X-Ray radiation is used to deactivate the viruses and reduce the viral load within the patient’s lungs, while keeping healthy tissue alive.

“These particles are harmless and nontoxic, but once they are hit with an extremely small and non-harmful dose of radiation, they facilitate the destruction of the viruses within the body,” said recent Clemson graduate Justin Napolitano, who worked on the project with senior genetics major Andrew Rifkin, Delphine Dean, and Endre Takacs, associate professor of physics and astronomy. They have applied for a patent and are looking further testing and commercialization opportunities.

This treatment method will not only allow patients to have a better chance of recovering from COVID-19, but could also be applied to other diseases. The project initially began as a potential cancer treatment, for example, but the research team quickly revamped its focus in response to the COVID-19 pandemic.

“The market for COVID-19 treatment is undeniably massive,” Rifkin said. “With treatment costing an estimated \$37,000 per patient in the U.S., and considering that over 100,000 people in the U.S. have been hospitalized to date, it is clear that COVID has been and will continue to be a multi-billion dollar market.”

REACTS placed second in the Clemson COVID Challenge, which earned the team a small seed grant, and was recognized among the finalists in the InnoVision Awards’ COVID Response in Technology Development category.

Rifkin hopes to attend medical school after earning a degree from Clemson. Napolitano plans to pursue a Ph.D. and ultimately a career in medical research, either in academia or the private sector.



Andrew Rifkin



Justin Napolitano

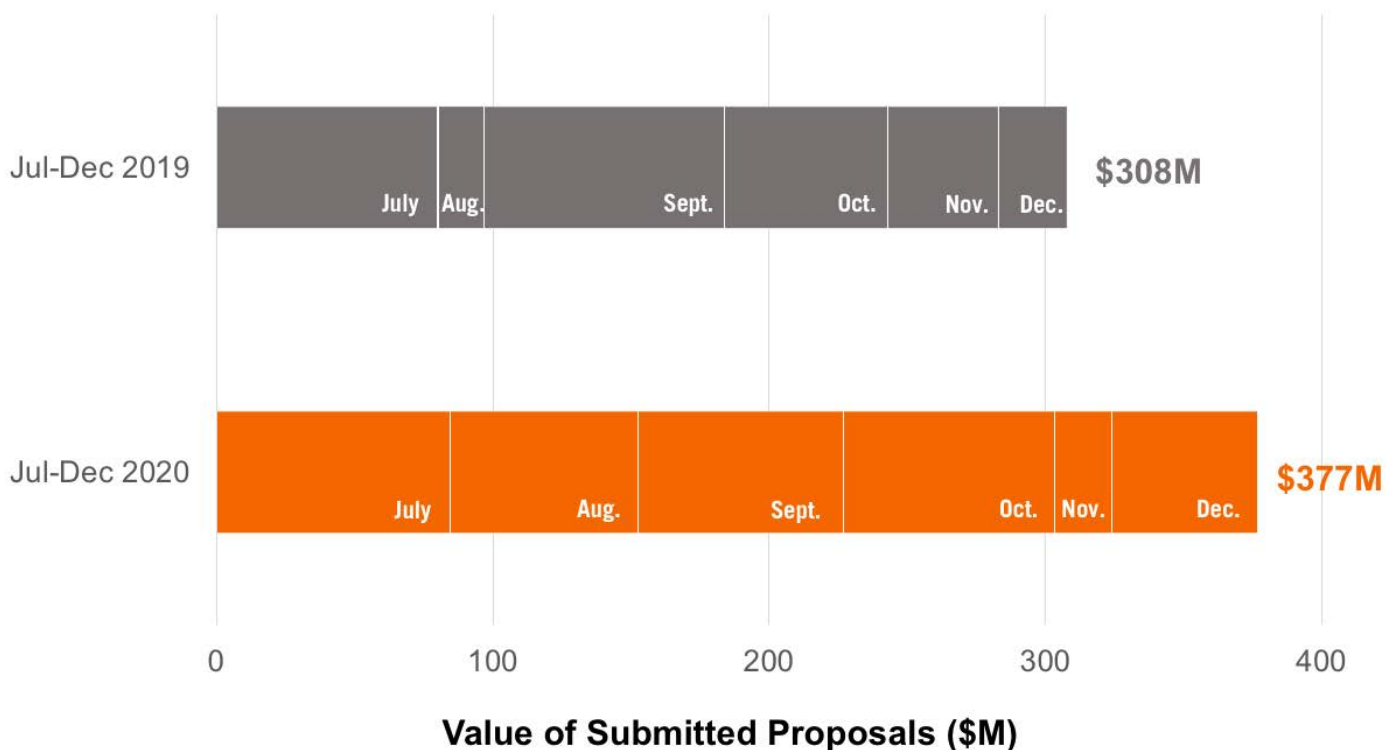
Analyzing COVID Impact

→ Continuously monitoring metrics and research disruptions

With the pandemic limiting on-campus activity, face-to-face interaction and other operations, the Division of Research has been comparing monthly research metrics during the pandemic to months prior to the pandemic. Proposal submissions (see below) and awards received (next page) have remained strong. The bar charts compare data from July through December 2019 (before the COVID-19 pandemic) to July-December 2020 (during the COVID-19 pandemic). The white lines break down monthly data while the figure at the right of each bar provides a cumulative total for all six months.

As shown below, proposal activity nearly doubled in October from the same month a year ago. From July through December 2020, proposal value is up 22 percent from the same period a year earlier.

Proposal Submissions



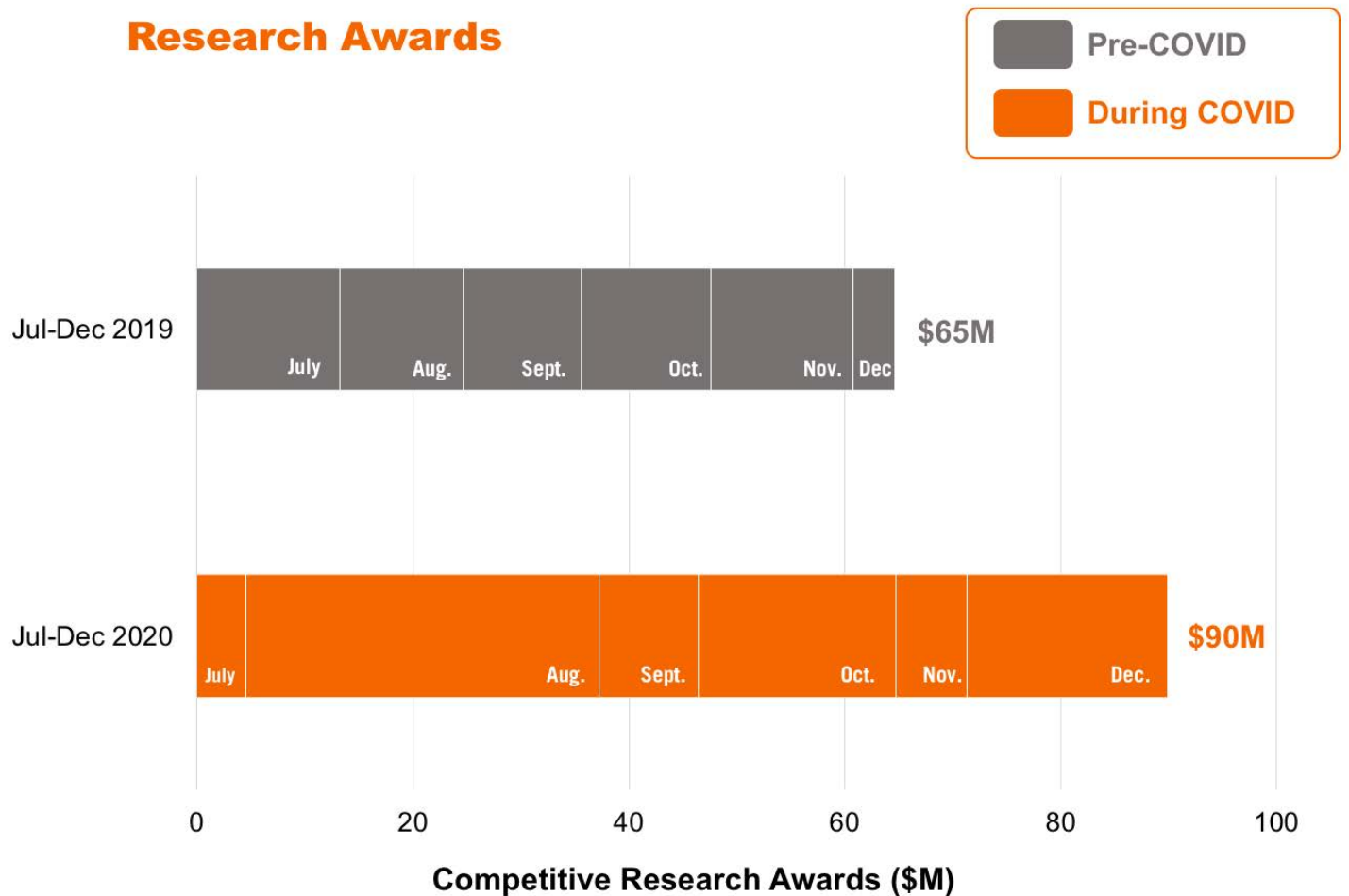
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Analyzing COVID Impact

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We can also report that faculty continue to be successful earning competitive awards during the pandemic. As shown in the chart below, awards earned in August tripled compared to the same month in FY2020 and were up 52 percent in October from the same month in the prior year.

Cummulatively, awards are up more than 38 percent at \$90 million from July through December 2020 when compared to the same period in 2019.



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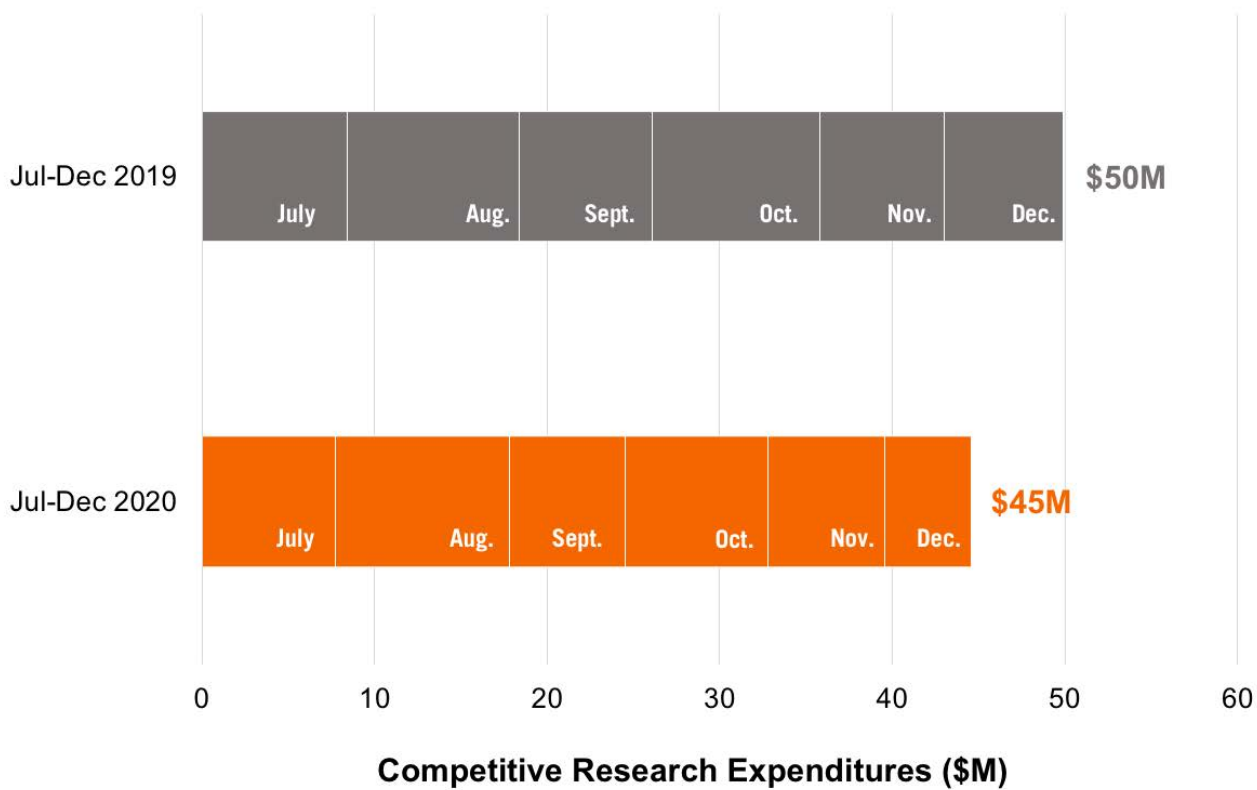
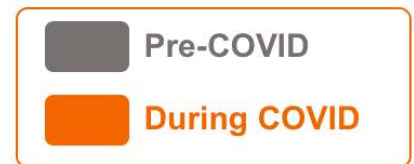
Analyzing COVID Impact

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Expenditures, meanwhile, are down about 11 percent over this period, as shown in the chart below. This is likely due to reduced travel and fewer equipment and supply purchases made during the pandemic.

While research proposals, awards and expenditures appear largely unaffected, we know that operational disruptions due to COVID can be painful for faculty members and students. We know researchers still can't access off-campus sites to complete projects. Schools, hospitals and other community sites, for example, continue to limit access and in-person interaction. Building occupancy restrictions are limiting lab-training opportunities for students and delaying research projects. Some faculty and students have missed opportunities to attend conferences due to travel restrictions. We have compiled a list of disruptions reported by faculty on the next page.

Research Expenditures



2021 Q2 totals preliminary

continued on next page

“ COVID-19 Disruptions Reported by Clemson Faculty

Delivery of equipment purchased for a new project was delayed due to broad disruptions in manufacturing/shipping, thus causing delays in system set up. I am now off on my timeline of work completion, and some of the preliminary data we hoped to collect for future grant proposals is delayed.

A major disruption I can identify is a delay in training new personnel (both graduate and staff level) and being able to offer research experience to undergraduate students.

An experiment that would have been started in the fall had to wait due to an inability to be trained by collaborators at another institutions. Even now, we are unable to be at full research capacity.

Delayed research means delayed publications means delayed grants means more delayed research, which disrupts pre-tenure faculty from building research programs. Additionally, some graduate students have lost months of work.

Hospital partners have put research on hold as a safety precaution.

Students have lost critical opportunities to present work at conferences, which is critical for professional development and networking opportunities.

Industry-funded research has suffered from back logs in the supply chain caused by COVID. Shipping for masonry block has been extremely delayed and lower production levels at the plants necessitated building some elements at the University that would have typically been provided by industry sponsors.

I, for one, am not taking on any additional students until it is safe for us to be fully in person. Given that I just don't have many virtual experiments to be done and most of our training requires close contact, it just isn't feasible.

The lack of professional travel is hurting professional development of junior faculty, who rely on professional meetings to build their networks. Online meetings are useful but not as good for younger persons still building a reputation.

It has been a struggle to hire lab technicians. Some months you can borrow someone else's technician for a few days or find a grad student willing to volunteer their help, but this is not sustainable.

When K-12 schools closed, school-based education research projects were suspended by school districts. For many education researchers, the school classroom is their "lab."

Face-to-face research with medical patients was discontinued as a COVID prevention strategy. Research on the effect of performing exercise on a diabetic patient's blood-sugar level after eating is a face-to-face event between patient and researcher. The blood specimen is tested; observation is made of the exercise performed.

Community sites have closed during the pandemic, so faculty investigators have been unable to maintain consistent contact with community partners. Many emails have gone unanswered. Faculty are unclear if employees at these sites are furloughed, no longer employed, or unable to respond for other reasons.



RESEARCH METRICS

This section covers institutional research productivity with data on proposal submissions, awards and expenditures.

Executive Summary

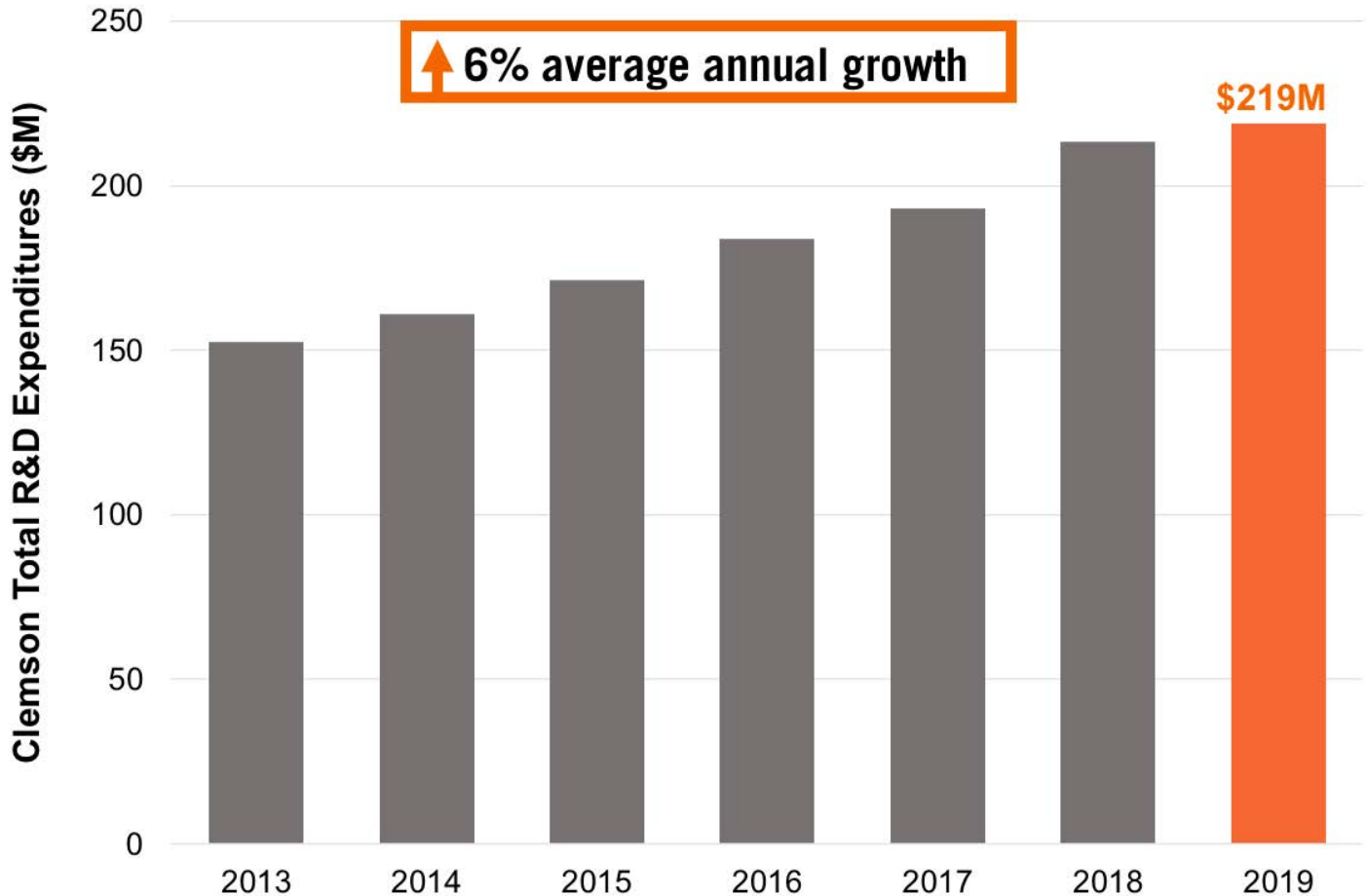
- Preliminary FY2021 competitive research expenditures were \$45 million through the end of the second quarter ([see page 27](#)).
- Research awards were up 38 percent through the second quarter of FY2021 compared to the same period a year ago ([see page 28](#)).
- Clemson faculty have earned eight major research awards valued above \$2 million this fiscal year, bringing \$46 million in new research funding to the university. Details on our highest value research awards are on [pages 29-31](#).
- Proposal submissions remain strong, reaching \$377 million through the second quarter of FY2021 ([see page 32](#)).
- Full details on research awards, expenditures and proposals per college are included in the Research Report Card on [pages 33-36](#).

Research Expenditures

→ Total R&D expenditures continue to climb

Reported to the National Science Foundation and used in the Carnegie Classification, total R&D expenditures are important to track and provide apples-to-apples comparisons to peer institutions. These expenditures include revenue from state support, gifts, external research services and other sources, including competitive awards.

Clemson has posted 6 percent average annual growth in total R&D expenditures since 2013.



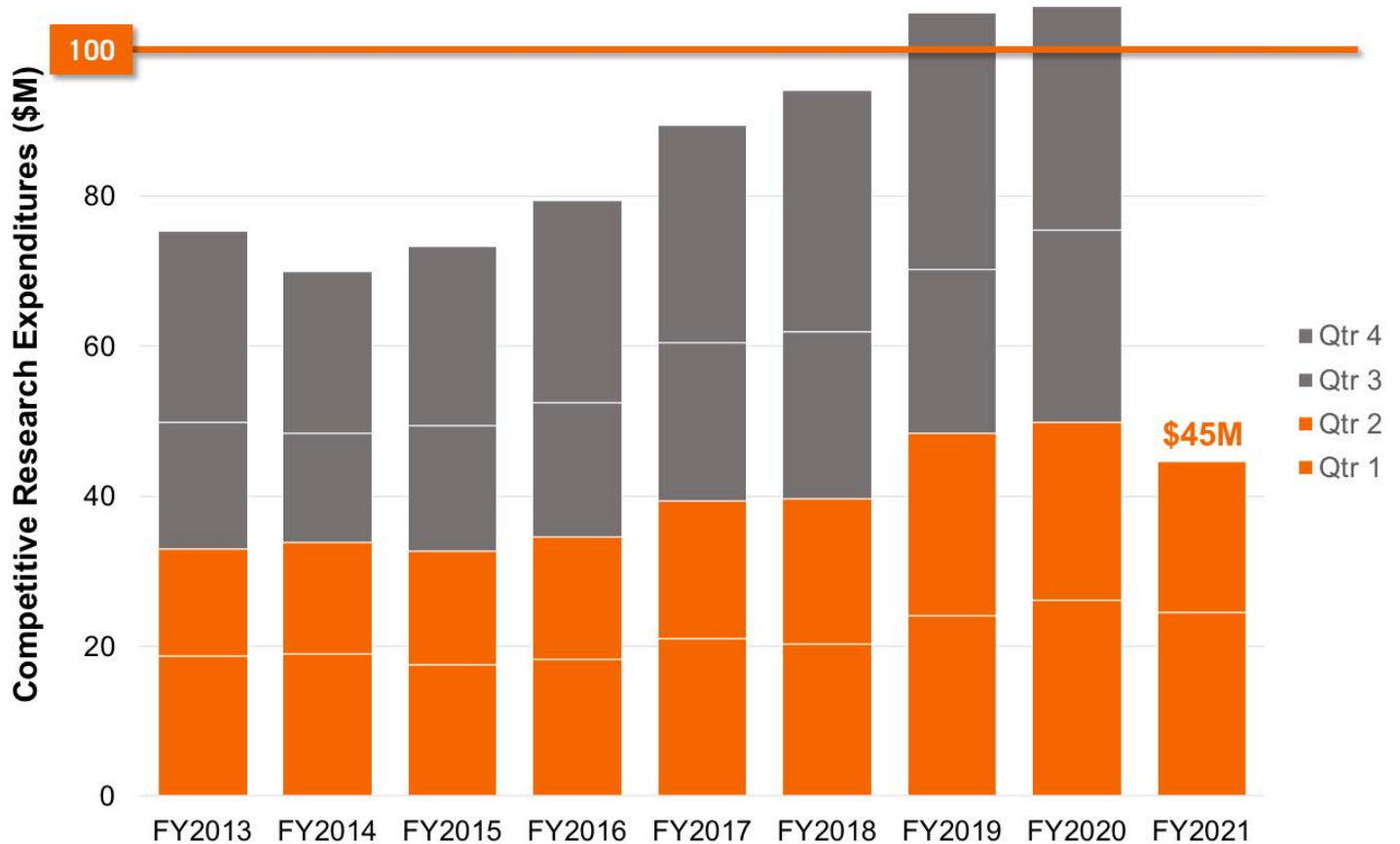
Research Expenditures

→ Competitive expenditures again top ClemsonForward goal

ClemsonForward set a 10-year goal in 2016 to top \$100 million in annual competitive expenditures. Clemson achieved that goal (marked on the graph with an orange line) seven years ahead of schedule in 2019. In FY2020, Clemson topped \$100 million for the second consecutive year.

Competitive expenditures include funds from competitively bid projects, such as federal grant awards.

The orange bars at right show expenditures as of the second quarter end for each fiscal year. The gray bar shows year-end totals. FY2021 data is preliminary.



2021 Q2 totals preliminary

Research Awards

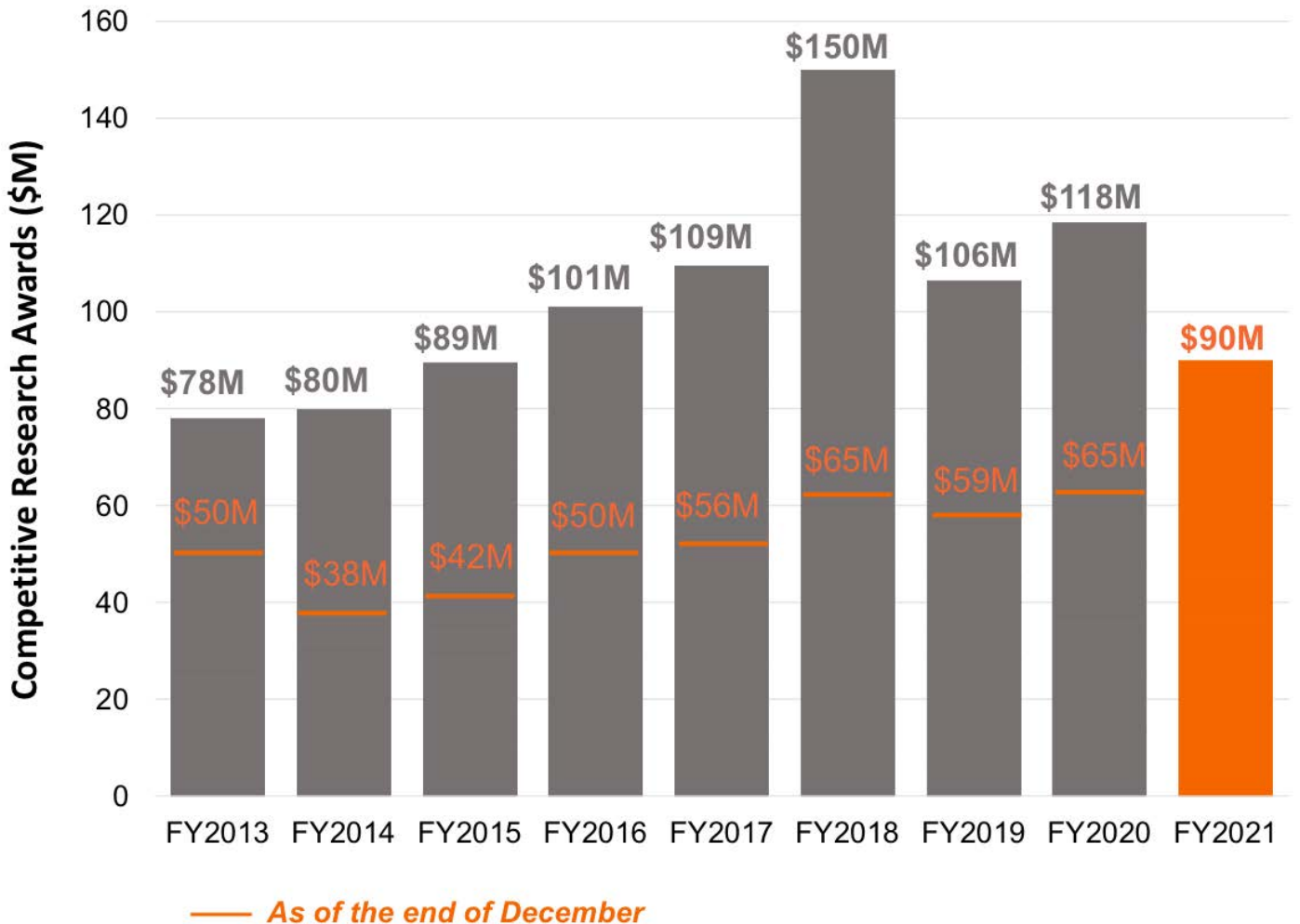
→ Research awards up 38% from prior year period

Clemson faculty continue to be increasingly successful earning competitive research awards. Research awards were up 38 percent through the second quarter of FY2021 as compared to the same period a year ago.

Awards in FY2018 were heightened due to two large industry contracts. Excluding that year, FY2020 was the top year for awards of the past eight years and FY2021 is on a high trajectory as well.

The gray bars show year-end totals for each year. The orange line shows awards received through the end of December to provide an annual comparison for FY2021, which includes awards through December.

Details on the highest-value grants recently received are listed on the next page.



Research Awards



Top Competitive Grants (received between May 27, 2020 and Jan. 4, 2021)

Zoran Filipi, Timken endowed chair in vehicle system design received \$16 million from the U.S. Army to support a project to make military vehicles autonomy-enabled cybersecure (pictured above), capable of running on a variety of energy sources, systems-aware and rapidly customizable. Bringing together 37 faculty members from seven departments, this project leverages Clemson's demonstrated capabilities in virtual prototyping and systems engineering to support the development of autonomy-enabled military ground vehicles to enable the US Army's rapid modernization of key capabilities.

Srikanth Pilla, Jenkins endowed professor of automotive engineering and founding director of the new Clemson Composites Center, received \$11.1 million from the U.S. Army for research related to manufacturing ground vehicle structures and components. Maximizing Clemson's strengths in materials discovery and engineering combined with emerging capabilities in additive manufacturing and artificial intelligence/machine learning, this project aims to develop new technologies and print high-performance structural components for ground vehicle systems.



Srikanth Pilla, right, and Saeed Farahani inspect parts they created as part of their research into hybrid single-shot manufacturing of metals and composites.

continued on next page

Research Awards

Top Competitive Grants **continued** (received between May 27, 2020 and Jan. 4, 2021)



Ksenija Gasic

Ksenija Gasic, professor of plant and environmental sciences, received \$5 million from the U.S. Department of Agriculture for specialty crop research on Armillaria Root Rot, a persistent fungal disease affecting stone fruit trees like peaches, cherries and almonds. The disease is both expensive and difficult to treat. This project – a collaboration between Clemson University, University of Georgia, University of Kentucky, Michigan State University and University of California, Davis – offers both short-term control and longer-term eradication solutions to mitigate the effects of this disease.

Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences, received \$4 million from the National Science Foundation to support research at Clemson University’s Center for Aviation and Automotive Technological Education using Virtual E-Schools (CA2VES). Funded as part of the NSF Advanced Technological Education program, this project involves the close collaboration of Clemson University with South Carolina technical colleges to prepare students for careers in aviation and automotive manufacturing. This project strives to develop a workforce prepared to succeed in these technologically advanced industries.

Jeff Marshall, professor and associate dean of research and graduate studies in the College of Education, received \$3.1 million from the U.S. Department of Education for a teacher-development project. Teacher professional development has long followed a ‘one-size-fits-all’ approach – an approach that does not take into consideration individual interests, skills, career stage and school needs. Using advanced data analytics tools, this project will develop models to identify and support personalized professional development to ultimately improve STEM teacher effectiveness and retention in South Carolina’s high-needs, high-poverty middle schools.

Barbara Campbell, associate professor and graduate program coordinator for microbiology, received \$2.5 million from the National Science Foundation for microbiome research. The NSF has identified ten “Big Ideas” to serve as guides for developing scientific capacity in the US. One of those ten, “Understanding the Rules of Life” is a theme aimed at uncovering the set of rules which govern phenotype, the physical manifestation of an organism’s genes. This project strives to elucidate and understand the ecological rules that govern the relationship between ecosystems and their microbiome inhabitants.



Barbara Campbell

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Research Awards

Top Competitive Grants **continued** (received between May 27, 2020 and Jan. 4, 2021)

Steven Long, assistant director of Clemson Regulatory Services, received \$2.3 million from the U.S. Department of Agriculture to support development of an Asian Longhorned Beetle eradication program. The Asian Longhorned Beetle is an introduced species in the United States and has very recently arrived in South Carolina, discovered in Charleston in 2000. These pests feed on maple, willow, elm and birch trees, and their feeding pattern kills the tree from the inside out. This project aims to develop and implement an eradication program for the Asian Longhorn Beetle in South Carolina.



Shelia Cotten

Shelia Cotten, associate vice president for research development, received \$2.3 million from the National Science Foundation to support workforce development in the era of automated transportation. As the United States transitions to automated vehicles, millions of American jobs will be impacted directly through the replacement of workers and changes in job requirements needed to work with and maintain automated vehicles, as well as indirectly through changes in organizations, standards of living, and worker well-being. This project will study the potential impacts of this transition and will develop strategies to prepare the driving workforce for the future.

Ronald Gimbel, chair of the Department of Public Health Sciences, received \$1.8 million from the Medical University of South Carolina for a COVID-19 screening initiative. Clemson University and MUSC partner to develop the “Healthy Me – Healthy SC” program aimed at providing COVID-19 testing support to rural and underserved areas in the Midlands and Upstate of South Carolina.

Celeste Bates, associate professor of literacy education, received \$1.8 million from the S.C. Department of Education for the Reading Recovery Early Literacy Teacher Training and Support program. Reading Recovery is a nationwide literacy program aimed at supporting first grade students who are struggling to read or write. An agreement with the SC Department of Education, this project establishes Clemson University as a training site for South Carolina elementary school teachers pursuing the specialized certification necessary for this intensive reading intervention to be successful.



Celeste Bates

56

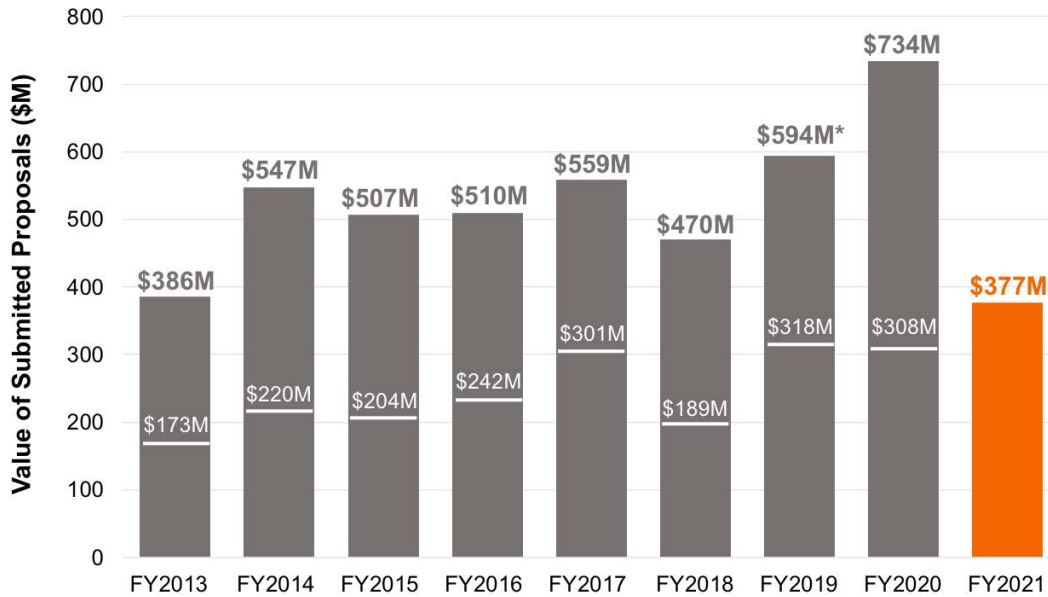
RESEARCH PROJECTS OF AT LEAST \$2M WON SINCE 2015

THE TOTAL VALUE OF THESE PROJECTS IS

\$264 MILLION

Proposal Submissions

Proposal submissions spiked in FY2020 as Clemson faculty submitted proposals for several high-value projects, a trend that has continued in FY2021.

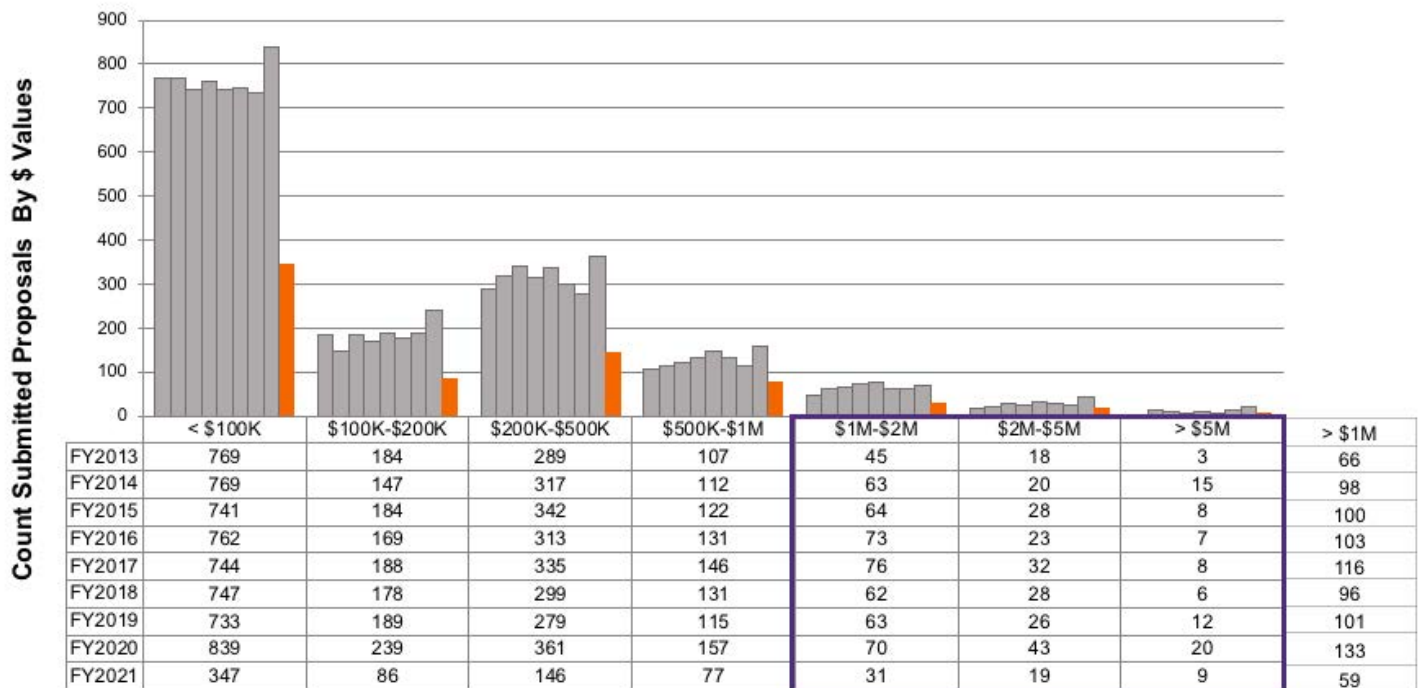


*This chart includes a large \$107M multidisciplinary proposal submitted in FY2019

Figure on white line as of the end of December

HIGH-VALUE PROPOSALS

The chart below breaks down the range of proposal value. Clemson faculty are increasingly pursuing high-value research projects. In FY2020, faculty submitted 133 proposals requesting funds of at least \$1 million. This is a sign that Clemson’s research culture is growing stronger. Data for FY2021 is through only the second quarter.



FY2021 through Q2

Research Report Card (FY2021 through Second Quarter)

INDEX

CAAH: College of Architecture, Arts & Humanities

CAFLS: College of Agriculture, Forestry & Life Sciences

CBSHS: College of Behavioral, Social & Health Sciences

CECAS: College of Engineering, Computing & Applied Sciences

COE: College of Education

COB: College of Business

COS: College of Science

CCIT: Clemson Computing & Information Technology

PSA: Public Service & Agriculture

		2013	2014	2015	2016	2017	2018	2019	2020	2021	
RESEARCH INPUTS										end of 2nd Quarter	
a. Proposal Submissions by Number		1,414	1,443	1,489	1,478	1,529	1,451	1,417	1,729	715	
1	CAAH	38	51	65	62	69	64	69	76	46	
2	CAFLS	235	230	224	222	241	229	377	473	132	
3	CBSHS	81	93	102	104	112	101	105	143	71	
4	CECAS	549	555	582	617	618	587	562	672	289	
5	COE	51	54	39	45	46	37	39	42	15	
6	COB	7	15	13	15	7	10	5	11	9	
7	COS	242	247	263	239	230	227	186	219	106	
8	CCIT	12	12	6	3	5	1	1	1	-	
9	PSA	88	90	118	97	170	163	33	37	14	
10	VP for Res & Interdisc Inst	31	17	7	17	14	12	25	29	20	
11	All Other	80	79	70	57	17	20	15	26	13	
b. Proposal Submissions by Dollar Value (in millions)		\$386M	\$547M	\$507M	\$510M	\$559M	\$470M	\$486M*	\$734M	\$377.1M	FY2021 Targets
12	CAAH	N/A	N/A	\$9.4	\$8.6	\$3.1	\$5.7	\$4.4	\$5.9	\$1.8	\$6.6
13	CAFLS	N/A	N/A	\$42.6	\$23.8	\$43.4	\$37.1	\$64.1	\$92.9	\$33.8	\$68.6
14	CBSHS	N/A	N/A	\$28.4	\$40.1	\$41.4	\$25.9	\$47.9	\$41.1	\$21.0	\$51.3
15	CECAS	N/A	N/A	\$260.5	\$281.2	\$306.4	\$235.5	\$255.3	\$405.9	\$181.7	\$310.9
16	COE	N/A	N/A	\$13.8	\$14.7	\$18.1	\$19.1	\$10.1	\$18.9	\$8.3	\$14.3
17	COB	N/A	N/A	\$7.5	\$4.3	\$2.8	\$1.8	\$2.1	\$2.9	\$2.5	\$2.3
18	COS	N/A	N/A	\$100.2	\$111.3	\$95.9	\$100.4	\$73.8	\$129.3	\$79.8	\$95.6
19	CCIT	N/A	N/A	\$4.3	\$2.0	\$4.0	\$0.9	\$0.4	\$3.0	\$0.02	
20	PSA	N/A	N/A	\$23.3	\$10.4	\$31.3	\$25.8	\$11.4	\$6.4	\$4.2	\$15.3
21	VP for Res & Interdisc Inst	N/A	N/A	\$5.6	\$7.7	\$6.0	\$12.7	\$9.5	\$19.8	\$18.7	
22	All Other	N/A	N/A	\$11.4	\$5.6	\$6.0	\$5.0	\$7.4	\$7.7	\$25.2	

*This figure excludes a large \$107 million proposal from Clemson and Prisma Health.

Research Report Card (FY2021 through Second Quarter)

		2013	2014	2015	2016	2017	2018	2019	2020	2021
RESEARCH INPUTS continued										end of 2nd Quarter
c. Research Awards (in millions)		\$78.0M	\$79.7M	\$89.3M	\$100.9M	\$109.5M	\$149.8M	\$106.3M	\$118.3M	\$90.0M
23	CAAH	\$0.2	\$0.6	\$0.7	\$1.4	\$0.5	\$1.9	\$2.0	\$1.4	\$1.1
24	CAFLS	\$7.3	\$6.7	\$14.1	\$8.6	\$10.9	\$13.9	\$14.2	\$22.3	\$14.4
25	CBSHS	\$2.7	\$3.4	\$4.8	\$5.1	\$4.6	\$8.1	\$5.9	\$7.7	\$6.8
26	CECAS	\$34.2	\$37.7	\$48.2	\$45.5	\$54.0	\$80.8	\$50.4	\$48.0	\$52.1
27	COE	\$2.6	\$4.1	\$3.2	\$2.9	\$2.8	\$4.5	\$3.3	\$2.3	\$4.7
28	COB	\$2.0	\$1.1	\$1.3	\$0.8	\$1.2	\$1.1	\$0.8	\$1.2	\$0.05
29	COS	\$10.3	\$7.8	\$9.9	\$15.6	\$19.9	\$14.7	\$18.7	\$14.2	\$5.8
30	CCIT	\$1.6	\$5.7	\$0.7	\$0.8	\$0.5	\$1.3	\$0.1	\$0.3	\$0.7
31	PSA	\$14.8	\$12.3	\$9.6	\$13.0	\$7.9	\$6.6	\$4.0	\$4.1	\$2.6
32	VP for Res & Interdisc Inst	\$1.8	\$0.3	\$0.6	\$5.1	\$5.0	\$15.1	\$6.2	\$14.6	\$1.1
33	All Other	\$0.3	\$0.2	\$1.2	\$2.0	\$1.2	\$1.7	\$0.7	\$2.2	\$0.6
d. National Young Investigator Awards		4	3	4	7	8	7	6	9	4*
34	NSF CAREER Awards (by start date)	4	1	3	5	7	7	4	6	4*
35	Air Force Young Investigator Awards	-	-	1	2	1	-	1	-	-
36	Army Young Investigator Awards	-	-	-	-	-	-	-	1	-
37	DARPA Young Investigators Awards	-	-	-	-	-	-	-	1	-
38	EPA Earley Career Awards	-	-	-	-	-	-	1	-	-
39	DOE Early CAREER Awards	1	-	-	-	-	-	-	-	-
40	Department of Homeland Security	-	1	-	-	-	-	-	-	-
41	Dept. of Ed. Inst. of Educational Sciences	-	-	-	-	-	-	-	1	-
e. Supporting Workforce										
42	Graduate Student Enrollment	4,206	4,372	4,670	4,664	4,425	4,985	5,282	5,627	5,538
43	Sponsored Graduate Research Assistants	822	745	707	693	696	761	558	637	546
44	Postdoctoral Fellows	48	64	83	85	90	97	98	98	106
45	Research Faculty: Permanent 100% Non-E&G Funded	6	6	6	11	17	14	11	18	12
46	Research Faculty: Temporary 100% Non-E&G Funded	18	18	15	14	24	27	29	54	45

* Awards anticipated. Additional proposals pending

VPR letter

1. News

2. COVID-19

3. Metrics

4. Efficiency

5. Faculty

Research Report Card (FY2021 through Second Quarter)

		2013	2014	2015	2016	2017	2018	2019	2020	2021
RESEARCH PROCESS										Preliminary data in red*
f. Sponsored Research Expenditures by Business Unit (in millions)		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	\$104.5M	\$105.3M	\$44.6M
47	CAAH	\$0.5	\$0.4	\$0.4	\$1.1	\$1.3	\$1.4	\$1.7	\$1.6	\$0.5
48	CAFLS	\$8.8	\$7.7	\$6.8	\$8.6	\$11.1	\$11.0	\$14.1	\$16.4	\$6.7
49	COB	\$1.2	\$1.2	\$1.1	\$1.0	\$0.9	\$0.8	\$0.8	\$0.7	\$0.3
50	CECAS	\$35.0	\$35.0	\$35.0	\$37.5	\$42.9	\$45.1	\$50.3	\$46.4	\$20.5
51	CBSHS	\$3.1	\$2.8	\$3.7	\$4.1	\$4.4	\$4.9	\$5.3	\$6.7	\$3.3
52	COE	\$3.3	\$3.3	\$3.8	\$2.5	\$2.6	\$2.2	\$2.5	\$2.4	\$0.8
53	COS	\$13.2	\$10.5	\$9.3	\$11.3	\$14.8	\$16.7	\$17.2	\$17.3	\$6.9
54	CCIT	\$2.0	\$1.6	\$3.4	\$2.8	\$0.4	\$0.6	\$0.2	\$0.1	\$0.1
55	PSA	\$4.7	\$4.9	\$5.8	\$5.6	\$5.7	\$5.9	\$3.7	\$3.9	\$2.0
56	VP for Res & Interdisc Inst	\$1.9	\$1.3	\$1.9	\$3.5	\$3.9	\$3.9	\$7.1	\$9.5	\$3.1
57	All Other	\$1.7	\$1.7	\$2.2	\$1.5	\$1.5	\$1.6	\$1.5	\$0.4	\$0.2
g. Sponsored Research Expenditures by Innovation Cluster (in millions)		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	\$104.5M	\$105.3M	\$44.6M
58	Advanced Materials	\$14.3	\$11.3	\$10.7	\$10.4	\$10.7	\$12.1	\$15.4	\$13.5	\$5.3
59	Cyberinfrastructure & Big Data Science	\$10.3	\$10.5	\$10.1	\$8.9	\$8.1	\$9.6	\$6.9	\$4.4	\$2.6
60	Energy, Trans. & Advanced Manufacturing	\$4.7	\$5.7	\$7.2	\$7.6	\$17.8	\$16.8	\$17.1	\$14.5	\$6.9
61	Health Innovation	\$13.1	\$10.2	\$10.2	\$12.5	\$16.3	\$17.8	\$23.8	\$27.1	\$10.2
62	Human Resilience	\$8.2	\$7.7	\$9.7	\$9.8	\$7.8	\$8.6	\$9.0	\$9.7	\$5.1
63	Sustainable Environments	\$18.3	\$16.9	\$17.9	\$21.7	\$18.9	\$19.5	\$20.6	\$23.9	\$9.1
64	Other	\$6.5	\$7.6	\$7.4	\$8.6	\$9.9	\$9.6	\$11.7	\$12.1	\$5.4
h. Sponsored Research Expenditures by Funding Source (in millions)		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	\$104.5M	\$105.3M	\$44.6M
65	Federal Government	\$62.9	\$56.9	\$58.5	\$65.1	\$74.6	\$78.2	\$85.1	\$85.2	\$37.7
66	Foundations, Societies, and Associations	\$4.2	\$4.3	\$4.7	\$4.1	\$4.7	\$5.1	\$7.4	\$6.9	\$1.3
67	Industry/Other	\$4.9	\$5.6	\$6.1	\$6.9	\$6.8	\$6.3	\$5.3	\$5.5	\$1.9
68	International	\$0.8	\$0.6	\$0.8	\$0.8	\$0.5	\$0.4	\$0.3	\$0.3	\$0.09
69	Local Government	\$0.6	\$0.6	\$0.6	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.4
70	State Government	\$1.9	\$1.9	\$2.7	\$2.0	\$2.4	\$3.7	\$5.7	\$6.8	\$3.3

*FY2021 expenditures are preliminary.

VPR letter

1. News

2. COVID-19

3. Metrics

4. Efficiency

5. Faculty

Research Report Card (FY2021 through Second Quarter)

		2013	2014	2015	2016	2017	2018	2019	2020	2021
RESEARCH PROCESS cont.										Preliminary data in red*
i. Sponsored Research Expenditures per T/TT Faculty by College										
71	CAAH	\$3,299	\$2,264	\$2,343	\$5,841	\$8,177	\$8,945	\$10,159	\$10,003	\$3,158
72	CAFLS	\$88,570	\$81,120	\$69,612	\$84,618	\$105,396	\$103,814	\$134,555	\$137,438	\$58,874
73	COB	\$14,415	\$13,047	\$11,510	\$9,683	\$8,855	\$8,269	\$8,200	\$6,991	\$3,307
74	CECAS	\$169,754	\$160,698	\$163,406	\$163,685	\$194,323	\$214,280	\$225,620	\$201,553	\$84,550
75	CBSHS	\$27,982	\$26,853	\$33,764	\$42,376	\$34,751	\$39,532	\$40,301	\$50,495	\$24,840
76	COE	\$54,779	\$51,688	\$62,195	\$38,037	\$44,483	\$40,197	\$47,371	\$47,742	\$16,516
77	COS	\$95,724	\$72,421	\$61,912	\$77,589	\$95,956	\$110,206	\$118,600	\$116,020	\$46,758
RESEARCH OUTPUTS/ OUTCOMES										
78	NIH R01-Equivalent Awards (by start date)	-	-	2	2	2	3	6	1	1
79	Doctorates Awarded (Aug, Dec, May)	187	217	237	233	231	234	301	249	70
80	STEM Doctorates Awarded (Aug, Dec, May)	118	153	165	138	156	171	174	162	51
81	Disclosures	102	129	70	60	65	48	61	68	21
82	Patents	16	15	15	14	18	11	18	12	5
83	Licenses/Options	9	7	7	5	10	10	16	13	10
84	Licensing Revenue		\$762,811	\$360,131	\$354,827	\$539,490	\$388,751	\$398,136	\$315,578	\$72,116
85	Start-up Companies (based on licenses/options)	1	4	4	2	3	3	5	1	-

*FY2021 expenditures are preliminary.

A person stands in a field of tall grass, holding a large orange flag with the white paw print logo of Clemson University. The sun is shining brightly behind the flag, creating a lens flare effect. In the background, there is a body of water and a line of trees under a cloudy sky.

RESEARCH EFFICIENCY

This section reviews the efficiency of Clemson's research enterprise.

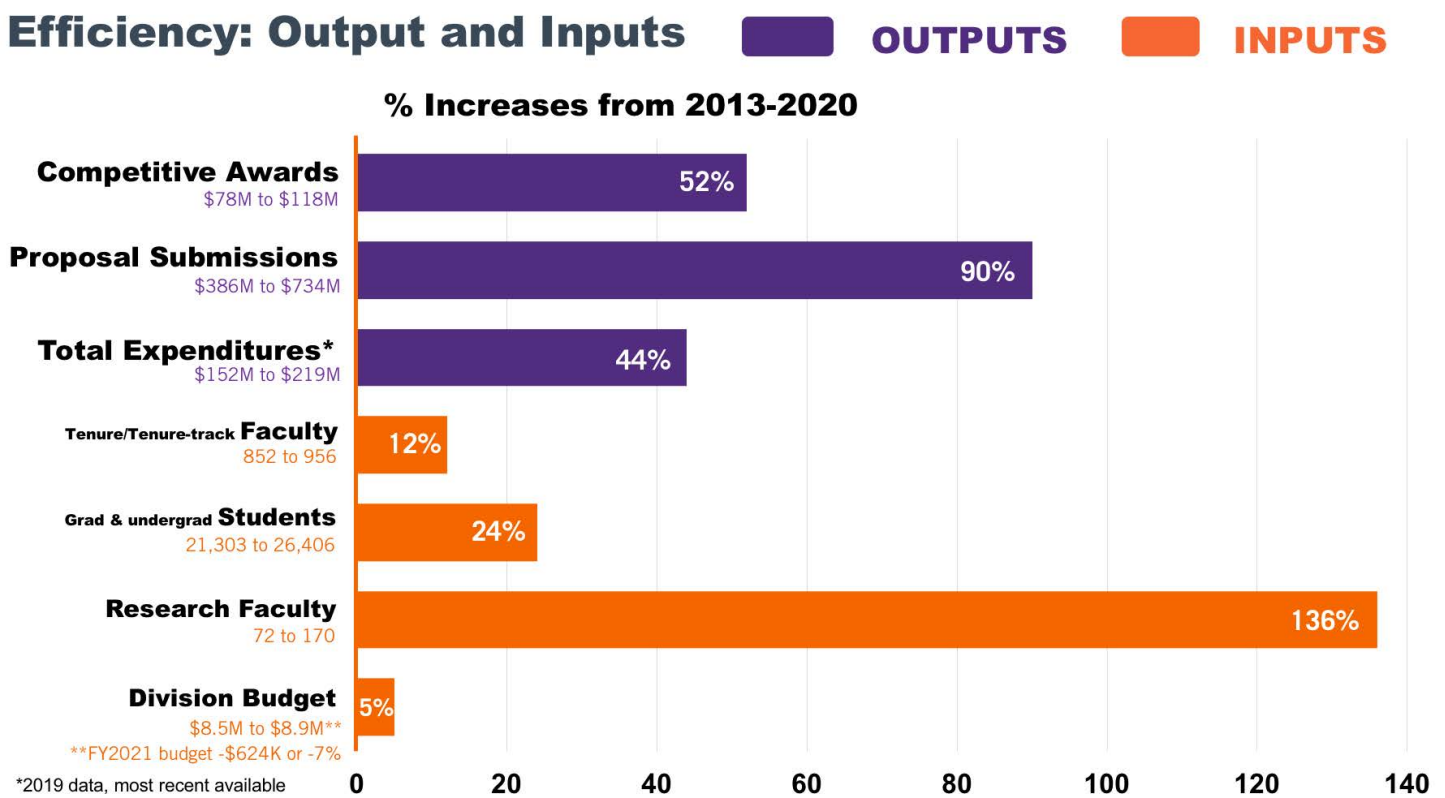
Executive Summary

- Percentage increases to research productivity (i.e. awards, proposals and expenditures) have increased at a greater rate than increases in inputs ([see page 38](#)).
- Per capita output - research expenditures and awards per researcher and per tenure and tenure-track faculty - have increased considerable ([see page 39](#)).
- When reviewing research enterprises at peer Carnegie R1 universities, we see that institutions with higher levels of expenditures (greater output) have larger faculty bodies and/or more available space ([see pages 40-41](#)). This suggests Clemson is operating at or near its capacity.

Increasing Productivity

➔ Research outputs are outpacing increases in inputs

To review research efficiency, we analyzed our productivity and have experienced notable improvements in the past seven years. Research outputs, which are productivity measures including awards, submissions and expenditures, have been increasing at a greater percentage than our inputs, or the number of faculty members, students and Division of Research support services and staff who account for that research output (see chart below). In the chart below, the purple bar represents outputs, and the orange bar denotes inputs.



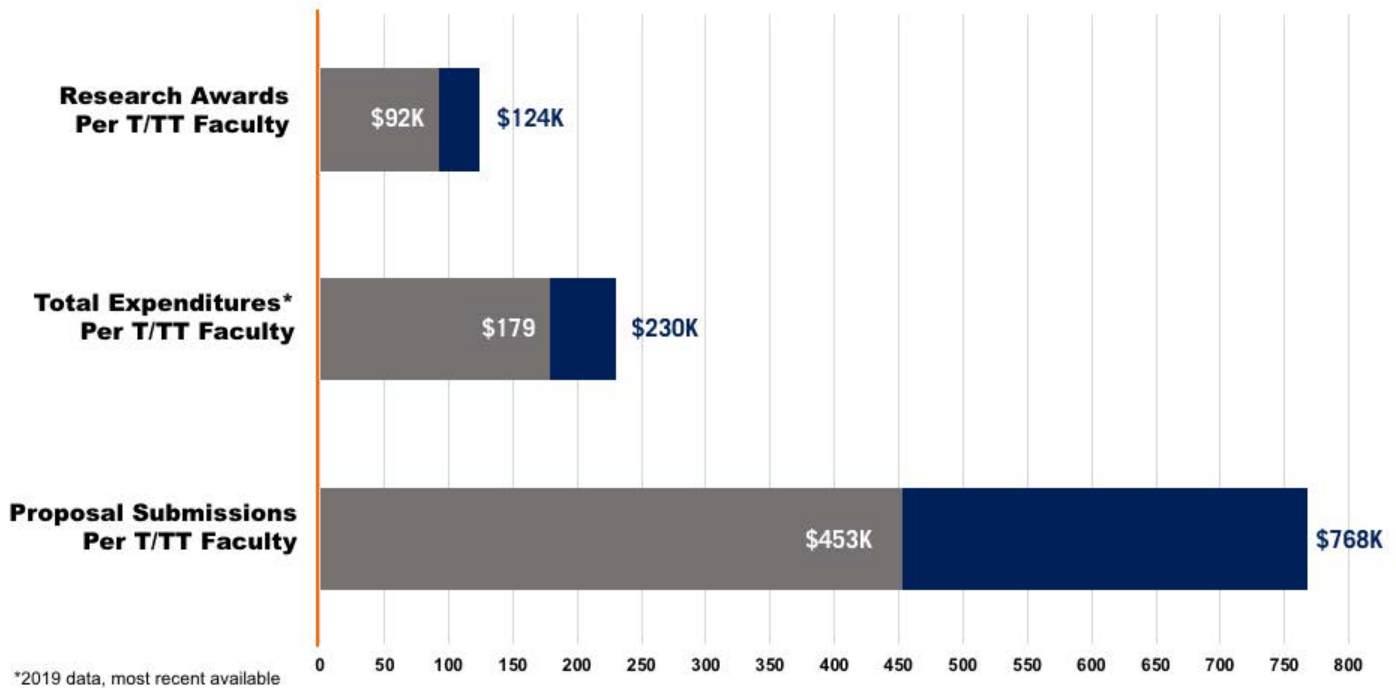
Increasing Productivity

→ Per-capita productivity is increasing

To further review efficiency, we analyzed productivity on a per-capita basis. We can see that on a per-capita basis, we are more productive than we were seven years ago. In the chart below, the gray bar represents the per-capita output in 2013, and the blue bar represents the per capita output in 2020. Data for total expenditures is for 2019 because 2020 data is not yet available.

Efficiency: Output Ratios

2013 2020



T/TT = Tenure/Tenure Track Faculty

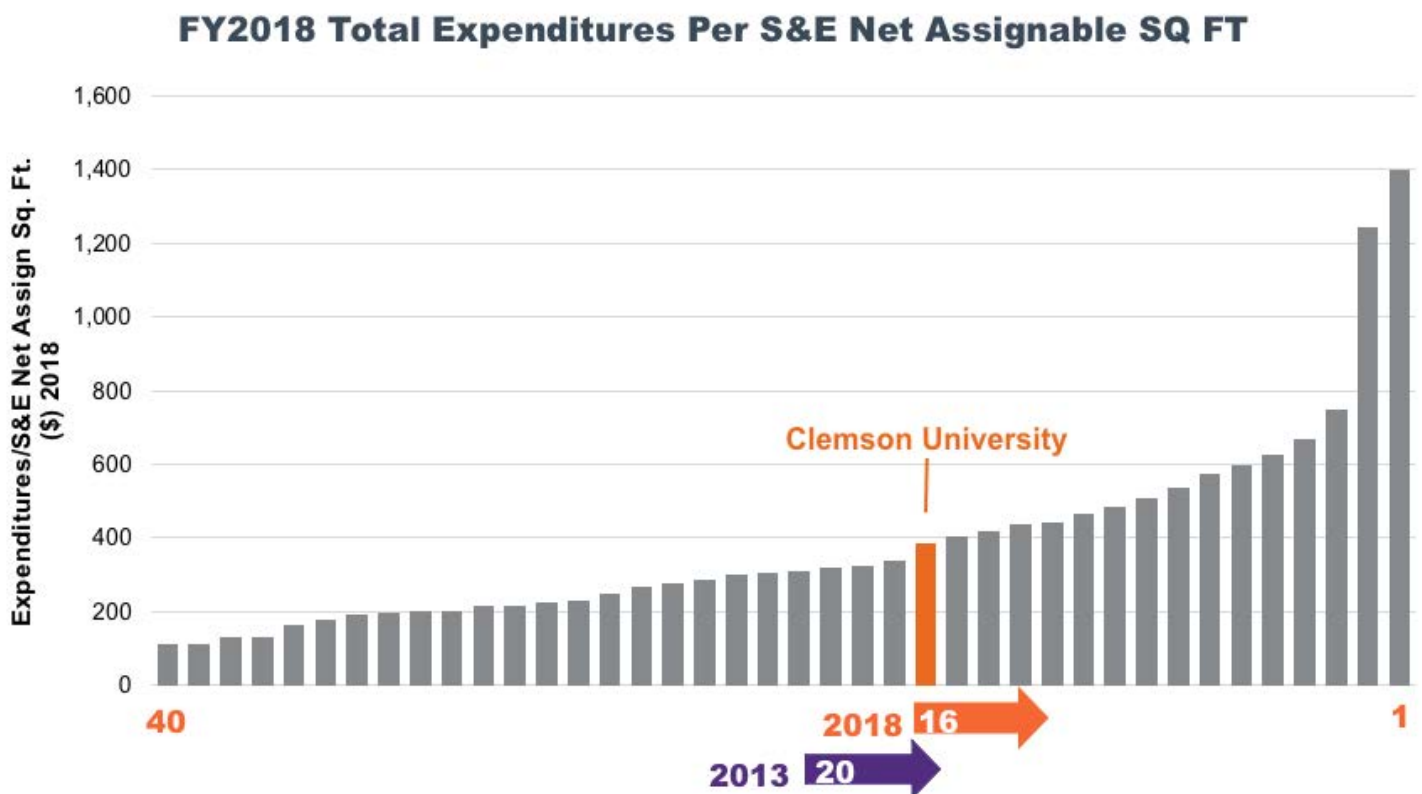
Operating Near Capacity

→ Productivity nearing peak given faculty size and available space

To analyze efficiency, we also compare ourselves to our peers institutions, which we define as public R1 universities without medical schools. The chart below includes expenditures per square footage of space assigned for Clemson (the orange bar) and our 39 peer R1 institutions.

As the chart below shows, we are slightly above average in expenditures per available space. Clemson is middle of the pack in this category, ranking No. 16. This was up four spaces from 2013 (No. 20) as our total expenditures have increased substantially.

To dig deeper, we plotted these institutions based on the size of the research workforce and the amount of available space to see if there was a correlation to production, or research expenditures (see the chart on the next page).



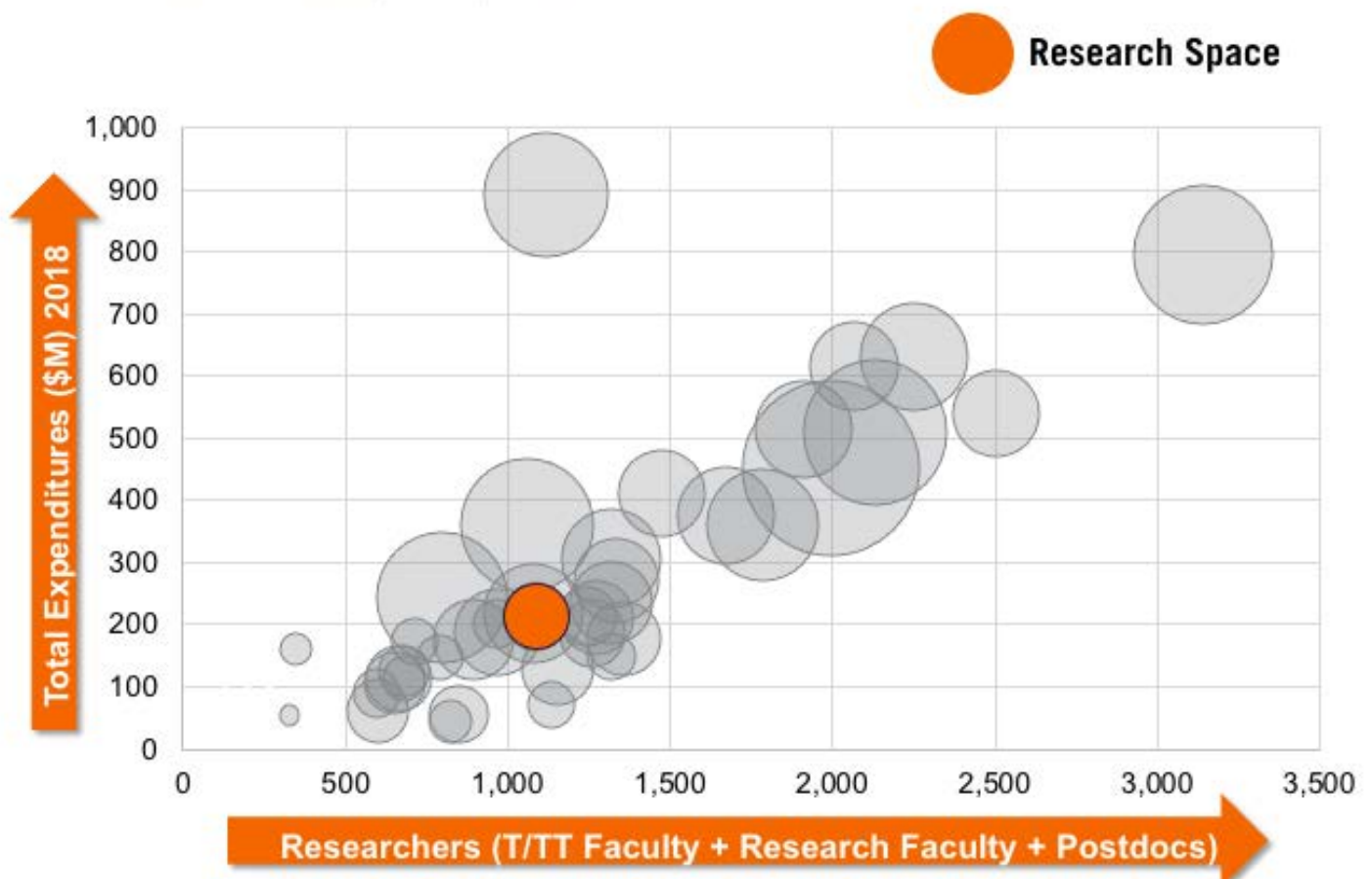
Operating Near Capacity

→ Productivity nearing peak given faculty size and available space

The chart below plots these 39 peer R1 universities and Clemson (the orange bubble) based on number of researchers, amount of space available and total expenditures. The size of the bubble depicts research space available: the bigger the bubble, the more space.

When plotting universities this way, we see that universities with higher levels of expenditures (greater output) have larger faculty bodies and/or more available space. This suggests that Clemson is operating near its research capacity, so further research growth would require faculty hiring and investments in space.

Total Expenditures Per Researchers by Science & Engineering Research Space:
FY 2018 Peer 39 (R1, Public, No Medical School)





FOCUS ON FACULTY

This section highlights the achievements of faculty members.

Executive Summary

- Three faculty members are highlighted from each college. Entries were submitted by the colleges.
 - » [College of Agriculture, Forestry and Life Sciences](#)
 - » [College of Architecture, Art and Humanities](#)
 - » [College of Behavioral, Social and Health Sciences](#)
 - » [College of Business](#)
 - » [College of Education](#)
 - » [College of Engineering, Computing and Applied Sciences](#)
 - » [College of Science](#)



Mireille Arguelles-Ramos, PhD

Assistant Professor

Department of Animal and Veterinary Sciences



Arguelles-Ramos has 10 years of experience as a non-ruminant nutritionist, formulating commercial and experimental feeds for poultry. Before joining Clemson University, she taught undergraduate and graduate courses at the University of Puerto Rico at Mayagüez and served as technical manager for several animal nutrition companies. Dr. Arguelles-Ramos recently transitioned to a tenure-track position. Her research interests include evaluating potential alternative feed ingredients (e.g., sorghum, hemp), studying the interaction with other feedstuffs, enzymes, and additives.

She studies feed manufacturing, egg and meat quality parameters that might be impacted by the inclusion of alternative ingredients, feeding and health management strategies to improve animal gut health, including new probiotics, prebiotics.

Selected Accomplishments

Recent Publications:

- Arguelles-Ramos, M., Brake, J. (2020). The effects of sodium chloride versus sodium bicarbonate at the same dietary sodium concentration on efficacy of dietary phytase and a carbohydrase-protease cocktail in broilers. *Brazilian Journal of Poultry Science*, 22(2), 1-8.
- Arguelles-Ramos, M., Nusairat, B., Qudsieh, R., Brake, J. (2020). Effects of phytase inclusion in broiler breeder diets during early lay on fecal and egg characteristics. *Brazilian Journal of Poultry Science*, 22(1), 1-6.
- Arguelles-Ramos, M., Rivera-Serrano, A., Cruz-Ramos, P., Hernandez, Z., Garcia, F. (2019). Effect of growth rate and age on the severity of white striping and woody breast and meat quality characteristics of broilers. ((E-Supplement 1) ed., vol. 98 , pp. 234).
- Arguelles-Ramos, M., Hernandez-Gracia, C., Ramirez-Diaz, G., Carrasquillo-Santiago, T., Fernandez-Otero, N., Rodriguez-Camacho, K., Fonseca-Martinez, J., Rivera-Serrano, A., Camareno-Lozada, L. (2019). Effect of the dietary inclusion of black soldier fly larvae meal on broiler performance and carcass traits. (pp. 86).



Tom O'Halloran, PhD

Assistant Professor

Department of Forestry and Environmental Conservation

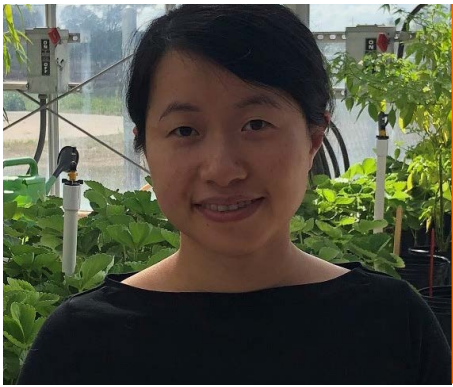


Thomas L. O'Halloran began his career with Clemson University with a 100% research appointment, and works at the Baruch Institute of Coastal Ecology and Forest Science in Georgetown, SC. He has B.A., M.S., and Ph.D. degrees from the Department of Environmental Sciences at the University of Virginia. He conducted postdoctoral research at the National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, CA and in the Department of Forest Ecosystems and Society at Oregon State University. His research examines the effects of ecosystem disturbances like hurricanes and land management (i.e. longleaf pine restoration) on carbon sequestration and Earth's climate. His work involves deploying high tech sensors on tall towers to measure gas and energy exchange above forests and other ecosystems.

O'Halloran's nationally-recognized research program is evidenced by invitations to speak at major universities (such as Johns Hopkins) and national society meetings, and, most recently, at the National Academy of Sciences. Since arriving at Clemson, he has published five papers in top journals (as measured by their impact factors [IF]), including Nature Climate Change [19.2], Geophysical Research Letters [4.3], and Environmental Research Letters [4.5], as well as contributed to one workshop proceeding (National Academy of Sciences). He has mentored seven undergraduate students (four at Clemson University, three at Sweet Briar College), and recruited a Master's and two Ph.D. students. Dr. O'Halloran also has leveraged internal funding to obtain nearly \$675,000 in extramural funding including from competitive programs at the National Science Foundation (NSF).

Selected Accomplishments

- Invited to serve as a panel reviewer for National Science Foundation and Department of Energy
- Invited to speak at the International Carbon Observation System (ICOS) in Norway
- Contributed to 27 additional presentations at regional and national meetings and workshops
- Publications cited nearly 1,000 times, including the Intergovernmental Panel on Climate Change (IPCC) report
- Established a new project to measure the carbon and water use of restored longleaf pine forests
- Established a new project to measure greenhouse gas emissions from managed waterfowl wetlands



Hehe Wang, PhD

Assistant Professor

Department of Plant and Environmental Science



Hehe Wang is a plant bacteriologist/pathologist, who conducts research at the Edisto Research and Education Center using both basic and applied approaches to inform her Extension activities addressing stakeholder needs. Dr. Wang promotes sustainable agriculture by studying epidemiology, ecology, and genetics of bacterial pathogens in numerous crop production systems, including peach, strawberry, and tomato. She develops novel, sustainable, and information-driven management practices to reduce sources of plant diseases and to minimize or prevent disease progression. In addition, Dr. Wang researches interactions among plant pathogens and beneficial bacteria.

Wang recently transitioned from being a research scientist to a tenure-track position within the College of Agriculture, Forestry and Life Sciences. She has approximately 36 publications, and has supervised five graduate and six undergraduate students. Dr. Wang is a member of Clemson University's renowned Peach Team, and has numerous awards from various commodity boards. She has served on three search committees at Clemson University and several committees of American Phytopathological Society. She also served as judge for several student/post-doc conference awards and served as reviewer for many manuscripts in peer-reviewed journals.

Selected Accomplishments

- Led a multi-institutional team that received a \$325,000 grant from USDA in 2017 titled "Development and Comparison of Pathogen Viability Tests for Seed Certification and Improved Management of Bacterial Spot of Tomato"
- Received annual funding support from the South Carolina Peach Council to work on bacterial diseases of peach
- Received funding from the South Carolina Department of Agriculture to develop strategies addressing bacterial diseases in the state's peach orchards
- Received two grants from the South Carolina Peanut Board to promote plant growth and manage white mold and late leaf spot in peanuts
- Received funding from Cotton, Incorporated to study the incidence and impact of cotton leaf roll dwarf disease in the Southeastern U.S.
- Received funding from USDA-APHIS to develop a field detection tool for Old World Bollworm



Paul Anderson, PhD

Associate Professor

Department of History and Geography



Before coming to Clemson in 2000, Professor Anderson taught at the University of Mississippi and the University of Alabama-Birmingham. In 2004, he was named Alumni Master Teacher, an award for outstanding undergraduate classroom instruction, which is presented to a faculty member nominated by the student body and selected by the Student Alumni Council. His areas of special interest are the American South and the American Civil War. Anderson's book, *A Short History of the American Civil War*, was published in September 2019 by Bloomsbury (UK). He teaches courses in nineteenth century U.S. history, including classes on the South to 1865 and the Civil War era. American South, South Carolina, American Civil War.

Selected Accomplishments

- Named University Historian, 2019
- Among those profiled in *The Best 300 Professors* publication by the Princeton Review
- Published, *A Short History of the American Civil War*, September 2019 by Bloomsbury (UK)
- Author of *Blood Image: Turner Ashby in the Civil War and the Southern Mind* (2002)



Dan Harding

Associate Professor
Architecture



Dan Harding is an associate professor of Architecture and Community Design+Build and serves as the director of the Community Research and Design Center (CR+DC) and the Architecture + communityBUILD graduate certificate program (A+cB) striving to ensure that South Carolina communities intently embrace the social, economic, and environmental pillars of sustainability.

Selected Accomplishments

- Awarded a Patent (No. 10,156,067) for the Sim[PLY] technology alongside Clemson students and other faculty as part of a hands-on study in affordable, wood-based building design. This is the first patent to originate from the College of Architecture, Arts and the Humanities, 2019
- Named as one of the thirty most influential design educators in the country by Design Intelligence (2013), citing the impact of his community-centric work.
- Thanks to its new patent, Sim[PLY] has partnered with a social housing group called Anomura based out of Victoria, British Columbia in Canada. The group is a British Columbia-registered society dedicated “to the creation of accessible housing solutions for all members of our community.” Sim[PLY] is set to debut commercially in British Columbia in the summer of 2019 as part of a grassroots effort to make affordable housing available to a workforce of teachers, nurses, police, firefighters and others who are vital to the Vancouver Island community. Anomura is also partnering with Camosun College, a public institution in British Columbia, to use its CNC equipment housed at Camosun Innovates, a research, manufacturing and innovation center.
- Named Robert Mills Professor 2015/16



Mashal Saif, PhD

Assistant Professor
Philosophy & Religion



Mashal Saif's research interests include Islam in contemporary South Asia and Yemen; the trans-temporal dynamics between medieval and modern Islamic discourses; contemporary Muslim political theology; the intersection of religious studies and postcolonial theory; and the anthropology of the state. Saif's teaching at Clemson has included specialized topics such as Islamic law, and Islam and the West.

Selected Accomplishments

- CAAH nominee for the University's Junior Researcher of the Year, 2020
- Sole recipient of the Dean's Excellence in Research Award, 2020
- Her scholarly articles have appeared in a variety of journals: *Modern Asian Studies*, *The Journal of Shi'a Islamic Studies*, *Islamic Studies*, *Fieldwork in Religion*, *Annali and Thinking About Religion*. She also authored several book chapters, book reviews and encyclopedia articles.
- Saif received a CU SEED Grant, 2018
- American Institute of Pakistan Studies, Collaborative Conference Award, 2016
- Selected for the Lightsey Fellowship, 2015
- Conference Presentations: "Shi'a Clerics and the Pakistani Constitution: Religion, Minority Rights and the State," Annual Conference on South Asia, Madison. 2018 Oct. "Authenticity and the Question of Belonging: Debating the Limits of Deobandism in Contemporary Pakistan," South Asian Muslim Studies Association Symposium, Madison.
- Invited Lecture: "Religion and Politics in Pakistan," at University of Notre Dame, Notre Dame, IN, in the course 'Islam and Politics,' taught by M. Tahir Kilavuz. (via Skype)



Bryan Lee Miller, PhD

Associate Professor

Sociology, Anthropology and Criminal Justice



Bryan Miller is a criminologist who studies substance abuse, corrections, and criminal justice policy. His work has evaluated drug use, probation practices, offender reentry, deviant peers, and substance treatment programs. His recent research has focused on evaluating the use of novel psychoactive drugs among those in community corrections and evaluating the impact of social media on drug use. He has worked on projects funded by the United States Department of Justice to reduce the number of individuals with mental illnesses and co-occurring disorders in jail, evaluate veteran treatment courts, design law enforcement led initiatives to respond to individuals with mental illnesses, and support justice led programs to implement evidence-based practices to reduce substance abuse.

Miller is graduate coordinator for the M.S. in Social Sciences program, an interdisciplinary program focused on social science research methods and theoretical knowledge, housed in the Department of Sociology, Anthropology and Criminal Justice. He teaches undergraduate criminal justice courses in corrections and criminology.

Selected Accomplishments

- Currently serving as the 49th President of the Southern Criminal Justice Association (2020-2021)
- Currently the Chair of the Drug and Alcohol Research Section of the Academy of Criminal Justice Sciences (2019-2021)
- Recent Fulbright Scholar at Tampere University, Finland (2018-2019)
- Recipient of the Clemson University Research, Scholarship and Artistic Achievement Award in 2019
- Published 8 peer-reviewed journal articles in 2019-2020 including 5 coauthored with students and 2 with international coauthors
- Delivered 7 international research presentations at conferences and invited events in 2019
- Selected to participate in the TIGER Advance Trailblazers leadership and mentoring program (2019-2020)
- Currently a faculty scholar at the Clemson University School of Health Research (CUSHR) and working with the Addiction Research Center (PRISMA) on projects to reduce substance abuse in Oconee County
- Currently serving as an Associate Editor of the American Journal of Criminal Justice



Zhuo Job Chen, PhD

Assistant Professor
Psychology



Job Chen is a social and personality psychologist who studies people's religious and spiritual beliefs and experiences. His research has examined the structure and phenomenology of mysticism and spirituality across faith traditions and cultures, including Tibetan and Chinese Buddhists, North American Shamans, Sunni and Shiite Muslims in Malaysia, Turkey, Pakistan and Iran, Hindu believers of India, and Christians and the non-religious in the US, China, and Germany. Chen has also studied the integration and conflict of religiosity and intellectual openness using both laboratory experiments and surveys, and much of his research reveals the mechanism of how various aspects of religion (e.g., religious coping, emotions of awe, sacredness) help people cope with difficulties and boost psychological wellbeing. He has authored and coauthored over 80 peer-reviewed publications and 4 book chapters.

Chen teaches graduate courses in research methodology and Structural Equation Modeling, as well as undergraduate courses of Psychology of Religion and Spirituality, Test and Measurement, and Personality.

Selected Accomplishments

- Co-submitted a \$1.7M dollar grant examining life-span development of religious styles to John Templeton Foundation
- Published 12 peer-reviewed journal articles between 2019-2020
- A publication was winner of the 2018 Constructed Environment International Award for Excellence
- Invited to author a chapter on "The Psychology of Religion in China – Eastern Traditions" for The Cambridge Handbook of the International Psychology of Religion
- Currently serving as program chair of Society for Scientific Study of Religion conference
- Nominated candidate for the council of Society for Scientific Study of Religion



Xia Jing, PhD

Assistant Professor
Public Health Sciences



Xia Jing is a health informatics scholar who has systematic education and training in medical informatics (MD), health informatics (PhD), and clinical informatics (Postdoc). She conducts health informatics research in China, the UK, and the USA. Her main research interests involve developing new methods, models, and applications to facilitate biomedical researchers, clinicians, and healthcare administrators to make better-informed decisions when utilizing existing evidence. On the basic science of health informatics, she and her collaborators conduct studies to explore clinicians' research hypothesis generation process via secondary data analytic tools (funded via NIH R15); on the applied science of health informatics, she and her collaborators explore better management and maintenance of clinical decision support rules in primary care settings, especially the settings without in-house technical support (funded via NIH R01). She teaches various undergraduate and doctoral health informatics courses.

Selected Accomplishments

- Awarded: Development, validation, and application of a CDS ontology to facilitate CDS rules reuse, management, and maintenance in simulated primary care settings (Principle investigator, PI, NIH R01GM138589, 2020.09 – 2025.06)
- Awarded: Exploration of the hypothesis-generation process as guided by secondary data analysis in clinical research: Can the process be more efficient? (PI, NIH R15LM012941, 2018.08 – 2021.07)
- Six peer-reviewed full-length publications since 2018 (four as the leading author)
- Currently serving in the NIH BCHI (biomedical computing and health informatics) study section (2020.10)
- Currently serving as a member in the AHA (American Heart Association) Strategically Focused Research Network (SFRN) Health Technologies & Innovation: Oversight Advisory Committee (2020 – 2022)
- Awarded: Faculty Fellowship Program in Israel in 2018 supported by Jewish National Fund
- Currently serving as a Review Editor, the Editorial Board of the 'Health Informatics' Section of Frontiers in Digital Health (2019 – present)
- Currently serving as a curriculum committee member for both DPHS and Clemson-MUSC BDSI program
- Currently serving as a member of the Women in AMIA- Awards and Leadership Subcommittee



Matthew Lewis, PhD

Associate Professor
Economics



Matthew Lewis is an Associate Professor in the John E. Walker Department of Economics at Clemson University. Professor Lewis joined the Department in 2013. Prior to joining Clemson, Professor Lewis was an Assistant Professor at the Ohio State University. Professor Lewis research focuses on the structure of markets and how the market structure impacts the organization of industries. With an emphasis on energy markets and healthcare markets, Professor Lewis's research has provided insights into competition and pricing, pricing dynamics, consumer search, and consumer's response to price fluctuation. His research has been published in leading journals including the American Economic Journal: Public Policy, the RAND Journal of Economics, the Journal of Economic Management and Strategy to name a few. Professor Lewis received his Ph.D. (2004) in economics from the University of California at Berkeley and a B.S. from the University of Illinois.

Selected Accomplishments

- Since arriving at Clemson in 2013, he has published five papers in highly regarded economics journals.
- Overall he has published eleven (11) papers in highly-regarded economics journals.
- His paper "Price Leadership and Coordination in Retail Gasoline Markets with Price Cycles" received the award for the best paper published in the International Journal of Industrial Organization.
- His research has been cited nearly 1,000 times (Google Scholar).
- Professor Lewis is an Associate Editor for International Journal of Industrial Organization.
- He is a program committee member for International Industrial Organization Conference.
- He has served as a reviewer for 28 journals in economics and he has been invited to 34 to present his research at more than 30 universities, government agencies and research organizations.



Lily Shen, PhD

Assistant Professor
Finance



Lily Shen is an assistant professor of finance and visiting scholar of the research department at the Federal Reserve Bank of Atlanta. She holds a B.A. from UC Berkeley and a Ph.D. in business administration from Penn State University.

Her research focuses on Fintech and Proptech, in which she applies Machine Learning and Artificial Intelligence to shed light on how technology innovation can help investors and policymakers better monitor financial risks.

Since joining Clemson in 2016, her work has been showcased to researchers from NYU, UC Berkeley, UCLA, Columbia University, UPenn, and the Federal Reserve Banks. She is also the single-author winner of the prestigious 2019 American Real Estate Society Manuscript Prize. She is honored to represent Clemson to give research seminars at Cambridge University, the Baruch College, University of Connecticut, and the Federal Reserve Banks. Her research papers have been published in top finance and economics journals.

Shen is actively involved in professional associations such as the American Economic/Finance Association (AEA/AFA), the American Real Estate and Urban Economics Association (AREUEA), the Southern Finance Association, at both national and international levels. She has been co-organizing and hosting sessions within her professional associations' conferences.

Shen is also actively involved with student mentoring and promoting Clemson's ranking within the field of business education. She created and is currently leading two Creative Inquiry (CI) projects in which finance students develop a better understanding of machine learning algorithms and apply them to research projects. Her supervised undergraduate research work, "Artificial Intelligence, Architectural Aesthetics, and House Prices," is featured in the Spring 2020 edition of the Decipher magazine. Due to her effort, Clemson is the first university that offers machine learning courses to business undergraduate students.

Selected Accomplishments

- American Real Estate Society Manuscript Prize, 2019 [Single Author Manuscript]
- American Economics Association CSWEP Summer Economics Fellowship, 2018, 2015, 2014
- Clemson University One-Year Accelerate Grant, 2016



Babak Mammadov, PhD

Assistant Professor
School of Accountancy



Babak Mammadov is an accounting faculty member who co-developed the data analytics course to help students better prepare for the competitive labor market. This course teaches students how to use big data in an accounting setting and answer various business questions using modern technological tools. As part of the course preparation, he is involved in various data analytics conferences organized by academicians and practitioners. Mammadov is also involved in academic research that studies the effect of corporate governance mechanisms on financial reporting quality. His research includes the analysis of social media and traditional media on the efficiency of capital markets. Dr. Mammadov's latest research project, which is an interdisciplinary project, investigates the impact of institutional investors' ethics on the transparency of financial reports.

Prior to starting his academic career, Mammadov worked in both public accounting and in the private sector. When he was in the corporate world, he worked in multiple countries, including Istanbul - Turkey (PwC), Moscow - Russia and Baku - Azerbaijan. He speaks four languages.

Selected Accomplishments

- Developed data analytics course to better prepare students for the labor market
- Published academic articles in quality peer-reviewed accounting journals
- Presented in competitive accounting conferences, including the American Accounting Association Financial Accounting and Reporting Section and Auditing Section meetings
- Nominated as a semifinalist for the best paper award in the 2018 Financial Management Association (FMA) conference
- Interacted with practitioners in social and professional events to learn more about the latest changes in corporate world and better prepare students for that environment
- Advised students in career choices



Daniella Hall Sutherland, PhD

Assistant Professor of Educational Leadership
**Educational & Organizational Leadership
 Development**



In 2017, Daniella Hall Sutherland joined Clemson's faculty in educational leadership, serving in four degrees' programs for school leadership at the Masters of Education (MEd), Educational Specialist (EdS), Doctor of Philosophy (PhD) in Educational Leadership, or Educational Doctorate (EdD) in Education Systems' Improvement Science (EDIS). Among these four degree programs, experienced teachers may also elect to add state licensing credentials as school principals (building-level leadership) or as district-level leaders. Dr. Hall Sutherland's research examines the intersection of educational leadership and policy in rural communities, with spotlight on educational equity. She conducts investigations about the relationship between rural schools and districts and their encompassing communities, as enacted through local control. Dr. Hall Sutherland is among the few remaining 21st Century scholars to study locally controlled school boards within current political contexts of rural education policies.

Hall Sutherland is an active member of American Educational Research Association (AERA); Carnegie Project on the Education Doctorate (CPED); Rural Education Special Interest group (SIG) of AERA; and the University Council for Educational Administration (UCEA).

Selected Accomplishments

- Invited co-presenter, Cultivating and supporting effective rural school leaders: State Support Networks Learning Cycles Webinar, Battelle for Kids & U.S. Department of Education
- Recipient NREA Best Research Study Award 2019, National Rural Education Association Research Symposium
- College of Education ADR SEED Grant; Equity under pressure: Understanding the challenges school leaders face in creating equitable educational systems in the rural south
- Invited speaker, "Over my dead body": Understanding Relationships, Power, and Policy Implementation of Rural, Locally Controlled School Boards, Michigan State University Education Policy Seminar Series
- AERA Division L (Educational Policy & Politics) Outstanding Dissertation Award



Shanita N. Anderson, PhD

Lecturer

Teaching and Learning



Shanita N. Anderson began her career in 2001 as a middle grades Social Studies teacher in Fayetteville, NC. Since that time, Shanita has served and supported the children and teachers of North Carolina as a classroom teacher, an AIG Coordinator, a Literacy Coach, Instructional Coach with the North Carolina Department of Public Instruction, and most recently as a New Teacher Support Coach with the University of North Carolina at Pembroke. She obtained her bachelor's degree in Middle Grades Education from East Carolina University and is certified in English Language Arts, Reading K-12, Social Studies, AIG, and Literacy Coaching. She has a master's degree in Language Arts through Fayetteville State University as well as a Master's of School Administration from the University of North Carolina at Pembroke. Shanita earned her doctorate in Curriculum and Instruction from the University of North Carolina at Wilmington. Her doctoral work primarily focused on trust and coaching practices geared to elicit instructional improvement. Anderson's coaching philosophy is grounded in aligning effective "best practices" in professional development with individual teacher needs to improve educator efficacy and effectiveness in an effort to increase student achievement.

Selected Accomplishments

- Awarded the Award of Excellence in Teaching, Clemson University, September 2019
- ADR Co-PI Grant Recipient
- Co-Chair of M.Ed search committee



Amanda Rumsey, PhD

Assistant Professor

Education and Human Development



Amanda Rumsey is a counselor educator who specializes in school counselor training. Prior to earning her PhD in 2017, she worked for over 6 years in mental health settings and for 14 years as a K-12 school counselor. She is a licensed professional counselor, a certified school counselor, and a nationally certified counselor. Dr. Rumsey's research focuses on trauma, school counseling, and counselor training and preparation. Her most recent (2019) publication identified trauma informed school counseling strategies for supporting academic engagement and high school completion. She is currently leading a research study with four graduate students who are exploring trauma training, implementation of interventions, and trauma self-efficacy among counselors working in school settings. She has completed over 20 peer reviewed presentations at national conferences and many more at regional and state conferences, and local school districts. Dr. Rumsey currently serves as the academic advisor for all MEd and EdS students in the school counseling track of counselor education. She is also a faculty co-advisor for Chi Upsilon, Clemson's Chapter of the International Counseling Honor's Society, Chi Sigma Iota.

Selected Accomplishments

- Selected to participate in the 2019-20 College of Education – Dean's Leadership Institute
- Awarded the 2019 Outstanding Journal Article of the Year in flagship journal for counselor education: Counselor Education and Supervision. - Suicide intervention training for counselor-trainees: Quasi-experimental study on skill retention
- Awarded the 2019 Outstanding Research Award - Chi Sigma Iota International Counseling Honors Association
- Serves as 2019-20 Research and Knowledge Committee Chair for the American Counseling Association
- Serves as a reviewer on three peer-reviewed journals: Professional School Counseling, Counselor Education and Supervision, and the Journal of School-Based Counseling Policy and Evaluation
- Selected as a 2018-19 Association for Assessment and Research in Counseling Emerging Leader
- Selected as a 2018-19 Counselor Education and Supervision Editorial Fellow
- Published five peer reviewed manuscripts, one white paper and four book chapters since starting at Clemson in 2017



Ardalan Vahidi, PhD

Professor

Mechanical Engineering



Ardalan Vahidi's expertise is in Automatic Control applied to automated and connected vehicles and energy systems. His research aims to cut energy use and environmental impact of modern vehicular transportation, reduce traffic congestion, and boost safety and mobility. His research is supported by the US Department of Energy, National Science Foundation, US Army, and several industries such as BMW, Ford, General Motors, Cummins, and Eaton. Over the past two years he has secured two large Department of Energy research grants on energy efficient mobility. He has secured \$1.3M as Lead PI from the DOE and he is the sole university PI on another \$5M collaborative DOE grant on truck platooning in collaboration with Cummins/Michelin/NREL.

Vahidi has authored 1 book, more than 80 refereed publications, and 3 patents. Dr. Vahidi's publications have been cited 5600 times, 12 of them more than 100 times each. Since the beginning of 2018 Dr. Vahidi has published 8 journal and 11 reviewed conference papers. Dr. Vahidi has been a visiting researcher at the University of California, Berkeley and BMW Technology office in California (2012-2013), and at IFP Energies Nouvelles in Paris (2017). He has given 37 invited talks on energy efficient transportation and energy systems. He has served as Associate Editor for IEEE and ASME flagship journals of his field and on program and organizing committees of several conferences.

At Clemson, Dr. Vahidi has taught over 1200 students and involved 17 undergraduate students in research. He has graduated 7 Ph.D. and 11 Master students. Many of his advisees lead in their professional roles and are recipients of prestigious awards. For instance, one of his Ph.D. advisees now leads the autonomous vehicle research in BMW Group's Technical Center in California. Another of his PhD graduates won the 2017 IEEE Intelligent Transportation Society Best Dissertation Award in a worldwide competition. One of his current Ph.D. advisees won the prestigious Chateaubriand Fellowship in 2018 to conduct research for 8 months in France and won the International Federation of Automatic Control Young Author Award in 2019.

Selected Accomplishments

- \$1.3M US DOE Grant on Energy Efficient Connected and Automated Vehicles (2017-2020)
- \$5M US DOE Grant on Truck Platooning, with Cummins, Michelin, and National Renewable Energy Lab (2019-2021)
- Co-author of new book, Energy Efficient Driving of Road Vehicles: Towards Cooperative, Connected, and Automated Mobility, Springer, 2019
- Author or co-author of 8 journal and 11 conference articles since 2018
- Best paper award, 2018 ASME DSC Conference/ Transportation and Automotive System, 2019



Jennifer Ogle, PhD

Professor
Civil Engineering



Jennifer Ogle is directing a curricular and departmental transformation program funded by the National Science Foundation in the Glenn Department of Civil Engineering. Her collaborative research network spans across the university to include Educational Leadership, Communications, Architecture, Psychology, Engineering and Science Education, English, the Gantt Multicultural Center and the Office of Teaching Effectiveness and Innovation. Dr. Ogle and partners are co-creating programming to prepare students to: 1) think beyond disciplinary boundaries, 2) identify natural interdependencies among civil infrastructure and other socio-tech systems, and 3) collaborate on heterogeneous teams to minimize the effects of threats faced by society and maximize opportunities.

Ogle is also helping move the needle on inclusion and diversity. Building on her experience as a graduate of the President's Leadership Institute, Dr. Ogle instituted the CE-MENT peer-mentoring program with CJ Bolding, CE Undergraduate Program Manager, to foster interdependencies among students and develop professional and personal leadership within a diverse and inclusive community of engineering students. As a Watt Faculty Fellow, she has worked with Dr. Marissa Shuffler Porter, a faculty in Psychology, to advance research on inclusive teamwork in engineering project-based courses and is sharing that knowledge by leading a Faculty Learning Community on Teamwork.

Ogle's core civil research involves transportation safety, vulnerable road users, roadway design, and performance management. She is a member of the National Academy of Science Transportation Research Board Committee on Highway Safety Performance. She served as the secretary of the research subcommittee for ten years leading to the publication of the first edition of the Highway Safety Manual in 2010 and is now collaborating on the 2nd edition. In the last few years, she has organized workshops on transferability of the manual to both high and lower/middle income countries at 3 major international conferences in Washington, DC; Paris, France; and Vancouver, Canada. She is also workshop chair for the upcoming International Highway Geometric Design Symposium to be held in Amsterdam in 2021.

Selected Accomplishments

- Serves on the President's Leadership Institute Advisory Board
- Author or co-author of 24 articles published or in print in journals or peer-reviewed conferences since 2015
- Serves on the Clemson ADA Committee and worked to build a navigable map interface for students, faculty, staff and visitors with access needs
- Chaired the Women's Commission and received support from President Clements and state legislature to fund the Clemson University Child Development Center, initiated the AAUW \$start \$mart workshop series, secured support for successful NSF ADVANCE grant



Kuang-Ching "KC" Wang, PhD

Professor

Electrical and Computer Engineering



KC Wang is a computer engineer who studies networking and computing systems, methods, and applications for challenging environments and novel uses. His work has been distinctively cross-disciplinary, integrating networking and computing research with grand challenges across numerous domains from future Internet to healthcare, transportation, agriculture, and artificial intelligence (AI). He has been known nationally as a champion for convergence research across disciplines. Currently he is a leader of the National Science Foundation's (NSF) national Future Internet and Future Cloud research infrastructure that supports thousands of researchers and students across U.S. and the world. Dr. Wang has led more than \$50M of research projects supported by National Science Foundation and other federal, state, and industrial sponsors. Dr. Wang also has a passion for integration of research and education. Anticipating imminent potentials for AI research across disciplines yet a shortage of students ready to take on the challenges, Dr. Wang spearheaded the Watson-in-the-Watt program since 2017 through a partnership with IBM to educate and transform Clemson undergraduate students in any majors into partners with faculty in diverse areas to bootstrap broad flavors of AI research. Dr. Wang currently supervises 10 Ph.D. and M.S. students working on 10 research projects, in addition to serving as Associate Director of Research for the Watt Family Innovation Center and as faculty advisors for the Dean, VP of Research (NSF Center Task Force), and the CIO.

Selected Accomplishments

- Co-PI of NSF FABRIC, the \$20M NSF research infrastructure supporting national-scale research in networking, cybersecurity, distributed computing and storage systems, machine learning, and science applications.
- Clemson PI for NSF CloudLab, a \$20M NSF research infrastructure supporting future cloud system research across three universities (with University of Utah and University of Wisconsin-Madison) interconnected at 100 Gbps over Internet2. To date, CloudLab has served more than 4,000 U.S. researchers with their more than 79,000 experiments.
- Author or co-author of twenty-three articles published or in print in journals or peer-reviewed conferences since 2015.
- Co-founder of Watson-in-the-Watt, an AI education and research enablement program at the Watt Center, attracting over \$660K cash and additional in-kind contribution of IBM Watson and IBM cloud credits.
- Chair of two NSF workshops on next generation networking (software defined networking) and huge data research, and one of six U.S. delegates on the 2017 US-EU Next Generation Internet collaborative research visioning workshop in Brussels, Belgium.



Sourav Saha, PhD

Associate Professor
Chemistry



Sourav Saha is a supramolecular / materials chemist who leads an interdisciplinary research program focused on developing new stimuli-responsive functional materials to advance molecular electronics, sensing, and energy conversion and storage technologies. His research has led to a paradigm-shifting discovery of anion-induced electron transfer phenomena that enabled direct colorimetric detection of toxic Lewis basic anions, such as cyanide and fluoride, and provided a new blueprint for discriminating anions based on their electronic and redox properties. He was awarded a US patent for the discovery of colorimetric fluoride sensors based on electron deficient organic molecules. His current research focuses on developing stimuli-responsive hybrid materials called metal-organic frameworks (MOFs) and coordination complexes that can produce, transport, and store electrical energy and detect and remedy toxic agents. He has published over 40 peer-reviewed research articles and several book chapters that have been cited nearly 3500 times. Dr. Saha's research is currently funded by two NSF grants worth of over \$800K. He is also a co-PI of an NSF-MRI grant for the acquisition of a new 500 MHz NMR instrument equipped with a cryoprobe. He has also received Clemson's Diversity and Inclusive Excellence Enhancement grant in 2018.

Saha teaches sophomore Organic Chemistry to a large number of undergraduate students and an Advanced Supramolecular/Material Chemistry course to Chemistry and Materials Science majors and graduate students. His current research group consists of 4 graduate (3 female) and 2 postdoctoral researchers. In addition, he has produced 3 PhD and 1 MS graduates. He has also mentored more than 25 undergraduate (many of them through Clemson's REU and EUREKA! programs) and 5 postdoctoral researchers from diverse gender and ethnic backgrounds. Dr. Saha serves as an Associate Editor of *Frontiers in Chemistry* journal.

Selected Accomplishments

- Kavli Fellow of National Academy of Sciences & Chinese Academy of Sciences
- Published over 40 research articles and 3 book chapters with 3400+ citations, h-index 24
- American Chemical Society Young Academic Investigator Award
- Chemical Communications (Royal Society of Chemistry) Emerging Investigator Award
- FSU Innovator Award
- Awarded a US patent for inventing a novel fluoride sensing method
- Recipient of a Clemson's Diversity and Inclusive Excellence Enhancement grant
- Mentored 7 graduate and 25+ undergraduate students; produced 3 PhD and 1 MS graduates
- Associate Editor of *Frontiers in Chemistry* supramolecular chemistry division



Feng Ding, PhD

Associate Professor

Physics and Astronomy



Feng Ding is leading a computational biophysics lab at the Department of Physics and Astronomy, which focuses on understanding the structure, dynamics and function interrelationship of biomolecules and molecular complexes. The long term goal of the Ding research lab is to develop state-of-the-art molecular modeling methodologies and apply these computational approaches to understand the molecular mechanisms of human diseases and help design therapeutic approaches in a cost-effective manner.

The current research projects in the Ding lab include understanding the fundamental interactions between engineered nanomaterials and biomolecules at the nano-bio interface for enabling nanomedicine and sustainable nanotechnology, modeling molecular recognitions between small-molecule ligands and protein receptors for drug discovery, exploring anti-amyloid agents against the aggregation of islet amyloid peptides (IAPP) in type-2 diabetes, and designing nanoplasmon sensors for real-time detection of analytes. For instance, in order to understand the etiology of type-2 diabetes the research team has been uncovering the molecular mechanisms for the endogenous inhibition of IAPP amyloid aggregation in healthy individuals. The Ding lab is also searching for small molecules and novel nanomedicines to inhibit the toxicity of IAPP aggregation for the development of theranostics. In response to the COVID-19 pandemic, Dr. Ding lab is currently developing an aptamer-linked nanoplasmon sensor for rapid detection of SARS-CoV-2 spike proteins. The current research projects in Dr. Ding lab are supported by multiple federal funding, including one NSF CAREER (PI), one NSF RAPID (PI), one NIH Maximizing Investigator's Research Award (MIRA) (PI), two NIH R01 (co-I), and the NIH COBRE SC-TRIMH (co-I and the mentor of the junior project).

Selected Accomplishments

- Published 16 peer-reviewed research articles and reviews in the last two years in top journals including Nature Communications, Advanced Materials, Advanced Sciences, Nano Letter, Nano Today, etc (131 total publications, 8353 citations, h-index = 50 as of Sep. 2020 according to google scholar).
- Presented invited seminars at multiple Universities and Institutes, including Penn State College of Medicine, University of Texas at El Paso, and Fudan Univeristy, and contributed more than 10 contributed talks and posters at professional conferences.
- Currently advising 3 postdoctoral fellow, 5 Ph.D, and 1 undergraduate students in the lab (in 8 years at Clemson Dr. Ding has supported 6 postdoctoral fellows, graduated 4 Ph.D. students, and supervised 12 undergraduate student researchers).
- Received a 1-year NSF RAPID award (\$190K, PI) to develop nanoplasmon sensors for rapid detection of SARS-CoV-2 spike proteins.



Kara E. Powder, PhD

Assistant Professor
Biological Sciences



Kara Powder's research aims to understand the genetic basis of changes in development, which can produce diseases in humans and the incredible variation of animals found in nature. Working at the intersection of developmental biology, genetics, and evolutionary biology, Dr. Powder studies craniofacial variation in cichlid fishes of the East African Rift Lakes, which have evolved an incredible range of facial shapes depending on feeding mechanisms. Current projects include analysis of how changes in gene regulation produce both normal and clinical facial variation, supported by both the National Science Foundation and the National Institutes of Health. Another project examines molecular control of differences between male and female skeletons, supported by the National Institutes of Health. Powder teaches Developmental Biology at the undergraduate-level and contributes to graduate courses in Evolution. She runs a Creative Inquiry program to engage undergraduate Biology and Genetics Majors in hands-on research and is initiating an educational outreach program to bring experiments into middle school classrooms across the state. Powder's lab consists of three graduate students, a lab technician, three undergraduate researchers, and, starting in November 2020, one postdoctoral researcher.

Selected Accomplishments

- Awarded a prestigious 5-year National Science Foundation Career grant for young investigators for \$1,167,162 as sole PI (2020-2025)
- Awarded a 3-year National Institutes of Health grant for \$444,465 as sole PI (2020-2023)
- Awarded a 2-year National Institutes of Health grant for \$196,854 as co-PI to study the rare disease Phelan-McDermid Syndrome (2018-2020)
- Member of the SC-TRIMH (Translational Research Improving Musculoskeletal Health) research group across Clemson, MUSC, and Prisma Health-Upstate
- Awarded a 1-year National Institutes of Health Pilot Project for \$108,576 through the SC-TRIMH group (2019-2020)
- Published 3 peer-reviewed articles in the past two years with another 4 in preparation
- Two graduate students recently awarded independent \$1000 research grants
- Undergraduate research mentees awarded the Outstanding Undergraduate in Discovery Award and the Outstanding Junior Award for Genetics in 2020
- Active member of department- and college-wide initiatives to increase Diversity, Equity, and Inclusion



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January 2021