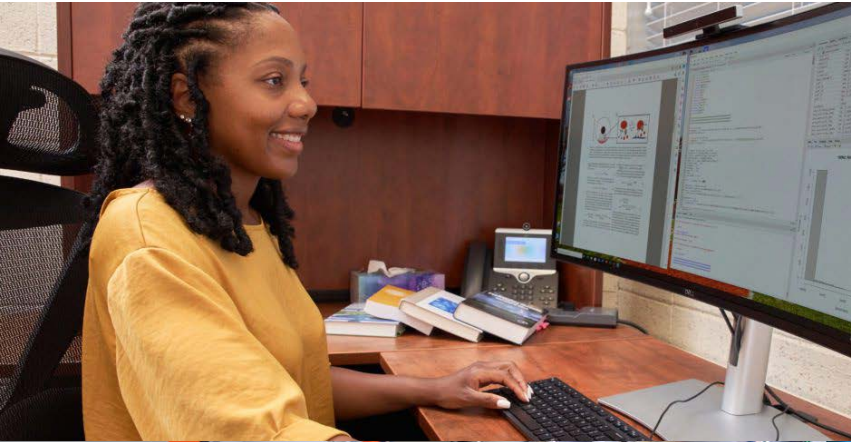


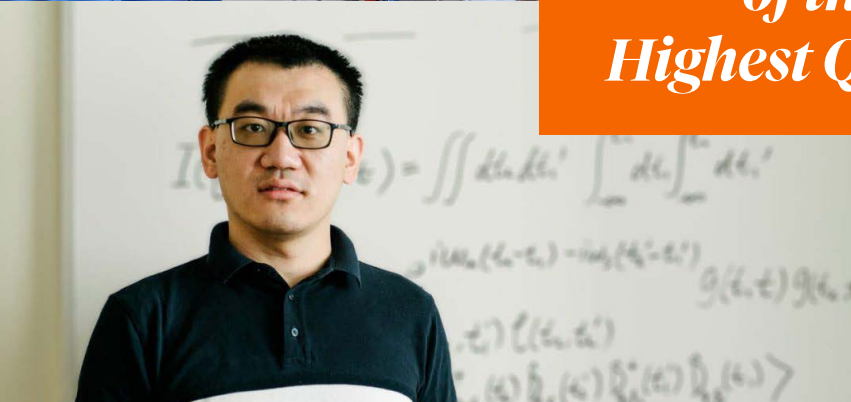


RESEARCH

BOARD OF TRUSTEES REPORT
OCTOBER 2022



*R1 Research
of the
Highest Quality*



▶ From the Vice President for Research

Dear Board of Trustees members,

I hope you are healthy and doing well. I am pleased to report that our research enterprise is indeed healthy and doing well, as we recently closed the books on another successful fiscal year.

In advance of our upcoming Research and Economic Development Committee meeting, I have prepared a report on [pages 4-22](#) to highlight the current state and quality of our research enterprise. We can evaluate the state and quality of our research many ways. First, our faculty members and students are receiving significant honors in recognition of top-quality work ([pages 5-10](#)). Our primary mission is to positively impact society through scholarship and discovery, and our quality research projects are making an impact ([pages 11-17](#)).



Our peers are confirming the quality of Clemson Research, as well. This year, Carnegie confirmed our R1 status, placing Clemson among the highest quality research institutions in the country ([page 18](#)). And, federal agencies increasingly reward high-quality proposals from Clemson faculty with highly competitive awards ([page 19](#)). For example, Clemson recently earned three significant awards: 1) an \$11 million phase 2 renewal of the Eukaryotic Pathogens Innovation Center ([page 19](#)); 2) a \$70 million grant from the USDA ([pages 35-36](#)); and 3) a \$10 million grant for an Energy Frontier Research Center ([pages 37-38](#)). Finally, the scholarly community has increasingly confirmed our quality through the publication and citation of Clemson research ([page 20](#)). These are spectacular achievements.

Fiscal year 2022 ending June 30 was another successful year for our research enterprise:

- Competitive research expenditures reached \$141 million, a 24 percent increase from the prior year ([page 25](#)).
- Proposal submissions were \$896 million, an 18 percent increase as faculty continue to pursue new projects ([page 26](#)).
- Competitive research awards were \$158 million, surpassing the \$150 million mark for the third time in the past five years ([page 27](#)).

Researchers from across Clemson's footprint are contributing. Our list of the highest competitive grants received in the past quarter include faculty from education, agriculture, behavioral science, nursing, engineering and science. It is an impressive list of academic diversity ([pages 28-29](#)).

Additional data on our research enterprise is included in the Research Report Card ([pages 30-33](#)).

Behind our success, of course, are the quality of our faculty members and students.

[continued on next page ▶](#)

▶ From the Vice President for Research

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We also have a high-quality research administration team doing a great job handling the incredible growth of our research enterprise. It is important to recognize the great impact of our research. Two faculty members will be available during the Research and Economic Development Committee meeting to discuss their research and answer any questions you may have. Brief introductions are included on [pages 39-40](#).

Additionally, the colleges have provided brief profiles of faculty members to give you a sense of the breadth of research activity at Clemson ([pages 41-62](#)).

I am proud of what we are accomplishing at Clemson. It truly is a great time to be a Tiger.

Respectfully submitted,



Tanju Karanfil, Ph.D., PE, BCEE, IWA Fellow
Vice President for Research, Clemson University

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RESEARCH

RESEARCH QUALITY

This section covers the quality of Clemson's research enterprise

Executive Summary

- Clemson University faculty and students have earned national and international honors in recognition of the quality of their research. Recent examples of these honors are included on [pages 5-10](#).
- Quality Clemson research is positively impacting the community. Examples of recent projects are included on [pages 11-17](#).
- The Carnegie R1 designation places Clemson among the nation's highest quality, most impactful research institutions, and based on analysis, Clemson continues to improve its position among Carnegie R1 schools ([page 18](#)).
- Federal agencies are increasingly rewarding high-quality proposals from Clemson faculty with highly competitive awards ([page 19](#)).
- The scholarly community is recognizing the quality of Clemson's work, as both peer-reviewed articles and citations of Clemson research are growing. Additionally, Clemson faculty have authored numerous papers designated as "hot papers" by the scholarly community ([pages 20-22](#)).

Earning high honors for top quality work

Julia Brumaghim named American Chemical Society Fellow

Clemson University bioinorganic chemistry professor Julia Brumaghim was named a fellow by the American Chemical Society for her extensive contributions to the scientific community.

The ACS, one of the world's largest scientific societies with over 150,000 members, selects fellows based on their outstanding scientific achievements and exemplary service to the society.

Brumaghim, a member of the Department of Chemistry faculty since 2003, is one of 45 awardees this year.

The society is honoring Brumaghim for her study of DNA and oxidative stress on cells and her work to promote diversity, equity and inclusion in STEM. It also celebrated her accomplishments while serving in significant leadership roles in the ACS's Western Carolinas Section, as a speaker for the ACS Tour and as part of the organization's Women Chemists Committee.

Brumaghim's research focuses on DNA and oxidative stress on cells — which is an underlying cause of many diseases of aging, including neurodegenerative diseases such as Alzheimer's and Parkinson's, cardiovascular disease and cancer — and how antioxidants can prevent metal-mediated oxidative damage. [READ MORE](#)



Brumaghim

Kapil Chalil Madathil wins young-investigator award from the Human Factors and Ergonomics Society

A Clemson University associate professor who has applied his mastery of human factors and ergonomics to a wide range of challenges, has made his mark as an inventor and has helped launch students into careers with top employers received one of his profession's most prestigious awards for early-career researchers.

Kapil Chalil Madathil, the Wilfred P. Tiencken Endowed Associate Professor of Industrial and Civil Engineering, won this year's William C. Howell Young Investigator award from the Human Factors and Ergonomics Society (HFES).

The award "recognizes the talent, creativity, and influence of a singular young researcher," according to the society's website. He was scheduled to receive the award Oct. 10 at a ceremony in Atlanta.

In the nine years since receiving his doctorate, Chalil Madathil has applied his talents to a wide spectrum of research, ranging from cybersecurity and advanced manufacturing to remote learning and telemedicine. His research is helping improve emergency medical service in underserved rural communities and helping find new ways to keep young adults from engaging in potentially harmful internet challenges. [READ MORE](#)



Chalil Madathil

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Earning high honors for top quality work

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Clemson alumna Roann Abdeladl awarded prestigious Phi Kappa Phi fellowship

Clemson University National Scholars Program alumna Roann Abdeladl – a 2021 Clemson University graduate who majored in Public Health Sciences – was recently recognized with a fellowship from Phi Kappa Phi, America’s oldest and most selective multidisciplinary collegiate honor society.

She is one of only 62 recipients nationwide to receive one of the \$8,500 awards, provided to outstanding students for their first year of graduate or professional study.

She was chosen for the award in recognition of her tireless work to provide safe spaces for people of color in her community, on the University’s campus and in health care settings. Abdeladl served in numerous leadership roles with the Muslim Student Association on campus. She also joined the National Civic Engagement Team for Young Muslims, where she helped to mobilize the Muslim-American vote in the 2020 election. She received the University’s Martin Luther King Jr. Award for Excellence in Service in 2020 and was also a finalist for the prestigious Truman Scholarship in 2021. [READ MORE](#)



Abdeladl

Team that created ultra-lightweight door honored by the U.S. Department of Energy

The Clemson University-led team that brought together public and private partners to create an ultralight vehicle door to help improve fuel efficiency has won an award from the U.S. Department of Energy’s Vehicle Technologies Office.

A Team Award went to Clemson University, Honda Development & Manufacturing of America LLC, the University of Delaware, Lanxess, and Proper Group International.

The award was “in recognition of Dr. Srikanth Pilla’s extraordinary expertise in leading carbon fiber thermoplastic composites door R&D to achieve weight savings, performance, and sustainability,” according to a Department of Energy announcement.

Four students graduated with doctorates based on their work on the project. When The American Society of Mechanical Engineers included Clemson University in its list of 10 innovative engineering institutes, it cited the door project among the reasons. [READ MORE](#)



From left: Michael Berube, Srikanth Pilla, Duane Detwiler, Pal Swaminatha, Shridhar Yarlagadda and Gang Li.

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Earning high honors for top quality work

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From left: Clemson Extension's Amy Dabbs, Millie Davenport, William Hardee, Terasa Lott and Amber Starnes.

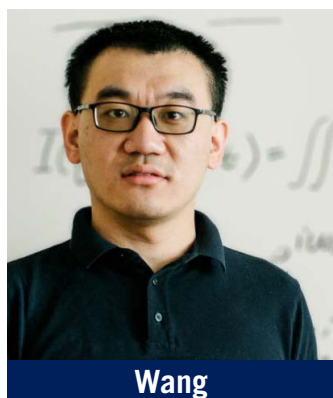
Clemson Extension agents honored on national stage for local impact

Clemson Cooperative Extension professionals were honored recently with a slew of awards on the national level to recognize the impact they are making on their respective local ones.

Clemson Extension garnered five National Award Winners at the 2022 National Association of County Agricultural Agents (NACAA) Annual Meeting in July in West Palm Beach, Florida, and also received an award for highest numerical membership gain in the organization out of all 50 states and two territories.

Clemson Extension's National Award winners were Achievement Award winners William Hardee and Amber Starnes, Distinguished Service Award winners Terasa Lott and Millie Davenport, and Amy Dabbs, who won in the Bound Book/e-Book category.

The Achievement Award is awarded to agents with less than 10 years of service in Cooperative Extension Service who have exhibited excellence in the field of professional Extension, while the Distinguished Service Award is given to encourage and recognize excellence for those with more than 10 years under their collective belt. [READ MORE](#)



Wang

Physics' Yao Wang wins prestigious U.S. DOE Early Career Award

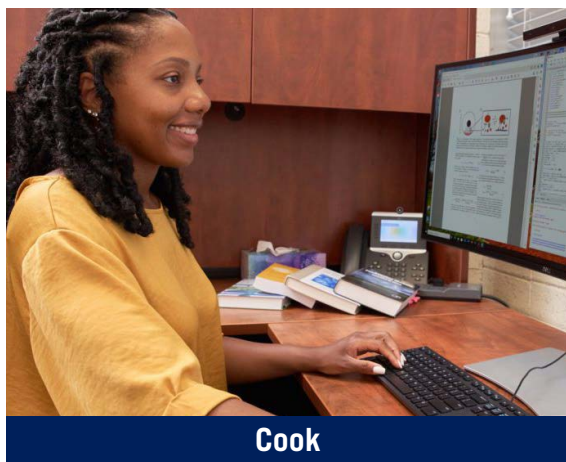
Clemson University physicist Yao Wang has received a prestigious 2022 Early Career Award from the U.S. Department of Energy to support his quantum materials research. Wang is an assistant professor in the College of Science's Department of Physics and Astronomy. He is the first DOE Early Career Award recipient from Clemson's College of Science.

The DOE Office of Science's Early Career Research Program awarded \$110 million in funding to 83 early career scientists from 47 universities and 13 national laboratories. The program, now in its 13th year, is designed to bolster the nation's scientific workforce by supporting exceptional researchers during crucial early-career years when many scientists do their most formative work. [READ MORE](#)

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Earning high honors for top quality work

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Cook

Mathematician Keisha Cook receives MSEC Early Career Fellowship

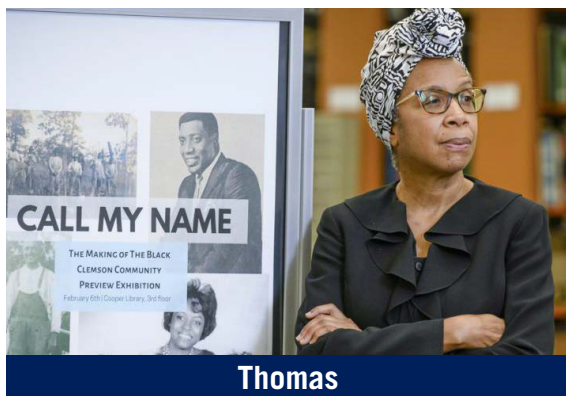
Clemson University mathematician Keisha Cook is a member of the inaugural class of MGB-SIAM Early Career (MSEC) Fellows.

The MSEC Fellowship, awarded by Mathematically Gifted & Black (MGB) and the Society for Industrial and Applied Mathematics (SIAM), recognizes the achievements of early career applied mathematicians — especially those belonging to racial and ethnic groups historically excluded from the mathematical sciences in the United States — and provides professional activities and career development. SIAM and

MGB selected recipients based on their achievements; support of diversity, equity and inclusion in their community; and commitment to industrial and applied mathematics, computational science and data science.

Cook is an assistant professor in the College of Science's School of Mathematical and Statistical Sciences.

Cook's research encompasses applied mathematics and computational biology, specifically stochastic processes, probability and mathematical modeling. On the biology side, she studies the transport of organelles in live cells. Mathematically, she uses simulations and statistical analysis to understand the underlying properties that influence their transport. [READ MORE](#)



Thomas

Rhonda Thomas to receive South Carolina Humanities award

Rhonda Robinson Thomas, Calhoun Lemon Professor of Literature, will receive the 2022 Fresh Voices in the Humanities Award from South Carolina Humanities for her significant research on the history of African Americans at Clemson University.

The mission of South Carolina Humanities, which is celebrating its 50th year, is to enrich the cultural and intellectual lives of all South Carolinians. The 501(c)3

organization is governed by a volunteer board of directors comprised of community leaders throughout the state. This new award honors innovative individuals who use culture and history to bring people together whose efforts may have gone relatively unnoticed beyond their communities.

Thomas' research and teaching interests include African American literature and culture; politics of black identity; autobiographical scholarship; African American literature and the Bible; race and culture studies; African American historiography; migration narratives; and African American women writers. [READ MORE](#)

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Earning high honors for top quality work

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Clemson University's Allen earns lifetime achievement award for work in water resources policy and research

Jeffery Allen, director of the Clemson University South Carolina Water Resources Center, was awarded the 2022 Warren A. Hall Medal by the Universities Council on Water Resources (UCOWR).

The Hall Medal is a lifetime achievement award that recognizes the “distinctive scholarly accomplishments of an individual in the field of water resources” and is named in honor of Dr. Warren Hall, known worldwide for his role in water resources education and research.

Allen has had a long and distinguished career in researching South Carolina and regional water issues and in helping inform water policy. His work includes directing Clemson's Strom Thurmond Institute of Government and Public Affairs and serving on numerous regional and state committees and advisory councils focused on water resources management and planning.

Allen has led research projects on the topics of urban growth models, water supply planning and management, coastal and beachfront management and the economic analysis of reservoir management in the state. He is also past president of the National Institutes for Water Resources. [READ MORE](#)



Jeff Allen (center), flanked by his son Nicholas Allen (left), wife Nancy Allen (right), and daughter-in-law Leigh Allen (far right).



McMahan

Chris McMahan named American Statistical Association Fellow

A Clemson University professor has received one of the highest honors bestowed on statisticians.

Chris McMahan, a professor in the College of Science's School of Mathematical and Statistical Sciences, has been named an American Statistical Association Fellow.

The ASA elects fellows based on their established reputation and exceptional contributions to statistical science. The ASA limits the honor to one-third of 1% of the organization's total membership each year.

During his career, McMahan has modeled the spread of vector-borne disease and studied allergy desensitization therapies, automated structure detection in neuroimaging, genetics associated with personalized medicine, genetics of agriculture, efficient infectious disease screening and surveillance, cancer, sexually transmitted disease, coupled engineering systems, environmental monitoring, biomedical applications, and epidemiology and public health. [READ MORE](#)

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Earning high honors for top quality work

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Sardashti

Clemson physicist earns prestigious junior faculty award

Kasra Sardashti, an assistant professor in the College of Science's Department of Physics and Astronomy, has received a 2022 Oak Ridge Associated Universities (ORAU) Ralph E. Powe Junior Faculty Enhancement Award.

Forty-one junior faculty from across the country received awards, which aim to enrich junior faculty's research and professional growth.

Each winner receives \$5,000 seed money for the 2022-23 academic year. Each recipient's institution matches the Powe award with an additional \$5,000. Winners may use the grants to purchase equipment, continue research or travel to professional meetings and conferences.

The award will support Sardashti's research in superconducting quantum computing devices. Quantum computers could revolutionize the future of science and technology by solving extremely complex problems beyond the reach of even the best current classical computers. [READ MORE](#)

Cutter, Wilkins win rare Astronaut Scholarships

Clemson University students Gabe Cutter and Grant Wilkins were among just 68 undergraduate students from 45 universities and colleges across the United States to receive Astronaut Scholarships this year.

Astronaut Scholarships are awarded to a select number of college juniors and seniors who are studying STEM topics and intend to "pursue research or advance their field upon completion of their final degree," according to the Astronaut Scholarship Foundation.

The foundation accepts applications only from universities that offer the country's highest-rated programs in science, technology, engineering and math, while also providing graduate-level research opportunities to their undergraduate students. Typically, each partner university may nominate only two students and only one can be selected.

Cutter and Wilkins are both Honors students with double majors – Cutter in computer engineering and economics and Wilkins in computer engineering and mathematics. They are also both Barry M. Goldwater Scholarship recipients. [READ MORE](#)



Gabe Cutter, left, and Grant Wilkins

Quality research making a societal impact

Research could lead to precision therapies for inflammatory diseases

Each day, you inhale hundreds of microscopic spores of the fungus *Aspergillus fumigatus*. For most people, it's no big deal because their healthy immune system destroys them before they can do any harm. But for people who take immunosuppressive drugs to prevent organ rejection after a transplant or to treat autoimmune diseases like Crohn's disease, breathing in the spores can lead to life-threatening infections.

"They are at risk of opportunistic infections by microbes in the environment that normally don't make people sick because a healthy immune system fights them off," said Clemson University's Emily Rosowski, an assistant professor in the College of Science's Department of Biological Sciences. "But when immunosuppressants depress your immune system, you are susceptible to these opportunistic pathogens."

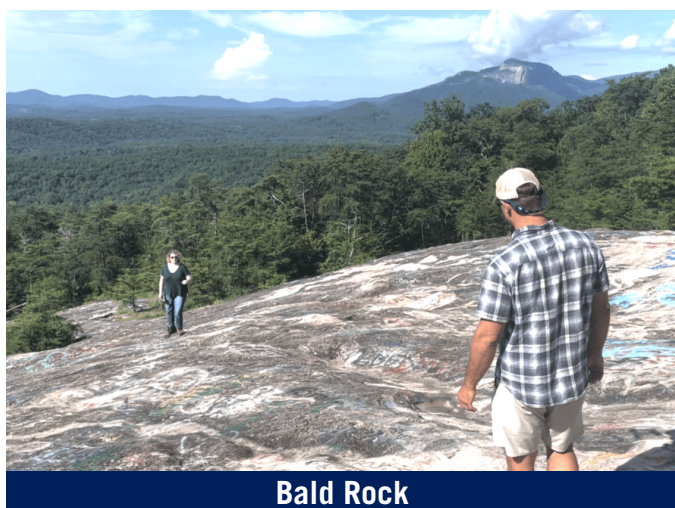
Around 30% of immunosuppressed people who get Aspergillosis, the disease caused by the usually harmless *Aspergillus fumigatus*, die from it. The solution to this potentially fatal problem may lie in reconsidering how immunosuppressant drugs work.

"We need better ways to target more specific immune pathways rather than have these broad immunosuppressive drugs that suppress the whole immune system," she said.

Rosowski has received a nearly \$1.2 million National Institutes of Health MIRA (Maximizing Investigators' Research Award) grant for her research to better understand which immune pathways downstream of these broadly acting immunosuppressive drugs are important to help control *Aspergillus fumigatus* infection. [READ MORE](#)



Rosowski



Bald Rock

Landscape architecture faculty team with SCDNR to design a clean future for Bald Rock

Bald Rock Heritage Preserve is well known to Upstate locals for two things: spectacular views and rampant graffiti.

"While hiking, photography and wildlife viewing are compatible uses of the property, the public currently engages with it in destructive ways such as graffiti, litter, cutting down trees for firewood and trampling patches of vegetation on the rock outcrop," explained Austen Attaway, a heritage preserve biologist for the South Carolina Department of Natural Resources (SCDNR).

SCDNR acquired the property in 2001 to protect its significant geographic features and rare plant life, Attaway said. Now the agency is developing a master plan to address the mismatch between the

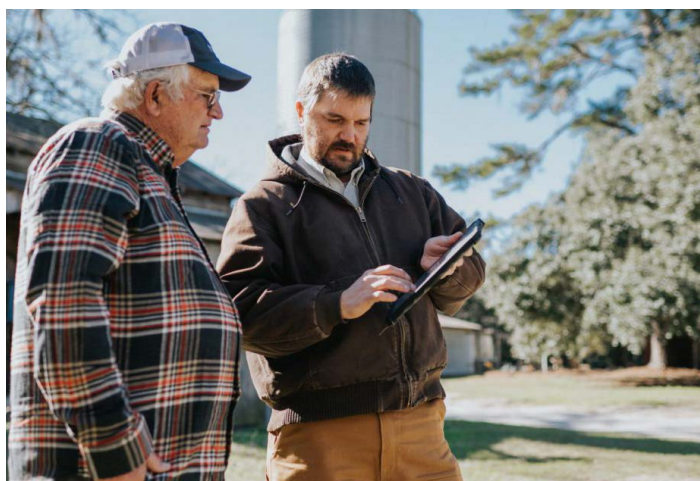
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Quality research making a societal impact

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preserve's intended purpose and the way it is currently treated.

It's a problem that requires a design solution, one which the landscape architecture faculty in Clemson University's School of Architecture are trained to address. In looking for solutions to improve Bald Rock, the landscape architecture team will review the watershed scale of the property and compare the space to similar properties such as Caesar's Head State Park and Sassafras Mountain. Their goal will be to recommend the ways in which design choices such as access points, trails and signage can shift the ways visitors engage with the land. [READ MORE](#)



Bamberg County farmer Richard Rentz and Clemson Center for Agricultural Technology director Kendall Kirk review farm data.

Clemson announces new Center for Agricultural Technology

Today's agriculture industry uses robots, temperature and moisture sensors, aerial images and GPS technology to be more profitable, efficient, safer and environmentally friendly.

To help farmers learn how to benefit from these new technologies, the Clemson University College of Agriculture, Forestry and Life Sciences has established CU-CAT – the Clemson University Center for Agricultural Technology. CU-CAT is a center for collaboration focused on research, education and outreach. Information provided by the Center will come from researchers of different disciplines who will collaborate to provide research-based information for farmers.

Kendall Kirk, CU-CAT director, graduated from Clemson with bachelor's, master's and doctoral degrees in biosystems engineering. He is a precision agriculture engineer at the Edisto Research and Education Center (REC) in Blackville, South Carolina. His work focuses on developing technologies and software that are useful, profitable and cost-effective for growers.

Technology is becoming more and more important in agriculture. Farmers no longer need to apply water, fertilizers and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently. Benefits include higher crop productivity; decreased use of water, fertilizer and pesticides, which in turn keeps food prices down; reduced impact on natural ecosystems; less chemical runoff into rivers and groundwater; and increased worker safety.

In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. This also gives producers greater control over plant and animal production, processing, distribution and storage, which results in greater efficiencies and lower prices, safer growing conditions and safer foods, as well as reduced environmental and ecological impact. [READ MORE](#)

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Quality research making a societal impact

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Manufacturers could save time and money with help of new research led by the Clemson Composites Center

The Clemson Composites Center is leading a new study that could help manufacturers save time and money while reducing their environmental impact—a project that adds to the center’s fast-growing portfolio of industry-guided automotive and advanced manufacturing research.

The team is developing new ways of 3D-printing low-cost manufacturing tools and is funding the research with \$5.16 million from the U.S. Department of Energy’s Advanced Manufacturing Office and industry partners. Collaborators on the project include Honda Development & Manufacturing of America, Ohio State University and Additive Engineering Solutions LLC.

The project will be based in the Clemson Composites Center’s cutting-edge facility in Greenville, South Carolina, placing it in the heart of a state where advanced manufacturing is a cornerstone of the economy.

With the new funding, the center’s researchers are using some of the same techniques to create not the components themselves but the tools that would be used to stamp sheets of metal or composites into components, said Srikanth Pilla, the project’s principal investigator, founding director of the Clemson Composites Center and the Jenkins Endowed Professor of Automotive Engineering. The research could help lower the cost of tools, which are often expensive to develop and produce, he said.

“The composite tool is a low-cost technology,” Pilla said. “At the same time, you can recycle the tools we will be creating. That’s why we decided to repurpose innovations that happened in the Clemson Composite Center for these kinds of applications.”

Researchers expect that at the end of the project they will have technology that Original Equipment Manufacturers could rapidly commercialize and put into use in a real-world factory. [READ MORE](#)



Srikanth Pilla, center, works in the Clemson Composites Center with Gang Li, left, and Feng Luo.

“ With this new research we will be better positioned to reduce carbon emissions and be more flexible to changing market conditions.

Ryan Hahnlen,
a principal engineer at Honda Development
& Manufacturing of America

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Quality research making a societal impact

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Clemson University researchers help personalized medicine take a step forward

Clemson University researchers are helping lay the groundwork for computer simulations that could eventually be used to match cancer patients with the medicine that will help them get well.

A team of 11 researchers that included six from Clemson recently reported on its work in the journal *Nature Communications*. The research is a step forward for personalized medicine, helping raise hopes that clinicians will one day be able to plug patients' data into a computer model to find the best possible medicine for each individual.

The paper's authors built on previous work to develop a new way of creating and altering mechanistic models that bring together large datasets with minimal computer coding.

Cemal Erdem, a postdoctoral fellow in Clemson's Department of Chemical and Biomolecular Engineering, said the paper will be of most interest to other researchers, especially those at pharmaceutical companies and those studying computational modeling or signaling networks.

Marc Birtwistle, an associate professor of chemical and biomolecular engineering at Clemson, said his overarching goal in building models is to match drugs to patients. He said that his work is aimed at helping medical researchers answer design questions, similar to how an airplane manufacturer would run computer models of airplane designs before building an actual airplane. [READ MORE](#)



Birtwistle, left, and Erdem

Clemson, UofSC faculty to use \$4.6 million award to help school districts across SC support students with social, emotional, behavioral needs

The South Carolina Department of Education Office of Special Education Services (OSES) in the Division of College and Career Readiness partnered with researchers at Clemson University and the University of South Carolina in August to develop the Behavior Alliance of South Carolina (BASC).

The BASC, which is led by Clemson University and University of South Carolina faculty, will use a \$4.6 million award from the OSES to work directly with the state to help districts and schools across South Carolina build capacity for supporting students with social, emotional and behavioral needs.

In the initial year of a planned five-year funding cycle, the BASC will set up its own internal structure and guide districts in collecting and analyzing initial data to define school needs. It will then provide statewide access to professional development and assist districts in the implementation of multi-tiered systems of support, which is a collaborative, evidence-based approach that provides proactive support to all students. These multi-tiered systems of support will focus on social, emotional and behavioral support for students.

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Quality research making a societal impact

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According to Shanna Hirsch, associate professor in the Clemson University College of Education and project director for the BASC, the multi-tiered system of supports framework will help grow district infrastructure to allow schools to make data-based decisions to support implementation of student-level interventions. Hirsch said that the final phase of the project will see districts establish their own communities of practice so that the support systems put in place are sustainable and lasting.

“We plan for the BASC to bring people together from Clemson, UofSC and OSES to collaborate, share resources and support districts across the state,” Hirsch said. “Our plan is to work with districts to help them create positive learning environments while improving the social, emotional and behavioral outcomes for students. To do this, the BASC will facilitate building the capacity of South Carolina schools to implement multi-tiered system of supports.”

Hirsch said that in the initial data collection phase, the team will be particularly interested in analyzing existing schoolwide data to see trends and identify potential areas to strengthen. A primary goal is to help school communities flourish by ensuring equitable outcomes.



Hirsch



Rautsaw

Where are the venomous snakes? An app created by a Clemson scientist can tell you

Recent Clemson University Ph.D. graduate Rhett Rautsaw wanted to explore whether the evolutionary theory of character displacement — when two species live in the same area and evolve to avoid competing over resources such as food — extended to pit viper venom.

There was one problem. To study competition, Rautsaw had to know where each pit viper species lived, and there wasn't a comprehensive source of that information readily available.

Rautsaw created VenomMaps, a database and web application containing updated distribution maps and niche models for all 158 pit viper species living in North, Central and South America. Pit vipers are a group of venomous snakes, including rattlesnakes, copperheads and cottonmouths. While Rautsaw needed the information for his evolutionary biology research, the maps provide vital information for conservation efforts, citizen scientists and medical professionals.

Rautsaw and his collaborators constructed the app's user-friendly, publicly accessible maps using global occurrence records from several databases, published distribution maps, field guides, U.S. Geological Survey maps, recent scientific publications and species distribution modeling. [READ MORE](#)

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Quality research making a societal impact

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Study examines impact of out-of-school programming on emotional health of Lakota youth

Clemson University researchers are using impact grant funding from the College of Behavioral, Social and Health Sciences to examine the role of out-of-school-time programming on the mental health and well-being of Indigenous youth in South Dakota.

Faculty in the departments of Parks, Recreation and Tourism Management, Psychology, and Political Science – along with leaders from the YMCA of the Oceti Sakowi (Seven Council Fires) located in Dupree, South Dakota on the Cheyenne River Reservation – are examining the relationships between high-quality out-of-school-time programming, socioemotional health, and the potential reduction in self-harming behaviors among reservation youth.

Led by Ryan Gagnon, assistant professor in the Department of Parks, Recreation and Tourism Management, the project began as a systematic assessment of camp programming at the YMCA. It quickly evolved into an action-oriented plan to document the unique and essential position the YMCA provides to develop a culturally centered and sustainable program that highlights the resilience and optimism within the community and to secure resources to serve more young people. [READ MORE](#)



Clemson professor uses award proceeds to encourage young girls in India

Using her scientific knowledge and a passion for social reform she learned as a child, Sruthi Narayanan is helping young female students achieve academic equality in her hometown in the Kerala state of India.

Narayanan, a Clemson University associate professor of crop ecophysiology in the Department of Plant and Environmental Sciences, is using money she earned from receiving awards such as the Early Career Award from the Crop Science Society of America to fund educational expenses for eight female students. Her gift is a way to “give back” to residents from where she grew up.

“I am a public education product from India,” Narayanan said. “I feel so much indebted to our government for the educational opportunities I was given while growing up, I wanted to give something back. This is my way of saying ‘Thank you for your support.’”

Narayanan’s gift will support educational expenses of eight female students from the Thrithala constituency for their 11th and 12th grade, courses. High school in India ends with the 10th grade. Students who enroll in 11th and 12th grades can study specialized areas, similar to college courses.

[READ MORE](#)



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Quality research making a societal impact

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Wenner

Clemson researcher nurtures STEM interest among children

Julianne A. Wenner, associate professor of science education in the Department of Teaching and Learning in the College of Education, received a \$349,000 grant from the National Science Foundation, to help families better nurture children's interest, engagement and aspirations in science.

Families are children's first teachers and significantly influence their interest, engagement, and aspirations in science. Family attitudes, conversations about science, expectations, and family career role models can be influential, particularly for people who identify with populations that are underrepresented in science. However, that support families from these populations can provide is often framed as inadequate or deficient. This may not present an accurate picture of family interactions, nor does it consider overlooked or undervalued assets available to these families that can be leveraged to better support children's interest, engagement, and aspirations.

Consequently, it becomes imperative to expand notions of what family science supports look like so that a wider segment of the U.S. may see experiencing the joy and wonder of science as possible for them. Broadening the lens of what actions and behaviors are recognized as what 'counts' as supporting science in the home may encourage those who typically feel excluded from science to see that what they already possess and who they are is not only valued in science but needed to move forward as a society to advance scientific discoveries, foster science literacy, and promote science careers.

The goal of this project is to develop a validated instrument for families that captures and measures broader and more inclusive notions of family science habitus (tacit ideas of "what we do" and "who we are" as a family in terms of science that becomes a child's 'language of possibility' in science) and science capital (science-related resources). A secondary goal of this project is for Wenner to build capacity in quantitative research, learn more about families from underrepresented populations in science, and forge connections for future research with local communities and experts.



Whitworth

Working to retain high school science teachers

Clemson University is working with the University of Georgia and school districts across the nation to evaluate how professional learning programs impact teachers during their first five years on the job. The project is funded with \$1 million from the National Science Foundation and led by Brooke Whitworth, associate professor of science education in the Department of Teaching and Learning in the College of Education.

Teachers may leave for a variety of reasons, but the role of district science coordinators in supporting teachers has not been investigated. Whitworth's project aims to serve the national need of supporting and retaining science teachers by exploring how the professional learning of district science coordinators impacts, if at all, the effectiveness and retention of new science teachers in high-need schools. This project could contribute to improved success of students in science, which could translate into an increase in the STEM talent pool.

Carnegie R1 status confirms highest quality

The latest Carnegie Classification has been released and again Clemson University has been named among the most active research universities in the United States. The designation as an R1 institution confirms the quality and relevance of Clemson's research enterprise and boosts our reputation globally.

Being an R1 institution helps Clemson recruit the best faculty and students, opens the door for more collaboration and funding, boosts our overall national reputation, and attracts industry looking for a reputable, relevant, world-class academic research partner in South Carolina. To compile the classification, Carnegie tracks research activity and PhD productivity across all disciplines, so every college at Clemson plays an important role in earning our R1 designation.

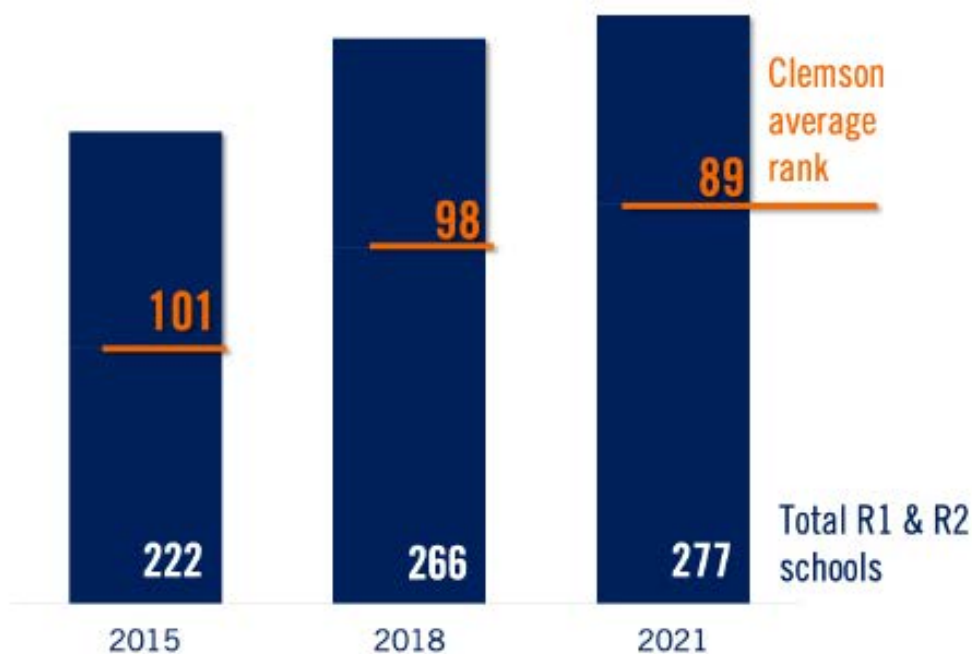
Doctoral universities are grouped into three categories:

- D/PU - Doctoral/Professional Universities;
- R2 Doctoral Universities – High Research Activity; and
- R1 Doctoral Universities – Very High Research Activity.

Carnegie collects the data every three years to compile its university classifications.

Clemson first became an R1 university in 2015 and – based on analysis of performance among peers – continues to solidify its place among the nation's most active research institutions. There are 277 schools classified as either R1 or R2. While Carnegie does not rank schools, the Division of Research has been analyzing Clemson's performance in Carnegie metrics to estimate its position among Carnegie R1 and R2 institutions.

Clemson has improved its position since 2015 from No. 101 out of 222 R1 and R2 schools to No. 89 out of 277 schools (see the chart below). Clemson is penetrating deeper into the field of perennial R1 institutions, solidifying its position as one of the nation's most active and relevant research universities.



Federal Agencies reward quality proposals

Federal funding for research is highly competitive. Federal agencies are looking for quality ideas with the most potential for great societal impact. The best universities across the country are competing for limited resources, trying to prove they have the best, most relevant ideas. Clemson has been increasingly successful since 2016 in securing federal funding, following a long period of flat levels of federal funding for research, as shown in the chart below.

Clemson received \$10.3 million from the U.S. Department of Energy for the Artificially Intelligent Manufacturing Paradigm for Composites (AIM for Composites) project led by Srikanth Pilla, the Jenkins endowed professor of automotive engineering. Read more about the project on [page 35](#).

In another example of a high-value project, the National Institutes of Health recently awarded \$11 million for phase two of the Eukaryotic Pathogens Innovation Center (EPIC), an NIH Center of Biomedical Research Excellence (COBRE). EPIC is leading research on eukaryotic pathogens that cause some of the world's most devastating and intractable diseases in humans, including malaria, amoebic dysentery, sleeping sickness, Chagas disease and fungal meningitis. EPIC is one of four COBREs at Clemson, which is the most a university can have at one time. COBREs are long-term investments of around \$30 million that build capacity for biomedical research around a central theme. With the recent award, EPIC has been awarded a total of around \$21 million.

74

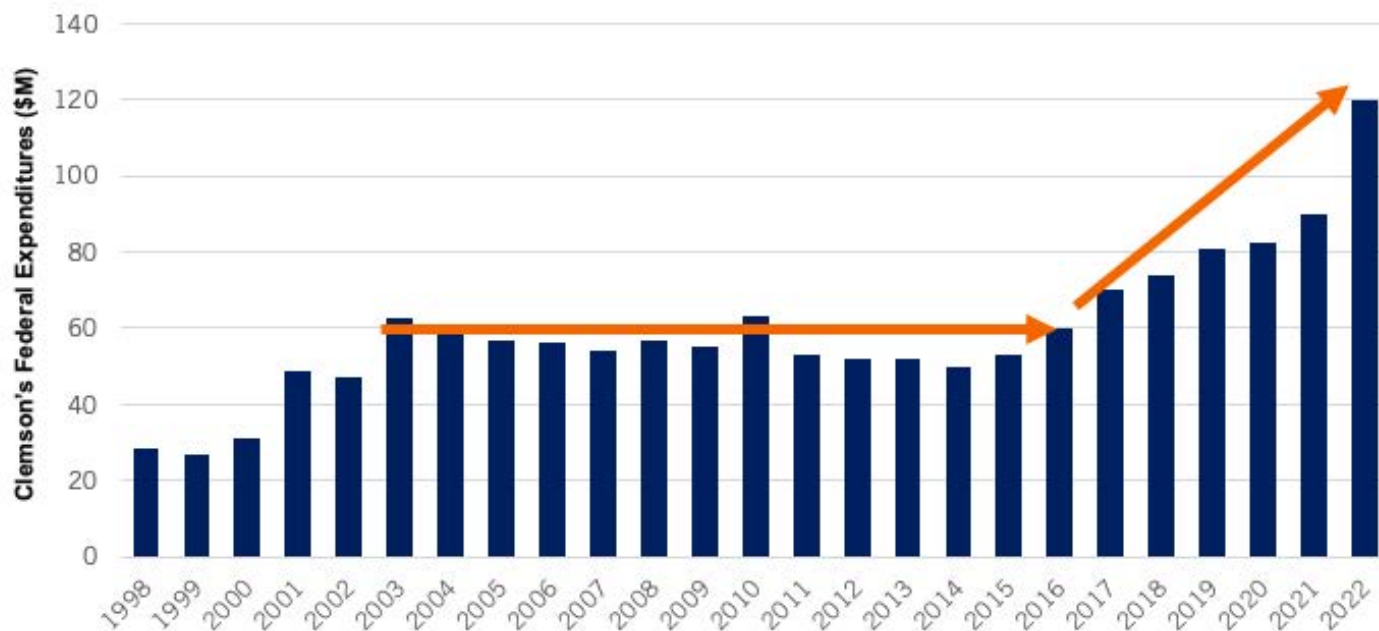
**RESEARCH AWARDS
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**THE TOTAL
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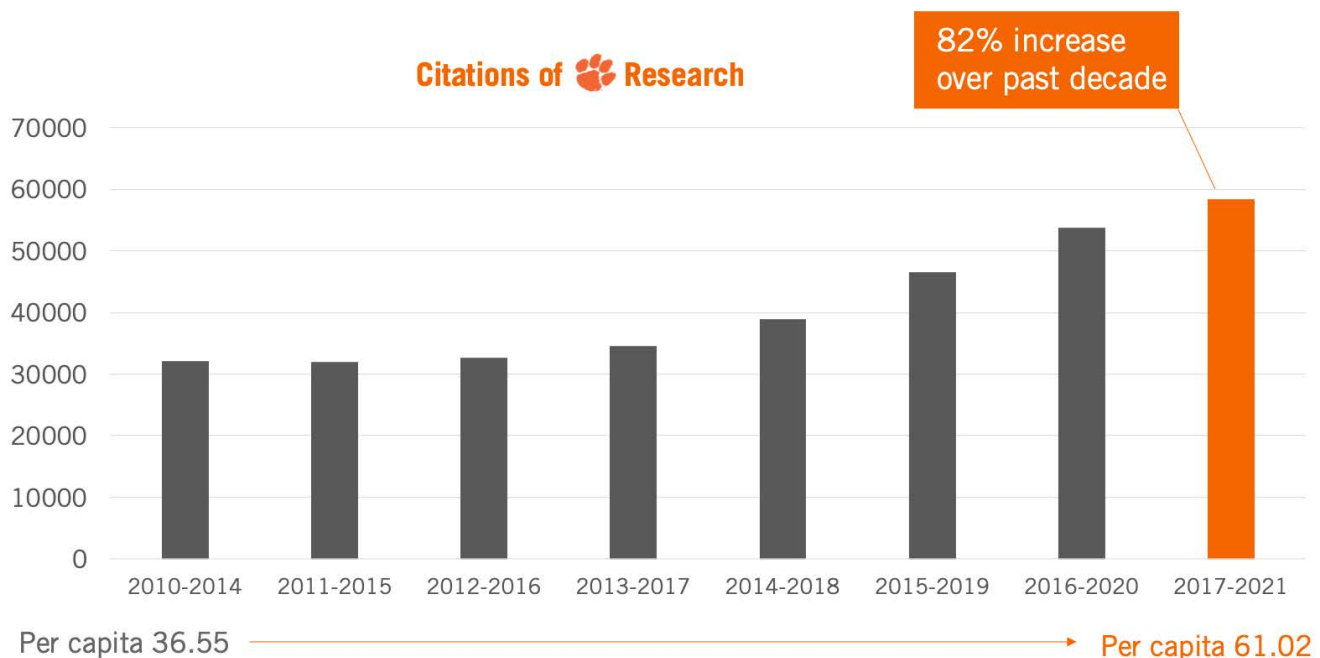
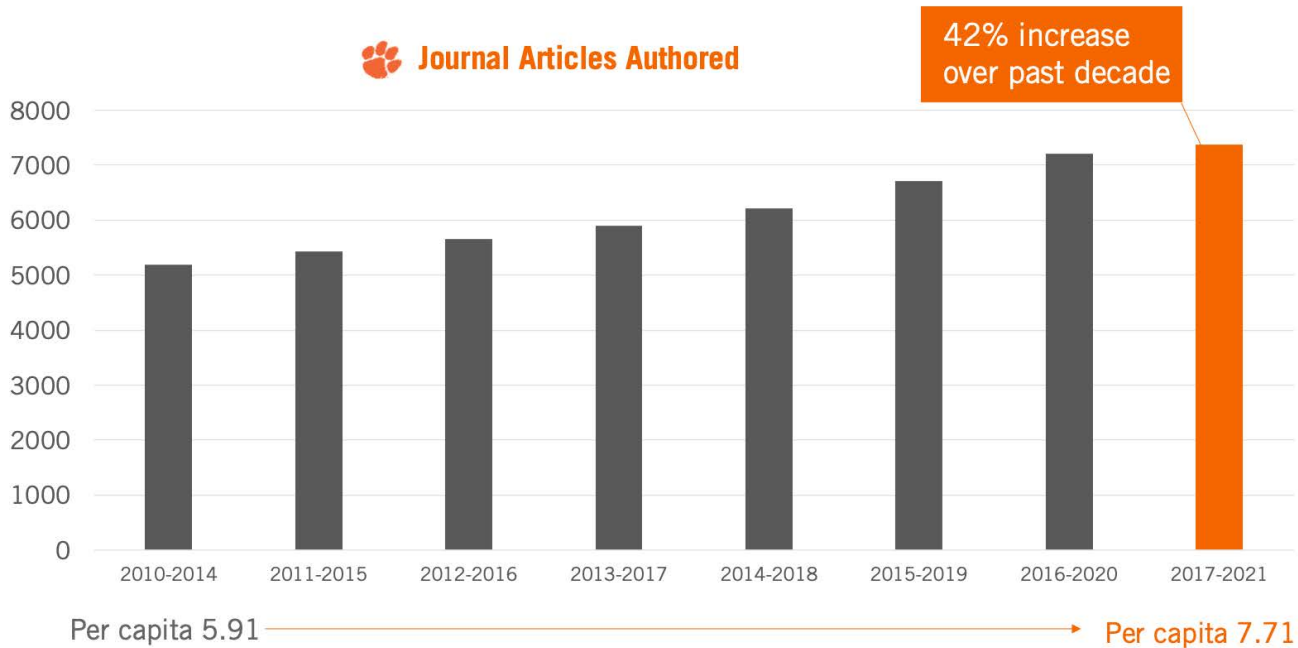
Federal Agencies Reward High Quality Ideas



SOURCE: NSF HERD (Higher Education Research and Development) Survey

Peers confirm quality of research

Peer-reviewed journal articles provide needed research findings to the scholarly community and contribute to ongoing discovery and innovation. When journals publish Clemson articles, they confirm the quality of the work and declare it a worthwhile contribution that others should read. Clemson has greatly increased its scholarly productivity in this area over the past decade, increasing its relevance to the scholarly community. The charts below show the annual average number of publications by Clemson authors and the average number of citations of Clemson research over four-year periods.



Quality research is highly cited

Citations of peer-reviewed journal articles typically accumulate over time. Some papers, however, grab the scholarly community's immediate attention. Web of Science, an independent database of scholarly activity, tracks publications and citations and denotes papers that received an unusually high number of citations shortly after publication as "Hot Papers." These articles are viewed as the key papers in their fields. In 2021, Clemson authors or co-authors were credited with publishing eight "Hot Papers," according to Web of Science. Brief descriptions of the articles are included below. Only Clemson authors are listed; to view the full article, including the full list of authors, click the links for each article.

Hot Papers

These papers have been cited enough times to place them in the top 0.1% when compared to papers in the same field.



Browning

Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States

Matthew Browning, associate professor, College of Behavioral, Social and Health Sciences

Abstract: The objectives of this study are to 1) identify the array of psychological impacts COVID-19 has on students, 2) develop profiles to characterize students' anticipated levels of psychological impact during the pandemic, and 3) evaluate potential sociodemographic, lifestyle-related, and awareness of people infected with COVID-19 risk factors that could make students more likely to experience these impacts. [Full Text](#)



Shirzadibabakan

Urban expansion modeling using an enhanced decision tree algorithm

Ali Shirzadibabakan, PhD student, College of Business

Abstract: Decision tree (DT) algorithms have been applied for classification and change detection in various geospatial studies and more recently, for urban expansion and land use/land cover (LULC) change modeling. The focus of this study is to enhance the performance of classification and regression tree (CART), one of the most efficacious DT algorithms, for urban expansion modeling. [Full Text](#)

Cell-like-carbon-micro-spheres for robust potassium anode

Apparao Rao, endowed professor, College of Science

Abstract: Large-scale low-cost synthesis methods for potassium ion battery (PIB) anodes with long cycle life and high capacity have remained challenging. Here, inspired by the structure of a biological cell, biomimetic carbon cells (BCCs) were synthesized and used as PIB anodes. This study represents a new strategy for boosting battery performance, and could pave the way for the next generation of battery-powered applications. [Full Text](#)

continued on next page ▶

Quality research is highly cited

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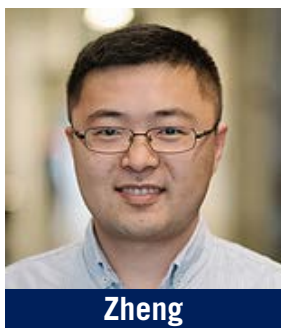


Rao

Sulfur-assisted large-scale synthesis of graphene microspheres for superior potassium-ion batteries

Apparao Rao, endowed professor, College of Science

Abstract: Large-scale low-cost preparation methods for high quality graphene are critical for advancing graphene-based applications in energy storage, and beyond. This papers presents a process that does not require substrates and is scalable for continuous or semi-continuous production of graphene, paving the way for graphene-based energy storage devices. [Full Text](#)

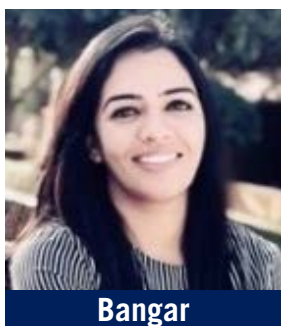


Zheng

Recent advances in cellulose and its derivatives for oilfield applications

Ting Zheng, postdoctoral fellow, College of Engineering, Computing & Applied Sciences

Abstract: The purpose of this review is to summarize and discuss the recent developments in exploring cellulose and its derivatives in the applications of oilfield chemicals for petroleum drilling and exploiting. [Full Text](#)



Bangar

Development and Characterization of Fenugreek Protein-Based Edible Film

Sneh Punia Bangar, graduate research assistant, College of Agriculture, Forestry and Life Sciences (CAFLS)

Abstract: The study demonstrated that the fenugreek protein concentrate film has influential characteristics and can be used as an edible packaging film. [Full Text](#)

Evaluation of Nutritional, Phytochemical, and Mineral Composition of Selected Medicinal Plants for Therapeutic Uses from Cold Desert of Western Himalaya

Sneh Punia Bangar, graduate research assistant, CAFLS

Abstract: The aim of this study was to determine the elemental and nutritive values of leaf parts of 10 selected wild medicinal plants collected from the high hills of the Chitkul range in district Kinnaur, Western Himalaya. [Full Text](#)

Delineating the inherent functional descriptors and biofunctionalities of pectic polysaccharides

Sneh Punia Bangar, graduate research assistant, CAFLS

Abstract: This review highlights various parameters considered important for describing the inherent properties and biofunctionalities of pectins in food systems. [Full Text](#)



RESEARCH

RESEARCH METRICS

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

Executive Summary

- Clemson's total R&D expenditures increased to \$237 million in 2021, the latest year for which data is available. This figure is reported in the National Science Foundation Higher Education Research and Development (HERD) Survey and used in the Carnegie Classification ([page 24](#)).
- Competitive expenditures, which include funds only from competitively bid projects, increased 24 percent to \$141 million in fiscal year 2022 ([page 25](#)).
- Proposal submissions increased 18 percent in fiscal year 2022 to \$896 million, an increase of more than 132% from FY2013 ([page 26](#)).
- Research awards for fiscal year 2022 were \$158 million. Clemson faculty continue to earn high-value awards of at least \$2 million, with 74 such awards received since 2015, bringing a total of \$322 million to Clemson ([page 27](#)).
- A list of the top 10 awards received recently are included on [pages 28-29](#).
- The research report card provides additional information, including research metrics per college, innovation cluster and business unit ([pages 30-33](#)).

Total R&D expenditures continue to increase

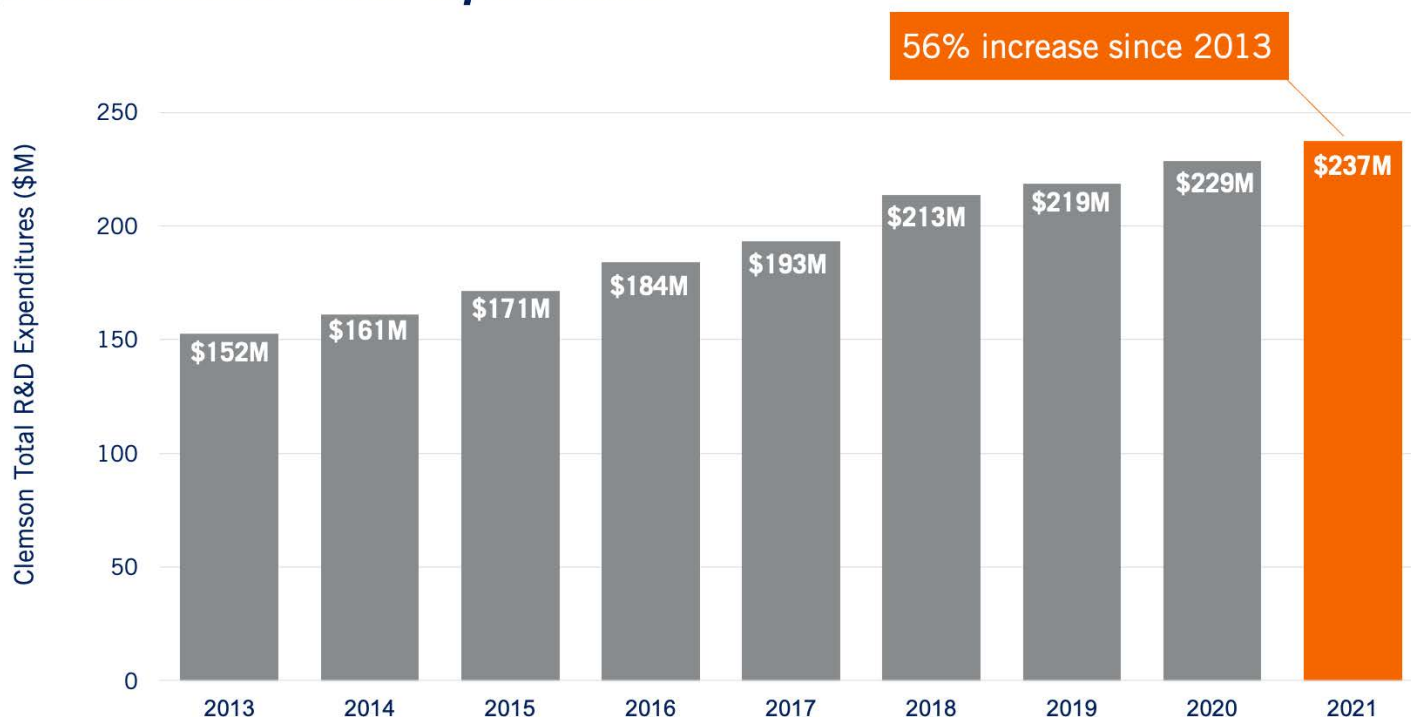
The latest National Science Foundation Higher Education Research and Development (HERD) Survey has been released, providing total R&D expenditure data for 2021.

Clemson's total R&D expenditures continued to increase in 2021, as shown in the chart below. This data includes expenditures on all research revenue, including state support, gifts, external research services, competitive awards, and other sources.

The HERD Survey is the primary source of information on research and development expenditures at U.S. colleges and universities. The survey collects information on R&D expenditures by field of research and source of funds and also gathers information on types of research, expenses, and headcounts of R&D personnel.

Total R&D expenditures from the HERD Survey are used in the Carnegie Classification and allow for an apples-to-apples compares of research expenditures at peer Carnegie R1 institutions.

► FY2013-2021 Total Expenditures



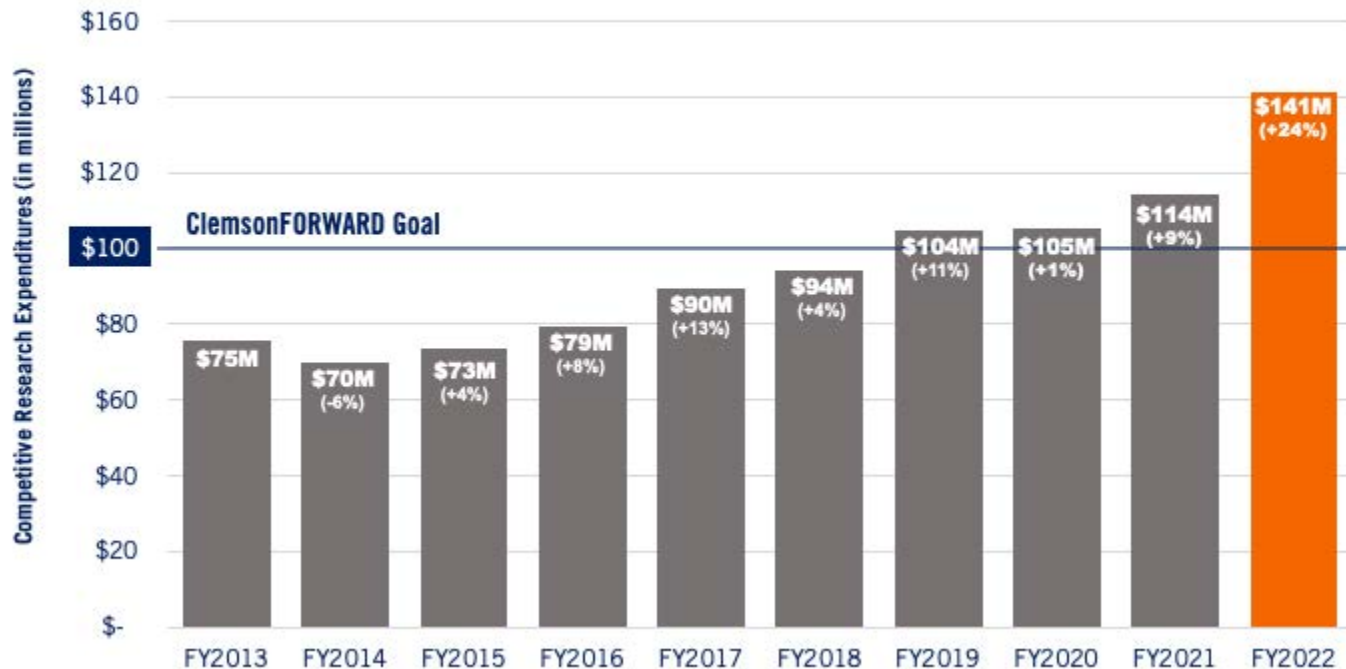
SOURCE: NSF Higher Education Research and Development (HERD) Survey

Competitive expenditures up from prior year

Clemson recorded its highest level of competitive expenditures of the past decade during fiscal year 2022. Competitive expenditures were up 24 percent at \$141 million when compared to the prior fiscal year, as shown in the chart below.

Competitive expenditures include funds only from competitively bid projects, such as highly competitive federal grant awards. In the ClemsonForward strategic plan, Clemson University aimed to surpass \$100 million in annual competitive expenditures by 2026. Clemson achieved that goal (marked on the graph below with a blue line) seven years ahead of schedule in 2019 and notched more than \$100 million in competitive expenditures again in fiscal years 2020, 2021 and 2022.

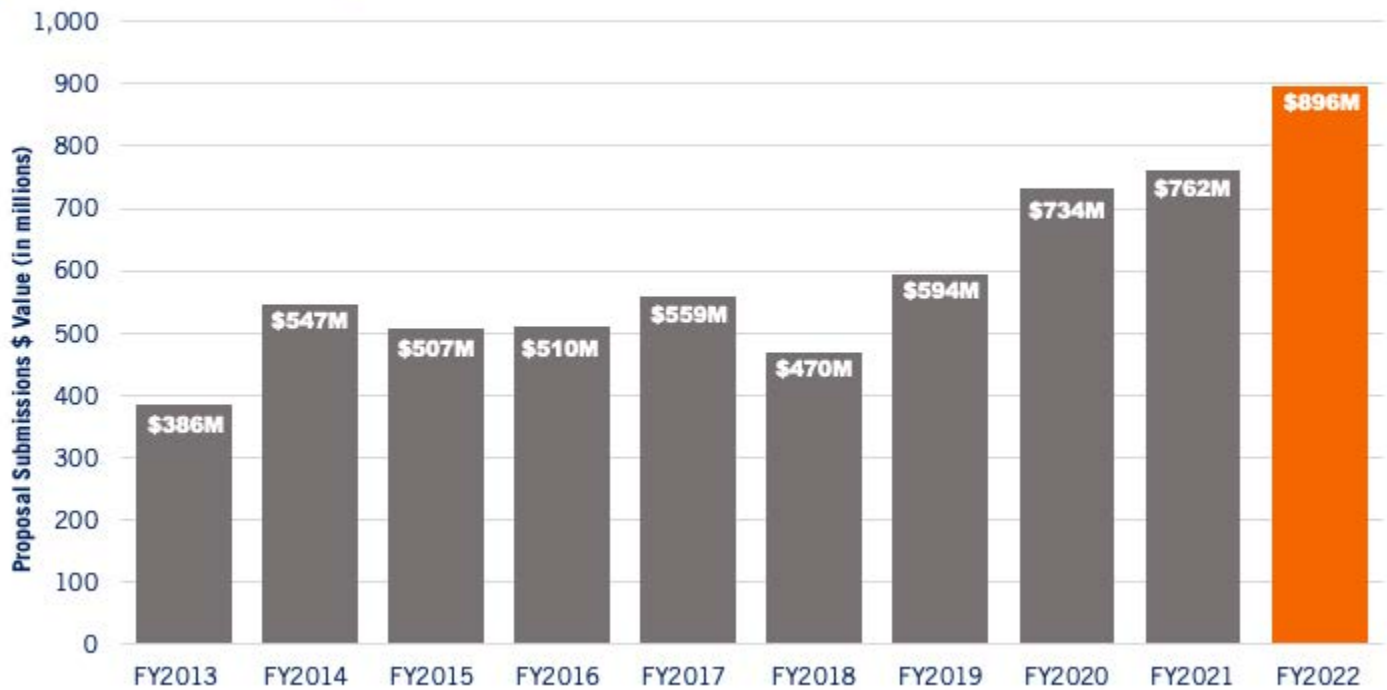
FY2015-2022 Competitive Research Expenditures



Proposal submissions

Proposal submissions have increased consistently over the past five years as Clemson faculty seek funding for scholarship and discovery. FY2022 saw submissions spike to \$896 million, an increase of nearly 18% from the prior year and more than 132% from FY2013.

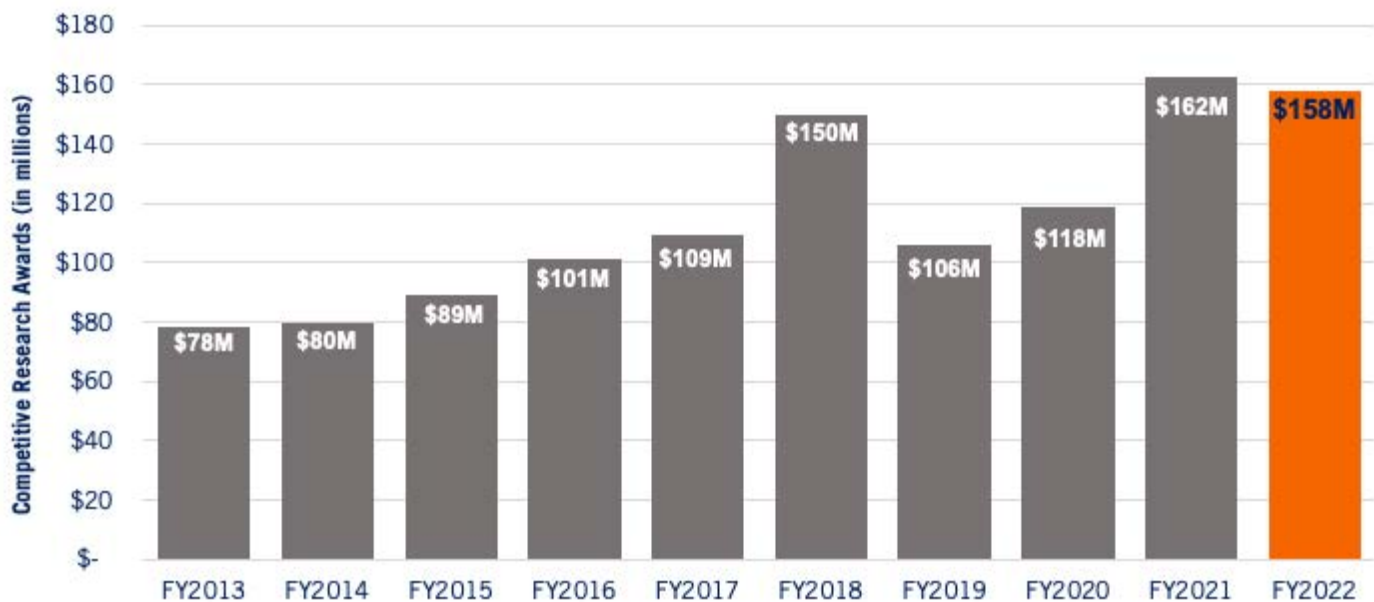
FY2015-2022 Proposal Submissions



Competitive Research Awards

Funding agencies continue to reward high-quality proposals and ideas from Clemson faculty. In particular, Clemson faculty are earning higher value awards of \$2 million and more, as shown in the graphic at the bottom of the page. This is fueling an ongoing upward trajectory in research awards received, as shown in the chart below. FY2021 was particularly strong with awards up 37 percent from the prior year. FY2022 was another strong year with awards reaching \$158 million, topping \$150 million for the third time in the past five years.

FY2015-2022 Competitive Research Awards



Earning High-Dollar Awards

74

**RESEARCH AWARDS
OF AT LEAST \$2M
WON SINCE 2015**

**THE TOTAL
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Top Competitive Awards (received June 6 – Sept. 6, 2022)



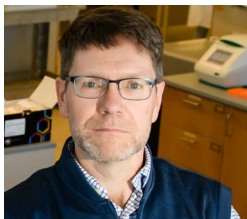
Hirsch

Shanna Hirsch, associate professor of education and human development, received \$4.6 million from the S.C. Department of Education to develop the Behavior Alliance of South Carolina (BASC). BASC, a collaborative between Clemson and University of South Carolina, will work directly with the state to help districts and schools across South Carolina build capacity for supporting students with social, emotional and behavioral needs.

Steven Long, assistant director for plant industry, received \$2.4 million from the U.S. Department of Agriculture for a program to help eradicate the Asian longhorned beetle in and around Charleston and Dorchester counties. The non-native pest causes extensive loss to ornamental and commercial tree species and forested areas, along with the associate industries that utilize these products or depend on forest-related tourism.



Long



Morris

James Morris, professor of genetics and biochemistry, received \$2.2 million from the National Institutes of Health to research novel therapeutic treatments for tropical diseases caused by eukaryotic pathogens. Specifically, Morris will study Human African trypanosomiasis, a neglected tropical disease that is endemic to sub-Saharan Africa, where millions are at risk for infection. The disease is typically fatal if untreated.

John Ballato, the J. E. Serrine Endowed Chair of Optical Fiber in Clemson's Department of Materials Science and Engineering, received \$1 million from the U.S. Army to advance development of laser-based directed energy (DE) systems. Ballato will evaluate the use of Raman fiber amplifiers, which are viewed as important prospective tools for the U.S. Army in DE systems.



Ballato



Gimbel

Ronald Gimbel, professor and director of Clemson Rural Health, received \$1 million from the BlueCross BlueShield of South Carolina Foundation to establish a diabetes care program for women in rural and underserved counties around Orangeburg. The project focuses heavily on preventing diabetes in women across the lifespan, from preconception through postpartum and beyond, including preventing gestational diabetes and preventing diabetes mellitus (DM) transition. It will also include self-management for those with diagnosis.

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Top Competitive Awards (received June 6 – Sept. 6, 2022)

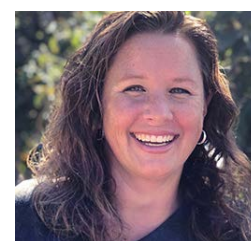
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Pilla

Srikanth Pilla, the Jenkins Endowed Professor of Automotive Engineering, received \$1 million from the National Science Foundation for a project that aims to increase collaboration among academic institutions in South Carolina to support underserved communities. The project will provide financial support and academic guidance with a focus particularly on individuals whose academic and professional options changed due to the COVID-19 pandemic.

Brooke Whitworth, associate professor of teaching and learning, received \$1 million from the National Science Foundation for a project to help school districts retain science teachers. Whitworth's project aims to serve the national need of supporting and retaining science teachers by exploring how the professional learning of district science coordinators impacts, if at all, the effectiveness and retention of new science teachers in high-need schools.



Whitworth



Valentine

Kathleen Valentine, professor in the School of Nursing, received \$1 million from the Health Resources and Services Administration of the U.S. Department of Health and Human Services to expand nurse-led mobile units and promote education addressing the community health needs of at-risk regions of South Carolina. Valentine will work with Prisma Health and the S.C. Department of Mental Health to increase the number of diverse nurses practicing in rural and underserved communities.

Rebecca Kaminski of the Department of Education and Human Development received \$1 million from the S.C. Commission on Higher Education to improve secondary students' achievement in English, language, arts and science in identified underserved, high-need school districts. In particular, secondary students at these schools will receive focused instruction to address the learning loss caused by COVID-19 related interruptions in instruction.



Kaminski



Oberheide

Jens Oberheide, professor of physics and astronomy, received \$1 million from the National Aeronautics and Space Administration to explore the global response of the ionosphere/thermosphere (IT) system to the Madden-Julian Oscillation (MJO) in the tropical troposphere. The project will evaluate how intraseasonal weather oscillations impact the ionosphere at low, middle and high latitudes relative to seasonal and interannual variations caused by waves from the lower atmosphere.

Research Report Card (FY2022 year end)

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	2022	
a. Proposal Submissions by Number		1,414	1,443	1,489	1,478	1,529	1,451	1,417	1,729	1,583	1,492	
1	CAAH	38	51	65	62	69	64	69	76	61	35	
2	CAFLS	235	230	224	222	241	229	377	473	401	366	
3	CBSHS	81	93	102	104	112	101	105	143	151	151	
4	CECAS	549	555	582	617	618	587	562	672	596	631	
5	COE	51	54	39	45	46	37	39	42	37	43	
6	COB	7	15	13	15	7	10	5	11	14	9	
7	COS	242	247	263	239	230	227	186	219	229	193	
8	CCIT	12	12	6	3	5	1	1	1	-	-	
9	PSA	88	90	118	97	170	163	33	37	26	26	
10	VP for Res & Interdisc Inst	31	17	7	17	14	12	25	29	29	23	
11	All Other	80	79	70	57	17	20	15	26	39	15	
b. Proposal Submissions by Dollar Value (in millions)		\$386M	\$547M	\$507M	\$510M	\$559M	\$470M	\$594M *	\$734M	\$762.4M	\$896M	FY2022 Targets
12	CAAH	N/A	N/A	\$9.4	\$8.6	\$3.1	\$5.7	\$4.4	\$5.9	\$5.6	\$8.3	\$7.7
13	CAFLS	N/A	N/A	\$42.6	\$23.8	\$43.4	\$37.1	\$68.4	\$92.9	\$84.1	\$242.1	\$70.9
14	CBSHS	N/A	N/A	\$28.4	\$40.1	\$41.4	\$25.9	\$87.5	\$41.1	\$64.3	\$73.1	\$53.1
15	CECAS	N/A	N/A	\$260.5	\$281.2	\$306.4	\$235.5	\$255.3	\$405.9	\$342.9	\$380.8	\$338.7
16	COE	N/A	N/A	\$13.8	\$14.7	\$18.1	\$19.1	\$10.1	\$18.9	\$22.4	\$32.3	\$16.5
17	COB	N/A	N/A	\$7.5	\$4.3	\$2.8	\$1.8	\$2.1	\$2.9	\$4.2	\$4.8	\$2.5
18	COS	N/A	N/A	\$100.2	\$111.3	\$95.9	\$100.4	\$73.8	\$129.3	\$175.4	\$127.3	\$106.5
19	CCIT	N/A	N/A	\$4.3	\$2.0	\$4.0	\$0.9	\$4.6	\$3.0	\$0.02	\$0.7	-
20	PSA	N/A	N/A	\$23.3	\$10.4	\$31.3	\$25.8	\$11.4	\$6.4	\$5.6	\$7.8	\$17.2
21	VP for Res & Interdisc Inst	N/A	N/A	\$5.6	\$7.7	\$6.0	\$12.7	\$68.5	\$19.8	\$22.3	\$11.0	
22	All Other	N/A	N/A	\$11.4	\$5.6	\$6.0	\$5.0	\$7.4	\$7.7	\$35.7	\$8.3	

*This figure includes a large \$107M proposal

Research Report Card (FY2022 year end)

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
c. Research Awards (in millions)		\$78.0M	\$79.7M	\$89.3M	\$100.9M	\$109.5M	\$149.8M	\$106.3M	\$118.3M	\$162.2M	\$157.6M
23	CAAH	\$0.2	\$0.6	\$0.7	\$1.4	\$0.5	\$1.9	\$2.0	\$1.4	\$1.4	\$1.3
24	CAFLS	\$7.3	\$6.7	\$14.1	\$8.6	\$10.9	\$13.9	\$14.2	\$22.3	\$24.2	\$19.9
25	CBSHS	\$2.7	\$3.4	\$4.8	\$5.1	\$4.6	\$8.1	\$5.9	\$7.7	\$17.4	\$13.7
26	CECAS	\$34.2	\$37.7	\$48.2	\$45.5	\$54.0	\$80.8	\$50.4	\$48.0	\$75.0	\$76.4
27	COE	\$2.6	\$4.1	\$3.2	\$2.9	\$2.8	\$4.5	\$3.3	\$2.3	\$5.1	\$5.7
28	COB	\$2.0	\$1.1	\$1.3	\$0.8	\$1.2	\$1.1	\$0.8	\$1.2	\$0.2	\$0.9
29	COS	\$10.3	\$7.8	\$9.9	\$15.6	\$19.9	\$14.7	\$18.7	\$14.2	\$25.4	\$17.8
30	CCIT	\$1.6	\$5.7	\$0.7	\$0.8	\$0.5	\$1.3	\$0.1	\$0.3	\$0.7	\$0.2
31	PSA	\$14.8	\$12.3	\$9.6	\$13.0	\$7.9	\$6.6	\$4.0	\$4.1	\$5.8	\$6.9
32	VP for Res & Interdisc Inst	\$1.8	\$0.3	\$0.6	\$5.1	\$5.0	\$15.1	\$6.2	\$14.6	\$5.1	\$6.6
33	All Other	\$0.3	\$0.2	\$1.2	\$2.0	\$1.2	\$1.7	\$0.7	\$2.2	\$1.9	\$8.2
d. National Young Investigator Awards		4	3	4	7	9	8	6	10	10	1
34	NSF CAREER Awards (by start date)	4	1	3	5	7	7	4	6	9	1
35	NIH KO1	-	-	-	-	1	1	-	1	-	-
36	Air Force Young Investigator Awards	-	-	1	2	1	-	1	-	-	-
37	Army Young Investigator Awards	-	-	-	-	-	-	-	1	-	-
38	DARPA Young Investigators Awards	-	-	-	-	-	-	-	1	-	-
39	EPA Early Career Awards	-	-	-	-	-	-	1	-	-	-
40	DOE Early Career Awards	1	-	-	-	-	-	-	-	1	-
41	Department of Homeland Security	-	1	-	-	-	-	-	-	-	-
42	Dept. of Ed. Inst. of Educational Sciences	-	-	-	-	-	-	-	1	-	-
e. Supporting Workforce											
43	Graduate Student Enrollment	4,206	4,372	4,670	4,664	4,425	4,985	5,282	5,627	5,538	5,448
44	Sponsored Graduate Research Assistants	822	745	707	693	696	761	558	637	546	729
45	Postdoctoral Fellows	48	64	83	85	90	97	98	98	106	117
46	Research Faculty: Permanent 100% Non-E&G Funded	6	6	6	11	17	14	11	18	12	2
47	Research Faculty: Temporary 100% Non-E&G Funded	18	18	15	14	24	27	29	54	45	32

Research Report Card (FY2022 year end)

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
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	\$114.4M	\$141.4M
48	CAAH	\$0.5	\$0.4	\$0.4	\$1.1	\$1.3	\$1.4	\$1.7	\$1.6	\$1.1	\$1.3
49	CAFLS	\$8.8	\$7.7	\$6.8	\$8.6	\$11.1	\$11.0	\$14.1	\$16.4	\$15.0	\$17.8
50	COB	\$1.2	\$1.2	\$1.1	\$1.0	\$0.9	\$0.8	\$0.8	\$0.7	\$0.7	\$0.7
51	CECAS	\$35.0	\$35.0	\$35.0	\$37.5	\$42.9	\$45.1	\$50.3	\$46.4	\$54.4	\$71.7
52	CBSHS	\$3.1	\$2.8	\$3.7	\$4.1	\$4.4	\$4.9	\$5.3	\$6.7	\$9.0	\$12.0
53	COE	\$3.3	\$3.3	\$3.8	\$2.5	\$2.6	\$2.2	\$2.5	\$2.4	\$2.3	\$3.8
54	COS	\$13.2	\$10.5	\$9.3	\$11.3	\$14.8	\$16.7	\$17.2	\$17.3	\$15.9	\$18.5
55	CCIT	\$2.0	\$1.6	\$3.4	\$2.8	\$0.4	\$0.6	\$0.2	\$0.1	\$0.2	\$0.4
56	PSA	\$4.7	\$4.9	\$5.8	\$5.6	\$5.7	\$5.9	\$3.7	\$3.9	\$5.5	\$7.2
57	VP for Res & Interdisc Inst	\$1.9	\$1.3	\$1.9	\$3.5	\$3.9	\$3.9	\$7.1	\$9.5	\$9.6	\$7.0
58	All Other	\$1.7	\$1.7	\$2.2	\$1.5	\$1.5	\$1.6	\$1.5	\$0.4	\$0.7	\$1.1
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	\$114.4M	\$141.4M
59	Advanced Materials	\$14.3	\$11.3	\$10.7	\$10.4	\$10.7	\$12.1	\$15.4	\$13.5	\$14.3	\$18.6
60	Cyberinfrastructure & Big Data Science	\$10.3	\$10.5	\$10.1	\$8.9	\$8.1	\$9.6	\$6.9	\$4.4	\$5.5	\$8.2
61	Energy, Trans. & Advanced Manufacturing	\$4.7	\$5.7	\$7.2	\$7.6	\$17.8	\$16.8	\$17.1	\$14.5	\$19.9	\$27.7
62	Health Innovation	\$13.1	\$10.2	\$10.2	\$12.5	\$16.3	\$17.8	\$23.8	\$27.1	\$27.1	\$26.3
63	Human Resilience	\$8.2	\$7.7	\$9.7	\$9.8	\$7.8	\$8.6	\$9.0	\$9.7	\$12.7	\$14.8
64	Sustainable Environments	\$18.3	\$16.9	\$17.9	\$21.7	\$18.9	\$19.5	\$20.6	\$23.9	\$21.3	\$26.8
65	Other	\$6.5	\$7.6	\$7.4	\$8.6	\$9.9	\$9.6	\$11.7	\$12.1	\$13.6	\$19.6
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	\$114.4M	\$141.4M
66	Federal Government	\$62.9	\$56.9	\$58.5	\$65.1	\$74.6	\$78.2	\$85.1	\$85.2	\$95.1	\$125.1
67	Foundations, Societies, and Associations	\$4.2	\$4.3	\$4.7	\$4.1	\$4.7	\$5.1	\$7.4	\$6.9	\$6.2	\$4.6
68	Industry/Other	\$4.9	\$5.6	\$6.1	\$6.9	\$6.8	\$6.3	\$5.3	\$5.5	\$4.8	\$4.8
69	International	\$0.8	\$0.6	\$0.8	\$0.8	\$0.5	\$0.4	\$0.3	\$0.3	\$0.4	\$0.5
70	Local Government	\$0.6	\$0.6	\$0.6	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.8	\$0.9
71	State Government	\$1.9	\$1.9	\$2.7	\$2.0	\$2.4	\$3.7	\$5.7	\$6.8	\$7.3	\$6.2

Research Report Card (FY2022 year end)

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
i. Sponsored Research Expenditures per T/TT Faculty by College											
72	CAAH	\$3,299	\$2,264	\$2,343	\$5,841	\$8,177	\$8,945	\$10,159	\$10,003	\$6,912	\$8,266
73	CAFLS	\$88,570	\$81,120	\$69,612	\$84,618	\$105,396	\$103,814	\$134,555	\$137,438	\$131,195	\$139,844
74	COB	\$14,415	\$13,047	\$11,510	\$9,683	\$8,855	\$8,269	\$8,200	\$6,991	\$7,132	\$6,787
75	CECAS	\$169,754	\$160,698	\$163,406	\$163,685	\$194,323	\$214,280	\$225,620	\$201,553	\$223,843	\$296,203
76	CBSHS	\$27,982	\$26,853	\$33,764	\$42,376	\$34,751	\$39,532	\$40,301	\$50,495	\$67,202	\$90,220
77	COE	\$54,779	\$51,688	\$62,195	\$38,037	\$44,483	\$40,197	\$47,371	\$47,742	\$48,805	\$80,058
78	COS	\$95,724	\$72,421	\$61,912	\$77,589	\$95,956	\$110,206	\$118,600	\$116,020	\$107,258	\$120,778
79	Clemson Average	\$83,858	\$75,089	\$78,826	\$85,753	\$84,297	\$103,706	\$99,125	\$96,497	\$103,187	\$142,129
j. Additional information											
80	NIH R01-Equivalent Awards (by start date)	-	-	2	2	2	3	6	1	3	1
81	Doctorates Awarded (August, December and May)	187	217	237	233	231	234	301	249	225	242
82	STEM Doctorates Awarded (August, December and May)	118	153	165	138	156	171	174	162	159	172
83	Disclosures	102	129	70	60	65	51	62	68	44	50
84	Patents	16	15	15	14	18	11	18	12	15	9
85	Licenses/Options	9	7	7	5	10	11	19	13	13	27
86	Licensing Revenue		\$762,811	\$360,131	\$354,827	\$539,490	\$461,755	\$398,136	\$315,578	\$239,074	\$380,286
87	Start-up Companies (based on licenses/options)	1	4	4	2	3	3	5	1	1	4



RESEARCH

RESEARCH NEWS

This section highlights research news from across the university.

Executive Summary

- Clemson received a grant from the U.S. Department of Agriculture with a funding ceiling of \$70 million for a project to establish climate-smart farming practices across the state. This is the largest single grant from a federal funding agency that Clemson has ever received ([page 35](#)).
- The Department of Energy (DOE) has awarded a team led by Clemson University \$10.35 million to establish an Energy Frontier Research Center (EFRC) that aims to open a new frontier of polymer composites and design ([page 37](#)).
- Lesley Ross, the SmartLife endowed chair of aging and cognition and director of the Institute for Engaged Aging, is leading research to help older adults maintain brain health, mobility and independence. Ross is available to discuss her research at the upcoming Board of Trustees Research and Economic Development Committee meeting, time permitting ([page 39](#)).
- Kendall Kirk, a precision agriculture engineer based at Clemson's Edisto Research and Education Center, is leading the effort to adapt modern technology into the state's agriculture industry to improve profitability, productivity and sustainability ([page 40](#)). Director of the new Center for Agricultural Technology, Kirk is available to discuss his research at the upcoming Board of Trustees Research and Economic Development Committee meeting, time permitting.

Building Partnerships for Climate-Smart Commodities in South Carolina



Clemson University and South Carolina State University, the two land-grant institutions of South Carolina, have established a statewide coalition to execute a pilot project that provides incentives to farmers to implement climate-smart production practices.



Agudelo

The project is receiving a grant with a funding ceiling of \$70 million from the U.S. Department of Agriculture, making it the largest single grant from a federal funding agency that Clemson has ever received.

Called “Building Partnerships for Climate-Smart Commodities in South Carolina”, the project is led by Paula Agudela, associate dean of research in the College of Agriculture, Forestry and Life Sciences, and director of the Clemson Experiment Station, a collection of research and education centers stretching across South Carolina.

Climate-smart practices such cover-cropping, reduced tillage and mulching can help improve soil nutrient retention, reduce erosion and runoff, lower agricultural inputs such as fertilizer, and reduce carbon and greenhouse gas emissions. But, adoption of such operational practices remains low. According to the NASS Census of Agriculture, 6 percent of farmers use cover crops and 23 percent use reduced till practices. Farmers are still weighing the economic, practical, and environmental impacts of integrating these practices into their production systems. There is a compelling need to understand the barriers to adoption and to provide education and technical support to assist and promote

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By The Numbers

\$70M

USDA Funding

27

Project Partners

29

Clemson Faculty

20

Graduate Students

11

Clemson Departments

Building Partnerships

► **continued from previous page**

implementation of climate-smart practices.

The Climate-Smart Commodities in South Carolina project will provide incentives for farmers to implement climate-smart (CS) production practices and will measure and verify the carbon and greenhouse gas (GHG) benefits associated with the practices (quantification of GHG emissions is rare in the state). Additionally, the project will support the development of markets for the resulting climate-smart commodities. This pilot project starts to develop an emission inventory by commodities and evaluates the capacity of the state to produce climate-smart commodities.

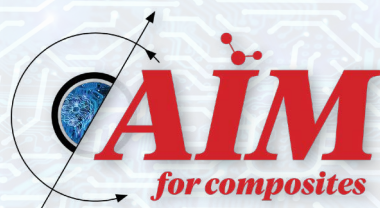
The statewide project will focus on representative agricultural production sectors of South Carolina and the Southeast, including vegetables, peanuts, beef cattle and forest products, and will ensure meaningful involvement of small and underserved producers.

South Carolina and Southeastern agriculture are challenged by highly degraded soils with organic matter content of less than 1% and low water-holding capacity. Climate-smart practices can overcome these challenges by helping to increase soil organic carbon, soil health, crop productivity, and climate resilience.

For historical and socioeconomic reasons, South Carolina has a large base of small and underserved farmers. The 2017 Agricultural Census (NASS, 2017) shows 92 percent of farms in South Carolina have less than \$100,000 in value of sales and are considered small (22,703 out of a total of 24,791 farms). Almost 50 percent (12,352 farms) of the farms are less than 50 acres, and over 90 percent are under 500 acres. Approximately 29 percent of South Carolina farmers are women, 7 percent are black, 13 percent have veteran status, and 29 percent identify as new and beginning farmers (NASS, 2017). Through strategic partnerships, this pilot project aims to have meaningful involvement of these small and underserved producers.

Statewide Coalition of 27 Partners

- American Peanut Council
- Aster Global Environmental Solutions
- Barry Graden, Forest Certification Consultant
- CU Wood Utilization Institute
- Forest Association of South Carolina
- Help for Landowners
- Mixon Seeds
- Palmetto Agribusiness Council
- Petrichor Global
- SC Cattleman's Association
- SC Peanut Board
- SC Southern SARE
- SC Timber Producers Association
- SC Forage and Grazing Lands Coalition
- SC Farmer's Markets (SCDA)
- SC Specialty Crop Association (SCDA)
- The Long Leaf Alliance
- Tidewater Lumber and Moulding, Inc.
- US Endowment for Forests & Communities
- WP Rawl
- Center for Heirs Property Preservation
- Gullah Geechee Community
- South Carolina Black Farmer's Association
- SC New & Beginning Farmers Program
- Farmer Veteran Coalition of South Carolina
- Women in Agriculture
- Women Owning Woodlands



Artificially Intelligent Manufacturing Paradigm for Composites

AIM for Composites with lower cost, lower environmental footprint, and higher performance

The Department of Energy (DOE) has awarded a team led by Clemson University \$10.35 million to establish an Energy Frontier Research Center (EFRC) that aims to open a new frontier of polymer composites and design.

The center, called Artificially Intelligent Manufacturing Paradigm for Composites, or AIM for Composites, will develop AI-enabled, cloud-based, inverse design tools that can accelerate the discovery and manufacturing of new high-performance composite materials. Inverse design, as its name suggests, inverts the paradigm of the direct approach by starting with the desired material properties and searching for an ideal composite material architecture. While AIM will focus on composites, new AI-based tools developed could eventually be applied to other materials, such as metals and alloys or ceramic matrix composites. These materials have vast applications in the automotive, aerospace, civil and defense industries.



Pilla

AIM is led by Srikanth Pilla, the Jenkins Endowed Professor of Automotive Engineering and founding director of the Clemson Composites Center. He will serve as the center's inaugural director.

AIM will establish a pipeline of highly trained students to become future STEM leaders in fields related to composites and energy sciences. The center will have a heavy emphasis on embracing diversity, equity and inclusiveness (DEI). DEI initiatives are led by a dedicated staff, DEI and outreach manager, hired for the center.

Among AIM's collaborators are two national labs, the Pacific Northwest National Laboratory (PNNL) and the Savannah River National Laboratory (SRNL). SRNL is a key partner with

[continued on next page](#)

AIM for Composites Partner Institutions



AIM for Composites

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Clemson. In 2021, the U.S. Department of Energy awarded a 10-year, \$3.8 billion contract to the Battelle Savannah River Alliance, of which Clemson is a member, to manage research at SRNL, one of the country's premier environmental, energy, and national security research facilities.

Additional collaborators include the University of Florida, The Ohio State University, Brown University and South Carolina State University. The multi-institutional, multi-disciplinary collaborations give the project access to unique facilities, capabilities and expertise, including high-performance computing, composite manufacturing and component-level testing, material engineering, software development, imaging, material characterization and testing, advanced microscopy, molecular characterization and more.

The center will be governed by four advisory boards, including a scientific advisory board, a DEI advisory board, an industry advisory board and a governance board. Industry advisors include Siemens Digital Industry Software, Boeing Research and Technology, Honda Development and Manufacturing of America, Hexagon, Altair Engineering and Moldex3D Northern America Inc.

AIM is funded through the U.S. Department of Energy's Energy Frontier Research Center (EFRC) program. EFRC was established in 2009 in response to the need to transform energy storage, collection and use to meet the rising global demand. EFRCs bring together creative, multi-disciplinary scientific teams to tackle the toughest scientific challenges preventing advances in energy technologies. These centers take full advantage of powerful new tools for characterizing, understanding, modeling, and manipulating matter from atomic to macroscopic length scales. They also train the next-generation scientific workforce by attracting a talented, diverse group of students and postdoctoral researchers interested in energy science. The AIM project will work to make composites and process manufacturing more economically viable, environmentally friendly and energy efficient, a key goal of the EFRC program.

Despite the vast design space of composites, there are significant gaps between the performance, economic and environmental targets and current design and manufacturing approaches. At the top of the list are the expensive and long development cycles, and sub-optimal design with wasteful resource usage which may bring adversarial impact to the environment and climate change. The fundamental cause of such gaps is due to the lack of detailed understanding of the influence of the material architecture, process methods and parameters on the material microstructure evolution and subsequently the end product's physical, economic, and environmental performance.

AIM, which includes a multi-disciplinary team of experimentalists, computational researchers and computer scientists, will build an AI-enabled inverse design approach for fundamental understanding and integrated material-manufacturing design of advanced polymer composites. While uncovering these fundamental insights, AIM will build Inverse Design Software (InDeS) tools that accelerate the discovery of advanced polymer composites for improved performance and energy-efficient manufacturing, thereby enabling lower carbon footprint, lower structural weight, and lower cost.

AIM By The Numbers

\$10.35M

Awarded by DOE

7 Institutional Collaborators

2 Clemson Colleges

7 Clemson Faculty

5 Clemson Departments

7 Graduate Students

4 Undergraduate Students



**PRESENTER
SPOTLIGHT**



Lesley Ross

SmartLife Endowed Chair in Aging and Cognition

Ross is the SmartLife endowed chair of aging and cognition, director of the Institute for Engaged Aging, co-director of the Study for Healthy Aging & Applied Research Programs ([SHAARP](#)) lab, and an associate professor of psychology. She joined Clemson University's Department of Psychology in 2020. Prior to joining Clemson, she was an associate professor and director of the PhD program in the Department of Human Development and Family Studies at the Pennsylvania State University and an assistant professor of psychology at the University of Alabama at Birmingham. Ross is an active member and leader in the Gerontological Society of America, National Academies' Transportation Research Board (TRB) and the former chair of the TRB's Committee of Safe Mobility for Older Persons.

Ross has a multidisciplinary background with expertise in cognitive aging, brain health, interventions to maintain healthy aging, human factors, and applied everyday outcomes such as mobility and driving. Her work seeks to understand and improve the health and everyday functioning of older adults, the fastest growing segment of the U.S. population. Her main research focus is the development of methods to maintain healthy brain aging, mobility, and independence for older adults.

Her research has two primary thrusts:

1. Identifying the predictors and best methods to assess changes in cognitive, health, and everyday outcomes (e.g., driving, instrumental activities of daily living, mobility, balance, etc.) among older adults. Better understanding of these trajectories will help to identify possible modifiable targets and key time points for interventions that may slow health and cognitive decline.
2. Identifying methods to maintain brain health and everyday function in older adults. Research in this area can identify interventions that reduce depression, maintain driving safety, or maintain the ability of an individual to age within his or her own home, for example.

Ross has brought more than \$11 million in research funding since joining Clemson and has multiple funded projects through the support of the National Institute on Aging (NIA), National Highway Traffic Safety Administration (NHTSA), and the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA).

Ross is available to discuss her research at the upcoming Board of Trustees Research and Economic Development Committee meeting.



***PRESENTER
SPOTLIGHT***



Kendall Kirk

Precision Agriculture Engineer

Kirk began working for Clemson as the precision agriculture engineer in May 2014 and is now leading the new Clemson University Center for Agricultural Technology (CU-CAT). CU-CAT is a center for collaboration between academia and industry focused on research, education and outreach. The Center will serve as a catalyst to promote and engage with cross-disciplinary research teams working together to accelerate agricultural technology development and provide science-based information for farmers.

Kirk received his bachelors, masters and Ph.D. in biosystems engineering from Clemson. Prior to starting his current position, he held teaching and research appointments on campus for almost 10 years in the Agricultural Mechanization and Business program.

His current work focuses on developing and evaluating technologies and software that are useful, profitable, and cost effective for growers. His team also builds automated data acquisition and control systems to support other agricultural researchers.

Since joining the faculty at Clemson's Edisto Research and Education Center, Kirk and his collaborators have been awarded U.S. patents for a peanut yield monitor and an automated depth control system for peanut harvest. He and his former graduate students also have been awarded software copyrights for various applications and patents for a hay yield monitor and a round hay bale weighing system.

Some of his current research includes variable rate prescription development for inputs in cotton, corn, and soybean; optimization of peanut harvest operations; and precision ag software development. Precision agriculture web apps developed by Kirk's team are rapidly growing in popularity, with over 60,000 views in the last year from more than 30,000 users located in 171 countries and every U.S. state.

Kirk is available to discuss his research at the upcoming Board of Trustees Research and Economic Development Committee meeting.



RESEARCH

FOCUS ON FACULTY

This section highlights achievements of three faculty members from each college. Entries were submitted by the colleges.

Executive Summary

- Click the links below to read about faculty from the respective college.
 - » [College of Agriculture, Forestry and Life Sciences \(pages 42-44\)](#)
 - » [College of Architecture, Arts and Humanities \(pages 45-47\)](#)
 - » [College of Behavioral, Social and Health Sciences \(pages 48-50\)](#)
 - » [Wilbur O. and Ann Powers College of Business \(pages 51-53\)](#)
 - » [College of Education \(pages 54-56\)](#)
 - » [College of Engineering, Computing and Applied Sciences \(pages 57-59\)](#)
 - » [College of Science \(pages 60-62\)](#)



College of
**AGRICULTURE, FORESTRY
AND LIFE SCIENCES**

Patrick Hiesl, PhD

Associate Professor

Forestry and Environmental Conservation



Hiesl is a forest operations researcher who studies the productivity and cost of timber harvesting operations, as well as the challenges that logging businesses face. He currently focuses on the human dimensions of logging operations, including the physical and mental workload of equipment operators. In addition to research, Hiesl is active in the Clemson Cooperative Extension, providing a variety of workshops including chainsaw safety training programs for women.

Current research projects are supported by the US Forest Service and USDA's National Institute of Food and Agriculture. Hiesl teaches courses in Forest Operations in forestry summer camp, Wood Procurement, and Harvesting Processes. He is the founder of CUTT – CU Tiger Timbers, a student-run portable sawmill operation that produces and sells roughcut lumber. He also leads one Creative Inquiry program focused on small-scale wood processing using CUTT and solar-powered drying kilns. His research lab consists of four master's students, two of whom are female students from Nepal and Sri Lanka.

Select Accomplishments

- Awarded tenure and promotion in August 2022.
- Awarded the departmental Ansel E. Miller Faculty Teaching Award.
- Awarded CAFLS Extension Award of Excellence (Assistant Professor/Post-Doctoral).
- Awarded Young Forester Leadership Award (South Carolina Division of Society of American Foresters).
- Awarded Young Forester Leadership Award (Appalachian Society of American Foresters).
- Awarded 1st place at the 2020 Appalachian Society of American Foresters (APSAF) student presentation session (student oral presentation).
- Published 12 peer-reviewed journal articles, five articles in trade magazines, and one teaching case study.
- Received a \$75,000 research grant from the US Forest Service (PI).
- Received a \$496,000 research grant from the National Institute of Food and Agriculture (co-PI portion \$110,000).
- Serves as Associate Editor for *Forest Products Journal*.



College of
**AGRICULTURE, FORESTRY
AND LIFE SCIENCES**

Susan K. Duckett, PhD

*Professor/Ernest L. Corley Jr. Trustees Endowed
Chair, Animal and Veterinary Sciences*



Duckett is an animal scientist who examines how nutrition and management of the animal alters muscle and adipose tissue growth and development. She conducts research on beef cattle and sheep at the Piedmont Research and Education Center. She is currently funded by USDA-NIFA to examine mitigation strategies for gestating ewes consuming endophyte-infected tall fescue, which contain mycotoxins that cause vasoconstriction and restrict fetal growth. Duckett teaches courses in Animal Growth and Development, Undergraduate Research Applications, and Tissue Lipid Metabolism. Her research laboratory consists of three PhD students, two master's students and eleven undergraduate researchers.

Select Accomplishments

- Godley-Snell Award for Excellence in Agricultural Research, 2022.
- Meats Research Award for American Society of Animal Science, 2022.
- Associate Editor for *Frontiers in Animal Science*, 2022.
- CAFLS Award of Excellence in Graduate Teaching, 2018.
- The Grass-fed Exchange Service Award, 2016.
- Oklahoma State University Advanced Degree Graduate of Distinction Award, 2016.
- Received \$500,000 grant from USDA-NIFA, 2020-2024.
- Received \$450,500 grant from USDA-NIFA, 2015-2019.
- Published over 100 refereed journal articles.
- Presented invited talks in Argentina, Brazil, Chile, Uruguay, and South Africa.
- Graduated 14 master's and seven PhD students as major advisor.
- Undergraduate students received first and second place in CAFLS Undergraduate Research Competition, 2022.
- Graduate student received SC-INBRE Student Initiated Research Project, 2021.
- Graduate students received NIH-USDA Young Investigator Travel Awards to present at Perinatal Biology Symposium, 2019.



College of
**AGRICULTURE, FORESTRY
AND LIFE SCIENCES**

Dil Thavarajah, PhD

Professor

Plant and Environmental Sciences



Thavarajah is an organic pulse breeder who focuses on the nutritional improvement of dry pea, lentil, and chickpea to combat global obesity and micronutrient malnutrition. She leads the Pulse Biofortification and Organic Nutritional Breeding program (nation's first public organic breeding program) and co-leads the Phenomics of the Feed the Future Innovation Lab for Crop Improvement at Cornell University. She is the 2022 FoodShot Global Award recipient for her career dedication to global food and nutritional security through pulse crop breeding and biofortification (Precision Protein Groundbreaker Prize). She conducts regional breeding research in South Carolina and North Carolina.

Thavarajah established the "Going Organic Platform," an extension outreach education program for growers and consumers. She initiated the development of organic pulse cultivars adapted to S.C. She serves as an honorary visiting lecturer at the University of Peradeniya, Sri Lanka, and a partner to the International Center for Agricultural Research in the Dry Areas (ICARDA) to release biofortified lentil cultivars for Africa and Asia. She is the past president of the North American Pulse Improvement Association (NAPIA) and the 2023 meeting hosting chair for the NAPIA and Bean Improvement Cooperative (BIC) joint meeting at Clemson to host 200-300 researchers around the world. Thavarajah is the North American representative for the International Food Legume Research Committee to host the 2023 meeting in Nairobi, Kenya.

Select Accomplishments

- \$5.6 million current research awards from federal agencies, the S.C. Department of Agriculture, foundations and industry.
- 75 peer-reviewed publications, 12 peer-reviewed book chapters, 45 peer-reviewed scholarly articles, 28 other scholarly articles, 61 popular articles, 73 invited lectures, 25 international talks, and 35 technical society publications.
- More than 800 advanced organic dry pea breeding lines are ready to test in on-farm locations in S.C.
- Advised six doctoral, five master's, and 20-30 undergraduate students.
- Pending patent: No. 63106015 for technologies for organic protein isolation.
- Developed a high-throughput non-destructive Fourier-transform infrared (FTIR) spectroscopy platform to measure a range of nutritional traits in pulse and cereal crops.
- Leads "Tiger Garden" Creative Inquiry class for community vegetable garden development.



College of
**ARCHITECTURE, ARTS
AND HUMANITIES**

Susanna Ashton, PhD

Professor

English



Ashton is a 19th Century Americanist exploring notions of authentication and identity in slavery and freedom narratives. From Fall 2021 to Spring 2022, she is on sabbatical leave from Clemson University and working as a W.E.B. Du Bois Fellow at Harvard University's Hutchins Center for African and African American Research.

Based on her research into life writing by enslaved South Carolinians and through innovative archival research, she identified authors of previously anonymous narratives (James Matthews, who anonymously narrated "Recollections of Slavery by a Runaway Slave"), definitively established and profiled enslaved authors who wrote under pseudonyms (Samuel Williams/Sam "Aleckson") and discovered that the anonymous fugitive Harriet Beecher Stowe once hid in her house was actually the author and activist, James Andrew Jackson. This discovery, which attracted international media attention, led to her current project: a biography of Jackson: *John Andrew Jackson, the hidden inspiration behind Uncle Tom's Cabin*.

Select Accomplishments

- 2021-22 Du Bois Fellow (Harvard's Hutchins Center).
- Fellow (Yale's Gilder Lehrman Center).
- Fulbright (University College Cork).
- PI, NEH Summer Institute "Reconstructing the Black Archive, South Carolina as Case Study 1739-1895" June and July 2023 for University and College faculty. \$200,000.
- "Before the War and After the Union by Sam Aleckson." Written by Samuel Williams. Edited by Susanna Ashton (Clemson University Press / Liverpool University Press, 2021).
- Susanna Ashton & William Hardwig, eds. *Approaches to Teaching Charles W. Chesnutt*. (New York, NY: Modern Language Association, 2017).
- Winner of the Sylvia Lyons Award from the Charles W. Chesnutt Association (2018).
- "The Fugitive Slave Act and the United States of Slavery" Book chapter for *African American Literature in Transition*, Volume 3 1830-1850. Series General Editor: Joycelyn Moody (Cambridge UP, 2021).
- "Collaborators in Literary America 1870-1920." Palgrave MacMillan Press, 2003.



College of
**ARCHITECTURE, ARTS
AND HUMANITIES**

Jordan Frith, PhD

Pearce Professor of Professional Communication

English



Frith is the author of three books and more than 30 peer-reviewed journal articles in a variety of highly competitive, higher impact disciplinary journals. His work has also been impactful, and as of February 2022, he had been cited almost 2,000 times in the past 10 years.

His second book, *Smartphones as Locative Media*, was published as part of Polity's Digital Media & Society series. His third book, *A Billion Little Pieces: RFID and Infrastructures of Identification*, was published by MIT Press in Spring 2019.

As of January 2022, Frith is lead editor on a multi-author book about the use of virtual reality across the creative industries that should be published in late 2022 or early 2023. He's also working on four other articles at various stages of development and two new book projects.

Select Accomplishments

- Frith, J. & Saker, M. (Eds.) (under contract, expected late 2022/early 2023). "The changing face of VR: Pushing the boundaries of experience across multiple industries." Vernon Press
- Frith, J., & Richter, J. (2021). "Building participatory counternarratives: Pedagogical interventions through digital placemaking." *Convergence: The International Journal of Research into New Media Technologies*. 27 (3), 696-710.
- Campbell SW, Zhao F, Frith J, Liang F. (2021) "Imagining 5G: Public sense-making through advertising in China and the US." *Mobile Media & Communication*. 9 (3), 546-562.
- Frith, J. (2021). "Introduction to business and technical communication and COVID-19: Communicating in times of crisis." *Journal of Business and Technical Communication*, 35, 1-6.
- Frith, J. (2019). "A billion little pieces: RFID and infrastructures of identification." Cambridge: MIT Press.
- Frith, J. (2015). "Smartphones as locative media." London: Polity Press.



College of
**ARCHITECTURE, ARTS
AND HUMANITIES**

Ehsan Mousavi, PhD

Endowed Assistant Professor

Construction Science and Management



Mousavi received his Ph.D. from the University of Nebraska in 2015, and he has served in various capacities in the construction industry including dam, road, building and healthcare construction projects. Collaborating in projects funded by the US Department of Energy, and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and the National Science Foundation, Mousavi has developed extensive research background in hospital indoor air quality. Specifically, he has studied the effect of environmental parameters (ventilation rate, ventilation arrangement, temperature, door motion, etc.) on the transmission and spread of pathogenic agents. Moreover, he has received more than \$400,000 of funding for his many collaborative research projects in healthcare facilities' air quality.

Select Accomplishments

- News Feature: [Why indoor spaces are still prime COVID hotspots](#), *Nature*.
- iaqRadio feature: Ehsan Mousavi PhD – Clemson Department of Construction Science & Management – [Indoor Air Quality: What Can We Learn from Hospitals](#).
- Selected as 2022 CUSHR Faculty Fellow.
- “COVID-19 outbreak and hospital air quality: a systematic review of evidence on air filtration and recirculation,” ES Mousavi, N Kananizadeh, RA Martinello, JD Sherman, *Environmental Science & technology* 55 (7), 4134-4147.
- “Performance analysis of portable HEPA filters and temporary plastic anterooms on the spread of surrogate coronavirus,” ES Mousavi, KJG Pollitt, J Sherman, RA Martinello, *Building and Environment* 183, 107186.
- “Ventilation rates and airflow pathways in patient rooms: A case study of bioaerosol containment and removal,” ES Mousavi, KR Grosskopf, *Annals of Occupational Hygiene* 59 (9), 1190-1199.



College of
**BEHAVIORAL, SOCIAL
AND HEALTH SCIENCES**

Tracy Fasolino, PhD

Professor, Distinguished Palliative Care Leader

School of Nursing



Fasolino is a nurse researcher working to improve the quality of life for individuals living in rural communities dealing with non-malignant serious illnesses. As a distinguished palliative care leader, she speaks regularly at local, state, and national platforms on the barriers to access in care and the compounding social determinants of health found in rural communities. She is recognized as an expert in advanced pulmonary conditions, such as chronic obstructive pulmonary disease, and contributes to the national dialogue on the gaps in care for patients and their caregivers. Her current efforts, funded by Cambia Health Foundation, focus on moving into the national policymaking and legislative efforts to address rural equity.

Fasolino teaches graduate courses in the School of Nursing and mentors doctoral students in the PhD program of healthcare genetics and genomics. She contributes regularly to the scholarly efforts of the department to ensure high quality nurse practitioners are 'practice ready' and successfully pass national certifications. She is a board certified Hospice & Palliative Care Nurse Practitioner and Family Nurse Practitioner with more than 25 years of experience working with inpatient and outpatient teams.

Select Accomplishments

- 2022 promotion to full professor, CBSHS, Clemson University.
- 2021-2023 Cambia Sojourn Leadership cohort to transition into a national voice for rural health equity and palliative care access.
- 2022 Health Affairs Podcast Fellowship – producing a three-part series on the past, present, and future of hospice and palliative care.
- 2022 Rural Health Symposium Facilitator for Clemson SON Team – Council to Advance Nursing Science, State of the Science Congress on Nursing Research Conference.
- Invited speaker for 2022 American Thoracic Society Conference – Early Palliative Care Policy Statement, Rural Equity for Advanced Lung Disease.
- 2021-2022 Education expert - Hospice & Palliative Care Association for APRN Polaris Modules.
- Published 16 peer-reviewed journal articles between 2020-2022.
- 2020 Award of Excellence in New Faculty Mentoring. College of Behavioral, Social, & Health Sciences, Clemson University.



College of
**BEHAVIORAL, SOCIAL
AND HEALTH SCIENCES**

Natasha P. Malmin, PhD

Assistant Professor

Political Science



Malmin is a policy scientist who studies access and procedural equity issues in health and disaster recovery systems. Areas of specialization include public health emergency response, school recovery after disasters, administrative burden and federal disaster recovery, participatory geographic information systems mapping, and community resilience. She has articles appearing in the *Journal of Emergency Management, Disaster Medicine and Public Health, Natural Hazards, Environmental Health, and Applied Geography*.

Malmin teaches graduate courses in public administration, an MPA degree program. The MPA is a graduate-level professional degree designed for and considered a top credential for non-profit, community, and government leadership. The Clemson MPA program incorporates business management and public policy elements, a combination that prepares students to become influential leaders in the public and non-profit sectors. Her courses include Public Policy Process, Public Policy Evaluation, and a unique special topics course on Public Health Emergency Response.

Select Accomplishments

- William Averette Anderson Fund Fellowship – Alumni Fellow.
- *American Journal of Public Health* – Injury Control and Emergency Health Services Section Councilor.
- Selected to participate in the 2021-2022 Clemson /Prisma NIH Accelerator Program.
- U.S. Department of Commerce, Economic Development Administration: University Center Forum panel reviewer.
- Natural Hazards Researchers Meeting: Social Vulnerability, and Disaster-Related Disparities session moderator.
- Paper presenter at the American Public Health Association Annual Conference, Natural Hazards Workshop, and American Political Science Association Annual Meeting.



College of
**BEHAVIORAL, SOCIAL
AND HEALTH SCIENCES**

Dawn M. Sarno, PhD

Assistant Professor

Psychology



Sarno is a human factors psychologist who studies human performance in a variety of applied tasks such as baggage screening, radiology, and online deception detection. Additionally, Sarno is interested in how to develop interventions to improve performance in each of these areas, particularly across the lifespan. Her current work is focused on understanding why users may be vulnerable to various forms of online threats, such as phishing attacks, scam text messages and fake news headlines (i.e., disinformation). She is also developing a novel, gamified intervention called IMPAWSTER to help younger adults detect phishing emails.

Select Accomplishments

- Published five peer-reviewed journal articles between 2021-2022.
- Received the Fall 2022 “Outstanding Publication Award” from the College of Behavioral, Social and Health Sciences, Clemson University.
- Presented eight conference presentations with at least one undergraduate student as a co-author between 2021-2022.
- Currently serving as a member of a multidisciplinary team that was awarded an NSF Convergence Accelerator grant. This team is developing the Deception Awareness and Resilience Training (DART) intervention to improve deception detection among older adults.
- Awarded the Clemson SUCCEEDS grant to kickstart the development of a novel phishing detection intervention for younger adults called IMPAWSTER.
- Appointed to the Editorial Board of the *Journal of Experimental Psychology: Applied* (2021-present).
- Presented seven invited research talks between 2021-2022, across three universities.
- Selected to participate in the NSF Early CAREER Academy at Clemson University.



Wilbur O. and Ann Powers College of

BUSINESS

Angeline Close Scheinbaum

*Associate Professor***Marketing**

Close Scheinbaum's research has been cited more than 3,000 times in some of the business discipline's top journals. She joined the faculty at Clemson University in 2019 as the Dan Duncan Professor of Sports Marketing. In this role, she assists the Brooks Sports Science Institute in the goal of building an in-depth program of study in sports marketing and making contributions to sports marketing education at Clemson.

Over the past few years, Close Scheinbaum's research advancements have been in the areas of sponsorship/experiential marketing and online consumer behavior. Her current projects are largely in sports marketing. In particular, she has ongoing research projects on the following topics: 1) examining fan identity in cycling; 2) the role of CSR perceptions in sponsorship effectiveness in motorsports, the PGA, and cycling; 3) the impact of jersey sponsorship in the NBA; and 4) COVID impact in tennis.

Of note, these projects generally entail both doctoral student mentoring and an industry relationship component. Scheinbaum's newest industry partnership is with the United States Tennis Association, which is interested in trends and perceptions of membership and the sport. Scheinbaum brings this research into the sports marketing classroom in order to bring a real-world application to the students' learning.

Select Accomplishments

- Hwang, A. H. C., Oh, J., & Scheinbaum, A. C. (2020). "Interactive music for multisensory e-commerce: The moderating role of online consumer involvement in experiential value, cognitive value, and purchase intention." *Psychology & Marketing*, 37(8), 1031-1056.
- Scheinbaum, A. C., Shah, P., Kukar-Kinney, M., & Copple, J. (2020). "Regret and nonredemption of daily deals: Individual differences and contextual influences." *Psychology & Marketing*, 37(4), 535-555.
- Scheinbaum, A. C., Lacey, R., & Drumwright, M. (2019). "Social responsibility and event-sponsor portfolio fit." *European Journal of Marketing*.
- 2020 Best Reviewer - *Journal of Advertising Research*.



Wilbur O. and Ann Powers College of

BUSINESS

Bill Kettinger, PhD

William S. Lee Distinguished Professor

Management



Kettinger is a management professor who studies the strategic impacts of information technology (IT) on businesses, industries, and communities. His research addresses vexing problems facing managers challenged in exploiting IT. Current research projects are supported by such companies as FedEx, IMC, and Freight Waves. Kettinger currently teaches Information Systems courses in the Clemson MBA program and PhD research seminars. He has chaired, or co-chaired, 14 PhD dissertations. He also serves as the co-faculty advisor for the undergraduate student chapter of the Association of Information Systems. Prior to joining Clemson, he served as professor and FedEx chair of excellence in MIS at the Fogelman College of Business and Economics at The University of Memphis. Kettinger has regularly taught in the MBA programs at IMD in Lausanne Switzerland, Wirtschaftsuniversität Wien, Vienna Austria and at the Tecnológico de Monterrey in Mexico. Kettinger has more than 100 publications, including four books and 80 refereed journal articles. He is a senior editor of *MISQ Executive*, *MIS Quarterly* (emeritus) and serves, or has served, as an associate editor of *Information Systems Research*, *MISQ* and *JAIS* and has served as a special editor for *JMIS* on three occasions.

Select Accomplishments

- Clemson University Research, Scholarship and Artistic Achievement Award, 2019.
- Ranked No. 28 among the most productive researchers in the world publishing in the Association of Information Systems six top journals between 1990-2017. Ranked No. 60 among the most productive researchers in the world publishing in the Financial Times-50 top MIS journals between 1990-2017.
- Co-Chair, Doctoral Consortium, Association of Information System (AIS), Annual Meeting – New Orleans, 2018; Faculty Mentor, AIS Doctoral Consortium: 2013, 2016, 2017.
- Member of the Finance and Compliance Technical Steering Committee, Blockchain in Transportation Alliance (BITA), 2018-ongoing; Clemson Academic Technology Council, 2019-2022; Clemson MBA Council, and the Council's Curriculum Review Subcommittee, 2018-2020; Graduate Program Committee, Department of Management 2018-2019; and Senior Associate Dean Selection Committee (2019-2020).
- Best Paper Award, Organization Systems & Technology Track, HICSS Conference, 2015.
- Fulbright Scholar at the Vienna University of Business and Economics, Vienna Austria, 2013.



Wilbur O. and Ann Powers College of

BUSINESS**Erica Walker, PhD***Assistant Professor***Graphic Communications**

Walker has a diverse background in visual communications, which includes feature film production, web design and development, print buying, marketing and graphic design for print. As a faculty member in the Department of Graphic Communications in the College of Business at Clemson University, she teaches courses in photography, video, web development, and entrepreneurship. She is interested in many areas of research, including software application, curriculum development, student development of 21st century skills, and artificial intelligence applications in color management for brands.

Select Accomplishments

- Received a full patent for ColorNet AI technology, a project that includes undergraduate students through the Creative Inquiry program and works with Clemson Athletics to ensure brand color accuracy during broadcasts and on social media channels (ColorNet 1.0 complete, ColorNet 2.0 currently in development).
- Awarded more than \$100,000 in research funding, including a CURF TechMat (\$29,918), a CU SEED grant (\$5,000), and a Robert H. Brooks Sports Science Institute (\$45,472).
- Held seven fellowship positions, including Watt Faculty Fellowship, TeachingForward Fellowship, and Brooks Faculty Fellowship.
- Completed 16 journal publications and five industry publications, and participated in five panels, 13 media interviews, and more than 50 presentations in the last five years.
- Named an International Adobe Education Leader in 2019 and 2020 (application in review for 2021).
- One of six Clemson University TeachingForward Fellows in 2019.
- Printing Industries of America Education Award of Excellence in 2019.
- Awarded the ClemsonGC Professor of the Year in 2018 and the College of Business Professor of the Game in 2017.
- Developed resources and training workshops for recruiting, training, and supporting Industry Expert Adjuncts (IEAs) in partnership with ClemsonGC and The Erwin Center for Brand Communications. Looking to expand this program into other colleges in the coming years.



S. Megan Che, PhD

Associate Professor

Teaching and Learning



Che's scholarly productivity focuses on expanding access to historically underserved students to rigorous, responsive, affirming, and equitable schooling environments, particularly within STEM disciplines. As a critical theorist and critical feminist, she seeks to uncover and disrupt mechanisms and structures that perpetuate inequitable access to high-quality schooling experiences in STEM. Che's accomplishments in these endeavors is partly exemplified in her record of external funding of nearly \$4 million as principal investigator (PI) or co-PI, as well as her publication record of 60 journal articles, book chapters, books, and conference proceedings papers. Che's most recent NSF-funded project, CRoCS, prepares teachers in South Carolina to teach Culturally Responsive Computer Science and contributes to our understandings of the nature of culturally responsive computer science in introductory high school computer science courses. Because of purposeful recruitment and selection of participating teachers and schools, this project has expanded access to racially and socio-economically diverse students to high school computer science opportunities previously inaccessible to them. Che also recently served as lead editor on a special issue of *Investigations in Mathematics Learning* focused on social justice and equity in mathematics schooling. Che has served in leadership positions in national organizations, including as president of the Research Council on Mathematics Learning and as a board member of the School Science and Mathematics Association.

Select Accomplishments

- Special Issue Guest Editor – *Investigations in Mathematics Learning*, Volume 13(1). Research Council on Mathematics Learning, 2021.
- PI, “CS For All: RPP: A Scalable RPP For Preparing and Supporting Teachers to Teach Culturally Responsive and Rigorous CS Courses in SC High Schools,” awarded by the National Science Foundation. \$1,130,316. August 2017.
- PI, “Impact of Single-Sex Public Educational Environments on Mathematics and Science Classroom Environment, Student Academic Performance, and Student Self-Concept,” awarded by the National Science Foundation. \$524,667. September 2011.
- Co-PI, “IUSE: Understanding and Propagating the Essence of Successful Computing Education Projects,” awarded by the National Science Foundation. \$50,000. August 2016.
- Co-PI, “Clemson University International Leaders in Education Program,” awarded by the U.S. Department of State. Total funding \$690,691. Funded 2009, 2010, 2011, 2014.



College of
EDUCATION

Emily Howell, PhD

Assistant Professor

Education and Human Development



Howell focuses her research on writing, digital literacy, adolescent literacy, and professional development for teachers. She is a recognized scholar for her research method in these areas, design-based research. She has published on these research topics and using design-based research in many of the top-tier, national peer-reviewed research journals in the field of literacy: *Reading Research Quarterly*, *Journal of Literacy Research*, *Journal of Adolescent & Adult Literacy*, *The Reading Teacher*, and *Professional Development in Education*. The field has recognized her research efforts with two national awards. In 2019, she was recognized as an emerging scholar in her field with the American Reading Forum Gary Moorman Early Career Literacy Scholar Award for Outstanding Research and Writing. She continues to demonstrate success and recognition in her research as in 2021 she received the Divergent Award for Excellence in 21st Century Literacies Research.

Not only has Howell received recognition for her research, but she serves nationally in leadership positions. She has served and continues to serve on the editorial review boards of national peer-reviewed research journals such as *Journal of Adolescent & Adult Literacy* and *Reading Research Quarterly*. Further, she served as a board member of a national literacy organization, the American Reading Forum, from 2018-2020. Howell served as the chair of the innovative community group on formative and design-based research for another national literacy organization, the Literacy Research Association.

Select Accomplishments

- Kaminski, R., & Howell, E., Co-PI. (2021, funded). English Learner instruction: Building capacity through design. Office of English Language Acquisition, Department of Education, National Professional Development Grant Program. \$2,145,671.
- Edited volume on design-based research: Philippakos, Z., Howell, E., & Pellegrino, A. (Eds.).(2021). *Design based research in education: Theory and applications*. New York, NY: Guilford Press.
- Howell, E., Perez, S., & Abraham, W. T. (2021). "Toward a professional development model for writing as a digital, participatory process." *Reading Research Quarterly*, 56(1), 95-118.
- Howell, E., Barlow, W., & Dyches, J. (2021). "Disciplinary literacy: Successes and challenges of professional development." *Journal of Literacy and Language Education*, 17(1).



Noelle A. Paufler, PhD

Assistant Professor

Educational & Organizational Leadership



Paufler is the program coordinator for the Doctor of Education (EdD) in Education Systems Improvement Science in the Department of Educational and Organizational Leadership Development. She has experience as a high school social studies teacher, district administrator, and applied researcher in high-need districts and schools. Her research interests include K-12 educational policy, specifically how leaders enact policy into practice and its impact on teachers and students. Additional areas of her research focus on doctoral leadership preparation, specifically preparing leaders who have the knowledge, skills, and systems perspective needed to effectively serve in high-need school communities. In her role as co-director of the Leading Educational Administrator Development for Excellent Rural Schools (LEADERS) Center of Excellence, she supports the development of leaders in rural, high-poverty, and/or underperforming schools with high teacher turnover. Her work has been published in premier journals such as the *American Educational Research Journal*, *Impacting Education: Journal for Transforming Professional Practice*, *Journal of Research on Leadership Education*, and *Journal of Teacher Education*.

Paufler is an active member of professional organizations in her field, including the American Educational Research Association (AERA) and University Council for Educational Administration. She represents Clemson University among more than 120 peer institutions as a delegate for the international Carnegie Project on the Education Doctorate CPED. She also serves as the treasurer for the Council of Professors of Instructional Supervision and program chair for the Supervision and Instructional Leadership Special Interest Group (AERA). Her work in these roles is dedicated to the reconceptualization of doctoral education for leadership preparation, especially in diverse, rural, and high-need schools.

Select Accomplishments

- Co-PI, South Carolina Commission on Higher Education Center of Excellence, Leading Educational Administrator Development for Excellent Rural Schools (LEADERS) Center of Excellence, funded 2021-2024 (Total \$387,000).
- PI, College of Education Associate Dean of Research Grant, Educational Leadership Doctoral Program Evaluation: Using Research Evidence to Improve Problems of Practice in Context, funded 2020-2022 (Total \$15,000).
- Co-PI, College of Education Associate Dean of Research Grant, Advancing Contextually Relevant Leadership Practices in High-Needs Schools: A Systemic and Equitable Approach to Improvement, funded 2020-2022 (Total \$20,000) of Excellence in Service (2020).



College of
**ENGINEERING, COMPUTING
AND APPLIED SCIENCES**

Sarah W. Harcum, PhD

Professor

**Bioengineering; and Chemical and Biomolecular
Engineering**



Harcum is a professor of bioengineering with an adjunct appointment in chemical and biomolecular engineering at Clemson University. She earned a PhD in chemical engineering from the University of Maryland, College Park in 1993. Prior to joining Clemson in 2002, she was an associate professor at New Mexico State University in chemical engineering with a joint appointment in the molecular biology program. Prior to NMSU, she was a certified product reviewer at the FDA.

Her research focuses on biopharmaceutical manufacturing, the production of drugs that require cells. Specifically, her research gains better understandings of cell behavior in the bioreactor environment. In addition to the most common cells used in biomanufacturing, *Escherichia coli* and Chinese hamster ovary (CHO) cells, Harcum studies cells with biomanufacturing potential, such as induced pluripotent stem (iPS) cells. Harcum's research interests include advanced manufacturing, gene expression analysis, and process models for cells in bioreactors. Examples of her current research include methods for bioreactor scale-up (bacterial and mammalian cells); methods to characterize yeast using microwaves with Pingshan Wang, professor of electrical and computer engineering; and characterization of genome instability in CHO cells with Chris Sasaki, associate professor of plant and environmental sciences. Research sponsors include NSF, NIST, and more than 30 industry partners.

Harcum is an active contributor to technical sessions at the American Chemical Society and Cell Culture Engineering. She also serves as an external advisory to the Department of Chemical and Biological Engineering at Colorado State University.

Select Accomplishments

- Averaged more than \$1 million in research expenditures for the last five years.
- Authored eight scholarly publications in the last year.
- Lead mentoring efforts for four early career tenure-track underrepresented minority (URM) faculty at four universities in three states, six post-doctoral fellows (five women and one URM), 15 graduate students (13 PhD and two MS; six women and five URM); and 35 undergraduate students (23 women and 19 URM).
- Invited guest editor for an upcoming *Current Opinions in Biotechnology* issue focused on Biomanufacturing.



College of
**ENGINEERING, COMPUTING
AND APPLIED SCIENCES**

Nathan McNeese, PhD

Assistant Professor

School of Computing



McNeese is the College of Engineering, Computing, and Applied Sciences dean's professor, assistant professor of human-centered computing and director of the Team Research Analytics in Computational Environments (TRACE) Research Group within the School of Computing at Clemson University. He is also the director of the university-wide Clemson University Data (Science) Laboratory. In addition, he holds a secondary appointment in Clemson's Human Factors Institute, is a faculty scholar in Clemson's School of Health Research, and is a Watt Family faculty fellow.

McNeese received a PhD in information sciences and technology from The Pennsylvania State University. For more than 15 years, he has conducted research mainly focused on teamwork, artificial intelligence (AI), and collaborative technology within a variety of different contexts (command and control, emergency crisis management, and healthcare). His current research interests span across human-AI/autonomy teaming, the development/design of human-centered collaborative tools and systems, and human-centered AI. He currently serves on multiple international/societal programs and technical committees, in addition to multiple editorial boards, including *Human Factors*. He is a previous member of two separate National Academies of Science, Engineering, and Medicine consensus study committees, and a previous member of the Army Research Lab HRED Technical Advisory Board. His research has been published in peer-reviewed venues over 100 times and has received multiple best paper awards/nominations in top human-computer interaction and human factors venues. In addition, he has acquired more than \$35 million in research funding.

Select Accomplishments

- Awarded Clemson University Junior Faculty Researcher of the Year in 2022.
- Provided one of the first definitions of a human-AI/autonomy teaming, which is now viewed as a canonical definition of the concept.
- Published the first empirical investigation of the performance of a real human-AI/autonomy team (real autonomous teammates as part of the team).
- First to publish empirical works on trust, situational awareness, coordination, team cognition, human perceptions, and ethics in human-AI/autonomy teaming.
- Authored more than 100 publications with five best paper awards, including four occurring in the past two years.
- Received \$35 million in funding as either principal investigator (PI) or co-PI.



College of
**ENGINEERING, COMPUTING
AND APPLIED SCIENCES**

Yue “Sophie” Wang, PhD

Professor

Mechanical Engineering



Wang is a professor and the Warren H. Owen – Duke Energy professor of engineering at Clemson University’s Department of Mechanical Engineering and the director of the Interdisciplinary and Intelligent Research (I2R) Laboratory. She earned her PhD in mechanical engineering from Worcester Polytechnical Institute in 2011 and was a postdoctoral research associate at the Department of Electrical Engineering at University of Notre Dame before joining Clemson in 2012.

Wang’s research interests include modeling, control, motion planning, learning, and verification methods for human-robot interaction (HRI) systems and autonomous systems. Examples of her current research include computational human-to-robot trust models, human decision-making models and risk quantification in HRI, collaborative robotics for advanced manufacturing, shared control of mobile robots, control of connected and autonomous vehicles, verification of autonomy, multi-robot cooperative control and symbolic motion planning, and deep reinforcement learning and imitation learning for human-robot collaboration systems.

Wang is a recipient of the NSF CAREER award and the Air Force Summer Faculty Fellowship. She is a senior member of IEEE and an active member of ASME. She serves as the associate editor of the *IEEE Robotics and Automation Magazine*, the *ASME Journal of Autonomous Vehicles and Systems*, and *IEEE Open Journal of Control Systems*. She is also a Technical Editor of the *IEEE/ASME Transactions on Mechatronics*. Her work has been featured in NSF Science 360, ASEE First Bell, State News, SC EPSCoR/IDeA Research Focus, and Clemson News.

Select Accomplishments

- Promoted as the first female full professor in Mechanical Engineering at Clemson University.
- Secured more than \$7 million in external funding after tenure (2018-2022).
- Authored seven journal publications and four conference papers (May 2021-May 2022).
- Received the George N. Saridis Best Transactions Paper Award from *IEEE Transactions on Intelligent Transportation Systems* in 2020.
- Graduated two PhD students recently and advising eight PhD and three master’s students.
- Developed a new graduate course: “Introduction to Robotics and HRI.”
- Writing Open Access textbooks on robotics in advanced manufacturing.



Julia Brumaghim, PhD

Professor

Chemistry



Brumaghim joined the Clemson faculty in 2003, and her research explores the areas of radical damage to DNA and how antioxidants prevent this damage. Thousands of antioxidants are found in foods and in cells, and researchers are very interested in understanding how these antioxidants can prevent cancer, Alzheimer's, Parkinson's, diabetes, and cardiovascular diseases. While most work focuses on how antioxidants scavenge radicals, Brumaghim focuses on the metals that generate radicals. She discovered that many different classes of antioxidants bind radical-generating metals to stop radical production at the source rather than scavenging radicals after they are released. This work earned her an award for the Best Paper from A Young Investigator in 2008 and a Rising Star Award from the Women Chemists Committee of the American Chemical Society in 2014, as well as research funding from the NSF, NIH, NASA, and American Heart Association. Her fundamental work on DNA damage and how to prevent it in vitro and in cells broadly impacts our understanding of disease development and prevention.

From antioxidants to nuclear waste and cosmic rays. Many processes involve radicals, from disease development to nuclear waste remediation to cosmic radiation, and Brumaghim has recently expanded her research efforts to encompass these areas. The radioactivity of nuclear waste degrades molecules developed to aid in its separation for easier storage, and this degradation involves radicals similar to those that damage DNA in cells. In 2021, Brumaghim was awarded her first Department of Energy grant to investigate whether rapid biochemical radical assays can be repurposed to help develop new nuclear waste separation technologies that can better withstand radiation.

Brumaghim is also active in promoting diversity, equity, and inclusion in STEM. As a member of Clemson's Commission on Women for 10 years, she helped spearhead the effort to open the first on-campus child development center in 2020. She is an executive mentor and adaptive leadership presenter for the Trailblazers: Provost's Mentoring Initiative for Faculty leadership program, and she helped develop and implement mentoring circles for assistant, associate, and non-tenure-track faculty in the College of Science.

Select Accomplishments

- Over 60 peer-reviewed publications and 160 scientific presentations.
- Mentored 47 undergraduates, four master's students, 19 PhD students, and two postdoctoral fellows in her 19 years at Clemson, including Beckman and Goldwater Scholars.
- 2021 Clemson University Research, Scholarship, and Artistic Achievement Award.
- Selected as a Fellow of the American Chemical Society in 2022.



Xinyi Li, PhD

Assistant Professor

School of Mathematical and Statistical Sciences



Li joined the Clemson faculty in August 2020 and has been active in research and teaching. Her research interests focus on developing novel statistical machine learning methods to study public health.

First, she has worked on conducting the imaging-genetics study in precision medicine for Alzheimer's Disease, which incorporates abundant features, including patients' demographic information, genetic/genomic risk factors, and neuroimaging features. She develops novel methods to find the association of the neuro-images in terms of the disease status while accounting for other individual information in the analysis. Once the association is identified, one can gain insights into morphologic disease information from the abundant features, smartly use the information as early detection and diagnosis tools, and guide optimal treatments. These efforts have led to awarded external funding from the National Science Foundation (NSF), as well as publications in top statistical journals and a podcast interview available on YouTube.

In addition, during the past few years when the COVID-19 outbreak created a worldwide health crisis, Li and her collaborators were devoted to studying the spatial-temporal pattern in the spread of COVID-19 in the United States. A novel epidemic modeling framework was built to dissect the spatial structure and dynamics of spread, as well as to assess how the outbreak may unfold through time and space, and thus help the local community and government to guide evidence-based decision-making. The proposed prediction model has been selected by CDC as one of the individual national/state forecasts. The work was featured in the newsletters of the two largest professional statistics organizations, the Institute of Mathematical Statistics and the American Statistical Association, and leads to publications in journals such as the *Proceedings of the National Academy of Sciences* (PNAS).

Li has taught courses at both undergraduate and graduate levels, and this semester she is co-developing and co-teaching a machine learning course in her school.

Select Accomplishments

- Serves as the pilot project leader at the Clemson Center for Human Genetics.
- Is a core faculty member for the Clemson-Medical University of South Carolina (MUSC) Biomedical Data Science and Informatics PhD program.
- Serves as an AI Advocate for the Clemson-MUSC AI Hub, and leads a collaborative project that has been awarded the AI Augmentation Grants from the AI Hub.



Emily E Rosowski, PhD

Assistant Professor

Biological Sciences



Rosowski joined the Clemson faculty in January 2019. Her research interests focus on host-pathogen interactions. Her lab uses a zebrafish host model to understand innate immune responses to fungal pathogens, including *Aspergillus fumigatus*. Rosowski brought a K22 Career Transition Award from NIH to Clemson to help fund the startup of her lab. Recently, her research program was externally funded through two additional NIH grants: a 5-year R35 or MIRA award from the National Institute of General Medical Sciences (NIGMS) for more than \$1.8 million in July, and a 2-year R21 award from the National Institutes of Allergy and Infectious Disease (NIAID) for more than \$400,000 in February.

Rosowski recently published the first primary research article from her lab in *PLoS Pathogens*. She also wrote a review that was published in June 2020 as part of a feature on “Early Career Scientists Shaping the New Microbiology” in *Infection and Immunity*. Her lab has continued to grow and the first graduate student under her supervision graduated with his master’s degree in May. She currently supervises a postdoctoral associate, two PhD students, and a full-time research technician. Rosowski and her lab members have presented at more than seven national or international conferences since she started her lab, and she was recently awarded a 2022 Peggy Cotter Award for Early Career Branch Members from the American Society of Microbiology. Her lab members have also received presentation awards, including the People’s Choice Award at the Clemson 3MT Postdoc Flash Talk Competition in 2020 and multiple presentation awards at Clemson Biological Sciences Annual Student Symposia over the last few years. Rosowski also makes significant contributions to both undergraduate and graduate curricula in the Department of Biological Sciences, including teaching MICR 4140/6140 Basic Immunology, contributing to graduate core courses, and providing research opportunities for undergraduates through Creative Inquiry.

Select Accomplishments

- Authored 19 peer-reviewed publications.
- Secured more than \$2.8 million in external funding since starting at Clemson.
- Has given seven presentations at conferences since starting at Clemson.
- Featured as an “Early Career Scientist Shaping the New Microbiology” in *Infection and Immunity*.
- Received the Peggy Cotter Award for Early Career Branch Members from the American Society of Microbiology.



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October 2022