

I D E A S

COLLEGE OF ENGINEERING, COMPUTING AND APPLIED SCIENCES

FALL 2020

INGENUITY. RESILIENCY. FLEXIBILITY.



Rising to the COVID-19 challenge

Diego Nigoa is among the many students, faculty and staff who turned the pandemic into an opportunity for innovation.



FROM THE DEAN

Much has happened since our last issue of IDEAS in March. Our college along with the nation and the rest of the world has adjusted to a new way of life as a result of the unprecedented COVID-19 situation, and our faculty, staff, and students have responded with exceptional ingenuity, resilience, flexibility, and most importantly, goodwill, finding creative virtual ways to support teaching, learning and research while ensuring everyone's health and safety. This issue is a testament of their ability to rise to this challenge in a remarkably short amount of time.

Even though they have been working and studying remotely, our faculty and students have continued their wide-ranging research addressing today's challenges. As you will see in this magazine, their projects range from discovering faster testing protocols to designing protective devices to developing strategies for protecting grocery shoppers. Just as important, our faculty have been creative in finding innovative ways to teach and collaborate with students to ensure we continue to provide them with a quality education. You can read about some of their unique efforts in this issue, including the college's first virtual dissertation defense where the graduating student and the committee members connected remotely from across the country.

Several recent incidents have renewed an important dialogue about justice and equality in our nation. As engineers and scientists, we have long appreciated the need for a diversity of voices and approaches because this robust and healthy exchange of ideas leads to richer, more impactful solutions to the issues we face. The past few months have given us the opportunity to pause, listen and re-evaluate our nation's narrative and recommit to a future in which everyone has a chance to succeed, and this issue features some of the efforts we are taking to create a more inclusive environment in our college. While these will be led by Oliver Myers and Melissa Smith, who were appointed associate deans for inclusive excellence in February, our entire leadership team is committed to making cultural change a long-term priority in our college. As Dr. Myers says in this issue, "This is not something that is going to be solved in a 40-minute conversation or a four-year program. This has to be solved as a long-term continuous engagement process."

We are also highlighting the accomplishments of some of our outstanding alumni in this issue. I want to extend my heartfelt

congratulations to the newest members of the Thomas Green Clemson Academy of Engineers and Scientists, Charlie Blackwell-Thompson, J. Richard Cottingham, Mike Mansueti and Tony Mathis. This recognition does not do justice to the impact their contributions have had on their communities, the nation, and the world. They represent the best of our college and our university, and this, the college's highest honor, is a testament to their dedication and service to their professions and beyond. I also congratulate our newest Outstanding Young Alumni, Matt Kelley and Elizabeth Sloan, for their professional achievements. They too are excellent representatives of our college, showing what is possible with a Clemson degree. All six of these honorees are outstanding ambassadors for our college and the university, and they are an inspiration to us all.

Finally, I want to congratulate the students and recent graduates who have earned such notable honors as Beckman Scholarships and awards from the Fulbright U. S. Student Program. They along with many of our graduates are well on the path to becoming the leaders of tomorrow.

The successes we celebrate in this issue are possible only because of the continued support of you, our alumni, partners and friends. I offer a special thank you for your generosity and support which, while always appreciated, are especially so this year as it has been a particularly life-changing and meaningful one. I look forward to inviting you back to campus as soon as it is safe so that I can thank you for your generosity in person and we can celebrate our achievements together.

Stay safe,



Anand Gramopadhye, Dean
College of Engineering, Computing and Applied Sciences



IDEAS

COLLEGE OF ENGINEERING, COMPUTING AND APPLIED SCIENCES

FALL 2020



ON THE COVER

Diego Nigoa graduated with a Bachelor of Science in bioengineering in May and decided to stay at Clemson University to pursue his Ph.D. He was involved in the early stages of a research project aimed at protecting healthcare workers from COVID-19. "Working on this has helped me stay connected to the professors in my department and made sure I'm constantly thinking about the pandemic in terms of 'what can I do to make things smoother' instead of in a doom-and-gloom 'there's nothing I can do to help' sort of way," he said.



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CORONAVIRUS USA

RISING TO THE COVID-19 CHALLENGE

Clemson University students and faculty quickly responded to the COVID-19 situation with new ideas to meet the many challenges the pandemic has posed. They found new research opportunities, new ways to teach online and new ways to defend their dissertations.



HELPING THE WORLD REOPEN IN THE MIDST OF A PANDEMIC

By Paul Alongi

Delphine Dean wants to use her talents as a researcher to help people struggling with the COVID-19 pandemic and to do her part to bring students back to Clemson University's campuses. Terri Bruce would like her son, a rising high school senior, to have the same opportunity to do all the fun things she was able to do when she was his age. Mark Blenner knows that Clemson and other universities play a crucial role in lifting people out of poverty, and he wants those institutions to safely reopen as soon as they can.

Dean, Bruce and Blenner were among the Clemson researchers who began developing new tests when SARS-CoV-2, the virus that causes COVID-19, began sweeping across the world, requiring quarantines and other social-distancing measures for safety.

They gathered via video conferencing on June 30, along with two Clemson colleagues, Sarah Harcum and R. Kenneth Marcus, to provide IDEAS magazine with an update on their work.

While their motives and roles varied, they were all working toward the same core goal—to develop faster tests that could help the world safely reopen its universities, schools, businesses and other places where people congregate.

The Clemson researchers were closely collaborating with colleagues from the Medical University of South Carolina, the University of South Carolina and businesses across the state. Dean was overseeing the Clemson portion of the work as the Clemson lead for the state's Serological Testing and Diagnostic Working Group.

"People aren't sleeping much because we're all trying to work around the clock to get these tests out as fast as possible," said Dean, who is the Ron and Jane Lindsay Family Innovation Professor of bioengineering.

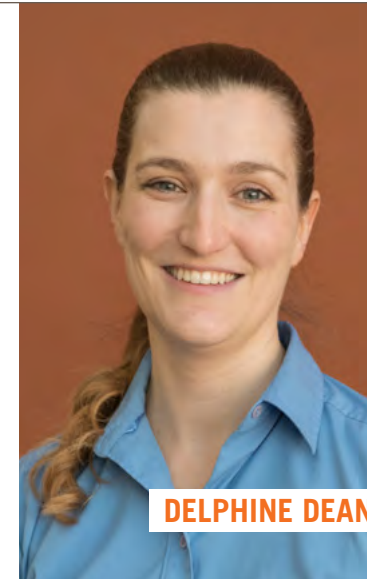
"Once we're on campus and we start having these hybrid classes, we're still going to need to monitor people. If somebody gets sick, we need to track it down really quickly, and

waiting several days for test results is not going to work. We need to have the pieces in place so that we can make sure that if anybody gets sick on campus, we can identify them and keep everybody else safe."

As of late July, some people were waiting six days for labs in South Carolina to return test results, Blenner said.

Bruce and Marcus were working to create a test that they said would reduce the turnaround time to about 10 minutes and could be done almost anywhere.

Patients would put the tests under their tongues and allow saliva to collect on a small pad. Capillary fibers would capture the virus, and then a solution would cause the virus to move into a colorimetric enzyme-linked immunosorbent assay, or ELISA, said Bruce, who is research assistant professor of bioengineering and director of the Clemson Light Imaging Facility.



DELPHINE DEAN



KEN MARCUS



SARAH HARCUM



TERI BRUCE

A color change would let patients know whether they are positive for SARS-CoV-2, she said.

"Ken and I are using commodity polymers that are very, very inexpensive, so it's a very cost-effective test," Bruce said. "You could test folks multiple times. It runs very similar to a pregnancy test in time, how it's evaluated and cost. It would solve a lot of initial problems that we're having right now."

Marcus said the Holy Grail would be to develop a test that could be done so quickly, it could help determine who could be admitted to bars and other businesses on the spot.

"While they are carding customers to make sure they are 21, they are handed a test kit and it's 'yes, you get in' or 'no, you don't get in,' depending on the results," he said. "The same would be true for your local pharmacy and grocery store."

Blenner, the McQueen Quattlebaum Associate Professor of chemical and biomolecular engineering, said his group was working to create an antigen test that would use saliva and off-the-shelf reagents. Antigen tests search for the presence of viral proteins and return results in a matter of minutes, although they aren't as sensitive as widely used PCR tests.

"We need to be doing tests that are much faster to get results on," Blenner said. "Some recent work is suggesting that the sensitivity of those tests-- or how accurate they are-- is not the most important factor. It's how fast you can get results and how frequently you test.

In order to get frequent, fast testing, we have to develop something that doesn't exist right now. So that's why Terri and Ken all along have been working on a point-of-care diagnostic, and that's a new direction Delphine and I have been heading in for a little while."

Harcum, a professor of bioengineering, has been working with Blenner to make reagents for tests.

In his lab, Blenner puts the DNA for spike proteins inside of human or hamster cells. When the cells grow, they produce the spike proteins, which will ultimately serve as the reagent in tests. The procedure is meant to make protein quickly but not mass produce it.

And that's where Harcum picks up the work. She puts the cells in computer-controlled bioreactors that can sense oxygen and pH levels. Pumps carefully control the nutrients that feed the cells.

"I grow cells to make them happier so they make more protein," Harcum said. "Normally, I look at how to make pharmaceuticals, but the pharmaceuticals I make are proteins, which makes this COVID-19 work a good fit for what I do."

Dean said that if any good has come out of the pandemic, it's that the situation has brought researchers from across the state closer together than they have ever been.

"I hope that once this pandemic passes that we continue these kinds of collaborations so that the next time a COVID-19-type event comes along, we'll be more prepared and tackle it more quickly," she said. *



Ron and Jane Lindsay provided the funds for a professorship that went to Delphine Dean (right), who organized the Clemson COVID Challenge



ACCEPTING THE CHALLENGE

By Scott Miller

DELPHINE DEAN LED A STATEWIDE EFFORT TO ENGAGE STUDENTS IN COVID-19 RESEARCH AS THE VIRUS FORCED CANCELLATION OF OTHER PLANS

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

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

Dean came up with the idea as undergraduate research, internships and study-abroad programs were being cancelled due to COVID-19. She wanted students to have continued opportunities to conduct research remotely, and students were looking to make an impact.

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

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

Some 80 volunteers from academia and industry judged the video pitch submissions, and the top eight teams presented their videos and answered

questions during a virtual awards forum on June 29. The forum had 220 participants.

The first-place team is developing a COVID-19 detection test they say would be more user friendly, faster, more dependable and more easily deployable than current testing methods. Led by Jeff Anker, the Wallace R. Roy Distinguished Associate Professor of Analytical Chemistry and Bioengineering at Clemson, the team is developing tests that would use buoyonic particles that rise to the surface of liquid and dark-colored magnetic particles. Both types of particles would have antibodies to bind to coronavirus-related proteins in saliva samples. Those proteins would then float to the surface, where they could be extracted with a magnet. The test could deliver results in about 10 minutes.

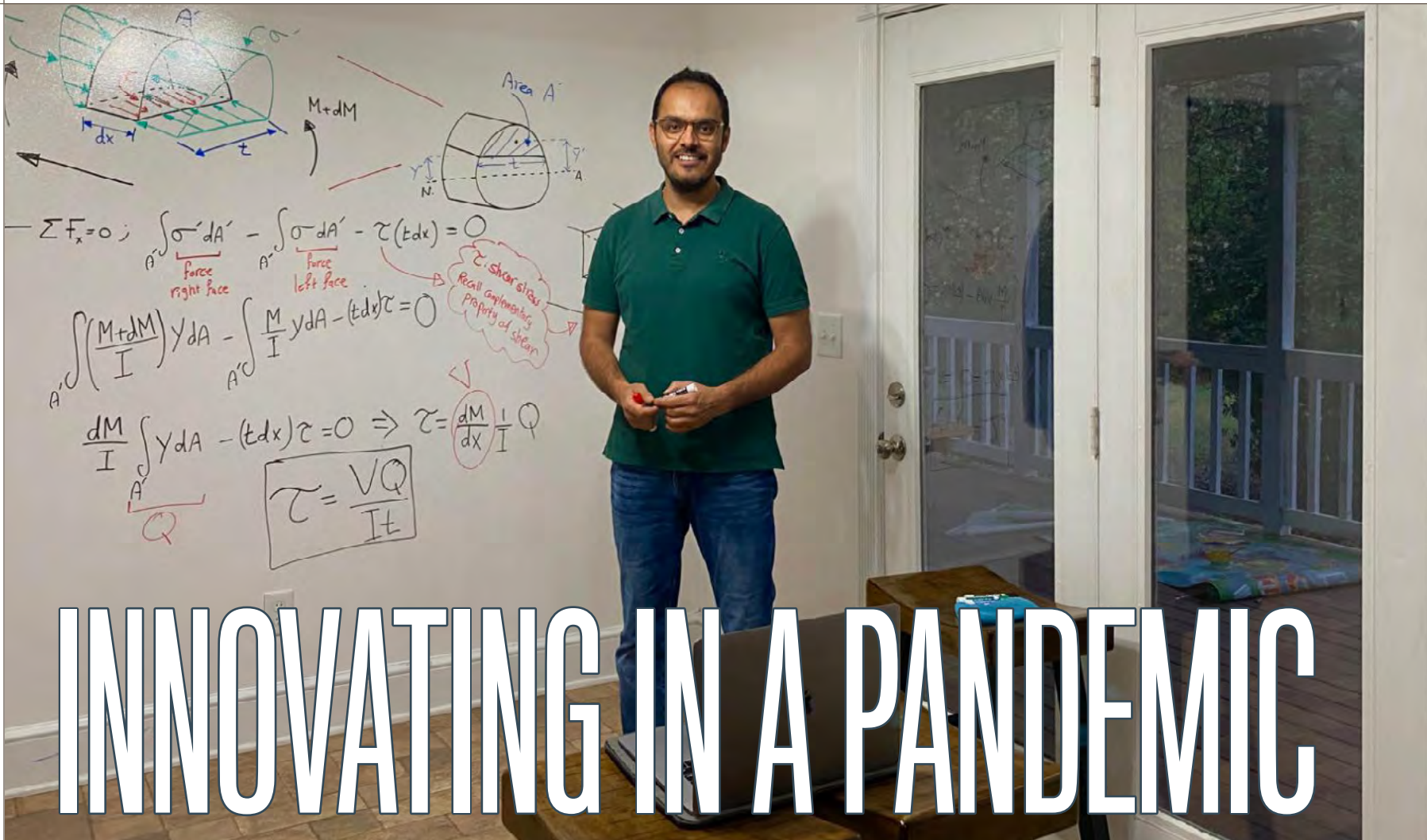
The Clemson COVID Challenge is supported by The Ron and Jane Lindsay Family Innovation Professorship, the Clemson College of Engineering, Computing and Applied Sciences Dean's Excellence Fund, the Vice President for Research, and the Creative Inquiry and Undergraduate Research Program, as well as the University of South Carolina.

Many of the teams were planning to continue their work in the fall semester through Clemson Creative Inquiry and the U of SC Undergraduate Research Office. With this initial success, Dean said she is also working to set up this program for future summers and exploring options to expand its reach.

More details on Clemson COVID Challenge projects can be found online by scanning this story's QR code. ✨



Members of the first-place team in the Clemson COVID Challenge participate in one of their weekly Zoom Seminars.



INNOVATING IN A PANDEMIC

By Paul Alongi

Faculty and students quickly responded to COVID-19 by searching for new ways to help Clemson University and the world safely navigate the pandemic. Dozens of innovators from across the College of Engineering, Computing and Applied Sciences poured their efforts into solving the many challenges posed by the novel coronavirus. They also found new ways of teaching, defending dissertations and carrying on the college's

daily life while maintaining a safe distance to avoid spreading the virus. Their work showed their resiliency and determination in the face of a pandemic, while underscoring the many opportunities for high-impact, cross-disciplinary translational research available to both undergraduate and graduate students. Here are a few of their stories...



Students design COVID-19 protection device for less than \$100

A few supplies available at just about any hardware store for less than \$100 can be assembled into a device that helps keep COVID-19 patients from infecting the healthcare providers who take care of them, a student-led group of researchers said.

The group has designed and built a “negative pressure” device that fits over patients’ heads. If they sneeze or cough, the device keeps the novel coronavirus from spreading to others in the room, researchers said.

The group worked with emergency-room doctors and emergency medical technicians to adapt the device for ambulances, and the group reported in late July that it had deployed 40 units for use by EMTs in the Upstate.

Those involved were students Amanda LeMatty, Robert Falconer, Noah Ashley and Ali Nafchi. Their faculty mentors were John DesJardins, the Robert B. and Susan B. Hambricht Leadership Professor; Delphine Dean, the Ron and Jane Lindsay Family Innovation Professor; and Ehsan Mousavi, an assistant professor in the Nieri Family Department of Construction Science and Management.



Clemson University freshmen Carleigh Coffin (left) and Ashlyn Soule (right) are working with Delphine Dean to create a device that could help combat COVID-19 at the grocery store. Dean is the Ron and Jane Lindsay Family Innovation Professor.

Students think ‘outside the box’ to protect shoppers from COVID-19

Carleigh Coffin and Ashlyn Soule are thinking outside the box – and shining a light inside it – to combat COVID-19 at the grocery store.

They are designing a device that would be located at supermarket checkout lanes. Groceries would be placed on the conveyor belt and then pass through an enclosed box where they would be exposed to UVC light.

Running groceries through the device help could kill off the novel coronavirus, preventing its spread during the pandemic, the students said. When it’s over, the device could still be useful, helping kill viruses that cause the flu and preventing contamination from pathogens, such as salmonella, they said.

Coffin and Soule were both freshmen when they started their research and were working on the project with Delphine Dean, the Ron and Jane Lindsay Family Innovation Professor.



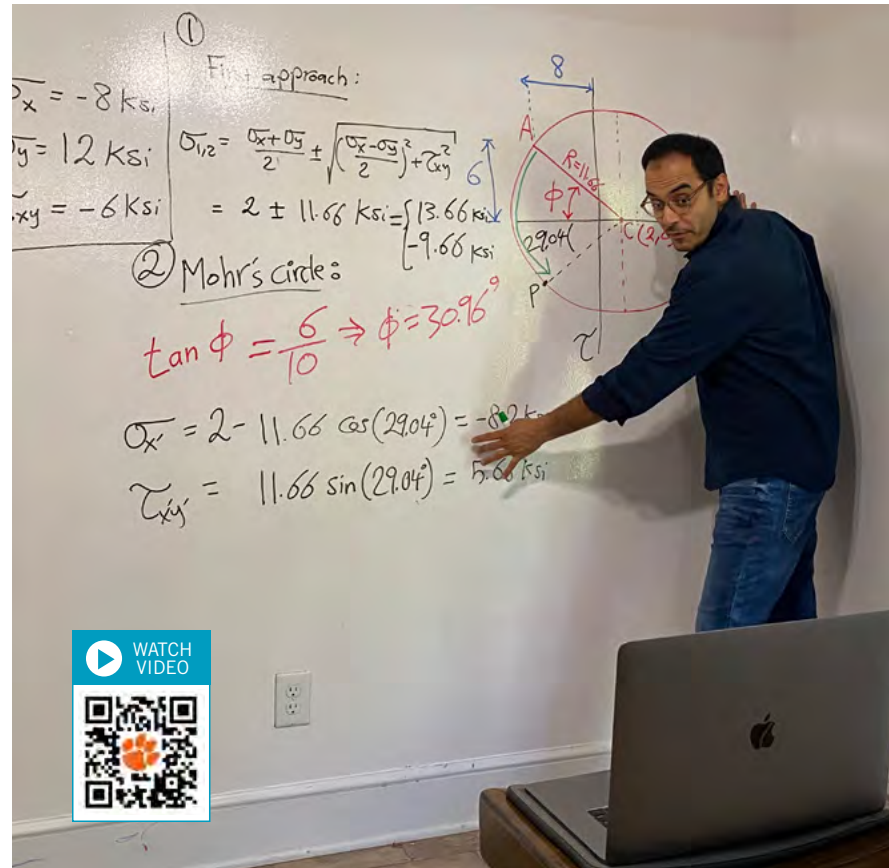
One faculty member's unique response to the COVID-19 situation

Two mornings a week, Fadi Abdeljawad went into a nook just off his kitchen, stood in front of his open laptop and taught a mechanical engineering course to about 30 students who were scattered across the country because of the COVID-19 outbreak.

One wall in the nook was covered in dry-erase paint, converting it to a giant whiteboard where Abdeljawad wrote equations and diagrams, just as he did when his class met in person in Dillard Hall.

The wall-sized whiteboard in Abdeljawad's home is one of the reasons the assistant professor of mechanical engineering has received rave reviews for successfully making the transition to online teaching.

"His online class is the closest experience to being physically in the classroom without actually being there," sophomore Trevor Newman said. "Dr. Fadi has made the transition easier by communicating effectively about what changes were being made and making sure everything was working for his students."



Ph.D. student makes history in her dissertation defense

Benafsh Husain Sapra became the first person to hold a Ph.D. in biomedical data science and informatics as part of a program jointly offered by Clemson University and the Medical University of South Carolina (MUSC).

Sapra successfully defended her dissertation on April 8 in a meeting conducted entirely over Zoom, the video conferencing platform, so that she, the members of her committee and her supporters could practice social distancing to help prevent the spread of COVID-19.

The defense was memorable for multiple reasons. Not only did Sapra conclude six years of graduate study, but her success represented a major milestone for a growing graduate-degree program and showed that the dissertation defense, a hallmark of the Ph.D. experience, can continue online during the COVID-19 situation.



Researchers search for ways to clean and sanitize N95 masks

At least two groups of researchers from the College of Engineering, Computing and Applied Sciences launched projects aimed at finding ways to clean and sanitize N95 masks to help protect healthcare providers from COVID-19.

In one project, a device would hold multiple N95 masks, helping ensure they maintain their shape while being washed so that they continue to fit securely around the mouth and nose, said Melinda Harman, an associate professor of bioengineering and director of Clemson University's Medical Device Recycling and Reprocessing program, or GreenMD.

In another project, highly pressurized carbon dioxide would be used as part of a process that not only sanitizes N95 masks by inactivating the novel coronavirus but also cleans the dirt and stains that result from normal use, said Mark Johnson, the Thomas F. Hash Endowed Chair in Sustainable Development and director of Clemson University's Center for Advanced Manufacturing.

N95 masks are considered crucial protective medical equipment because they prevent healthcare providers from inhaling the virus. They were in short supply as the pandemic spread around the globe. *



AN EARLY WARNING SYSTEM

By Paul Alongi

Dr. Freedman's research provides a valuable piece of the puzzle as we try to bring COVID-19 risk into full view

— Tanju Karanfil, VP for Research

The lowest possible level is 2,600 virus copies per liter of wastewater. Anything below that is undetectable in the tests.

The possibility of an exponential rise in virus transmission becomes a reality when the results jump into the tens of thousands of virus copies per liter – 10,000 to about 100,000, Freedman said.

“When it jumps from the tens of thousands into the hundreds of thousands of copies per liter, at that point you have very active transmission of the virus and you need to do something like masks,” Freedman said. “The next step above that is levels in the millions of copies per liter. Several times the numbers at Cochran Road have jumped into the millions of copies per liter, and I think that is indicative of very active transmission of the virus in the community.”

One of the lingering questions among researchers is how long it takes for high virus levels in wastewater to decrease, Freedman said.

The number of virus copies per liter at the Cochran Road plant was 1.8 million on June 16; 550,000 on June 18; 3.8 million on June 23; 970,000 on June 25; 980,000 on June 30; 170,000 on July 7; 240,000 on July 9; 1.9 million on July 14; 490,000 on July 16; 59,000 on July 21; 910,000 on July 28; and 700,000 on August 5.

At the University's wastewater treatment plant, the virus copies per liter were below detectable levels on six dates from May 27 to June 11. The first time the level was detectable came on June 16 with 5,500 virus copies per liter. Then levels fell below detectable levels on four dates from June 18 to June 30. The number of virus copies per liter was 18,000 on July 2 and 10,000 on July 7. Levels dropped below detectable levels on July 9, 14 and 16. The number of virus copies per liter was 12,000 on July 21 and 14,000 on July 28. The level dropped below detection on Aug. 5.

The number of virus copies per liter at the Pendleton/Clemson wastewater treatment plant was 290,000 on June 23; 900,000 on June 25; 290,000 on July 2; 220,000 on July 7; 330,000 on July 9; 450,000 on July 14; 120,000 on July 16; 200,000 on July 21; 130,000 on July 28; and 160,000 on Aug. 5.

Freedman makes his data public on the city of Clemson's website.

Freedman said the support of Tanju Karanfil was crucial in securing initial funding for the project. Karanfil is the University's vice president for research and a professor of environmental engineering and Earth sciences, whose primary

research interests include physiochemical processes in wastewater.

“Dr. Freedman's research provides a valuable piece of the puzzle as we try to bring COVID-19 risk into full view,” Karanfil said. “The data collected will be critical for informed decision-making to protect public health.”

Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences, said the health and safety of students, faculty and staff are paramount in the University's return-to-work plan. Internal and external public health experts are extensively analyzing multiple sources of data, he said.

“Dr. Freedman's testing is providing data that are available for administrators and the general public to use as they make decisions about their health and safety,” Gramopadhye said. “His work serves as an example of the many ways the college's researchers have creatively responded to help the community and the world manage the challenges presented by the COVID-19 situation.” *

In addition to testing wastewater at Clemson University and the surrounding community, Dr. Freedman has collaborated with ReWa to conduct wastewater testing in nearby Greenville County. Read The Post and Courier's coverage here:

READ STORY





LISTENING, PREPARING AND STRIVING FOR EQUITY

Members of the college's leadership team sat down for interviews with IDEAS magazine via Zoom to describe how they are responding to some of the big issues framing the start of the 2020-21 academic year, including the COVID-19 situation and issues of equity and inclusion in the wake of George Floyd's death. Their answers varied based on their responsibilities, but some overarching themes became clear. The college and university have adapted well to the challenges of COVID-19

and have a flexible, comprehensive, data-driven plan for the upcoming academic year that prioritizes the health and safety of students, faculty and staff. Members of the leadership team also said they are ready to listen to the voices of students, faculty and staff and that leadership wants to work to level the playing field for all members of the college community. Read more from Kelly Collins, Oliver Myers, Daniel L. Nonkeaker, Brad Putman and Melissa Smith here.



CREATING A LEVEL PLAYING FIELD

By Paul Alongi



Oliver Myers and Melissa Smith began work in February as associate deans for inclusive excellence in the College of Engineering, Computing and Applied Sciences. Three months later, the death of George Floyd raised fresh questions about justice and equality across the country, including at Clemson University. In their new roles, Myers and Smith are at the center of the college's efforts to listen to the concerns of its students, faculty and staff, and then drive change to ensure a level playing field for all in the college.

Myers' duties primarily involve undergraduates, while Smith's duties mostly involve the graduate enterprise. In addition to their inclusion work, Myers and Smith are tasked with specific duties that harness their unique skill sets.

Myers and Smith sat down with IDEAS magazine in mid July 2020 to talk about their work, how they define success and how they will respond to the COVID-19 situation.

Would you give us an overview of what your new duties are?

Smith: As associate dean for inclusive excellence and graduate studies, I will be leading a team focused at the graduate level on inclusion, equity and diversity issues, as well as supporting current students in their progress toward their degrees.

Myers: Melissa and I will share a lot of the same ideas in terms of recruitment, retention and matriculation. But I'll work with the undergraduate students on making sure they have the requisite backgrounds to be successful in their undergraduate curriculum so Melissa and I can have a natural bridge from the undergraduate to the graduate programs.

Can you help us unpack the terms equity and inclusion and what they mean for the everyday life of students in the college?

Myers: One particular goal is to meet our land-grant mandate of representing the state in terms of underrepresented students. And we want all of those students to be successful. We face the challenge of students coming from backgrounds that didn't necessarily prepare them for the rigor of a STEM discipline, and we have to give them the support they need. They have a dream of being an engineer or scientist, and we want to facilitate that dream.

Smith: I would add that we also need to look at the issue in terms of research and what it means to have a diverse and inclusive environment and how important that it is. We need to understand the challenges that are in our communities, and the way to do that is to ensure we have representation from those communities participating in the research and how we solve those problems.

Why do you think some populations of students are underrepresented?

Smith: There are a number of factors. One of which is not having mentors. If you can't see it, you don't know that you can be it. Trying to create communities of support is one aspect to help us along that journey.

Myers: Another side would be exposure. How many students have seen a student, professor, doctor or engineer who looks like them? How many have experienced a visit to an advanced manufacturing facility or a research lab? Those are not opportunities that are afforded to everybody. Not being able to see or experience those things limits our short and long term visions.

I would define success as when our jobs are completely obsolete. It's...when we can say that everybody truly has a fair chance and an opportunity to be successful in whatever discipline they're in.

— Oliver Myers



Oliver Myers, Associate Dean for Inclusive Excellence



How would you define success in your jobs?

Smith: One of my goals is to significantly increase our representation from our domestic students. The pathways that Oliver and I are going to be building to support underrepresented populations, including women, is going to be one of the key components in doing that. We will be showing undergraduates the avenues and opportunities that continuing into graduate school will afford them. I want to see those students be successful and take on mentoring roles as faculty or industry leaders that young people can look up to and aspire to be.

Myers: I would define success as when our jobs are completely obsolete. It's when diversity, equity and inclusion are organic not only to the university but to society at large, when we do not have to worry about division and strife and unrest, when we can say that everybody truly has a fair chance and an opportunity to be successful in whatever discipline they're in. Five years from now, we would like to see more underrepresented students complete the undergraduate curriculum successfully so they can be master's and Ph.D. students. And then 10 years from now, we want those same students to be professors and doctors and leaders in their chosen disciplines. This is not something that is going to be solved in a 40-minute conversation or a four-year program. This has to be solved as a long-term continuous engagement process.

How do you expect the challenges of COVID-19 to affect your work?

Myers: We will maintain the conversations. The Zoom meetings have been great. We're able to communicate over the miles, even during quarantine. The educational process does not stop even if the buildings are closed. We want to continue to mentor the students and encourage them, and we will get through this. *



Melissa Smith, Associate Dean for Inclusive Excellence and Graduate Studies

We need to understand the challenges that are in our communities, and the way to do that is to ensure we have representation from those communities participating in the research and how we solve those problems.

— Melissa C. Smith



Daniel L. Noneaker began serving as the associate dean for research in the College of Engineering, Computing and Applied Sciences in mid March, just as COVID-19 dramatically changed how researchers conduct their work.

It's a challenge he has embraced.

Noneaker has helped faculty investigators safely continue their research, taking measures to maintain social distancing and observing safety protocols, such as wearing masks. He has also supported faculty members who have new ideas for solving the engineering and scientific challenges presented by COVID-19.

"At last count, faculty in our college have submitted about 40 funding proposals for research projects based on ideas they have to address one aspect or another of COVID-19," Noneaker said in a July interview. "That runs the gamut from testing potentially ill people for COVID-19 to clinical treatment of individuals to epidemiological data tracking. There has been a burst of creativity from researchers motivated by the desire to help see our fellow citizens, our society and the world through this crisis."





Let me start by saying to our colleagues who are internationals... you are an integral part of our community, and we are much better as a community for what you bring to Clemson and the college.

**— Dan Noneaker,
Associate Dean for Research**

Noneaker is charged with supporting the college's research enterprise, which topped \$50 million in expenditures in fiscal year 2019 and accounts for 48% of Clemson University's total. The college plays a crucial role in the University's R1 designation for "very high research activity" it has received from The Carnegie Classification of Institutions of Higher Education.

The college's faculty and students conduct a wide range of research but have demonstrated particular strength in the areas of advanced manufacturing, advanced materials, artificial intelligence and big data, energy systems, health innovation and sustainable and environmentally conscious systems. A special emphasis is placed on translational research that nudges new techniques and technologies out of the lab and into the real world.

Noneaker himself is a seasoned researcher and administrator. He joined Clemson in 1993 as an assistant professor and rose through the ranks to become chair of the Holcombe Department of Electrical and Computer Engineering, serving in that position from 2014 until he took the associate dean job.

Noneaker sat down with IDEAS in mid July to brief the magazine on his new duties, what he is doing to ensure equity and inclusion for researchers and how researchers are responding to COVID-19.

Would you give us an overview of what your office does?

There are three primary components. One is research administration. A fairly sophisticated technical infrastructure and staff skill sets are needed to operate the back-office functions that come with attaining and managing research grants. We're fortunate in our college in that we have outstanding personnel as well as mature organizational structures and processes.

Second, we have an education role, primarily for faculty members in their role as investigators on research projects. When faculty members become principal investigators, they inherit a whole range of responsibilities from both a legal and managerial standpoint depending on the original source of the funds, often the federal government.

Third, in our business development function, we work on behalf of faculty in our college to help the college and individual faculty members identify opportunities for externally funded research and to understand how what is being sought by funding agencies can match with the skill sets and interests of faculty members.

We're seeing a renewed interest in equity and inclusion in the wake of the death of George Floyd. What is your office's response?

The college leadership maintains an open door to discuss any circumstance or environment that impedes the opportunity for professional success of one of our faculty, staff, or students or detracts from their acceptance as an integral part of the CECAS family. We take this very seriously, and we want to learn so we can address the situation.

At the faculty level, there are two places we can make the greatest impact in terms of equity and inclusion. First, we can ensure that we recruit heavily among prospective faculty members across all populations of available candidates. Second, we can ensure we have an environment institutionally and in the college that ensures faculty members of all backgrounds and interests feel that they

are an integral part of the Clemson community and feel they are fully supported and encouraged and given the opportunities to develop and progress toward their career goals.

At the graduate student level, the best opportunity is to identify and ensure that we have resources to provide funded graduate assistantship opportunities for a diverse pool of students in engineering, computing and applied sciences. That's one side of the equation. The other is the recruiting aspect. That means recruiting from both within our own undergraduate population but also doing the heavy lift of reaching out to other institutions,

including institutions that may have a high proportion of underrepresented populations.

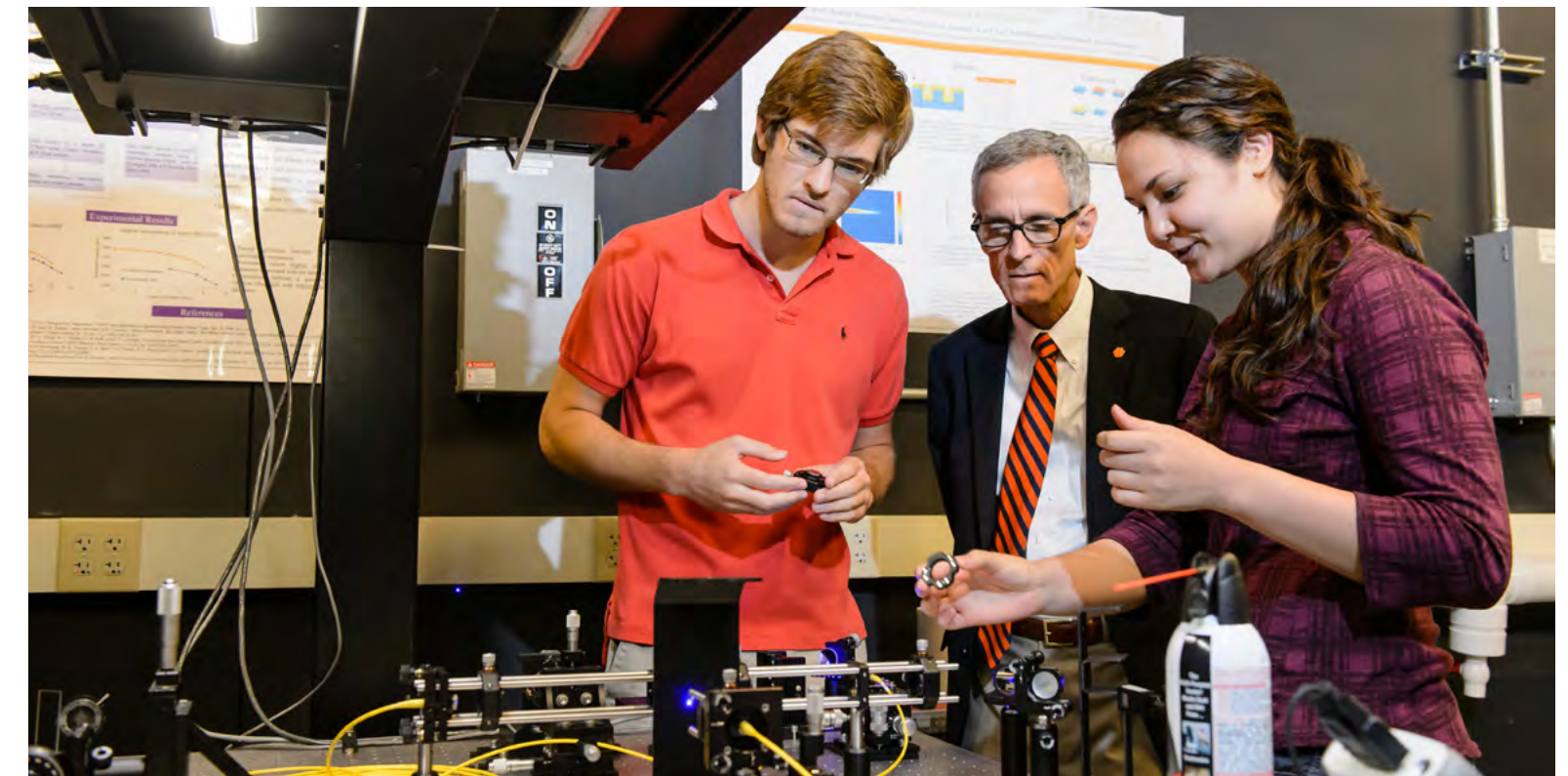
COVID-19 has posed some unique challenges for international students and faculty members. What message would you have for them?

Let me start by saying to our colleagues who are internationals who are either faculty members or graduate students in the college-- we value you very deeply as colleagues and as members of our community. We understand this is a time of heightened stress for many of you, and we are committed to making decisions

and providing support that serves your best interest in the same way that we do for individuals who are U.S. citizens and permanent residents. You are an integral part of our community, and we are much better as a community for what you bring to Clemson and the college.

With respect to travel abilities, we do have to adhere to legal restrictions. Beyond that, we are not going to ask an individual to engage in travel that puts them at risk or where they feel like they are being put at risk. We will continue to monitor the legal situation and practical constraints on travel to identify when and how it is safe and allowable for individuals to travel. *

Associate Dean for Research, Dan Noneaker, observes as graduate students in the Holcombe Department of Electrical and Computer Engineering discuss their research.





SHAPING THE UNDERGRADUATE EXPERIENCE

By Paul Alongi



Brad Putman arrived on Clemson University's campus as a freshman from a small town in upstate New York in 1994 and never left. Today Putman serves as associate dean for undergraduate studies in the College of Engineering, Computing and Applied Sciences. He and his team help undergraduates find the path that suits them best and make the most of their Clemson experience. Putman also plays a leading role in introducing STEM topics to K-12 students across South Carolina and in keeping the college's graduates connected to their alma mater.

If anyone ever truly did bleed orange, it's Putman. He has been a Clemson undergraduate, master's student, Ph.D. student and a professor in the Glenn Department of Civil Engineering. He lives a few minutes from campus with his wife, Janeen, and their two daughters, and they like to spend their Saturdays in the fall cheering on the Tigers football team.

His 26-year, wide-ranging history in the college gives him a perspective few others have. Putman sat down with IDEAS

magazine in mid-July 2020 to provide an overview of what the Office of Undergraduate Studies does and how he is responding to some of the biggest themes expected to frame the 2020 academic year, including the COVID-19 situation and a deeper awareness of equity and inclusion issues in the wake of George Floyd's death.

Would you give us an overview of what your office does?

The college's Office of Undergraduate Studies helps to support the undergraduate experience for all the students, faculty and staff in the college and runs from K-12 outreach to orientation to helping students find their path and create their experience once they are on campus. Our team supports this experience through PEER & WISE, the RISE Living Learning Community, the college's global engagement office, the General Engineering Advising Center, curriculum matters, assessment, and other student support and engagement efforts, such as Clemson's Grand Challenge Scholars Program and the college's student advisory board.

What makes the college's undergraduate experience unique?

We get a lot of good reviews from alumni and employers of students for the practical preparation students have when they leave Clemson as alumni and go into the workforce. Faculty and staff are dedicated to ensuring that students get that preparation and to building up their skill sets and mindsets so they can

hit the ground running and be problem solvers when they enter the workforce. We also see the impact of the relationships students have built with their peers and faculty and staff. A lot of the relationships continue beyond graduation in their alumni years.

We're seeing a renewed interest in equity and inclusion in the wake of the death of George Floyd. What is your office's response?

We want to see everybody succeed, and we want everybody to feel like they belong. Students were accepted to Clemson for a reason. They are among the best of the best, and we want to support them throughout, and we will continue to do that. The University, college and departments are committed to that. We also want to hear students' voices. If there is anything students feel is missing or that they need to succeed, we want to know that. We have the programs, and we have the staff and faculty who are there to listen and then work with the students to make the changes. There are going to be some things that are going to take a little bit of time. When we look at culture as a whole, it's something that takes some time. But we've seen over the last several years things start to change, and we'll continue to see that into the future, and we'll see it accelerate. The voice of the students can be very powerful, and we are here to listen.

It's looking like COVID-19 is going to be with us into the fall semester. What is the college doing to keep undergraduates safe and to ensure their learning continues if classes need to go online?

The University as a whole is making very careful and thoughtful decisions. We want to look at all the data, talk to the consultants, weigh all the options and take all the necessary precautions. For example, we've decided to require masks in a number of circumstances, including in all the buildings, all the classes and all University-sponsored events, whether they are on or off campus. We're limiting the density of students in classrooms, and we've got a well-thought-out procedure to clean classrooms after every single class.

We learned a lot from having to shift to remote instruction and learning in the springtime, and faculty have been preparing over the summer for a robust blended educational experience. There has been a university-wide effort to provide resources to all of our instructors and to look at the best practices. The University has even installed new technology in 400-plus classrooms across the University to be able to stream live to a remote location. We are well prepared for multiple scenarios. For the latest information, you should visit the University's main coronavirus website at: clemson.edu/coronavirus. *



MOVING THE COLLEGE FORWARD

By Paul Alongi



Staff members work behind the scenes like well-oiled gears in a machine to keep the College of Engineering, Computing and Applied Sciences running smoothly. They are often the unsung heroes who maintain labs, write grants, fabricate parts for research, handle finances, manage human resources, schedule meetings, create presentations, organize events and promote the college far and wide-- just to name a few examples.

At the top of the whole enterprise is Kelly Collins, a Clemson University alumna and working mom who has built a reputation for helping her employees advance their careers.

Collins graduated from Clemson with a Bachelor of Science in financial management in 2003 and immediately went to work for her alma mater as business manager in the College of Architecture, Arts and Humanities. She joined what was then

the College of Engineering and Science in January 2007 as an accountant/fiscal analyst II. Collins is now the college's chief of staff and operations.

While rising through the ranks, Collins has earned a reputation for supporting employees, especially ambitious, young women. The Clemson University President's Commission on Women honored Collins in 2018 with an Outstanding Women Award in the staff category.

Collins sat down with IDEAS magazine in late July to talk about her role and how the staff is responding to the big issues framing the 2020 academic year.

Would you give us an overview of what your office does?

As chief of staff and operations, my role is to manage and oversee all the HR functions in the college and all the

operational aspects for the college as well. Everything that keeps the gears in motion and keeps the college moving forward falls under my office. Fortunately, we've got great team members. They are carrying the heavy lift, making sure the college runs extremely smoothly on a day-to-day basis.

How well did the staff respond to the challenges presented by the COVID-19 situation?

A vast majority of our staff were transitioned to working remotely in March. From an operational standpoint, I think we had a few hiccups when we made the initial transition. What we're realizing now is that we can work pretty well from home. It might look a little different. Some of us have children, so we're balancing those working hours with educating, entertaining and feeding children. But we're squeezing it in and making it work. What we're also finding is that some employees are more productive at home, with fewer disruptions that happen in the workplace.

How crucial is staff to ensuring class and research can continue during quarantine?

They have done an extremely heavy lift. Our student services folks and our registration coordinator folks had to switch the way they did everything on a dime. Orientation-- usually a big, in-person event--has flipped completely to virtual. Our advisors have managed that while still engaging with students and providing them the Clemson experience. It's been a Herculean effort on their part. Our IT support group, CECAS CORE, has worked with CCIT to make sure classroom technology is where it needs to

be and has made sure the faculty have what they need to start instruction in a hybrid mode. Machining and Technical Services and other technical staff also deserve a mention. They are essential employees who have worked to address the needs of essential research. These are just a few examples.

We're seeing a renewed interest in equity and inclusion in the wake of George Floyd's death. How do you see equity and inclusion applying to staff?

Equity falls into two buckets. First, it's making sure that the playing field is equal for all of our staff members. Whatever their career goals are, that playing field should be level, and they should be able to accomplish their career goals. Second, in an academic setting, faculty and administrators have a loud voice, and they are comfortable using that voice, even if that voice is different from somebody else's, and they are used to engaging in that debate. I think we need to encourage our staff members to not be afraid to share what they feel. If a process is not right or inherently unfair, I want them to have that voice.

How about inclusion?

It's fostering an environment where everybody feels comfortable. In light of recent events, we're finding out now that what we thought was inclusive, some of our team members don't feel that way. We've got to do some hard work and some listening to learn what it means to create a more inclusive environment such that all of our team members feel like they are



Kelly Collins, Chief of Staff and Operations

at home and that they are a part of the Clemson family.

What do you like best about your job?

I think it's interacting with people. There are no two days that are alike. A lot of people say if somebody has a problem, they come to Kelly. Sometimes, that's stressful and difficult, but at the same time I take it as an opportunity to help. It allows me to engage with multiple people across the college or across campus. Everyday is different. Everyday we are trying to make things better or help someone where we can, and that's the fun part of the job. *



FOUR MEMBERS INDUCTED INTO THE THOMAS GREEN CLEMSON ACADEMY OF ENGINEERS AND SCIENTISTS

By Paul Alongi



Clemson University's largest college is inducting four alumni into the Thomas Green Clemson Academy of Engineers and Scientists and celebrating two others as Outstanding Young Alumni.

Charlie Blackwell-Thompson, J. Richard Cottingham, Mike Mansueti and Tony Mathis are the academy's newest members. Matt Kelley and Elizabeth Sloan are being honored as Outstanding Young Alumni.

The recognition comes from Clemson's College of Engineering, Computing and Applied Sciences.

The academy was established to give special recognition to college alumni and friends who have made major contributions to their professions and have brought

significant distinction to the college and university. It's the college's highest honor, one that goes to fewer than 0.2 percent of alumni.

The Outstanding Young Alumni award is reserved for graduates of the college who are 40 years old or younger and have made significant achievements to their profession or the welfare of society.

Anand Gramopadhye, the college's dean, said all of the honorees are changing the world for the better in their own unique ways.

"The remarkable work they have done in their careers and in their communities is truly inspirational," he said. "They are excellent



ambassadors for the college, showing what is possible with a Clemson degree and a determined spirit. I congratulate each of our honorees on this well-deserved recognition."

A gala originally planned for April 30 to celebrate the honorees was postponed because of the COVID-19 situation, and an online event is now planned for Oct. 7.

Below is a brief look at each honoree.

Thomas Green Clemson Academy of Engineers and Scientists

Charlie Blackwell-Thompson, NASA's first female launch director, is an exceptional role model for females in STEM. She is currently leading the launch planning for NASA's inaugural flight of the Artemis program which will return human exploration to the moon and one day on to Mars.



She grew up in Gaffney and graduated from Clemson in 1988 with a degree in computer engineering. Blackwell-Thompson has received numerous awards in her distinguished career with NASA, including multiple Space Flight Awareness Team Awards, the Silver Snoopy for her work on the Hubble Space Telescope, the NASA Exceptional Achievement Medal, the NASA Outstanding Leadership Medal and the Rotary National Award for Space Achievement Stellar Award.

J. Richard Cottingham is a retired naval officer, former engineering firm president, and is still a practicing professional engineer. He is a 1966 Clemson civil engineering graduate and has a master's degree from the Georgia Institute of Technology. He has received numerous military decorations and other honors, including Clemson's Distinguished Service Award and the DSA for service as president of the National Council of Examiners for Engineering



They are excellent ambassadors for the college, showing what is possible with a Clemson degree and a determined spirit.

— Anand Gramopadhye, Dean

and Surveying. In 2019, he was honored as Clemson's "Hero of the Game" for his service with the Navy Seabees during the Vietnam Tet Offensive of 1968. He has supported Clemson in many areas, with a special current focus of promoting professional engineering licensure.

Mike Mansueti has served as president of Bosch in North America since 2012. He received his Bachelor of Science in mechanical engineering from Clemson in 1987 and joined Bosch the following year. He has held executive leadership roles in engineering, manufacturing and management in the United States and Germany. Mansueti helps guide the college as a member of the Advisory Board and was instrumental in securing a \$500,000 grant from the Bosch Community Fund to establish an endowment in perpetuity for automotive engineering fellowships aimed at diversifying the workforce.



Tony Mathis serves as president and chief executive officer of GE Aviation Military Systems. He graduated from Clemson with a Bachelor of Science in mechanical engineering in 1986 and later received a master's degree in mechanical engineering from California State University, Fresno and an MBA from Xavier University. Mathis has been highly supportive of the university's





efforts to enhance diversity, and he has created new scholarship, research and job opportunities for students. Mathis serves on the Clemson University Foundation Board of Directors and manages the executive relationship between the University and GE. His impact is reflected in a previous honor, a 2018 Alumni Association Distinguished Service Award.

Outstanding Young Alumni

Matt Kelley is the president of Kelley Engineering in Piedmont. The company launched in a room above his garage in 2015 and in just over four years grew to 22 employees, 30 pieces of equipment and at least \$2.4 million in annual sales. Gov. Henry McMaster recognized Kelley Engineering as the Emerging Manufacturer of the Year. Anderson County Economic Development honored the firm with an Employer Impact Award. Kelley received his Bachelor of Science in mechanical engineering from Clemson in 2007.



Elizabeth Sloan was diagnosed during her sophomore year at Clemson with rheumatoid arthritis. The experience sparked her curiosity, and she learned that the disorder can affect even children. Sloan graduated from Clemson with her Bachelor of Science in bioengineering in 2011 and then headed for UT Southwestern Medical School in Dallas. In 2015, she won the Eliot Goldings Award in Rheumatology, which honors UT Southwestern's most outstanding medical student in rheumatology. She also received the Senior Resident Teaching Award during her residency, along with awards for abstracts submitted to an international and a national conference for research during her fellowship. As of summer 2020, Sloan was entering her last year of fellowship in pediatric rheumatology at UT Southwestern and was expecting to graduate next year. ✨



CREATING SCHOLARS

Undergraduates Lauren Davis and Hayden Tharpe excel in the lab and set their sights on graduate school





Lauren Davis and Hayden Tharpe, both undergraduates in the College of Engineering, Computing and Applied Sciences, learned during the spring 2020 semester that they were named Beckman Scholars. It's a competitive program with rigorous criteria. Students must have completed one year (or one semester and a summer) of research, have a 3.8 GPA and display excellence in research, analytical skills, as well as oral, written and digital communications skills. Each scholar receives funding from the Arnold and Mabel Beckman Foundation for 15 months of laboratory research. The experiences of Davis and Tharpe underscore not only their excellent work, but the research opportunities available to undergraduates in the college. Here's more about their research, what motivates them and their plans for after graduation.

Lauren Davis gets a jump start on her career plans with bioengineering research

Lauren Davis said that she was nervous when she first started looking into research opportunities as an incoming freshman at Clemson University. She wanted to get involved but wasn't sure how to start.

Then she emailed Melinda Harman, an associate professor of bioengineering.

"We talked for a long time about where I would fit in," Davis recalled. "When she told me I would be able to do hands-on research that first semester, it was something I wasn't hearing from other schools. That really excited me and got me into working with her on orthopaedic joint replacements and other implant biomaterials."

Davis' courage to try something new is paying off.

Davis, now a junior bioengineering major, was named a Beckman Scholar, a distinction that comes with 15 months of funding for laboratory research from the Arnold and Mabel Beckman Foundation.

"It's a very prestigious program," Davis said. "When I started reading up on it before applying, I could tell the foundation really focuses on helping students reach their full potential in research. I knew I wanted to be a part of that. Having them recognize my past work and potential was just a huge honor."

Davis is researching mesh implants that are used in hernia-repair and organ prolapse surgery. The mesh spans the entire injury site to help reinforce tissues that repair the injury and support the abdominal wall and pelvic floor. Although intended as a permanent implant, mesh sometimes need to be removed from the patient for medical reasons, and that is when Davis's research takes off.



Davis looks for mechanical and structural changes in the mesh and its fixation to the body's tissue. As part of the research, she asks, "Is it brittle? Did it shrink? Did normal tissues grow into it? Basically, what happened to the mesh while implanted in the body?"

"There are literally dozens of different types of mesh on the market, and it is important to understand the differences in their performance characteristics," Davis said. "If you're able to publish papers about the adhesives used for fixation or mechanical strength of the mesh, and link those characteristics to medical outcomes, that helps the clinical teams and companies come up with better solutions. If the material isn't working, let's innovate a new solution."

Davis said it is a joy to learn from Harman and the graduate students in her lab and to work within a diverse team that has knowledge across the STEM disciplines.

"She really pushes every student to their fullest potential, which is something I really value," Davis said. "Being able to work with

someone who is so passionate and knowledgeable about the field is an honor. Her passion for bioengineering is infectious, and I love it."

Davis, who is from Lakeville, Minnesota, said her long-term goals include graduating from Clemson with honors and enrolling in Clemson's Master's of Engineering in Biomedical Engineering program. She is also considering pursuing a PhD.

Davis wants to eventually conduct research for a medical device company, such as Medtronic, where she had an internship in the summer of 2019.

With Clemson as her launching pad, she's off to a great start.

Hayden Tharpe helps design biosensor to search for weapons of mass destruction

Hayden Tharpe considers herself "a regular college student" who likes to hang out with friends and play with her dog, but when she puts on her white lab coat and blue gloves, the work she does is extraordinary.

Although she is still an undergraduate, Tharpe is already deeply involved in research. The junior chemical engineering major from Easley, South Carolina is helping design a biosensor that would aid in the search for weapons of mass destruction.

"The biosensor would use antibodies as the recognition element," she said. "We're taking enzymes and using that to amplify the signal so that it can detect even trace amounts. If there were small amounts of TNT or anthrax there in the past, you would be able to detect them."

Tharpe's work has won her recognition as a Beckman Scholar. Each scholar receives funding from the Arnold and Mabel Beckman Foundation for 15 months of laboratory research.

"It allows me to develop my independent research skills and basically become a better researcher before I even get to graduate school, which is the final goal," she said.

Tharpe's experience shows not only her success but also the exemplary research experiences available to undergraduates in

Clemson University's College of Engineering, Computing and Applied Sciences.

She first became involved with research in the summer between her freshman and sophomore years when she met with Mark Blenner, the McQueen Quattlebaum Associate Professor of chemical and biomolecular engineering.

"I told him I was interested in doing research and the kind of research that he was doing," Tharpe recalled. "He was totally open. He was like, 'Here are my projects. Which one do you find interesting? Let's get you started.' I was really thankful for that."

Tharpe, the daughter of two Clemson graduates, said that after receiving her Bachelor of Science, she plans to pursue a Ph.D. in chemical and biomolecular engineering. Her long-term goal is to work in industry and that she is especially interested in virus engineering for targeted drug delivery and gene therapy.

What Tharpe likes best about research is not necessarily the end product.

"It's the process that goes into it," she said. "That's why I want to be a chemical engineer. It's trying to solve problems that you see in the world. Having the ability to practice that before I go to graduate school and start my career has been really rewarding." *





COVERING THE WORLD IN ORANGE



By Paul Alongi



Four students from the College of Engineering, Computing and Applied Sciences learned during the 2020 spring semester that they have received grants through the Fulbright U.S. Student Program. They are highly competitive awards designed to create mutual understanding between people of the United States and people from other countries. All the students involved were planning to travel abroad but were also carefully watching the COVID-19 situation and planning to follow the Fulbright program's guidance. Whatever happens, winning a Fulbright is a huge honor and a great start for a young scholar. Here's a look at the honorees:



Jessica is no stranger to world travel and has been privileged to see Mount Ranier (top left) and Olympic National Park (bottom right) in Washington as well as New Zealand's exotic wildlife (top right) and Pinnacle Rock (bottom left).

Jessica Baron travels the globe for computer graphics research

Jessica Baron has traveled the globe and worked as an intern for some of the world's top video game, animation and visual effects companies since arriving at Clemson University three years ago.

Come January, the computer science Ph.D. candidate is planning to pack her bags again. This time she will be heading to Switzerland to work with Assistant Professor Wenzel Jakob at Ecole polytechnique fédérale de Lausanne.

Baron's research focuses on modeling the appearance of feathers for computer graphics.

She arrived at Clemson in 2017 as a master's student and received her Master of Science in Computer Science in 2018. Baron stayed

at Clemson to pursue her Ph.D. under Eric Patterson, an associate professor of visual computing and the associate director of Digital Production Arts.

Baron's Fulbright award is the latest in a string of remarkable internships and study-abroad experiences she has had since joining Clemson.

In summer 2020, she served as rendering programming intern at North-Carolina-based Epic Games, a video game software developer and publisher that counts "Fortnite" among its popular titles.

Baron was a RenderMan intern for Pixar Animation Studios in Seattle during the summer of 2019. During Clemson's

2018 summer break, she traveled to New Zealand for a software engineering internship at Weta Digital, an Academy Award-winning digital effects studio known for its work on "The Lord of the Rings" movies.

Baron began her feather research in 2017 at Germany's Cologne University of Applied Sciences (TH Köln), where she was a UAS7 graphics research intern.

Charles Dove caps extraordinary undergraduate experience with high honor

As an undergraduate at Clemson University, Charles Dove helped lead teams that experiment with nuclear fusion, launch rockets to the same height as Mount Everest and build small satellites that orbit Earth.

His Fulbright award will allow him to take a research position at Ecole polytechnique fédérale de Lausanne in Switzerland, where he will help advance Lidar, the light-based technology that allows autonomous cars to "see" the world around them.

Dove graduated in May with his Bachelor of Science in electrical engineering.

While at Clemson, he played a leading role in the Rocket Engineering Team. He also founded the Small Satellite Team and the Fusion Engineering Team, positions that involved recruiting faculty members and students.

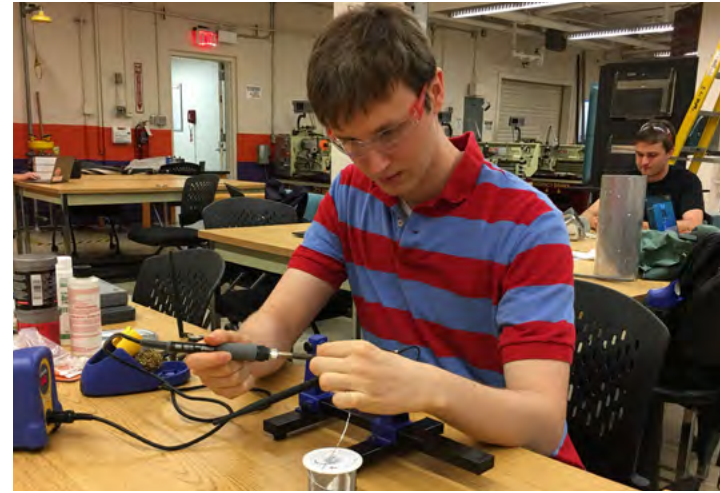
During summer of 2020, Dove began pursuing his Ph.D. in electrical



engineering from the University of California, Berkeley. Dove said he is glad he chose Clemson for his undergraduate education.

“I have had the best experience here academically,” he said. “All the people are just incredible. I’ve enjoyed all my classes. All my professors have been supportive and personable. There were lots of one-on-one opportunities to make new connections.”

Dove said some of the Clemson faculty members who were supportive of his efforts were: Daniel Noneaker, associate dean for research in the College of Engineering, Computing and Applied Sciences; Garrett Pataky, an assistant professor of mechanical engineering; Lin Zhu, a professor of electrical and computer engineering; and Chad Sosolik, professor of physics and astronomy.



Top right: Recent graduate, Charles Dove, works in the Cook Engineering Laboratory. **Bottom left:** McKinnon Reece during a recent trip to Dominica. **Opposite page:** Jonathan Vogel is pictured (top) as a student mentor and (bottom) with members of the Clemson Formula SAE team.

McKinnon Reece looks to make a difference with his Fulbright award

McKinnon Reece knows engineers tend to make better-than-average salaries, but when the recent Clemson University graduate thinks about what he might be doing a decade from now, he has bigger things on his mind.

“Long term, I want to be able to make a difference in the world,” he said.



Reece plans to head to Taiwan in January to teach English and STEM to elementary- and middle-school children with the help of his Fulbright award.

Reece graduated from Clemson in May with a Bachelor of Science in mechanical engineering and a minor in Mandarin Chinese. He said he has accepted a job with ABB and was training over the summer to be a field sales engineer at the company’s Greenville location.

While at Clemson, Reece served as president of the Chinese Language Club. He was also heavily involved in Engage Dominica, a program that gave students the opportunity to help rebuild the island nation after a devastating tropical storm.

Reece’s goal is to become business proficient in Mandarin, fluent enough to carry on technical discussions about engineering matters.

Jennifer Ogle, civil engineering professor and faculty director of Engage Dominica, helped Reece secure the Fulbright grant, he said. So did Senior Lecturer Su-I Chen, Lecturer Ling Rao and Robyn Curtis, director of Clemson’s Office of Major Fellowships, Reece said.



Fulbright fuels Jonathan Vogel’s Formula One dream

Jonathan Vogel’s two years of service as chief engineer for Clemson Formula SAE came to an end in May when he received

his Bachelor of Science in mechanical engineering. His next stop is England.

Vogel is planning to pursue a Master of Science in automotive engineering at Coventry University as part of his Fulbright award. Then he will have a yearlong work placement with Aston Martin, he said.

Vogel said that his passion is vehicle dynamics, the study of how vehicles behave in motion and respond to driver inputs. He said that he is particularly interested in motorsports, especially Formula One.

Vogel said that Greg Mocko, an associate professor of mechanical engineering, served as an important mentor in leadership and management during Vogel’s time with Clemson Formula SAE, a team that designs, builds and races open-wheel race cars.

He also conducted research on carbon fiber with Srikanth Pilla, the Jenkins Endowed Professor. And in summer 2019, Vogel helped create a tool aimed at helping researchers design better-integrated vehicles, a project overseen by Chris Paredis, the BMW Chair in Systems Integration.

“These sorts of opportunities have given me the real-world application knowledge to augment my theoretical knowledge from the classroom,” Vogel said. “The experience has helped me round out as an engineer. I can walk in the door and tackle a fresh problem head on and come up with a creative, integrated solution.”

Vogel said he was also grateful for the National Scholars Program for providing a scholarship that allowed him to attend Clemson and for its small community of mentors, which helped him make decisions and set long-term goals. ✱



News from Around the College

SIMULATED HEART ATTACKS COULD HELP RESEARCHERS SCREEN DRUGS

A team of researchers from Clemson University and the Medical University of South Carolina developed a new way of simulating heart attacks in a lab and then using the engineered tissue to screen drugs that show promise for treating patients with heart damage, according to a recent article in the journal Nature Biomedical Engineering. Ying Mei, an associate professor of bioengineering at Clemson, is a corresponding author. When specific human heart cells were placed in a culture they self-assembled into a tissue called an “organoid” that mimicked the heart. Researchers then reduced oxygen to a defined level to resemble the conditions that occur in a heart attack. The resulting tissue can be used as a model to screen drugs that are designed to treat heart damage, Mei said. It could also be used to screen chemotherapy drugs that are toxic to the heart and could be harmful to patients with heart conditions.



REVIEW OF SELF-HEALING POLYMERS SHARPENS FOCUS ON CLEMSON'S EXCELLENCE IN ADVANCED MATERIALS

Marek Urban, the J.E. Sistine Foundation Chair and Professor, was selected to write a review on self-healing polymers that appeared in Nature Reviews Materials. Self-healing polymers are a type of smart material that repair their own damage without help and could lead to a host of futuristic technologies, such as car paint that heals its own scratches and smartphone screens that fix their own cracks.



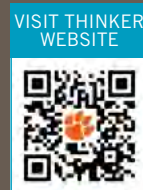
'GHOST' VEHICLE RESEARCH SHOWS ENERGY SAVINGS IN SELF-DRIVING CARS

Ardalan Vahidi, a mechanical engineering professor, created algorithms that help autonomous, wirelessly-connected vehicles anticipate the behavior of other vehicles to reduce braking. The team found its algorithms resulted in energy savings ranging from 8-23%, depending on the scenario.



LAINÉ MEARS LEADS LIST OF 20 MOST INFLUENTIAL PROFESSORS IN SMART MANUFACTURING

Mears, the BMW SmartState Chair in Automotive Manufacturing, was the first professor mentioned in “The 20 most influential professors in smart manufacturing,” an article on SME’s website. Among the innovations that SME cited was THINKER, a program Mears founded to create a new model for graduate education.



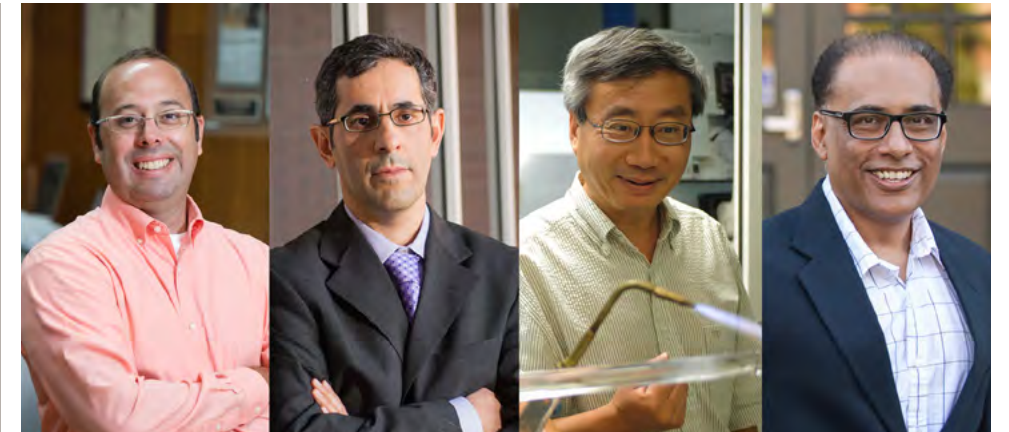
STUDENTS CREATE ONLINE TOOL TO HELP CIVILIANS IN CONFLICT ZONES

Richard Brooks, a professor of electrical and computer engineering, is leading a team of Clemson University students who are developing an app-like digital tool that uses a smart phone to securely connect civilians in conflict zones with people who can provide food, medicine, transportation and other aid. A prototype of the tool, P2PR2P, was showcased at November 2019’s Paris Peace Forum, where it was warmly received. Students are working on the finishing touches so that it can be deployed in real-world situations.



HAI YAO WORKS TO DEVELOP ALTERNATIVE TREATMENT FOR SPINAL DEFORMITIES

Yao, the Ernest R. Norville Endowed Chair, is developing a novel surgical system for correcting spinal deformities without anchoring rods to the spine with screws. This new approach, which is called the R-FIXation system, anchors rods to the ribs using a series of hooks instead of to the spine. The research is funded by the National Institutes of Health.



CECAS FACULTY NAMED FELLOWS

Four faculty members were named Fellows of professional societies, high honors that recognize career achievements. The Fellows (pictured from left to right), their titles at Clemson, and the societies are:

Kyle Brinkman, chair of the Department of Materials Science and Engineering, The American Ceramic Society

Ardalan Vahidi, mechanical engineering professor, The American Society of Mechanical Engineers

Liang Dong, professor of electrical and computer engineering, The Institute of Electronics and Electrical Engineers (IEEE)

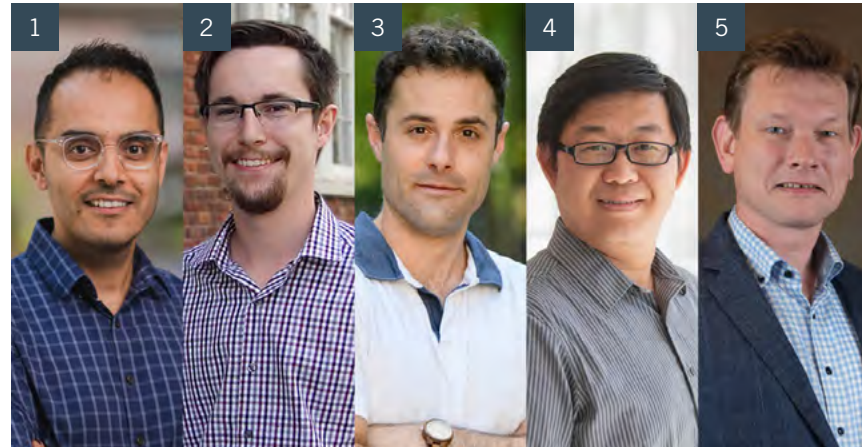
Sukumar Brahma, Dominion Energy Distinguished Professor of Power Engineering, The Institute of Electronics and Electrical Engineers (IEEE)

KALYAN PIRATLA WINS NATIONAL AWARD FOR EARLY-CAREER PROFESSIONALS

Piratla, the S.E. Liles, Jr. Distinguished Associate Professor of Civil Engineering, won the Ralston Young Trenchless Achievement Award from the North American Society for Trenchless Technology (NASTT). The award honors society members who are under 36 years old and have demonstrated excellence early in their career by making valuable contributions to the trenchless technology industry, achieving noteworthy professional success, and actively participating in NASTT or its regional or student chapters.



News from Around the College



FIVE ENGINEERS WIN AWARDS FOR EARLY-CAREER RESEARCHERS

Five assistant professors in the College of Engineering, Computing and Applied Sciences are receiving some of the nation's top awards for engineers and scientists who are early in their careers, providing a boost to Clemson University's research in smart materials, supercomputers and environmental sustainability. Here are the award winners, their titles and the agencies funding their research.

1. Fadi Abdeljawad, assistant professor of mechanical engineering, Army Research Office Young Investigator Program Award
2. Jon Calhoun, assistant professor of electrical and computer engineering, National Science Foundation CAREER Award
3. Ezra Cates, assistant professor of environmental engineering and Earth sciences, U.S. Environmental Protection Agency Early Career Award
4. Kai He, assistant professor of materials science and engineering, National Science Foundation EPSCoR Research Infrastructure Improvement Track 4 Award
5. Ulf Schiller, assistant professor of materials science and engineering, National Science Foundation CAREER Award

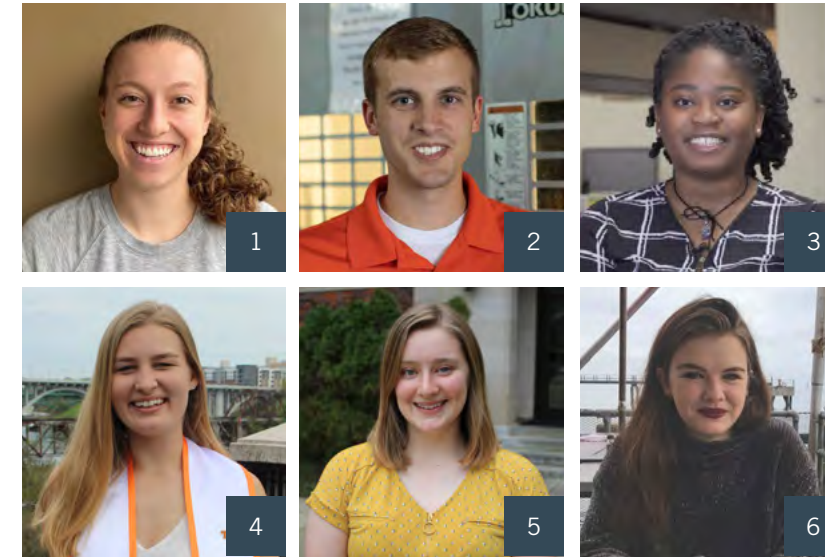
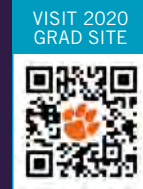


FACEBOOK FELLOWSHIPS FUND PH.D. RESEARCH IN SCHOOL OF COMPUTING

Moses Namara and Samaneh Zamanifard were among 36 Ph.D. candidates from 16 universities selected this year as Facebook Fellows, according to a Facebook Research blog post. The social media platform recognizes fewer than 2 percent of applicants, supports research for up to two academic years and helps raise Clemson University's profile in Silicon Valley.

2020 GRADUATES CELEBRATED

Clemson University saluted its graduates in the spring with videos, social media posts and a promise to hold an in-person ceremony when it is safe to do so. The Class of 2020 included 1,061 graduates from the College of Engineering, Computing and Applied Sciences. The tally includes 791 bachelor's degrees, 240 master's degrees and 30 Ph.D.s.



SIX STUDENTS LAND GRADUATE RESEARCH FELLOWSHIPS

Four doctoral students and two seniors from the College of Engineering, Computing and Applied Sciences received Graduate Research Fellowships from the National Science Foundation. The highly competitive grants provide three years of support for recipients' graduate education. Those receiving awards were:

- Margaret Elpers [1], a graduate in bioengineering and biomedical engineering, will pursue her Ph.D. at Cornell University in biomedical engineering.
- Tyler Grimm [2] is a doctoral student in automotive engineering.
- Britney Hudson [3] and Megan Pitz [4] are doctoral students in bioengineering.
- Allison Kaczmarek [5], who was a double major in materials science and engineering, and chemistry, will pursue her doctoral studies at the Massachusetts Institute of Technology with a focus on materials science and engineering.
- Kelli McCourt [6] is a doctoral student in biosystems engineering.



FOUR CLEMSON UNIVERSITY RESEARCHERS HONORED WITH NAMED PROFESSORSHIPS

The four are expanding research and education into advanced manufacturing and biotechnology innovation. Two come from bioengineering, one from automotive engineering and the fourth holds appointments in civil and industrial engineering. The honorees, their professorships and departments are:

1. Kapil Chalil Madathil, the Wilfred P. Tiencken Professorship, dual appointment in the Glenn Department of Civil Engineering and the Department of Industrial Engineering
2. Delphine Dean, the Ron and Jane Lindsay Family Innovation Professorship, Department of Bioengineering
3. Yunyi Jia, the McQueen Quattlebaum Assistant Professorship, Department of Automotive Engineering
4. Jeremy Mercuri, the John Witherspoon Gilpin, M.D. '82 Endowed Associate Professorship, Department of Bioengineering

CLEMSON UNIVERSITY STRENGTHENS ABILITIES IN ARTIFICIAL INTELLIGENCE WITH AIRISE

Clemson University is strengthening its ability to conduct research and offer courses in artificial intelligence, a fast-rising technology that is beginning to revolutionize industries ranging from advanced manufacturing to healthcare. About 80 faculty members are banding together to launch the new Clemson Artificial Intelligence Research Institute for Science and Engineering, or AIRISE.

Clemson researchers have been developing and using artificial intelligence for years, and the institute will build on projects already underway.

Mitch Shue, a professor of practice, serves as executive director of AIRISE. Feng Luo, a computer science professor, is the institute's director and founder.

You can read about projects already underway in the last issue of IDEAS magazine by scanning the QR code.



CLEMSON UNIVERSITY OBSERVED 'E.WEEK' WITH FUN-FILLED SLATE OF ACTIVITIES

Students, faculty and staff celebrated Engineers Week with a host of activities, including photo booth pictures, talks with accomplished professionals and a "zombie takeover" simulation. The events are part of a national celebration established in 1951 by the National Society of Professional Engineers.



SUE LASSER HONORED FOR WORK IN PEER & WISE

Lasser is receiving the Thomas Green Clemson Award for Excellence for staff. She co-founded PEER, the forerunner to PEER & WISE, and served as its director for 28 years. Lasser stepped down in 2015 but continued to serve as a part-time personal counselor and study coach. PEER & WISE aims to educate, recruit and retain underrepresented populations in STEM.

News from Around the College

HONORS & AWARDS 2020



TOP COLLEGE STUDENTS RECEIVE HONORS

Some of the best and brightest students in the College of Engineering, Computing and Applied Sciences were recognized for their outstanding academics, character, leadership and research. The winners were: Thomas Birdsong, Austin Bruner, Mary Grace Stanchik, Corrina Laird, Mallory Ann Jordan, Natalie DellaMaria, Allison Kaczmarek, Jared Capuano, Mitra Shabani, Longxiang Guo, Azrin Jamison and Illana Jamison. To learn more about their awards and why they chose Clemson, scan the QR code.



HAI XIAO NAMED INTERIM CHAIR OF THE HOLCOMBE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

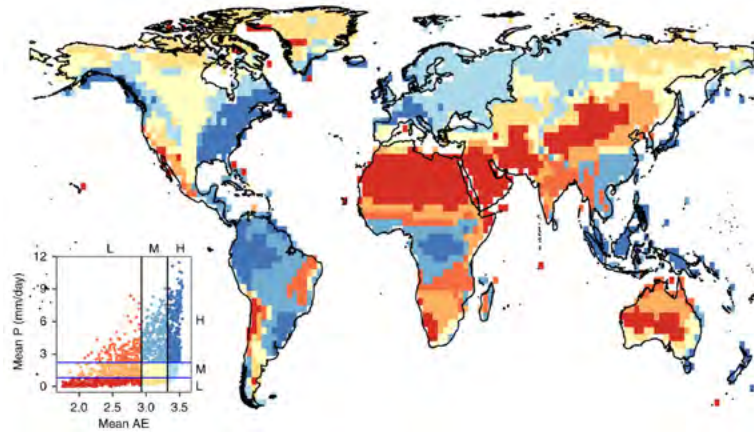
Hai Xiao joined Clemson in 2013 as the Samuel Lewis Bell Distinguished Professor in Electrical and Computer Engineering. He has earned a reputation as a team-builder who brings together colleagues for big, multidisciplinary research projects.

CLIMATE CHANGE WILL CAUSE MORE EXTREME WET AND DRY SEASONS, RESEARCHERS FIND

The world can expect more rainfall as the climate changes, but it can also expect more water to evaporate, complicating efforts to manage reservoirs and irrigate crops in a growing world, according to a Clemson University researcher whose latest work has been published in the journal Nature Communications.

Ashok Mishra, who is the corresponding author on the new article, said that previous studies have focused mostly on how climate change will affect precipitation. But the key contribution of the new study is that it also examined the magnitude and variability of precipitation and evaporation and how much water will be available during the wettest and driest months of the year.

The regions that will be hardest hit by climate change are the ones that already get slammed with rain during wet seasons and struggle with drought during dry seasons, researchers found. They include much of India and its neighbors to the east, including Bangladesh and Myanmar, along with an inland swath of Brazil, two sections running east-west across Africa, and northern Australia, according to the study.



HIGH SCHOOL STUDENTS AND CLEMSON UNIVERSITY RESEARCHERS DEVELOP ARTIFICIAL INTELLIGENCE TO TAME SOCIAL MEDIA HATE SPEECH

Daniel High School students Wyatt Dorris (left) and Roger Hu worked alongside Clemson University Professor Feng Luo from the School of Computing, to create HateDefender. Artificial intelligence detects hate speech and offensive words on social media and then encourages users to reconsider their posts.



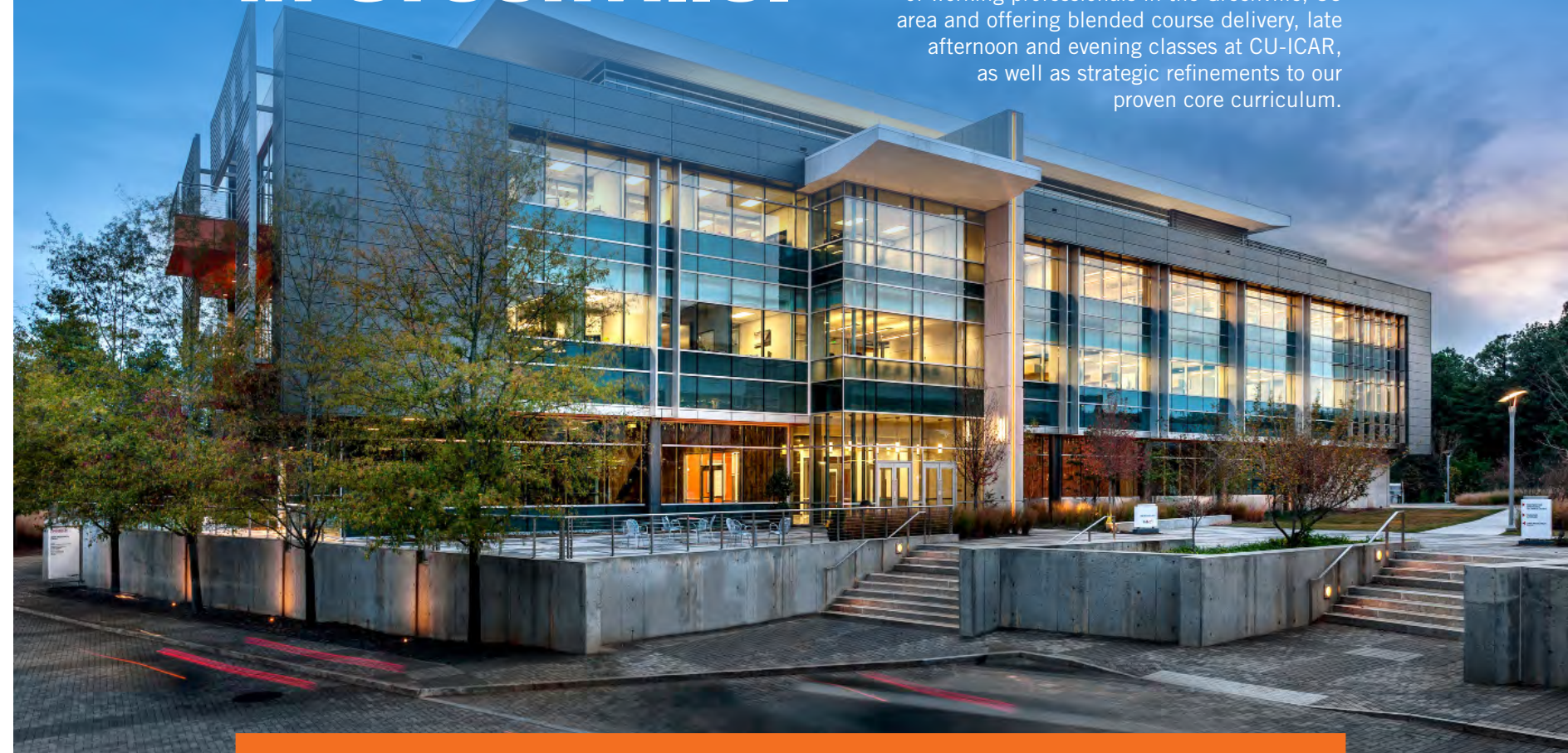
RONALD W. FALTA, JR. RECOGNIZED BY THE AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS AND SCIENTISTS

Falta, a professor of hydrogeology in Clemson University's environmental engineering and Earth sciences department, is receiving the 2020 Honor Award for University Research. He is being recognized for his work in environmental remediation of hazardous waste sites, geologic sequestration of carbon dioxide, and mathematical modeling of contaminant transport and remediation.



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Departments

Departments

Departments



Automotive Engineering

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Fast Facts

Tenured/tenure-track faculty: 12

Enrollment: (Fall 2019)

Undergraduate	N/A
Master's	187
Doctoral	37
Total:	224

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	N/A
Master's	62
Doctoral	10
Total:	72

Research expenditures: \$3,997,362 (FY19)

Research thrusts: systems integration, vehicle manufacturing, vehicle design and development, vehicular electronics



Bioengineering

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Fast Facts

Tenured/tenure-track faculty: 27

Enrollment: (Fall 2019)

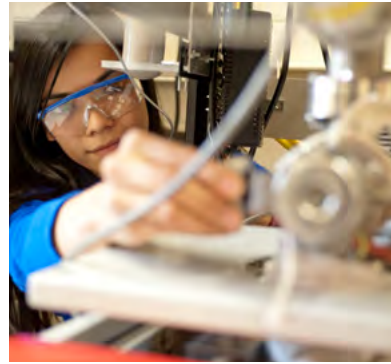
Undergraduate	347
Master's	52
Doctoral	88
Total:	487

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	110
Master's	46
Doctoral	16
Total:	172

Research expenditures: \$6,931,226 (FY19)

Research thrusts: biomaterials engineering, bioelectrical engineering



Chemical and Biomolecular Engineering

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Fast Facts

Tenured/tenure-track faculty: 12

Enrollment: (Fall 2019)

Undergraduate	218
Master's	6
Doctoral	53
Total:	277

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	84
Master's	2
Doctoral	8
Total:	94

Research expenditures: \$3,784,890 (FY19)

Research thrusts: advanced materials, kinetics and catalysis, energy, chemical and biochemical separations, molecular modeling and simulation, biosensors and biochips



Glenn Department of Civil Engineering

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Fast Facts

Tenured/tenure-track faculty: 22

Enrollment: (Fall 2019)

Undergraduate	380
Master's	65
Doctoral	61
Total:	506

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	114
Master's	43
Doctoral	11
Total:	168

Research expenditures: \$4,578,485 (FY19)

Research thrusts: sustainable and resilient infrastructure



School of Computing

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Fast Facts

Tenured/tenure-track faculty: 37

Enrollment: (Fall 2019)

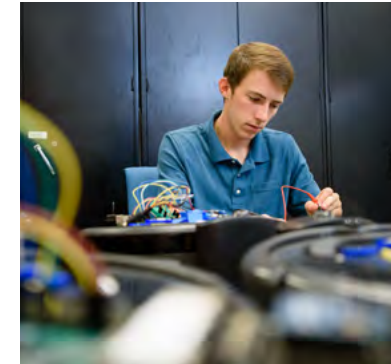
Undergraduate	951
Master's	167
Doctoral	105
Total:	1,223

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	160
Master's	60
Doctoral	6
Total:	226

Research expenditures: \$3,333,773 (FY19)

Research thrusts: computing foundations, data analytics, software engineering, cyberinfrastructure, networking, bioinformatics, computer graphics and animation, eye tracking, visualization, digital arts, intelligent and interactive systems, identity science and affective computing, virtual environments, human/computer interaction, pedagogical tools using tablet PCs and handheld devices



Holcombe Department of Electrical and Computer Engineering

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Fast Facts

Tenured/tenure-track faculty: 32

Enrollment: (Fall 2019)

Undergraduate	520
Master's	77
Doctoral	103
Total:	700

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	144
Master's	36
Doctoral	11
Total:	191

Research expenditures: \$9,793,087 (FY19)

Research thrusts: optoelectronics, cyberinfrastructure, wireless communications, computer networks, nanoelectronic materials processing, biochips, semiconductor lasers, optical systems, integrated circuit design, high-performance computing, computer security, robotics, image processing, biological modeling, situation and threat assessment, power systems



Engineering and Science Education

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Fast Facts

Tenured/tenure-track faculty: 6

Enrollment: (Fall 2019)

Undergraduate	N/A
Master's	N/A
Doctoral	20
Total:	20

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	N/A
Master's	N/A
Doctoral	1
Total:	1

Research expenditures: \$748,383 (FY19)

Research thrusts: student motivation, problem solving, equity and gender issues in STEM disciplines, physics identity development, modeling of large-scale data, social capital, students' academic and career development and success



Environmental Engineering and Earth Sciences

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Fast Facts

Tenured/tenure-track faculty: 21

Enrollment: (Fall 2019)

Undergraduate	183
Master's	56
Doctoral	36
Total:	275

Degrees awarded: (12/18; 5/19; 12/19)

Undergraduate	61
Master's	21
Doctoral	5
Total:	87

Research expenditures: \$4,608,269 (FY19)

Research thrusts: environmental chemistry, environmental fate and transport, hydrogeology, nuclear environmental engineering and science, biosystems engineering, process engineering, sustainable systems



Industrial Engineering

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Fast Facts
 Tenured/tenure-track faculty: 12
Enrollment: (Fall 2019)
 Undergraduate 501
 Master's 180
 Doctoral 32
 Total: 713

Degrees awarded: (12/18; 5/19; 12/19)
 Undergraduate 155
 Master's 58
 Doctoral 3
 Total: 216

Research expenditures: \$2,588,689 (FY19)
Research thrusts: supply chain optimization and logistics, human factors and safety in health care and in technologically complex environments, education and learning systems



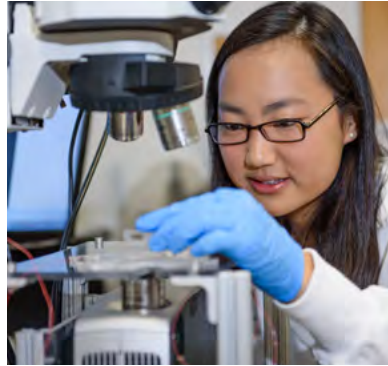
Materials Science and Engineering

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Fast Facts
 Tenured/tenure-track faculty: 19
Enrollment: (Fall 2019)
 Undergraduate 108
 Master's 20
 Doctoral 46
 Total: 174

Degrees awarded: (12/18; 5/19; 12/19)
 Undergraduate 46
 Master's 6
 Doctoral 8
 Total: 60

Research expenditures: \$6,198,594 (FY19)
Research thrusts: manufacturing, characterization and structure/property/performance relationships of ceramics, glasses, polymers, photonics/optics, fiber-based materials, thin films, metals



Mechanical Engineering

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Fast Facts
 Tenured/tenure-track faculty: 31
Enrollment: (Fall 2019)
 Undergraduate 847
 Master's 157
 Doctoral 77
 Total: 1,081

Degrees awarded: (12/18; 5/19; 12/19)
 Undergraduate 257
 Master's 58
 Doctoral 3
 Total: 323

Research expenditures: \$3,157,967 (FY19)
Research thrusts: transportation, energy, design, materials, manufacturing, fluids, complexity, multi-scale modeling

CLEMSON UNIVERSITY RECOGNIZED FOR INNOVATION IN ENGINEERING EDUCATION

Mechanical Engineering magazine included Clemson University among its "10 Innovative Engineering Institutes." The article cited several initiatives that are key in making the Clemson experience unique and keeping the pipeline to industry filled with top talent. Those initiatives included Dr. Srikanth Pilla's work to design an ultra-lightweight automobile door that is made of carbon-fiber-reinforced thermoplastic composites. In this photo, Srikanth Pilla (left) and grad student Saeed Farahani inspect some of the parts they created as part of their research into hybrid single-shot manufacturing of metals and composites.





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COLLEGE OF ENGINEERING, COMPUTING AND APPLIED SCIENCES RECEIVES FIRST CORNERSTONE GIFT

Carla and Mitch Norville showed their support to Clemson University with a transformational \$2.5 million gift to the College of Engineering, Computing and Applied Sciences. The gift, announced in February, further strengthens the college, South Carolina's leader in educating engineers. Pictured above are Mitch and Carla Norville (center) along with their sons Griffith (far left) and Taylor (right) with their daughter-in-law Ellen.

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STORY

