Department of
BIOENGINEERING
Clemson® University

Educating Thinkers, Leaders and Entrepreneurs

BIOE NEWS

Spring 2024

Discovery of Neolastin skin care products by a Bioengineering Professor, page 26

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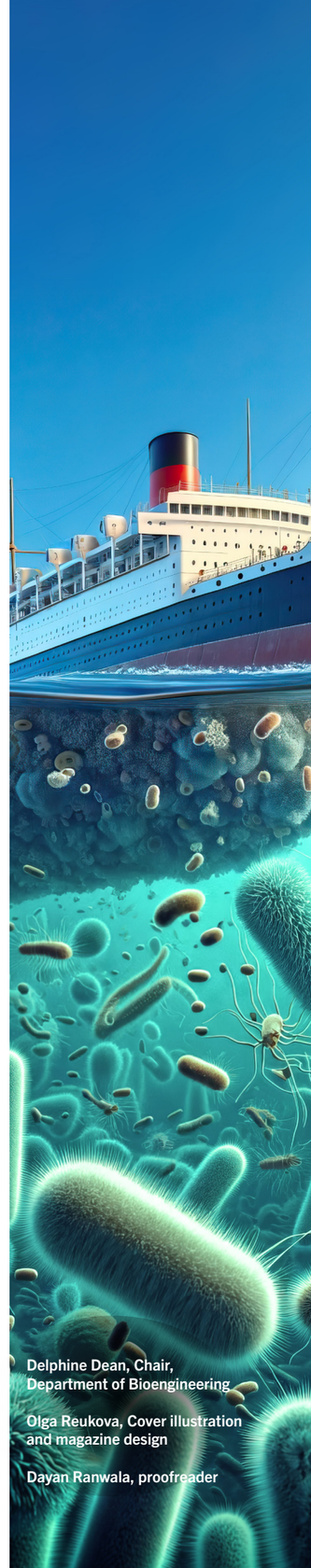
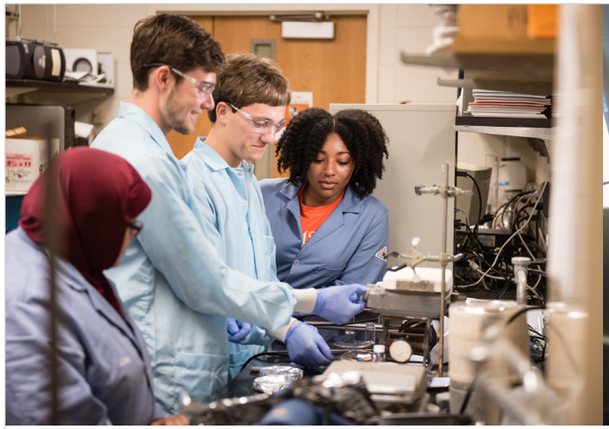
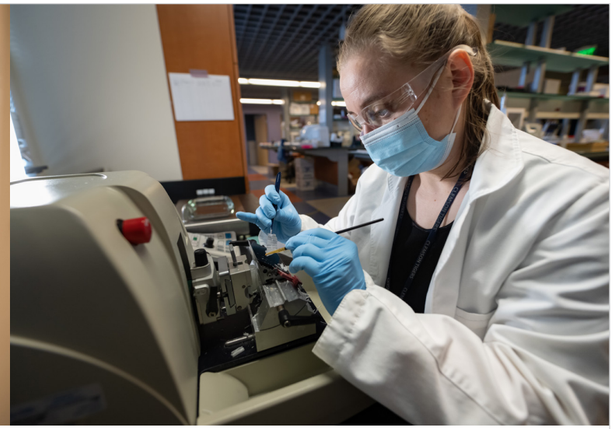


Delphine Dean, Chair, Department of Bioengineering

Olga Reukova, Cover illustration and magazine design

Dayan Ranwala, proofreader





Master of Science in Bioengineering

Non-thesis (1 year)

Offered through:

DEPARTMENT OF BIOENGINEERING AT CLEMSON UNIVERSITY

Overview:

- The Master of Science (M.S.) in Bioengineering - Non-Thesis is a full-time, 1-year, course-based graduate program designed for engineers, scientists, and clinicians.
- Students will be assigned an initial faculty adviser, who will assist the student in designing a plan of study that creates a cohesive degree program with a concentration in a particular bioengineering focus area.
- Focus areas include but are not limited to biomedical devices, biomaterials, bioimaging, biomechanics, biotechnology, and tissue and cell engineering.
- The Clemson bioengineering department offers this degree program across three campuses: Clemson, SC, Greenville, SC, and Charleston, SC.

clemson.edu/cecas/departments/bioe/academics/graduate/ms.html

Program Goals:

Prepare students for exciting careers in industry, academia, or healthcare sectors through a combination of basic science knowledge, engineering strategies, and clinical applications

Program Outcome:

- Earn a graduate MS degree in Bioengineering
- Introduces the students to the major challenges in bioengineers, along with strategies and evolving technologies

Department of BIOENGINEERING Clemson University

Message from the Chair

"Our Bioengineering Department is growing both at the undergraduate and graduate levels; we were ranked as the 2nd highest Ph.D. student enrollment at Clemson University for the 2023-2024 academic year!"

Dear Students, Alumni, Colleagues, and Friends,

I am so thrilled to write this message as I finish my first year as chair of the Department of Bioengineering sharing our students, faculty, and staff accomplishments. First, I want to acknowledge the foundation and success that has been built in the Department by our former chair, Dr. Martine Laberge. Her nearly 20 years of dedicated service as Department chair and her vision, leadership, and commitment to excellence have made a lasting impact on our Department and on the field of bioengineering as a whole. These are big shoes to fill! We have continued with this legacy of excellence and growth. Our Bioengineering Department is growing both at the undergraduate and graduate levels; we were ranked as the 2nd highest Ph.D. student enrollment at Clemson University for the 2023-2024 academic year!

In this newsletter, we are featuring many of the high caliber recognitions and awards for education, research, and economic development that our department has achieved. These highlight our work to advance health innovation and biotechnology in alignment with Department's mission and Clemson University's land-grant mission.

Our undergraduate students won the competitive national award, Design by Biomedical Undergraduate Teams Challenge, for an innovative urinalysis insert, U-sert, for urinary tract infections providing a streamlined solution compared to current collection and diagnostic methods. Another team of undergraduate students won the 1st place receiving the Arrow Electronics People's Choice Award at the Collegiate Inventors Competition for their novel medical device, CatheSure, designed to prevent unnecessary surgery in hydrocephalus patients.

For the first time, our Master of Engineering students participated in the Heartland Challenge, which is a global student startup competition, and won the 4th place by competing against established start-up companies with experienced executive management teams. This team also won 1st place in the Product Development and Management Association's Global Student Innovation Challenge.

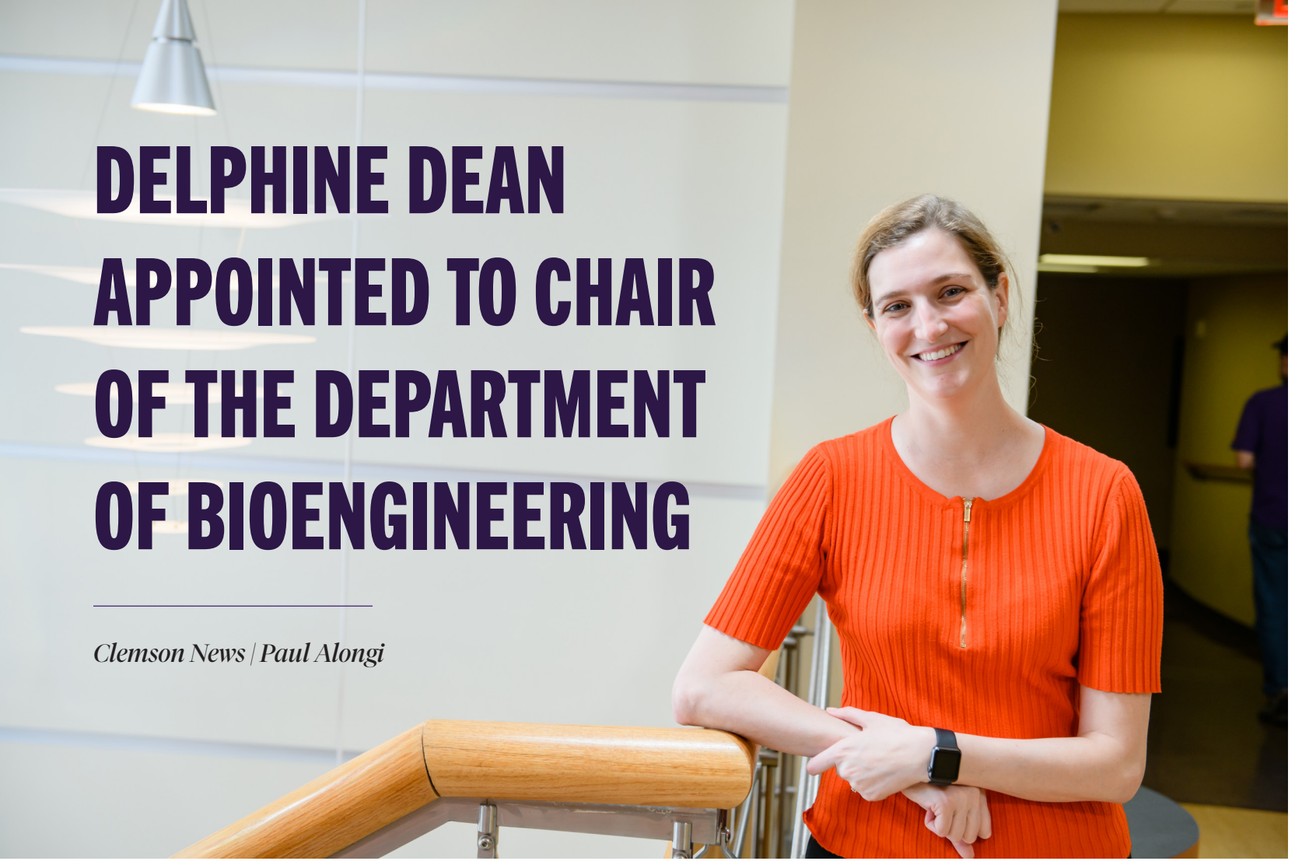
Our new undergraduate program, Call Me Doctor ESTEEMED, seeks to expand and diversify the bioengineering workforce. Further, our collaboration with industry partners such as SCbio have paved the ways to develop the next generation of medtech, life sciences innovations, and the workforce itself.

Our faculty is leading an international team to conduct innovative research to solve an old-age maritime challenge to reduce drag by employing natural biofilms. They received one of the largest grants of $13.6 million funded by the Defense Advanced Research Projects Agency. Our South Carolina Translational Research Improving Musculoskeletal Health Center received its second award of $11.13 million. The second-phase funding is not only advancing knowledge in this field but also expanding research capacity for the entire state.

I highlighted just a few examples of our exemplary work here. I am proud to say that all members of our Department are working together to achieve the University's new strategic plan, Clemson Elevate, three core pillars to enhance student experience, double research, and transform lives.

Delphine Dean, PhD
Professor & Chair
Ron and Jane Lindsay Family Innovation Professor

DELPHINE DEAN APPOINTED TO CHAIR OF THE DEPARTMENT OF BIOENGINEERING



Clemson News | Paul Alongi

Delphine Dean, the Ron and Jane Lindsay Family Innovation Professor, has been appointed to serve as the chair of the Department of Bioengineering.

In an announcement to faculty and staff, Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences, said that Dean's impeccable research credentials, passion for helping students achieve at their highest potential, tireless work ethic and ability to work across disciplines, departments and institutions make her eminently qualified to serve as department chair.

Dean played a central role in Clemson University's response to COVID-19, leading the creation of a diagnostics lab that at its height ran 9,000 tests a day for the University and surrounding community.

She has mentored hundreds of students in Creative Inquiry research projects that have proven educational and inspirational. In one project, Dean and her students traveled to rural areas of Tanzania to assess residents' needs and then returned to Clemson to develop low-cost medical devices for them.

Dean has advocated for more diversity in the faculty at Clemson and statewide. As part of her advocacy, she spoke at the State House at the invitation of the lieutenant governor and helped lead a workshop arranged by the Governor's Office to assist women in starting entrepreneurship ventures.

Dean's research focuses on cardiovascular cell biomechanics, biological effects of radiation and medical device design. Dean

Delphine Dean, Governor McMaster, Presedent Clements

was named the Ron and Jane Lindsay Family Innovation Professor in 2020, and she was honored the following year as a member of the American Institute for Medical and Biological Engineering's College of Fellows.

She received her Ph.D. in electrical engineering and computer science from the Massachusetts Institute of Technology in 2005 and joined Clemson's faculty later that year.

In the announcement, Gramopadhye recognized Martine LaBerge, who has been at the helm of the department for over two decades.

"To say that she leaves a lasting legacy would be an understatement," he wrote. "I personally have benefitted from her mentorship and leadership but most importantly her friendship. She has been a leader not only of the department but for the College of Engineering, Computing and Applied Sciences, the University, the state and the broader bioengineering profession.

"She made a lasting positive impact on the department, and she will continue to positively impact the department through her academic pursuits in her faculty role. I thank her for her years of selfless service. I also thank the search committee led by Jeremy Gilbert and the Bioengineering External Advisory Board, which is chaired by Rebecca DeLegge.

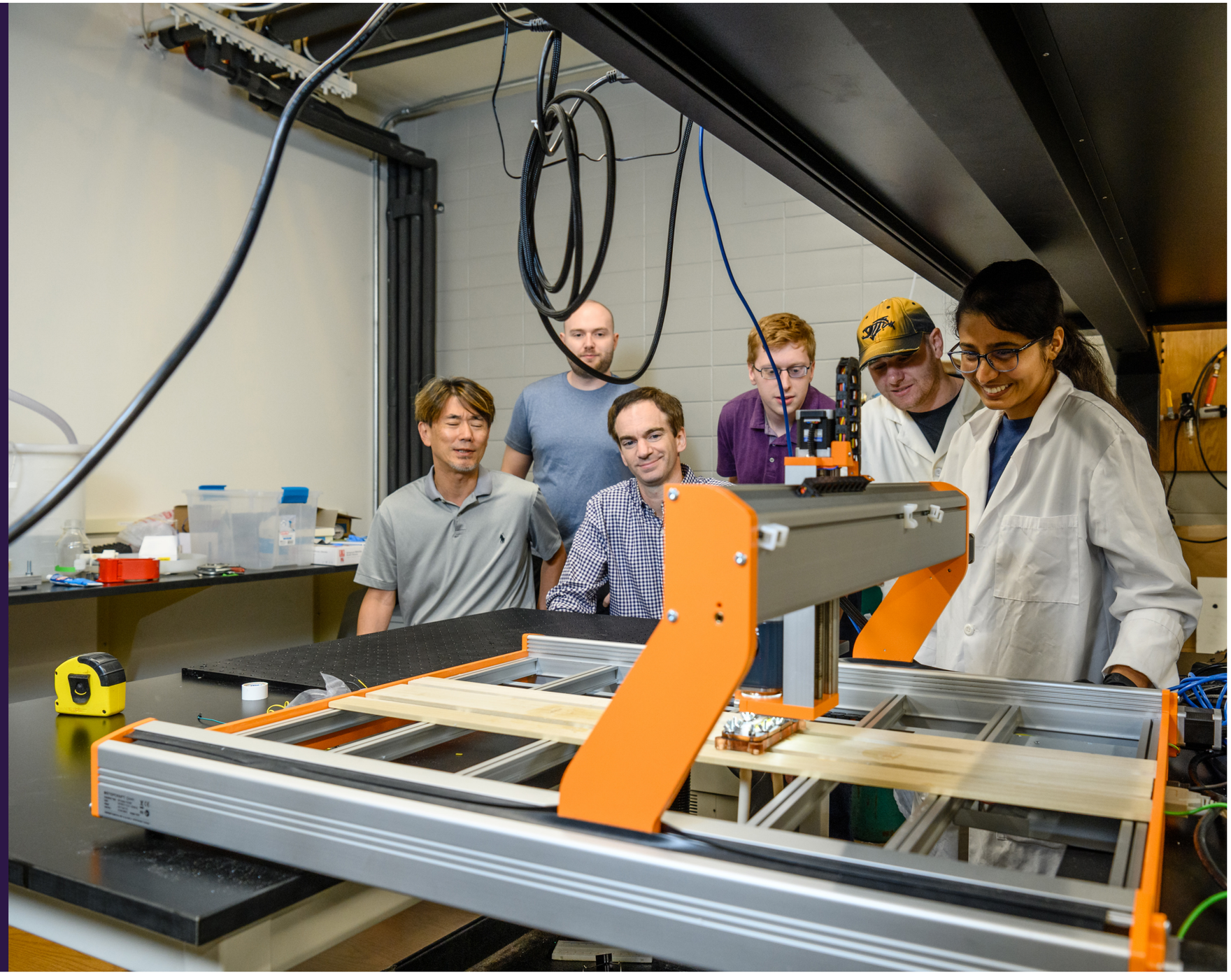
"I am excited to work with Dr. Dean as she takes the department to even greater heights. Please join me in welcoming her to her new role."

Martine LaBerge

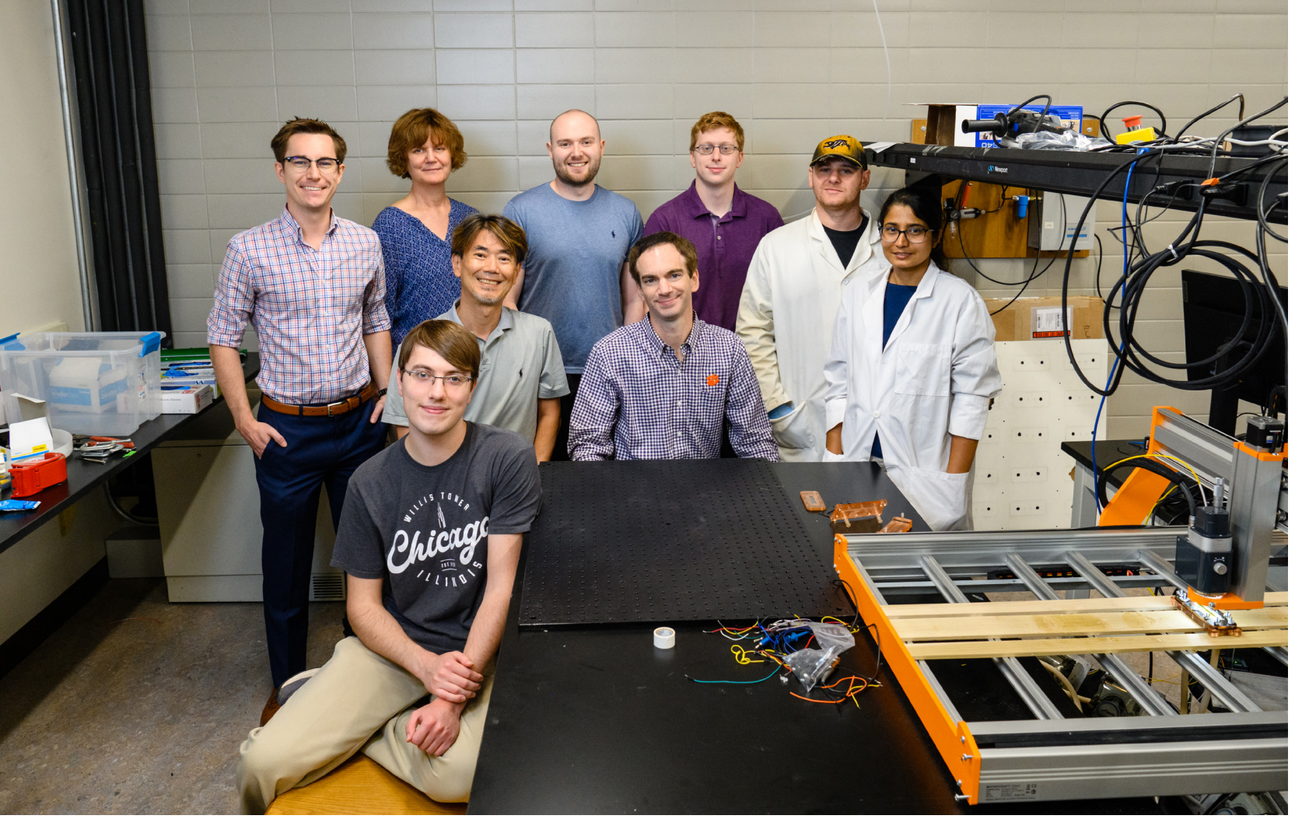
HARMONIZING WITH NATURE:

Clemson University and Partners Share up to $13.6 Million to Solve Maritime Challenge

Clemson News | Paul Alongi



The Karig team works with a device created for the DARPA project.



Those from Clemson involved in the DARPA-funded project include: (from left standing) Jon Calhoun, Barbara Campbell, Reece Fratus, Andrew Derasmo, Skylar Leslie and Diptee Chaulagain; (from left seated second row) Jiro Nagatomi and David Karig; (in the foreground) Justin Leonhardt; and (among those not pictured) Emma Harrington.

Clemson University is leading an international team that is trying an innovative tack to solve an age-old maritime challenge, and researchers said the solution involves working with nature instead of fighting it.

The Defense Advanced Research Projects Agency (DARPA) is providing up to $13.6 million over four years for the project. Partnering institutions are Duke University, the University of Essex, the University of Copenhagen and Pompeu Fabra University.

The principal investigator on the cooperative agreement is David Karig, an associate professor of bioengineering at Clemson. Under his leadership, the team aims to address a pressing maritime issue.

When a hull enters the water, it begins to accumulate unwanted microbes that lead to increased drag. The buildup, called biofouling, reduces vessels' speed and efficiency and can result in higher fuel consumption and maintenance costs.

The current solution is to use antifouling coatings that are environmentally harmful, costly or ineffective. The Clemson-led team is working on a more sustainable alternative that would employ natural marine microbes as "building blocks" to form smooth, stable biofilms that reduce drag.

A smooth biofilm that uniformly covers the surface of the treated area should perform as well or better than contemporary biofoul coatings, researchers said.

"Clemson University is committed to leading research, driving innovation and making a positive impact across the globe," said Clemson University President Jim Clements. "We are excited for this team of top researchers, led by Dr. Karig, to develop creative solutions for a long-standing challenge facing marine vessels. We are also grateful to the Defense Advanced Research Projects Agency for awarding up to $13.6 million to this project and look forward to seeing the impact this research has for defense and industry on a global stage."

The project's focus is unmanned underwater vehicles (UUVs). Biofouling is a particular problem for UUVs because they often run on battery power, and the drag can reduce the amount of time they can be operated.

But researchers said the findings could apply more broadly, including to: the Navy, industries tied to marine transport, and a wide range of areas where biofouling is a problem, including oil production, water treatment, fuel tanks, the food and beverage industry, and nuclear power plants.

"Biofouling is a long-standing problem that goes back thousands of years, and it's hard to address," Karig said. "With this project, we're embracing a solution that harmonizes with nature, rather than fights against it. I'm thrilled about the opportunity to develop engineering methods towards this goal, and I'm optimistic about the positive impact it can bring."

As part of the project, researchers are isolating and characterizing the various types of bacteria found in water samples. They want to keep and grow the bacteria that form smooth biofilm communities and get rid of the ones that lead to biofouling.

One of the key pillars of the project is a scalable testbed built in the Rhodes Engineering Research Center at Clemson. The testbed mimics a UUV's operational environment, including such factors as temperature, shear forces and pressure.

The team is also pioneering new research techniques. They are using optical coherence tomography (OCT) to view biofilms in real time and then go a step further, integrating OCT with superspectral imaging (SSI). Researchers call their technique OCTaSSI and said they expect it will be transformative in making predictions about biofilms.

The research is particularly ambitious in its aim to not only develop beneficial communities of natural microbes, but also to co-optimize for resilience and longevity in the application environment, researchers said.

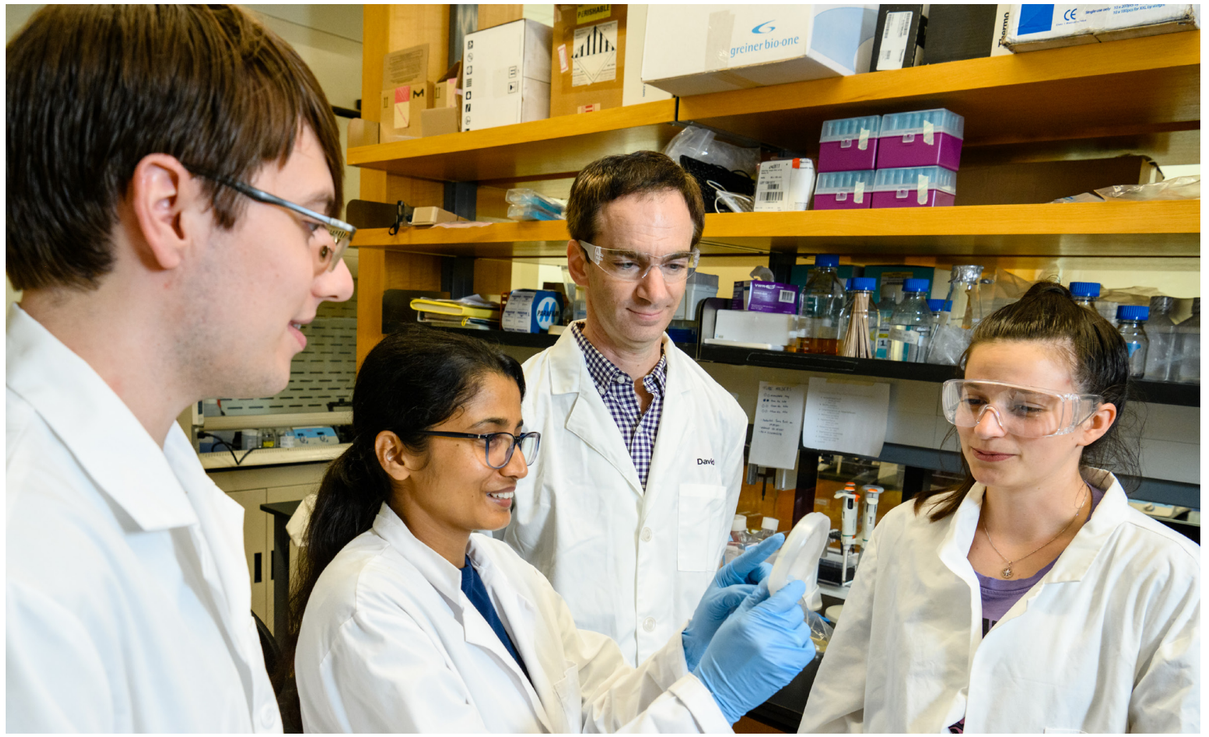
The idea for the research grew out of an award that Nick Aldred of the University of Essex and his team won in 2020 as part of the U.S. Office of Naval Research's Global-X Challenge. In that project, the Aldred team demonstrated a sample biofilm that resists biofouling with the goal of eventually replacing traditional hull coatings.

"Our recognition in the Global-X Challenge was just the beginning," Aldred said. "Collaborating with institutions such as Clemson amplifies our collective strengths. The synergy brought by this international consortium has the potential to set a global benchmark in sustainable marine solutions."

Co-principal investigators from Clemson include: Zhi Gao, Jiro Nagatomi and Bob Latour, all of the Department of Bioengineering; Barbara Campbell of the Department of Biological Sciences; and Adam Hoover and Jon Calhoun, both of the Holcombe Department of Electrical and Computer Engineering.

Lingchong You, James L. Meriam Distinguished Professor of Biomedical Engineering at Duke, said combining biomedical expertise with the challenges of marine biofouling brings a unique perspective.

"By diving deep into microbial dynamics, we are working to craft solutions that are both innovative and sustainable," You said. "It is a privilege to be part of this international team, and I'm excited to see where our collective insights lead us."



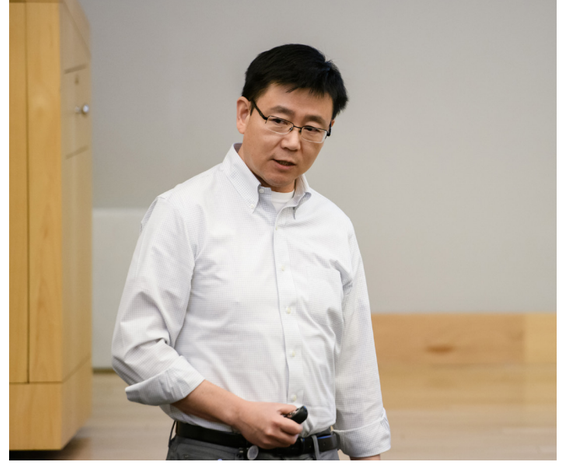
SC-TRIMH RECEIVES MAJOR GRANT *for Pioneering Research into Musculoskeletal Health*

Clemson News | Paul Alongi

A biomedical research center that is headquartered at Clemson University and has resulted in more than 400 publications in its first five years is entering its second phase with an $11.13-million grant.

The center is called South Carolina Translational Research Improving Musculoskeletal Health (SC-TRIMH). It is funded through a National Institute of General Medical Sciences program aimed at establishing Centers of Biomedical Research Excellence.

In the first phase, SC-TRIMH's leaders established research cores in multiscale computational modeling, preclinical assessment and advanced fabrication testing. The number of participating investigators working in musculoskeletal health rose from 15 before the first phase to now more than 40.



They collectively have generated $40 million in new research grants, not including the $22.13 million from the National Institute of General Medical Sciences.

The SC-TRIMH director is Hai Yao, Clemson's associate vice president for biomedical innovation, Ernest R. Norville Endowed Chair in Biomedical Engineering and professor of bioengineering.

"SC-TRIMH has been tremendously productive and innovative in the first phase," said Yao, who has a joint appointment at the Medical University of South Carolina and serves as associate chair for the CU-MUSC Bioengineering Program. "Our multidisciplinary approach has positioned the center at the forefront of musculoskeletal health research. The second-phase funding is a testament to the hard work and dedication of our researchers."

In the second phase, SC-TRIMH leaders aim to expand the critical mass of funded investigators conducting musculoskeletal research; strengthen innovative scientific cores that support and advance musculoskeletal research; and advance the ongoing development of an independent, sustainable, multidisciplinary thematic program.

Robert Jones, executive vice president for academic affairs and provost at Clemson, said SC-TRIMH supports the human-performance focus area of the Clemson Elevate strategic plan.

"The second-phase funding is not only advancing knowledge in the field of musculoskeletal health but also expanding research capacity for the entire state," he said. "This is well-deserved funding, and I offer the team my congratulations

Centers of Biomedical Research Excellence (COBRE) are eligible for funding in as many as three phases. SC-TRIMH received $11 million in 2018 for its first phase, and the center's leaders are already starting to plan to apply for third-phase funding.

SC-TRIMH has been a major force for collaboration across disciplines and institutions, with frequent partnerships among clinicians at Prisma Health.

"Our collaborations with SC-TRIMH have been transformative," said Michael Kissenberth, clinical professor of orthopaedic surgery and sports medicine at Prisma Health and adjunct professor at Clemson University. "The innovative research cores have complemented our clinical practice, helping us advance patient care and outcomes in musculoskeletal health."

The first-phase research project leaders were: Will Richardson, Feng Ding, Hugo Sanabria, Fei Peng, Kara Powder, Melinda Harman, Tong Ye and Yongren Wu. Second-phase researcher project leaders are: Shangping Wang, Zhaoxu Meng, Powder and Sarah Floyd.

SC-TRIMH is among four Centers of Biomedical Research Excellence at Clemson. The others are: the South Carolina Bioengineering Center for Regeneration and Formation of Tissues (SCBioCRAFT); the Eukaryotic Pathogens Innovation Center (EPIC); and the Center of Biomedical Research Excellence in Human Genetics.

Among those applauding the most recent SC-TRIMH grant was Tanju Karanfil, vice president for research, scholarship and creative endeavors at Clemson.

"Clemson has proven success leading large-scale, interdisciplinary Centers of Biomedical Research Excellence that are generating innovations in healthcare diagnostics, treatment and delivery," Karanfil said. "This continued investment underscores the high-level impact that SC-TRIMH is having and will further catalyze its mission."

Research reported in this publication was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number 2P20GM121342-06. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

John Witherspoon Gilpin donates $1 million to Clemson University's Department of Bioengineering

Clemson News | Paul Alongi

The Clemson University alumnus who is donating $1 million to establish a distinguished professorship in bioengineering is a talented radiologist, medical school faculty member and avid marathon runner.

John Witherspoon Gilpin said he made the donation because he wanted to support research programs and other work in Clemson's Department of Bioengineering and to encourage its relationship with Prisma Health in particular and medicine in general.

The donation is also a tribute to his six nieces and nephews. They include his brother, Al's children, Thomas, Laney, and Hattie, a Clemson graduate; and his brother, Lewis' children, Bailey, Mason and Amy Blaine.

The donation establishes the John Witherspoon Gilpin, MD '82 Distinguished Professorship in Bioengineering. The funds go into an endowment, and the faculty member who is selected for the professorship will be able to use proceeds to help pay for research support, travel, student assistance and research equipment.

While the professorship is intended for the department chair, Gilpin has given Clemson the flexibility to occasionally use it to recruit and retain other outstanding bioengineering faculty members.

"My respect for the chair of the department, Martine LaBerge, and Associate Professor Jeremy Mercuri helped inspire this donation," Gilpin said. "My vision for these funds is to support the research activities of the talented faculty, graduate students and undergraduates of the bioengineering department and Martine."

Gilpin has generously donated both time and treasure to Clemson's bioengineering department for several years. He helps guide the department as a member of the External Advisory Board. A gift of $250,000 that was announced in 2020 established the John Witherspoon Gilpin, MD '82 Endowed Associate Professorship, now held by Mercuri.

LaBerge said she is grateful for Gilpin's generous support of Clemson bioengineering.

"John Witherspoon Gilpin exemplifies our mission to educate thinkers, leaders and entrepreneurs," she said. "His forward-thinking generosity is helping us attract and retain some of the nation's top bioengineering talent. I thank him for his most recent gift and all he does for the Department of Bioengineering."

Gilpin, who grew up in Columbia, said that when he started at Clemson he knew he wanted to go to medical school after receiving his undergraduate degree. He said he probably would have majored in bioengineering, but it wasn't offered as a Bachelor of Science degree until 2006.

Gilpin instead majored in microbiology. While at Clemson, he served as student body vice president, president of the student alumni council, a member of the Pi Kappa Alpha fraternity and a member of the Tiger Brotherhood, a group he is now helping to reorganize. He was also director of Tigerama, which was sponsored by Blue Key Honor Society, an organization that inducted Gilpin when he was a student.

Gilpin said the roles he held as a student helped teach him to handle the problems he encountered later and helped him become a better physician and faculty member.

"I owe a lot to Clemson for helping make me the man I am now," he said.

Gilpin graduated in 1982 with a Bachelor of Science in microbiology and the Norris Medal, an honor given annually to the best all-round graduating senior. He then headed for the Medical University of South Carolina, where he was a member of the Alpha Omega Alpha Honor Society.

Gilpin is now program director of medical student education in radiology at the University of South Carolina School of Medicine Greenville. He is also a board certified diagnostic radiologist at Prisma Health and medical director of the Radiology Department at Prisma Hillcrest Hospital in Simpsonville.

John Witherspoon Gilpin (center) poses for a photo with Anand Gramopadhye (left) and Jeremy Mercuri.

Gilpin reconnected with Clemson about 10 years ago when Doug Gray, a friend from his undergraduate days, invited him to a gathering at the Clemson University Biomedical Engineering Innovation Campus (CUBEInC) in Greenville. Gray, a senior director of development at Clemson, introduced him to LaBerge.

"I was so impressed with what bioengineering was doing and how it impacted multiple different areas of research and medicine, and I wanted to be part of it," Gilpin said.

Gilpin is the son of the late Albert Thomas Gilpin, who was an independent insurance agent, and the late Ann Witherspoon Bailey Gilpin, a public school teacher.

His father, the first in his family to go to college, graduated from Clemson in 1949.

Gilpin's twin brother, Lewis Bailey Gilpin, is also a radiologist at Prisma Health. Their older brother, named after their father, graduated from Clemson and is an orthopedic surgeon in Florence County. The youngest brother in the family, Boyd Darby Gilpin, died in 2019.

Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences, thanked Gilpin for his gifts and for the time he provides to the college.

"Dr. Gilpin's inspirational leadership is helping create the leaders, innovators and entrepreneurs of the future," Gramopadhye said. "He is transforming lives, and we are indebted for his service to the community and the University."

In his spare time, Gilpin enjoys running, working out, sports, travel and philanthropy. He has run hundreds of road races, including 14 consecutive Boston Marathons.

Gilpin said that as he moves closer to retirement, he will be looking to explore national parks, get more involved with Clemson bioengineering and continue with his personal philanthropy.

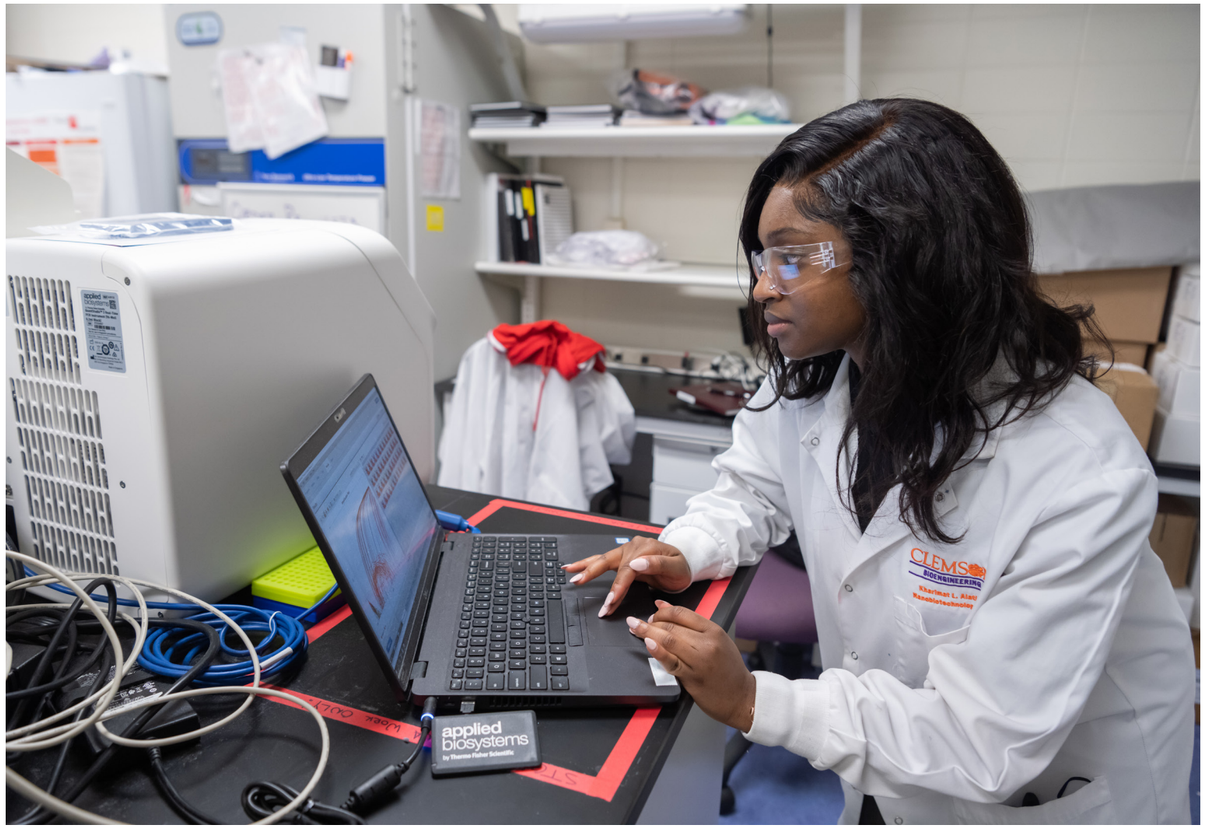
"I'm just trying to be a good steward of the Lord's money," he said.

Whatch on YouTube: *youtu.be/TFp83oLwLBQ*

New Undergraduate Program Seeks to Expand and Diversify the Bioengineering Workforce

Clemson News | Paul Alongi

Angela Alexander-Bryant and Jordon Gilmore, both assistant professors of bioengineering, are organizing Call Me Doctor ESTEEMED Scholars Program.



Clemson University is launching the Call Me Doctor ESTEEMED Scholars Program for undergraduates who are from groups that are underrepresented in STEM and have an interest in conducting biomedically-related research and pursuing a Ph.D. or M.D./Ph.D after completing their undergraduate degree.

The idea is to help underrepresented students overcome the barriers that often keep them from entering graduate programs. Just 7.9% of students enrolled in bioengineering or biomedical engineering nationwide were from groups underrepresented in the discipline, according to the National Science Foundation's 2019 Survey of Earned Doctorates.

The Call Me Doctor ESTEEMED Scholars Program provides programming for first- and second-year students. Scholars will live on campus the summer before freshman year and learn from mentors. The scholars will conduct research during their freshmen and sophomore years and receive a competitive salary.

Angela Alexander-Bryant in her lab with students

Previous research has shown that mentoring and early exposure to activities such as research helps underrepresented students persist in rigorous undergraduate and graduate programs. The new program is designed to help students build confidence, create a STEM identity, and establish a network of peers, faculty and administrators to support them on their academic journey.

The program's organizers are Angela Alexander-Bryant and Jordon Gilmore, both assistant professors of bioengineering at Clemson.

"Our goal is to increase the number of students, particularly from underrepresented groups, who are participating in research early in their college years and then moving on to a Ph.D.," Alexander-Bryant said. "We can also use this as a recruiting mechanism that helps bring in high-achieving students who might have gone elsewhere for college."

Gilmore said the program targets highly talented freshmen and sophomores who will be part of the Honors College in addition to the ESTEEMED scholars program. The program is open to students in bioengineering and bioengineering-related disciplines, including: biological sciences; genetics and biochemistry; electrical engineering; chemical engineering; and materials science and engineering.

ESTEEMED scholars who sign up prior to freshman year will participate in the Summer Bridge Program, which will give them a chance to live on campus before the academic year begins. They will be introduced to research, campus life, mentors and each other.

"The goal is to have the students work together in a cohort model in which they build relationships with each other that can support them throughout their time at Clemson," Gilmore said.

The Call Me Doctor ESTEEMED Scholars Program is funded with $1 million from the National Institute of Biomedical Engineering and Bioengineering's research education program, Enhancing Science, Technology, EnginEering and Math Educational Diversity (ESTEEMED).

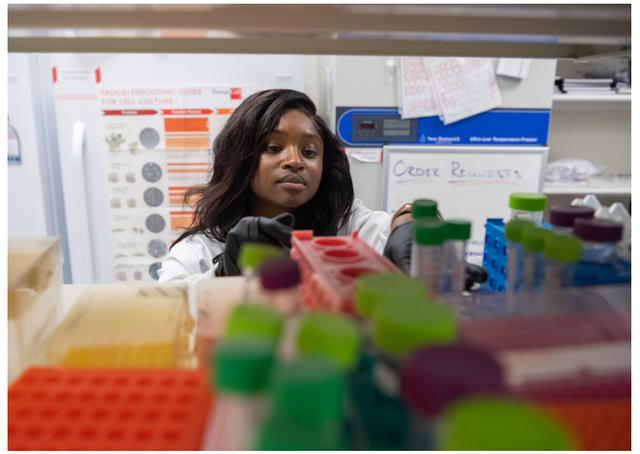
Delphine Dean, chair of the Department of Bioengineering, said the grant was well deserved.

"The Call Me Doctor ESTEEMED Scholars Program incorporates innovative programming, mentoring, research experiences and career development to help widen and diversify the talent pipeline," she said. "I congratulate Drs. Alexander-Bryant and Gilmore on developing the program and finding funding for it."

The undergraduate program is an offshoot of Call Me Doctor, a graduate program established in 2010. Call Me Doctor provides mentoring and financial support to students who are from underrepresented groups and are pursuing doctorates in STEM disciplines. Since Call Me Doctor launched, 85% of participants completed their doctoral degrees.

Some of the mentors to the ESTEEMED scholars will come from Call Me Doctor. Gilmore, who was a fellow in Call Me Doctor before joining Clemson's faculty, is now the program's director.

Robert Jones, executive vice president for academic affairs and provost, said investment in programs such as Call Me Doctor is paying dividends.



"Extending this Part of Call Me Doctor supports Ph.D. students as part of our efforts to expand the STEM workforce, and the ESTEEMED Scholars program will allow us to apply these same successful concepts at the undergraduate level," he said. "These two programs together will be a powerful force for building the workforce of tomorrow in STEM disciplines."

Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences, said the Call Me Doctor ESTEEMED Scholars Program is helping create the leaders, innovators, and entrepreneurs of the future.

"I congratulate Drs. Alexander-Bryant and Gilmore on their award," Gramopadhye said. "Programs such as these are key as we develop career pathways and for students from underrepresented groups and create a more diverse workforce."

The Call Me Doctor ESTEEMED Scholars program will have room for five incoming first year students per year, and the first cohort starts this fall.

For more details, visit the program website click or scan

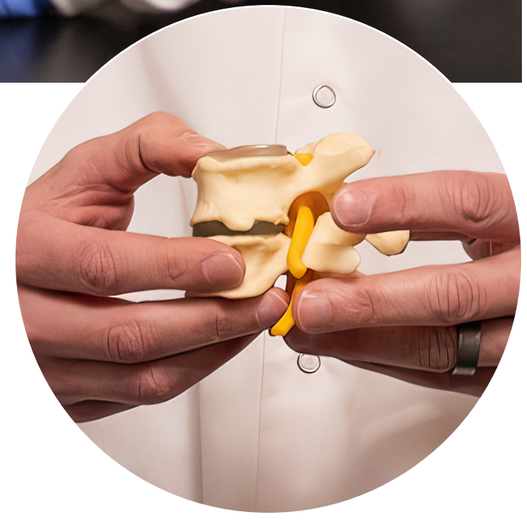
> "I congratulate Drs. Alexander-Bryant and Gilmore on their award. Programs such as these are key as we develop career pathways and for students from underrepresented groups and create a more diverse workforce."
>
> *Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences*

CLEMSON UNIVERSITY'S JEREMY MERCURI

APPOINTED TO LEADERSHIP POSITIONS IN PARTNERSHIPS WITH PRISMA HEALTH

Clemson News | Paul Alongi

▲ *Jeremy Mercuri (second from left) with his students*



Jeremy Mercuri has been appointed deputy director of the Clemson University Biomedical Engineering Innovation Campus (CUBEInC) and faculty fellow in the Clemson University School of Health Research.

Mercuri joined Clemson's bioengineering faculty in 2013 and currently serves as the John Witherspoon Gilpin, M.D. '82 Endowed Associate Professor.

As part of his new duties, Mercuri will serve as the administrative lead for CUBEInC and facilitate programs in health education, research and innovation and Clemson's CUBEInC related partnerships with Prisma Health.

CUBEInC is a 30-000-square-foot facility devoted to education and translational research on Prisma Health's Patewood Hospital campus. The facility was opened in 2011 and has been home to numerous health innovation partnerships and initiatives, including biomedical start-up and orthopedic research partnerships between Clemson and Prisma Health.

As a newly named faculty fellow in the School of Health Research, Mercuri will help lead the development of collaborative health partnerships between Clemson and Prisma Health and study the impact of cigarette smoking on the development and progression of osteoarthritis. The fellowship runs from summer through fall of 2023.

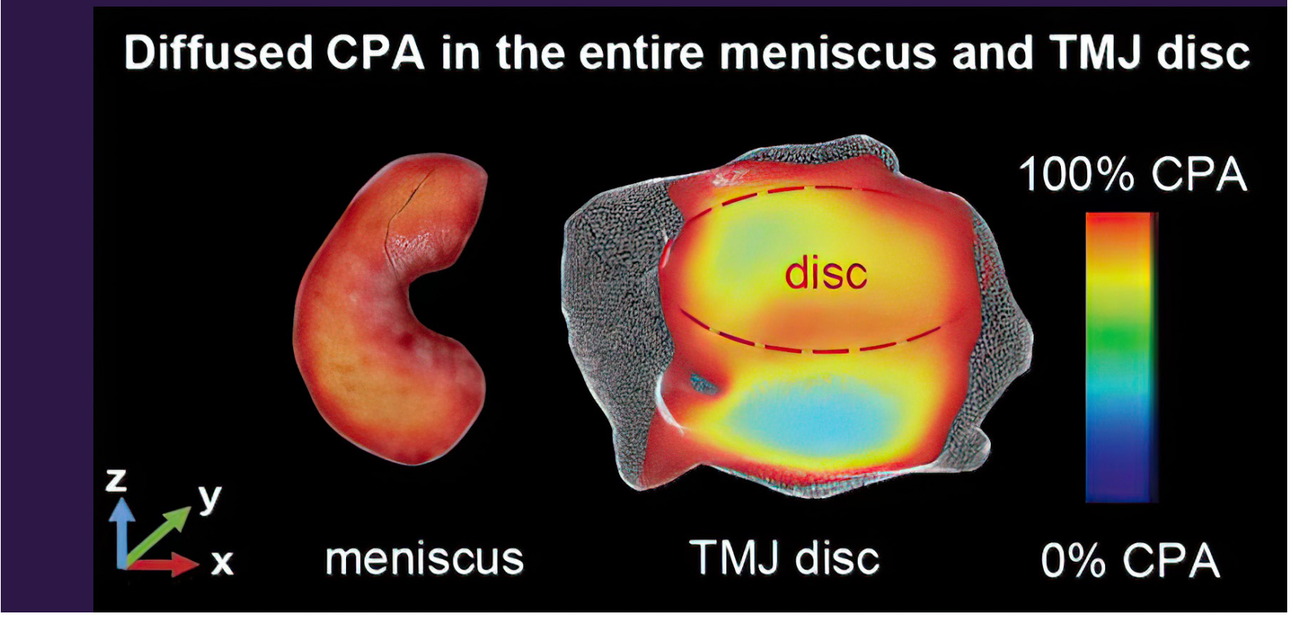
The CUSHR Faculty Fellowship program is a competitive program in which faculty members are selected to spend a semester and summer embedded with Prisma Health. ThefFellow shifts focus from regular teaching duties to develop a comprehensive research agenda with clinical partners, serving as a bridge to additional collaborative research.

Mercuri received his master's and doctorate, both in bioengineering from Clemson, and then went to work in the medical device industry. He returned to Clemson driven by his passion for teaching and research, but he remains actively engaged in the industry.

COOL RESEARCH:

Breakthrough tissue-preservation method offers new hope for knee and jaw patients

Clemson News | Paul Alongi



A study that came out of Clemson University's partnership with the Medical University of South Carolina and an industry collaborator sharpens the focus on the knee or the jaw's temporomandibular joint (TMJ).

New hope for millions of patients who suffer from knee and jaw problems is emerging from a study that came out of Clemson University's partnership with the Medical University of South Carolina and an industry collaborator.

Researchers have found a promising new technique that could help stem the shortage of meniscus grafts. The grafts are often needed to treat injuries and degeneration in the knee or the jaw's temporomandibular joint (TMJ).

The solution involves preserving donated meniscus tissue by freezing it in a process called vitrification. This process allows better storage of grafts for longer periods of time, making more tissue available for transplantation.

The research team was headed by Shangping Wang, an assistant professor of bioengineering at Clemson University. The team reported its findings in the journal Advanced Healthcare Materials.

The challenge: The meniscus is a rubbery, crescent-shaped tissue that cushions the joint and keeps it stable during movement, such as running or chewing. When the meniscus wears out or is injured, it has limited ability to repair itself and causes severe pain and difficulty moving.

Doctors often replace a damaged meniscus in a person's knee or jaw joint with preserved meniscus tissue. But the supply of fresh meniscus tissue falls short of what is needed for the more than 1 million patients who undergo surgical repair or meniscectomy each year.

The primary obstacle is that viable meniscus tissues can be preserved for less than a month, leading to a critical shortage.

In the new study, researchers have proposed a promising solution known as vitrification. The process enables living cells to be chemically treated and then cooled to extremely low temperatures without harming the living cells.

Using vitrification, researchers are able to surround the tissue in a transparent, glassy state. The process effectively prevents the formation of damaging ice crystals within the cells of the tissue.

One of the challenges the scientists faced, though, is that meniscus tissues have dense structures that can be difficult to permeate. It can be challenging to penetrate the tissue with chemicals for preservation, and the tissue becomes exposed to the chemicals for too long.

When that happens, it can harm or kill the cells. To make vitrification work, it is critical to strike a balance between penetrating the tissue with chemicals but not exposing it for too long, researchers said.

The solution: To address the problem, researchers combined computational modeling with micro-CT imaging to pinpoint the crucial balance they wanted to achieve. They were able to determine the minimal exposure time necessary to effectively penetrate the tissue during vitrification, while avoiding damaging or killing the tissue.

The researchers then used what they found in the computational model to effectively preserve whole meniscus tissues both in knee and jaw joints.

The upshot of the study is that the vitrified meniscus tissues can be stored at very low temperatures for a long time, making the tissue suitable for transplantation.

"This pioneering work represents the first successful application of vitrification strategies to preserve whole viable grafts in both tissue types which opens new avenues for the successful preservation of various avascular tissues and holds the promise of facilitating widespread adoption of viable graft transplantation and research endeavors," researchers wrote.

The title of the study is "Viable Vitreous Grafts of Whole Porcine Menisci for Transplant in the Knee and Temporomandibular Joints."

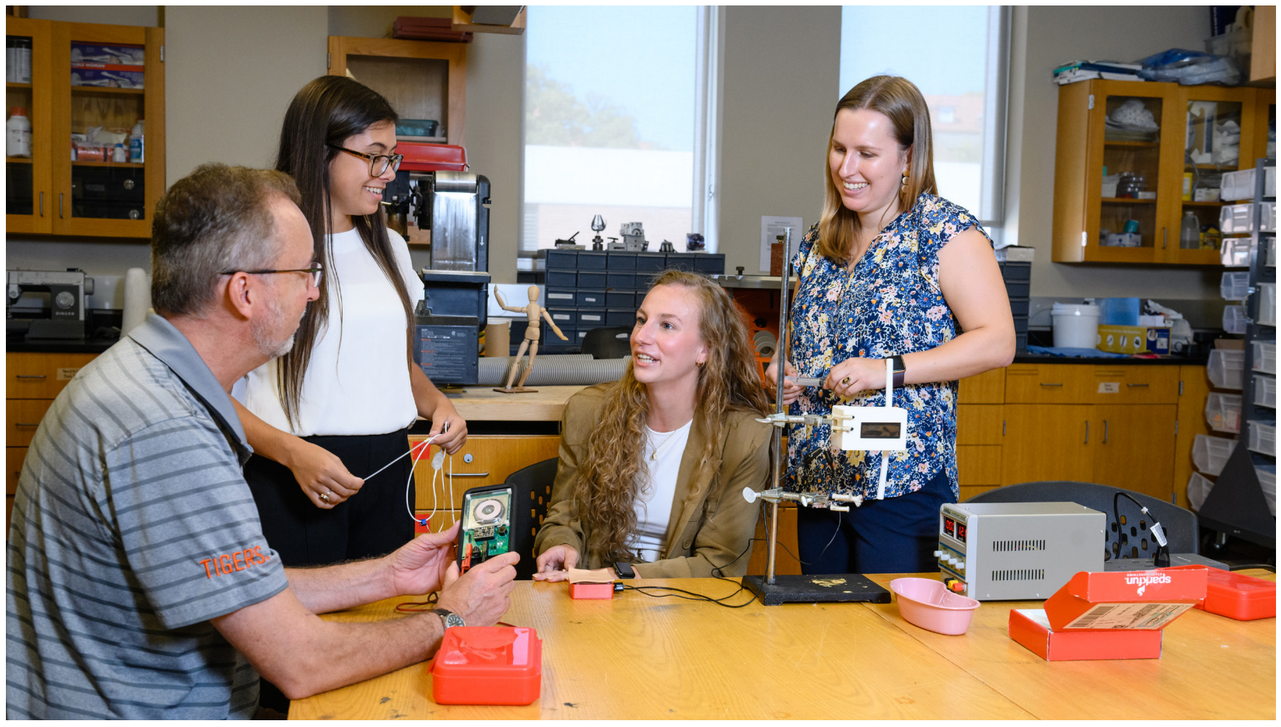
A provisional patent stemming from the work has been established through the Clemson University Research Foundation, with backing from Executive Director Chris Gesswein.

The Musculoskeletal Transplant Foundation was a partial funding source for Wang's research.

Equally contributing authors of the study are Dustin Mueller, a DMD/PhD student from the NIH T32 dental research training program within the Clemson-MUSC Bioengineering Program and Hai Yao, Clemson's associate vice president for biomedical Innovation.

CLEMSON UNIVERSITY BIOENGINEERS *WIN TWO NATIONAL TITLES AT COLLEGIATE INVENTORS COMPETITION*

Clemson News | Paul Alongi



From left: John DesJardins poses with CatheSure team members Jordan Suzanna Cole, Allison Reichart and Kathleen Fallon.

A team of Clemson University bioengineering students that has been winning accolades for its novel medical device triumphed in its biggest national test so far, taking first place in the undergraduate category and receiving the Arrow Electronics People's Choice Award at the Collegiate Inventors Competition.

The all-woman team is composed of Jordan Suzanna Cole, Kathleen Fallon, Karly Faith Ripple and Allison Reichart. They created the CatheSure, a device designed to prevent unnecessary surgery in hydrocephalus patients.

The Clemson bioengineers traveled to the U.S. Patent and Trademark Office in Alexandria, Virginia from from Oct. 10-13 to face off against undergraduate teams from four other universities that have created inventions of their own.

The team's innovative solution, which involves remote pressure monitoring, had previously won or placed highly in several local and regional contests, including second place in last spring's Atlantic Coast Conference InVenture Prize competition.

When the students began the project in fall 2021, they were seniors majoring in bioengineering. Cole, Fallon, Ripple and Reichart stayed at Clemson after graduation and are now pursuing master's degrees in the same discipline. Sarah Anne Stevens, who also helped create the CatheSure as an undergraduate, is now a medical student at the Medical University of South Carolina.

The CatheSure is designed to wirelessly detect shunt malfunctions in hydrocephalus patients in less than five minutes. Hydrocephalus patients, often children, suffer from a build-up of cerebrospinal fluid in their brains, and a shunt is surgically placed in the body to help drain the fluid.

When the shunt malfunctions, it can result in symptoms, such as nausea, that could be linked to a wide range of maladies and are difficult to diagnose. The CatheSure is designed to make diagnosis faster and less invasive, helping prevent unnecessary exploratory brain surgeries, prolonged hospital stays and repeated radiation exposure.

The Clemson team is advised by John DesJardins, the Hambright Distinguished Professor in Engineering Leadership, and Tyler Harvey, a lecturer, both in the Department of Bioengineering.

Earl Christopher Troup, a pediatric neurosurgeon at Prisma Health who has advised several groups of Clemson bioengineering students, served as clinical advisor to the CatheSure group.

> **"What has been interesting with this group is that they have complementary strengths, and they are very energetic," Troup said. "Those factors have pushed them beyond what other groups have been able to do."**

Team members said the CatheSure kept them motivated during senior year and inspired them to pursue master's degrees. The amount of work they have put into the device over the past year has been about the equivalent to a full-time job, they said.

> **"We call it our child," Reichart said. "I think I've learned more working on the CatheSure in one year than in my whole life. I've never been tested in the ways we've been tested."**

All seniors in bioengineering are required to form a team that identifies an unmet medical need with a clinical mentor and then designs a medical device to meet the need. The CatheSure started as one of those projects but soon became much more than a mere graduation requirement.

Team members said they started as acquaintances and classmates and that the project brought them closer together.

> **"We stayed up until 3 or 4 a.m. in the lab almost every night," Fallon said. "We figured out each other's strengths and weaknesses and how to put everything together to create a really, really good final product. It was a lot of fun, especially when we started winning and I was able to share that with people I thought of as best friends."**

Cole said that as the group became close knit, she learned about herself and became a better engineer.

> **"Being surrounded by such great group mates, I learned a lot about my problem-solving skills," she said. "We were running into obstacles often, such as parts being out of stock. One time something was supposed to be 3D-printed and it wasn't, so I had to find another way. It was really a great experience getting to know my group mates and knowing that I'll have them for the rest of my life."**

The Clemson team is among five teams of finalists in the undergraduate category of the Collegiate Inventors Competition. Other teams are from Virginia Commonwealth University, Drexel University, Johns Hopkins University and the University of California, Santa Barbara.

> **"The Clemson team has worked hard for more than a year on the CatheSure, and its position in the competition is well-earned," DesJardins said. "The Collegiate Inventors Competition is among the nation's most prestigious contests of its kind. Just being named a finalist is an honor."**

The competition will be held Oct. 11-12 and is sponsored by the National Inventors Hall of Fame.

As the Clemson bioengineers make preparations for Alexandria, they are building on prior success. The team took first place in spring 2022 in two Clemson University competitions, the CECAS SPARK Challenge and the Walter Hunter Business Plan Competition and Lecture Series Pitch Smackdown.

The SPARK Challenge victory earned the team a spot in the Atlantic Coast Conference InVenture Prize competition, where the team took second place. The team also took first in PDMA Carolinas student innovation competition.

The team's success showed its diverse skill set, Ripple said. The members not only used technical abilities to create the CatheSure, but they also honed the business skills needed to bring it to market. In competitions, the bioengineers have had to answer tough questions about FDA approval, how much the device will cost and when investors can expect to see a return.

> **"It really prepared us," Ripple said. "If we want to sell our idea to a bigger company, we could, and it gives us a big leg up for job opportunities in the future."**

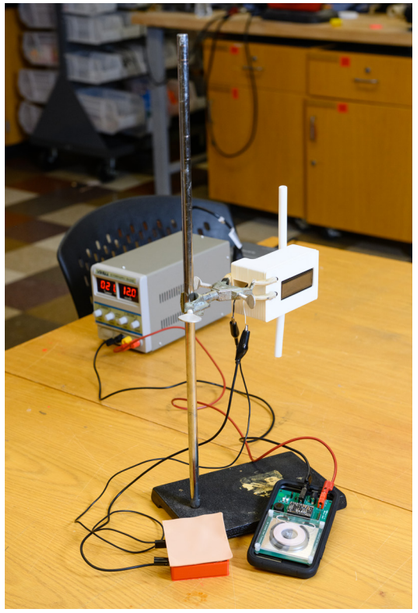
DesJardins said the CatheSure team is one of two teams of Clemson bioengineers headed to national competitions. U CANnula won a Clemson bioengineering department competition and has entered the Biomedical Engineering Society's Senior Design Competition. Members are Laurel Egerter, Rachel Audrey Emerson, Julia Mae Lunt, Lily Elizabeth Sykes and Alex Tedeschi.

Whatch on YouTube:
https:youtu.be/haU9ABGLVOc

click or scan

Martine LaBerge, former chair of the Department of Bioengineering, said the teams' successes underscore the high level of talent the department is attracting and cultivating.

> **"We are educating nationally competitive leaders, thinkers and entrepreneurs of the future," she said. "I congratulate both teams on their well-deserved success and thank the members for representing Clemson so well on the national stage."**



Bioengineering department alumni inducted into the Thomas Green Clemson Academy of Engineers and Scientists

Clemson News | Paul Alongi

Clemson University's largest college inducted four alumni into the Thomas Green Clemson Academy of Engineers and Scientists and recognized two others as Outstanding Young Alumni during a rooftop gala on May 4 at the Watt Family Innovation Center.

The College of Engineering, Computing and Applied Sciences selected Marshall Brown, Harold Gillens, John Witherspoon Gilpin and Jeff Schmersal for membership in the academy, the college's highest honor. Angela Johnson Culver and Amy Hixon are this years' Outstanding Young Alumni.

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.

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 the honorees left their marks in their own unique ways.

"We will always cherish the fact that your Clemson University education contributed to your success," he said. "On behalf of the Clemson family let me once again congratulate today's inductees for enriching our lives. As exemplary ambassadors of Clemson, we are eternally grateful to you."

Here's a look at bioengineering department honoree:

John Witherspoon Gilpin

Gilpin is the program director of medical student education in radiology at the University of South Carolina School of Medicine Greenville. He is also a board-certified diagnostic radiologist at Prisma Health, and medical director of the radiology department at Prisma Hillcrest Hospital in Simpsonville. He has generously donated both time and treasure to Clemson's bioengineering department. In 2020 he established the John Witherspoon Gilpin, MD '82 Endowed Associate Professorship, and late last year provided for the establishment of the John Witherspoon Gilpin, MD '82 Distinguished Professorship in Bioengineering. His gifts help pay for research support, travel, student assistance and research equipment. Gilpin's concept of servant leadership began as a student at Clemson. He served as student body vice president, president of the student alumni council, was active in the Pi Kappa Alpha fraternity and was a member of the Tiger Brotherhood. Gilpin credits the roles he held as a student for helping him become a better physician and faculty member.

Discovery of Skin Care Products on Aging: Interview With Dr. Naren V., Bioengineering Professor and Neolastin's Chief Scientific Officer

Naren Vyavahare, Tara Cohen

Tara Cohen, Neolastin's SVP of Marketing & Development, sat down with Dr. Naren Vyavahare to find out about his vast research on elastin, what makes Neolastin skincare so different, how he discovered our patented NUFLEX™ technology, and what impact it can have on aging skin.

Tara: *Let's talk a little bit about your background first. With 15 Interna onal and US patents, plus many awards including the McQueen Quattlebaum Faculty Excellence Award, Faculty Mentoring Award and the Alumni Award for Outstanding Achievement, you've accomplished quite a lot!*

Dr. Vyavahare: Thank you. I've been a Professor of Bioengineering at Clemson University for the past 23 years, with a PhD in Chemistry.

My area of study is cardiovascular conditions. They're the leading causes of death not only in the United States, but worldwide. We really wanted to discover what conditions make cardiovascular diseases worse. One protein found in our arteries and heart is called elastin. Elastin protein is like a rubber band that gives elasticity to your arteries. So, when your heart is well-functioning it is pushing the blood through your arteries. Your arteries and heart are more elastic so they can move blood to flow effectively to your organs.

As you age, you get plaque in your arteries and that makes your arteries become stiff. Then they don't work well and the elasticity they used to have is lost. This elastin protein is only made once. The elastin that's in your arteries, lungs, skin is made when you are about 15-20 years old - and then rapidly declines from there. Our cells really can't make elastic fibers after that.

This is the problem that happens with cardiovascular conditions, we lose elastin. Our bodies can keep making collagen, but that doesn't really give elasticity, that rubber band like property that elastin has. When that happens our arteries get stiff, that puts more pressure on the heart, and the heart gets bigger. Eventually the heart can get hypertension.

So, my research for the last 20 years has been to understand why elastin degrades. How can we stop the degradation of elastin? Is there any way to repair elastin?

T.C.: *What did you find?*

Dr. V: Elastin is a very complex protein, and when it degrades, there's no way to stop it. In our research we found a compound called polyphenols (PPs). What's great about it is that when inflammatory

enzymes (from inflammation in our skin and bodies) chew on the elastin in your skin it causes degradation, but when these PPs bind to the elastin fibers it blocks the enzymes from chewing. So, the PPs first help stabilize the elastin that you have. Second, as we get older and that assembly line of elastin production starts to get chewed apart and degrade, the PPs help a ract other small molecules, called tropoelastin made by cells, to bond to it, reinforcing and repairing the elastin fibers.

T.C.: *You mentioned inflammation, what else can degrade your skin's elastin?*

Dr. V: The inflammation can be due to smoking and heavy drinking. They cause internal inflammations that can affect your elastin, your skin and its health. But as we age, sun damage or photooxidative stress damage from the sun is the most impactful assault to our skin. Environmental free radicals are very reactive and they can break down both collagen and elastin in the skin. Think of how a rubber hose left outside in the sun slowly cracks and degrades. As a result of free radical damage, our skin cells can become inflamed. That inflammation can also cause a slow degradation of elastin – and the assembly line of elastin that crosslink to form the band-like strength.

T.C.: *What's in Neolastin's NUFLEX™ technology?*

Dr. V: In our NUFLEX™ we have a special polyphenol, which restores and repairs elastin. We have collagen producing peptides, hyaluronic acid (HA) and microhyaluronic acids. You need all three to make your skin supple and strong. Additionally, we have GABA-Care which increases natural collagen and HA production in the skin; Ectoin to protect skin from UV-induced cellular damage and prevent skin dehydration; and finally, we have Matrixyl 3000, an anti aging peptide that promotes the production of natural collagen and HA in the skin.

T.C.: *I find it interesting what you said earlier, that collagen can be reproduced your entire life. There are many skincare products with peptides and collagen in them, and you can get collagen injections. Plus, HA can be found naturally in your skin or can be easily supplied back into your skin. The key factor here is Neolastin's patent around NUFLEX™ technology with mini/micro hyaluronic acid, which is unique. Can you talk a little bit about that?*

Dr. V: Anything that you apply topically has to absorb into the top epidermal layers of skin. Something with a large molecular weight will just sit on the top of the skin and get washed away. You need

very small molecule sizes to really work. Our micro HA can not only hold water for hydration, but has also been shown to Improve elastin production in the skin. So, it boosts hydration and helps cells make more elastin.

T.C.: *The elastin part is really the breakthrough of NUFLEX™ technology. It's what differentiates Neolastin from other skincare brands. The polyphenols are critically important. Are they naturally derived? Why are they special?*

Dr. V: Polyphenol cells are a very good compound that have been known for years. They have antioxidant properties. They can help block/prevent free radical and oxidative damage to the skin because they're antioxidants. But the polyphenols binding to the elastin is a unique thing. Our patent shows that we can stabilize elastin with our unique polyphenols. They sit there and they will not allow enzymes to degrade the elastin. They are small molecules so they can penetrate the skin and keep binding for many months. It's not a one-time thing. It's a hydrophobic binding not chemical; it's a physical absorption and will stay there for 6-8 months. It does not wash away. Once it's there, it can also attract tropoelastin molecules which accumulate on top of the special polyphenols and cross-link to make elastin fibers again. It's like an assembly line creating new elastin. But without the polyphenols to bind them together, the tropoelastin would just wash away in your blood or urine.

T.C.: *I think that's the key, and the amazing part about this. The origins of our patented polyphenol are really truly based in science. You're working with it on an internal level with arteries, aneurysms and lungs. This is the same polyphenol that we're applying topically in the Neolastin skincare system. This ingredient has very beneficial applications on a scientific and humane level as well. That's our differentiator.*

Dr. V: Yes, this polyphenol naturally helps your own elastin to be stabilized, while also encouraging and aiding your cells to create more elastin and collagen. No other skincare brand can claim this. And we've won awards for it, including the ***2021 Global Beauty & Wellness Award for Best Emerging Cosmetic Product*** for our Revitalize & Firm Eye Cream. The science is there, it really can transform your skin. We made sure to include it in all three of our core skincare products, in addition to the eye cream we have our Rejuvenate & Hydrate Moisturizing Cream and the Face & Neck Regenerative Serum. Used individually or as a system, our clinical studies show that consumers can see results in 28 days.

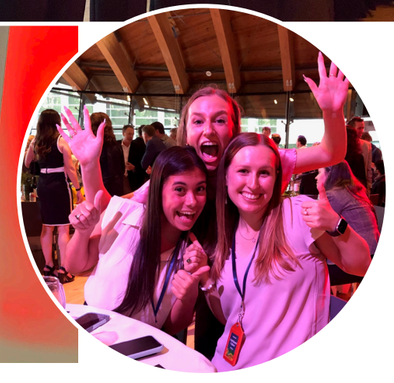
For more information, or to purchase Neolastin products, go to https://www.neolastin.com

Heartland Competition:

M.ENG STUDENT TEAM WINS NATIONAL AND INTERNATIONAL AWARDS

Richard diMonda

During the '22/'23 academic year, for the first time one of our M.Eng project teams (Cathesure – Hydrocephalus Shunt Malfunction Sensor) competed in national business plan competition (The Heartland Challenge). Out of 92 entrants, the team finished fourth. They successfully competed against established start-up companies with experienced executive management teams. This was significant considering the M.Eng team was composed of only engineering students who managed to field sophisticated business and financial questioning exceptionally well. This project team also recently won The Product Development and Management Association's Global Student Innovation Challenge placing 1st out of 15 teams from 9 universities fielded from 4 countries.



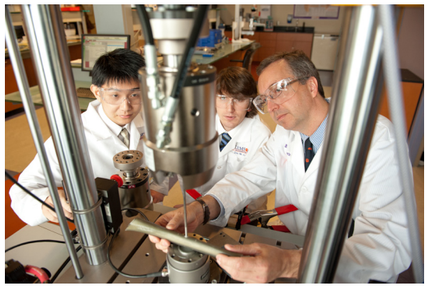
From left: Jordan Cole, Ally Reichart, Kathleen Fallon, Rich diMonda (Professor of Practice - BioE).

John Desjardins Appointed Interim Director of Robert H. Brooks Sports Science Institute

Clemson News | Kayla Rogers

John DesJardins, Ph.D., has been appointed interim director of the Clemson University Robert H. Brooks Sports Science Institute (RHBSSI).

As part of this appointment, DesJardins will engage with Institute collaborators and campus leaders to develop and implement a new strategic plan to support the mission of the Institute.



"John's expertise will serve Clemson well as he engages with campus leaders to develop and implement a new strategic plan, supporting the Robert H. Brooks Sports Science Institute's mission of serving as a multi-disciplinary platform for the academic study of sports sciences across the University."

Clemson University Executive Vice President for Academic Affairs and Provost Robert H. Jones

About DesJardins

DesJardins is the Hambright Distinguished Professor in Engineering Leadership and a professor in the Department of Bioengineering. An Institute fellow since 2021, DesJardins completed many collaborative research projects with the assistance of RHBSSI seed funding, including a golf swing balance mechanics study, a wheelchair tennis match movement study, and a football head and helmet impact mechanics study.

DesJardins joined Clemson in 1998 as a research associate in Bioengineering. After receiving his Ph.D. in Bioengineering in 2006, he began a faculty position in 2008 in the area of biomaterials and biomechanical engineering. He has co-authored over 350 abstracts and journal publications, and mentored over 200 undergraduates, 33 master's and 13 doctorate students in their research. His work is highly multi-disciplinary, with projects in orthopedics, biomaterials tribology, biomedical device design, sports biomechanics, rehabilitation, engineering education and mechanical testing.

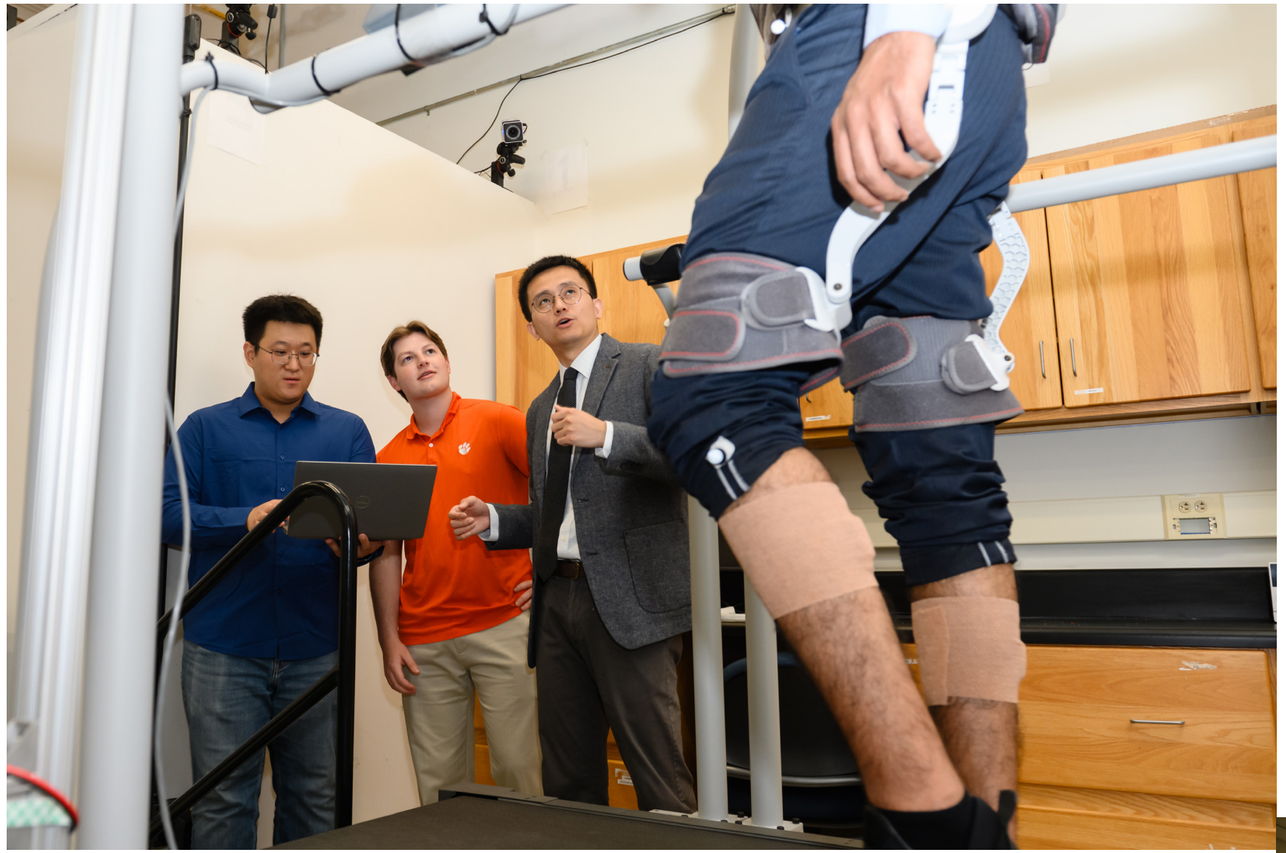
"I have enjoyed serving as a fellow for the Institute and am excited to be stepping into the role of interim director for RHBSSI," said DesJardins. "I am looking forward to working with collaborators across campus to develop a new strategic plan for the Institute. Our mission is to support and promote the work of students, staff and faculty towards enhancing the athletic experience at Clemson. Together we discover new ways to tell Clemson's story through the narrative of sports, and share our successes one step at a time."

DesJardins began his position on January 2, 2024. RHBSSI founding director, Brett Wright, Ph.D., will retire from Clemson May 15.

About RHBSSI

Thanks to the generosity of the late Robert H. Brooks, '60, the Institute began in the 1990s with a founding emphasis on motorsports engineering, sports communication, sports management and sports marketing. Expanding to other disciplines across campus, the Institute seeks to define, enhance and promote the role of sports in academia and society. It provides experiential learning opportunities through academic programs, research, sports organizations and support for service and outreach programs. Through all of its activities, the Institute works to support the work of faculty, staff and students, disseminate knowledge, enhance the understanding of the significance of sport in modern society and prepare students to perform at the highest levels within sports industries.

Clemson University undertakes this mission out of deep respect for Robert H. Brooks and as testimony to his love for Clemson University and his love for sports.



STROKE PATIENTS COULD GET HELP WALKING THANKS TO EXOSKELETON RESEARCH

Clemson News | Paul Alongi

Exoskeletons that are designed to help stroke patients walk, soldiers carry heavy loads and manufacturing workers avoid muscle fatigue could become easier to customize to each individual with the help of new research at Clemson University.

Ge Lv, an assistant professor of mechanical engineering and bioengineering, said the project he is leading focuses on exoskeletons for the legs but could later be applied to devices for the upper body.

The research has the potential to help expand the use of powered exoskeletons, which are robots that can be worn on the body to enhance physical abilities.

One of the major hurdles to more widespread use is that it typically takes a team of engineers and therapists hours of trial and error to customize a single exoskeleton for one person, Lv said.

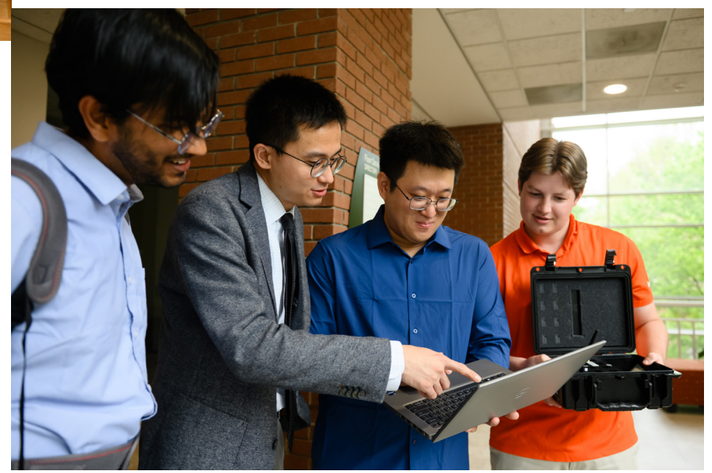
Even then, the exoskeleton can be adapted for one type of movement, such as walking, but doesn't accommodate the many different types of motion a person performs in a day, he said.

Instead, Lv and his team are working on new strategies that would help powered exoskeletons adapt to different tasks and people more quickly.

"A key feature is going to be rapid customization, meaning the exoskeleton is going to achieve the task quickly rather than having to wear the device for months before it knows what is going on," Lv said.

Lv said the research was inspired in part by his grandfather, Zhenguo Xing, a policeman who suffered from Parkinson's disease. Normally simple tasks such as walking or drinking a glass of water can be difficult for Parkinson's sufferers because the disease causes tremors.

▲ *Master's student Hamdan Khan wears an exoskeleton while walking on a treadmill in Ge Lv's lab while Ph.D. student Miao Yu (far left) and undergraduate Tapp Rhoads (second from left) and Lv watch and discuss their research.*



▲ *From left: Hamdan Khan, Ge Lv, Miao Yu and Tapp Rhoads huddle around a laptop after testing an exoskeleton.*

Lv wanted to do something to help.

He began his work with robots and exoskeletons when he went to the University of Texas at Dallas to pursue his Ph.D.

While working with stroke patients, he was surprised to learn it took almost a full work day for one patient to participate in experimental trials and rehabilitation.

"The exercises could assist people, but what is the cost in terms of finances or time?" he said. "I began to ask, can we do something as engineers to reduce these kinds of things? Can we lower the burden for therapists and patients?"

The experience gave him the idea to focus on new strategies for exoskeleton customization.

Lv is now conducting his research as part of a CAREER award from the National Science Foundation.

In addition to the research, he plans an interdisciplinary education program that includes lab tours for K-12 students, promoting wearable robot awareness among traditionally underrepresented groups, workshops to teach bioengineering students how to work with exoskeletons and opportunities for students in electrical and computer engineering and mechanical engineering to learn to use a motion capture system and muscle sensors.

STUDENT BIOENGINEERING TEAM WINS NATIONAL COMPETITION FOR U-SERT MEDICAL TECHNOLOGY

Clemson News | Paul Alongi

Four recent Clemson University graduates will collect a national award this month for creating medical technology designed to help nurses monitor babies for urinary tract infections.

Reagan Hamm, Allie Beiter, Maddie Thomas and Anna Wichmann were students last academic year when they developed the U-Sert, which adheres to diapers and changes colors to signal when the child has an infection.

All four all graduated in May and pursued further education or went on to professional jobs in healthcare. Their invention won a part of the DEBUT Challenge called the NINR Technologies to Empower Nurses in Community Settings Prize.

The DEBUT Challenge is a nationwide competition offered by the National Institute of Biomedical Imaging and Bioengineering and the nonprofit VentureWell.

The team's advisors were John DesJardins, the Hambright Distinguished Professor in Engineering Leadership, and lecturer Tyler Harvey, both in bioengineering.

"The award is a testament to the brilliance and hard work displayed by Reagan, Allie, Maddie and Anna," DeJardins said. "They have demonstrated a passion for making a positive difference and a willingness to disrupt the status quo. They are excellent ambassadors for Clemson bioengineering and I offer them my congratulations."

The four Clemson students, who called their team RAAM Inc., learned in August that the U-Sert had won and that they will receive $15,000 in prize money. They will be presented with their award in Seattle this month at the Biomedical Engineering Society conference.

◀

The team that developed the U-Sert included (from left to right): Maddie Thomas, Anna Wichmann, Allie Beiter and Reagan Hamm.

"I was already so proud of our team for all of the hard work we have dedicated to the U-Sert, but winning a DEBUT award really amplifies that feeling," Hamm said. "It is so fulfilling to know that other people also see potential in our device, especially when it has the ability to make a positive impact on people's lives."

Beiter said working on the U-Sert added a sense of purpose to her studies and solidified her decision to pursue a career in healthcare.

"It also served as a reminder of how important communication is," she said. "To ensure a cohesive, functional design, we had to communicate constantly within our team and with faculty members, clinical collaborators, and even medical device manufacturers. Communication is a skill that is invaluable regardless of career path."

Thomas said the U-Sert work gave her an opportunity to apply what she learned as a Clemson student, build a tangible device and work with experts in clinical, industry, and academic settings.

"Currently, I am working with kidney transplant patients at the Medical University of South Carolina," she said. Working on the U-Sert with our clinical collaborator, Dr. Sudha Garimella, M.D., of Prisma Health, gave me a great background in nephrology that I apply every day at my job."

Wichmann, who is now an IPS planning engineer at KLS Martin, said the U-Sert project gave her a behind-the-scenes look at what goes into creating a medical device.

"I am currently working at a company that creates a variety of custom products for orthognathic surgery," she said. "So, having that background knowledge of how things go from an idea to a fully functional device just helps me understand and appreciate the whole process that much more."

National Society of Black Engineers (NSBE) 49th annual National Convention:

Celebrating the excellence and diversity in the field of engineering

Sydney Savage

A significant milestone in achieving this mission has been our participation at the Annual NSBE National Convention.

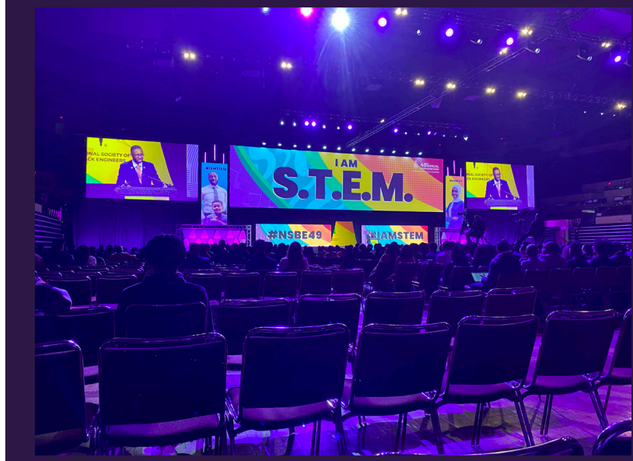
In the back row starting from the left: Gabrien Gillespie, DeAundre Cooley, Derrick Joyce, A.J. Garrett, Christopher A.J. Sanders, Zach Cartledge, and Willie Ferguson
In the middle row: Sydney Savage, Assiatou Wann, and Ansley Morrow
In the front row: Daylon Boone

The National Society of Black Engineers (NSBE) has stood as an influential organization, dedicated to its mission for nearly five decades – increasing the number of culturally responsible black engineers who excel academically, succeed professionally, and positively impact their communities. On Clemson's campus, our chapter works diligently to embody this mission, exposing our students to professional opportunities and fostering confidence as minorities in a prestigious field. A significant milestone in achieving this mission has been our participation at the Annual NSBE National Convention.

This highly anticipated event draws thousands of students from across the country, uniting chapters to celebrate the excellence and diversity in the field of engineering. The convention provides invaluable opportunities to network and gain wisdom from professionals acclaimed in their fields. The convention features a dynamic career fair, connecting students with hundreds of potential employers, including esteemed companies like NASA, SpaceX, DuPont, Boeing, and more, to explore numerous job opportunities. Additionally, those considering graduate school, also have the option of connecting with college representatives and scholarship opportunities as well.

Thanks to the generosity of the departments in the College of Engineering, Computing, and Applied Science, thirteen students, including myself, were provided the opportunity to attend the 49th Annual NSBE Convention in Kansas City, Missouri, last year. This convention was a truly once-in-a-lifetime experience, instilling in me not only a sense of pride in my culture but also in my school, as we proudly represented Clemson University to employers and other NSBE chapters who hold our institution in high esteem. So much so, that all thirteen of us in attendance successfully secured at least one full-time job offer from companies such as Lockheed Martin, Boeing, Pfizer, Johnson & Johnson, and Toyota, totaling an impressive 26 job offers.

As we prepare for this year's 50th annual convention, located in Atlanta, Georgia, we're excited to share we're ambitiously aiming to bring a record number of students to experience this incredible event. NSBE continues to unite the best and brightest minds in the field of engineering, celebrating achievements, fostering professional development, and promoting diversity and inclusion and we aim to grow our numbers and expose even more individuals to this enriching experience. The 50th Annual Convention of the National Society of Black Engineers promises to be impactful and a testament to the organization's ongoing commitment to empowering and inspiring the next generation of black engineers.



Collaboration Between Clemson Bioengineering and SCbio:

Developing the Next Generation of Medtech, Life Sciences Innovations, and the Workforce Itself

Hobey Tam

The problem with innovation

Why is making new, innovative things so hard? Especially medtech to literally save people's lives? The first time I started a medical device company felt like getting jumped into brawl. Knocked down then kicked in the stomach and continually get stomped on. You get up only to be knocked down again and again. The only way your little start-up survives is if you figure out how to fight before you run out of blood - aka cash. When you are trying to create new value for the world, treading water feels like drowning and you have no clue what direction to swim in to reach land. But you know you have to do something because staying put is simply waiting to die.

These lessons and skills are completely absent from education because they are impossible to teach in the safety of a classroom. We have not figured out a way to simulate game time in the confines of academia yet.

Most people would say it's hard to innovate new things because we do not know enough. I do not believe this to be true. We have so much science. So many facts. So much information. So many humans doing so many different things nowadays. Remember, we got to the moon on less computational power than a singing birthday card. Today, I can summon a global supply chain to deliver me anything at the tip of my finger. Access the global hive of human knowledge through something that fits in my pocket. And I can do all this without getting out of bed. Therefore, I have a hard time believing that innovation is bottlenecked because of a lack of knowing things or people being able to do things.

If it is not for a lack of knowing things, then why do we still not have nice things? Let's revisit the analogies from the beginning. Why are you alone in a fight against many? Who put you out in the ocean by yourself? Both these situations have the same thing in common - you are alone and for whatever reason you are trying to solve an impossibly complex problem no one person can solve in their lifetime. A lot of these problems require a team to solve - or better yet - a community of like-minded individuals moving in the same direction with a collective toolbox of tried and tested methods that can be shared with you. The problems do not go away nor do they get easier. However, they can be broken down to more manageable, solvable chunks that can be built back together into a robust solution through knowledge sharing and combined efforts. ***The real underlying problem is communication and specifically the lack of a community that exists to promote communication between the fractured silos of the different links of the MedTech and life sciences value chain within SC***.

The real problem

The worst feeling a human can have is the infinite emptiness that your life, your loved ones lives, and all the collective consciousness of humankind has no meaning. That all your efforts are in vain and there is no hope that things will feel better. These feelings exponentially spiral out of control when you are alone and it feels like drowning. You are merely a stranded homeless gear alone spinning until your energy runs out. So many gears spinning alone - the teeth just missing the next gear to do some real work. There is no one articulating these gears together into systems that produce meaningful outputs for society.

I saw it as a freshly minted PhD. You come out of academia with all the IQ but no EQ. You could design a solution to end all pain and suffering in the world but because academia spends near zero time developing

communication skills, your ideas die with you never being realized. As if it never existed. I don't know what is more tragic - that we ***could not figure out a solution*** or if we ***knew of a solution*** and simply could not work together to make and give it to people that needed it. Almost nowhere in my 10 years of engineering schooling was communication skills emphasized nor developed. If I had a great idea, I was blind to the other wars I had to fight to commercialize it. There was no support network to go to if I was stuck. And even if there was, I had no clue how to ask for help. I put myself out in the ocean to drown. I chose to walk into a fight by myself.

I see it almost daily as an educator - students are not taught to ask the right questions, seek the right help, communicate in teams, operate under duress, hold peers accountable in difficult conversations, market themselves in interviews, nor network and build meaningful relationships that lead to opportunity. To feel fulfillment in their lives. So many students put themselves out on an island and become frustrated when they do not have an opportunity lined up after graduation. They go to years of school - their entire adult lives - going into massive debt and develop these romantic illusions of their dream job. Then they reach senior year where they are on the cusp of the "real world" in what should be the climax of their education and are instead forced to confront the notion of "is this what I am going to do for the next 50 years until I retire and die leaving no measurable impact in the world?" No one is there to correct this perspective through mentorship and the student goes forth with blinders. These students do not need to meet every day for a therapy session - no - they are actively seeking internships, co-ops, and quarterly mentor meetings over coffee to better understand what they can do with the trajectory of their life. That's all they need - some real data points to bolt down the theory they have learned in the classroom.

And I especially saw (and still see as an operator) communication as a bottleneck when starting and operating my own company. Finding your first customer and managing expectations with leads. Marketing. Telling your story to investors. Contractors. Managing first employees. Changing regulation. Dealing with the tax office. Legal. The first time someone sues you. The first time you have to sue someone else. All these speeding tickets start to add up on your cash flow statement as your bank account runs drier and drier. You find out that your success as an entrepreneur is half dependent on you figuring out the solution ***as well as*** figuring out how to communicate your ideas to all the different people that need to work together to get this solution to the masses. And of course, all this has to happen before you run out of

I don't know what is more tragic - that we could not figure out a solution or if we knew of a solution and simply could not work together to make and give it to people that needed it.

cash. Trying to do this in the wild west that is the innovation sector in SC is near impossible because of the fractured landscape.

People's lives are literally at stake when we are talking about the medtech and life science space. Having an organized community and place where we can break down these communication barriers is vital to the growth of an industry. Thankfully there exists such a network in the our state and it is called SCbio. SCbio is a non-profit organization and industry association that actively breaks down these barriers by putting people in touch with the right people swimming in the same direction... Articulating the gears. The only price for admission for students into this network is that you actively participate. Led by industry leaders, workforce development is a priority for this organization. SCbio regularly holds industry-student events geared toward connecting college students to life sciences leaders in the state.

I have gone to SCbio events as a student, business owner, operator, and now as an educator. Whether you are looking for a contractor, employees, further development of existing employees, a job yourself, relationships, mentors, getting the newest insight in an ever-changing industry, or simply looking to be around like-minded people to keep you going forward in life, SCbio has never disappointed me.

Has SCbio fulfilled its mission? It's a work in progress. Led by sector input, the organization continues to enhance its program of work related to ***workforce and economic development***.

Our ***workforce development*** value chain still needs critical attention because we are missing the mark in preparing students and keeping talent in SC. Academia is not outputting what is needed in industry even though we are producing the most STEM graduates ever. Industry does not want more scientists or R&D engineers - they need

dynamic operators that can make fast and correct decisions under duress. They need entry level candidates that can learn in 6 months to put out fires with customers as well as internal engineering teams or deal with a regulatory audit. A hurdle for existing industry is when these young professionals develop these skills, they leave for jobs in the northeast, midwest, and west coast. In my interaction with students, they report they are experiencing lackluster communication with human resource departments in local companies despite company executives at the top claiming they are desperate to hire. There is a huge communication gap between what is conveyed from the leadership and what is happening in the trenches of their own companies. This does not bode well for recruitment and job retention resulting in brain drain from the companies and SC itself.

The other side of this equation is ***economic development*** and, in my opinion, it remains to be the largest challenge for SCbio. The economic culture of SC still does not understand the new age of tech. Though there are still strong manufacturing capabilities along highway 85, there lacks the economic development infrastructure to bring investment and business incubation to SC to take advantage of these competencies. The days of traditional manufacturing are long gone - it is all about creating things that lead to high tech, data, agile and user-centric design. Old and institutional money still does not know how to value companies with new technological trends. Good companies will continue to leave for greener pastures just like our students. Personally, I have tried starting companies in SC and 95% of the value chain and investment is outside of SC simply because people did not understand what we were trying to do, did not have the capabilities, nor agree with our vision.

Despite these challenges, I believe SCbio has the wherewithal to mitigate these barriers. The following is my reasoning. There are many conferences that have several hundred companies represented by c-level executives, academia, business support, and key people happening every year. However, few have such an energy that only comes from one thing - creating value for the place where they and their families live. This one difference changes the attitude of the conference from “everyone showing off what they are doing” to “everyone showing how they can help everyone else”. SCbio has this unique energy and it’s something different that stands out among other conferences. This coupled with the growth of its target industry sector outcomes is why I believe it is worth building and investing in SCbio. It has grown significantly since I started my first business as the team works to achieve its workforce and economic development goals, it may be worth moving my company back to SC to grow with the region.

The spark plug of an engine is a small percentage by weight of the entire engine block but I have never seen an engine turn on without a spark plug. That is what SCbio is to the life sciences sector of SC, which includes medtech. Clemson Bionengineering’s participation along with other universities in the state brainstorming ways to create a competitive workforce is critical in forming this nexus of foundation for value creation for the coming years. This effort has two objectives. (1) Develop more skills based curriculum that plug directly into industry jobs and (2) building a direct workforce pipeline of qualified students to work in companies. Students get meaningful jobs near their families to build a basis for their life’s work. Business leaders get value creating employees. The state becomes a fertile ground for life saving innovation and manufacturing.

As I type these words, a flood of memories from SCbio overcomes me not just from this past week but from the past several years. To me, the most important attribute about SCbio are the people and more importantly, the relationships to be made. A significant number of my mentors come from SCbio and the lessons from their collective experiences cannot be put into words. SCbio’s momentum continues to rise, and because of this energy and growing support, I would seriously consider starting a company in SC again. The landscape is much different than several years ago due to the growth of the sector and of SCbio. If you are trying to drive value in this sector and need a place to go to because you feel beat down or don’t know where to begin - you feel lost – attend a SCbio event or visit their website at www.scbio.org. Participation for students at networking events and industry-student specific events are free. Participation as an industry partner requires an annual cost however that small investment pays dividends in new partnerships. Join the fastest growing sector in South Carolina and be part of the fuel that feeds the growth.

Bioengineering student awarded prestigious 2024 Goldwater scholarships

Clemson News | Shawna Cass

In a first for Clemson University, five students were selected this year for the prestigious 2024 Barry M. Goldwater Scholarship, which recognizes students who show exceptional promise of advancing research in mathematics, natural sciences and engineering.

Biochemistry majors Caroline Argenti and Adam Gatch, physics major Maggie Marte, mathematical sciences major Cody Waters and bioengineering major Audrey Wessinger are among 438 scholars selected nationwide.

“We congratulate Caroline, Adam, Maggie, Cody and Audrey on the contributions each is making through research, service and leadership to transform lives in South Carolina and beyond,” said Clemson University’s Executive Vice President for Academic Affairs and Provost Robert H. Jones. “The fact that five Clemson students were selected as Goldwater Scholars this year is a testament to our University’s commitment to undergraduate research ascension and faculty mentoring.”

More than 1,350 students were nominated by 446 institutions across the country for this year’s competition, which provides scholarship recipients with $7,500 in financial support towards their undergraduate studies and associated expenses for up to two years.

Clemson is one of only eight institutions to have five scholars selected this year. The announcement brings Clemson’s total number of Goldwater scholars selected since the program’s inception to 63.

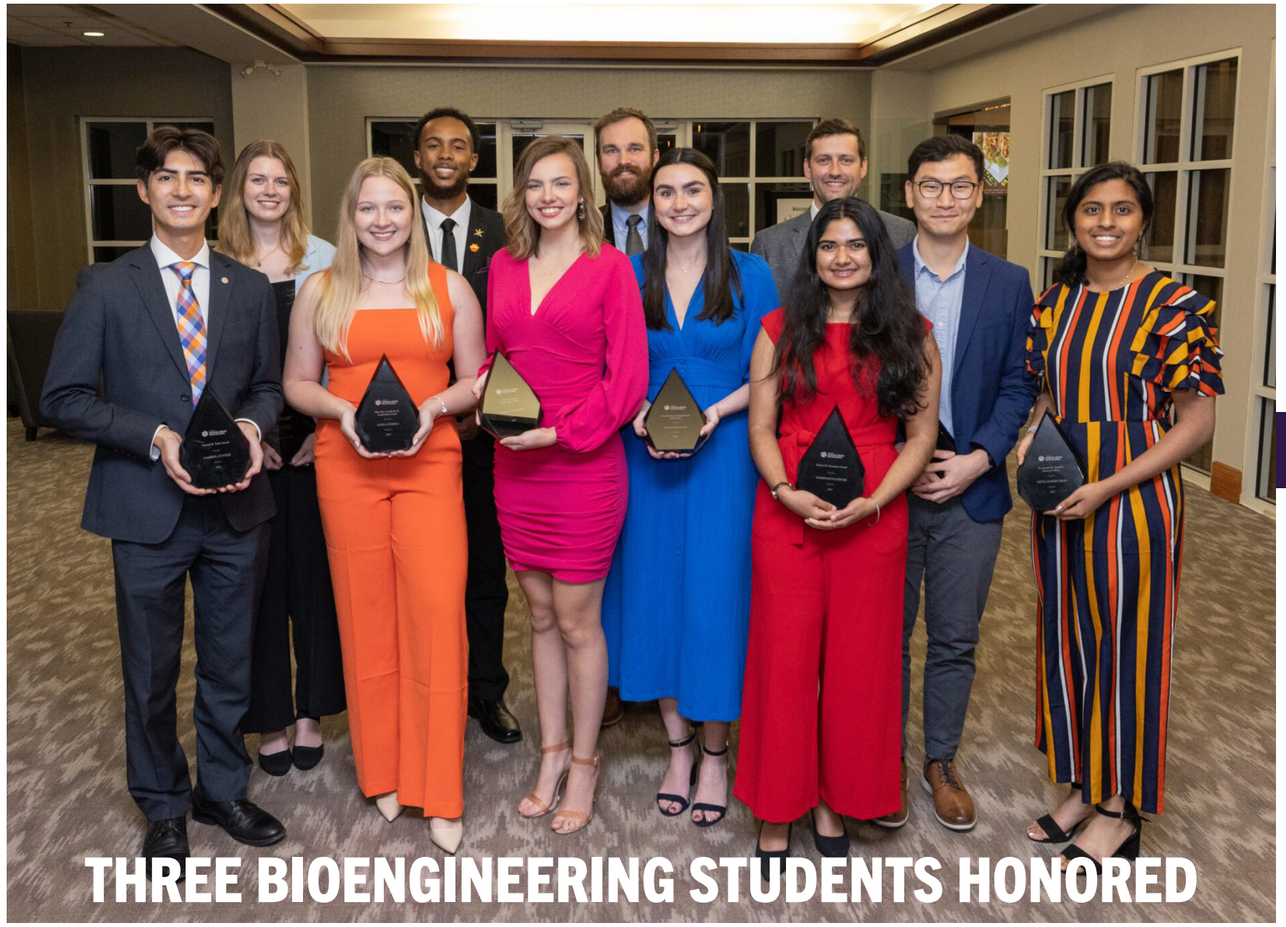
The University leads the Atlantic Coast Conference (ACC) with 47 scholars since 2006.

Audrey Wessinger, a bioengineering junior and Honors student from Mount Pleasant, South Carolina, is working towards a career in genetic engineering research, with a focus on contributing to transformative advancements in antibiotics or cancer therapies. She is one of only 56 Goldwater recipients majoring in engineering.

Wessinger started her research in high school, contributing to five different projects with four faculty bioengineering faculty members: Angela Alexander-Bryant, Jeremy Gilbert, Jeremy Mercuri and Jiro Nagatomi. Her work has already been shared in four co-authored publications, including two papers where she was listed as the second author. She has also been part of five research presentations, including two at international meetings.

She also has a strong focus on service. Wessinger is a member of the Bioengineering Student Advisory Board and the University’s Student Funding Board while also being part of the marching band and working as an academic tutor and as a DJ on WSBF FM (Clemson’s student radio).

In the future, Wessinger plans to earn a Ph.D. in bioengineering and pursue a research career focused on drug delivery and genetic engineering.



by College of Engineering, Computing and Applied Sciences

Clemson News | Paul Alongi

Several Clemson University students won awards Tuesday when the College of Engineering, Computing and Applied Sciences held its annual awards banquet.

The awards recognized top students' accomplishments in a number of areas, including scholarship, character and service.

Family, friends, faculty and supporters gathered in the Madren Conference Center ballroom for a banquet in the students' honor.

The college's dean, Anand Gramopadhye, urged the students to be seekers of truth and knowledge, to make the world a better place and to be appreciative of all who help and guide them.

"All of us look forward to living in the world you create," Gramopadhye said. "Exceed our expectations!"

This year's honorees included a freshly minted Goldwater Scholar, Vaishnavi Kanduri.

Those pictured are college-level award winners and are (from left): Gabriel Cutter, Grace Haller , Aniela Nozka, Christopher A.J. Sanders Jr., Arabella Rose Hunter, Justin Lee Cromer, Eliza MacCaulay, Nathan Goulet, Vaishnavi Kanduri (wearing red), Lucky Cho and Nitya Harikumar.

The scholarship is one of the most prestigious and competitive undergraduate awards in the natural sciences, engineering and mathematics.

This year's college-level awards and their winners from bioengineering department are listed below. You can also hear from the winners themselves in a series of videos that were shown at the ceremony and will be posted on the college's social media channels.

Robert W. Moorman Award

Vaishnavi Kanduri, Junior, Bioengineering

Dr. Robert W. Moorman was the son of Commandant Thomas Moorman, a graduate in civil engineering and head of the Engineering Mechanics Department from 1958 to 1974. The Robert W. Moorman Award is given in his honor to the most outstanding junior in engineering on the basis of scholarship and character.

Phi Kappa Phi Certificate Of Merit

Grace Haller, Senior, Bioengineering

The honoree must be a graduating senior with a GPA of 3.4 or above and have made noteworthy contributions in areas such as leadership, service and creative endeavors to his or her department, college and Clemson University.

Blue Key Academic And Leadership Award

Aniela Nozka, Senior, Bioengineering

As a result of funds generated from Tigerama, an endowment has been established to give an award to one student in each of the seven colleges at the university who has distinguished himself or herself in academic scholarship and campus leadership.

AIMBE – Beyond the Classroom:

Students gaining knowledge on how policy impacts biomedical engineering

Megan Pitz

In October, I attended the AIMBE (American Institute for Medical and Biological Engineering) Public Policy Institute in Washington, D.C. The Institute acts as a workshop for biomedical engineers at any point in their education, including undergraduates through postdocs, to learn about how policy affects the biomedical field and vice versa. This year, we heard two days' worth of speakers who have experience working on Capitol Hill in many different aspects, including career options in policy, regulation, lobbying, policy analysis, and general government functions regarding biomedical policies. Speakers represented agencies including the NIH (National Institutes of Health), NSF (U.S. National Science Foundation), FDA (U.S. Food and Drug Administration), American Cancer Society, and the Union of Concerned Scientists. The workshop included Q&A and networking time with the speakers and concluded with a tour of the Capitol building.

Megan Pitz, NSF Graduate Research Fellow
Nanobiotechnology Lab, Clemson University Bioengineering

Serena Gilmore Helps Those Who Need it Most

Clemson News | Paul Alongi

Serena Gilmore saw that Black students were underrepresented in the Honors College, so she started a recruitment drive.

When Serena learned about food insecurity, she volunteered at the Paw Pantry. She also took on domestic violence as a volunteer at Safe Harbor's shelter in Anderson, and she volunteered at Clemson Career Closet, which provides students in need with business attire.

Those are some of the reasons that the Clemson University Commission on Women honored Gilmore with an Award of Excellence for the Advancement of Women in the undergraduate category.

"When I started at Clemson, I didn't really go in thinking, 'I'm going for this award,'" she said. "As I was learning more about the tribulations women go through, I was like there's a problem here, and there are resources for me to aid in the fight."

Serena graduates this week with a Bachelor of Science in bioengineering and is headed to the University of California, San Francisco to pursue a Doctor of Medicine.

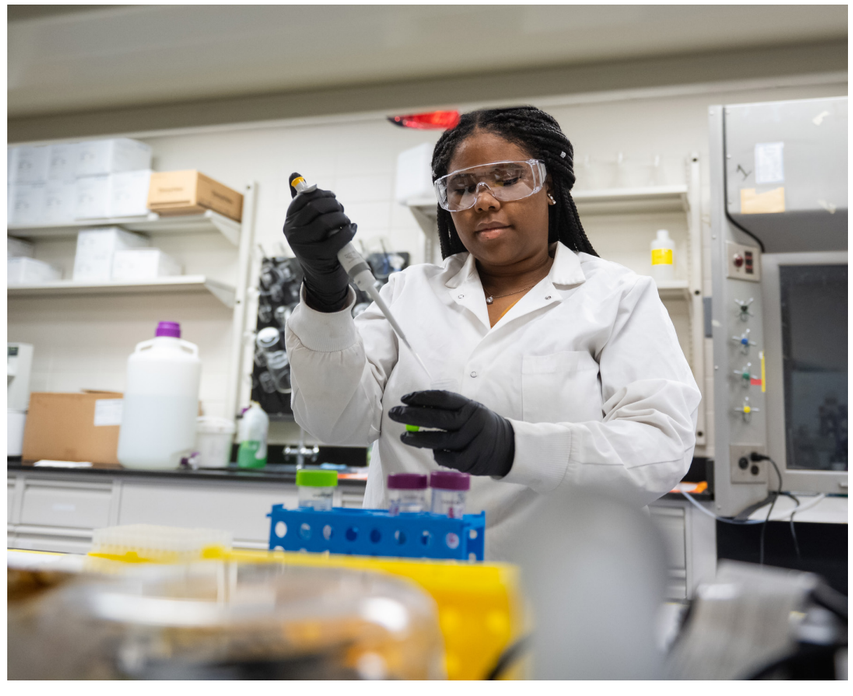
While at Clemson, Serena worked as an UPIC intern at the Clemson Light Imaging Facility, where her manager, Rhonda Powell, encouraged her and helped her talk through some of the challenges of being a woman in STEM.

Serena also conducted research under Dr. Angela Alexander-Bryant, assistant professor of bioengineering.

"She has definitely shown me how it is to be a Black woman in science and specifically in the bioengineering department," Serena said. "Just seeing someone thrive in the same field I'm interested in and seeing everything that she has been able to accomplish in her short time in her career– it's inspirational."

When Serena crosses the stage at Littlejohn Coliseum, she will become the second person in her family with a Bachelor of Science in bioengineering from Clemson. Serena's brother, Devante Horne, graduated in 2015 and then got a Ph.D. from the UCSF-UC Berkeley Joint Ph.D. Program in Bioengineering.

When Serena moves for medical school, she will have family in the area. Devante lives in San Francisco.



Serena Gilmore works in a lab in 1 Rhodes Research Center.

Clemson Ph.D. Student Named Regional 3-Minute Thesis Champ; Moves on to North American Showcase

Clemson News | Jill E. Bunch

Clemson University's Vishal Thomas, a Ph.D. candidate in bioengineering, took top honors in the Three-Minute Thesis®—or 3MT—regional competition held during the Conference of Southern Graduate School's annual meeting last week in Greenville.

Thomas' win in this regional event, where he competed against 3MT winners from more than 60 universities in the southern region, means he will represent Clemson and the CSGS Southern Region at the Council of Graduate Schools' North American annual meeting, scheduled for December in St. Louis. He won Clemson's own 3MT competition last semester to earn his shot at the regional title.

In the 3MT competition, students must summarize and explain the significance of their research in three minutes or less, using only one static slide to support their talk to a general audience. A panel of judges evaluates participants based on criteria such as comprehension, engagement, and communication effectiveness. In the preliminary heats, the field was winnowed down to 13 finalists who competed in a final round.

Thomas' winning presentation, titled "A Novel Implant for Cartilage Repair," delved into his work to create and implement a more durable and better-functioning knee implant made from a novel biomaterial. He recently discussed his research on FOX Carolina's Access Carolina show (see video here).

Judges represented the media (Carol Clarke and Sydney Shadrix of WYFF; Blair Knobel of Vessel Magazine and the Knobel Media Group; Margaret Burnquist of FOX Carolina); government (Robert Halfacre, mayor of Clemson; Logan Kipling, U. S. Senate communications and outreach staffer; Russell Stall, Greenville city council member), and Annie Sutton, director of Anderson County Library System), industry (Pat Randall and Robert Randall of Princeton Consultants and the Graduate School's advisory board; Britton Swingle from Michelin; David Stefanich of Rymedi) and higher education administration (Council of Graduate Schools President Suzanne Ortega; Ariel Turner from Clemson Libraries and Kim Banks, Clemson's director of communications for academic affairs). Clarke, Ortega, and Knobel judged the final round.

Thomas is the Department of Bioengineering's Frank H. Stelling and C. Dayton Riddle Orthopedic Doctoral Scholar, recipient of the Michael A. Zebuhr Memorial Fellowship for Excellence in Graduate Research from the Department of Bioengineering, a lab manager in Jeremy Mercuri's OrthO-X lab, an instructor of record for engineering graphics and machine design, and president pro tempore of the Graduate Student Government.

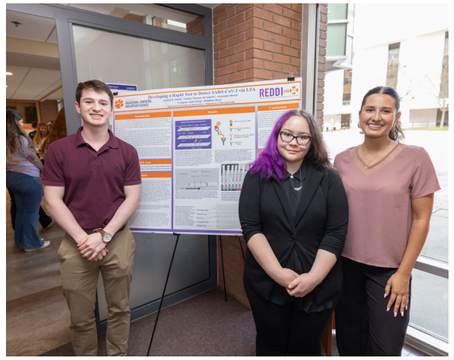
Lab-A-Thon: A New Method of Research Recruitment

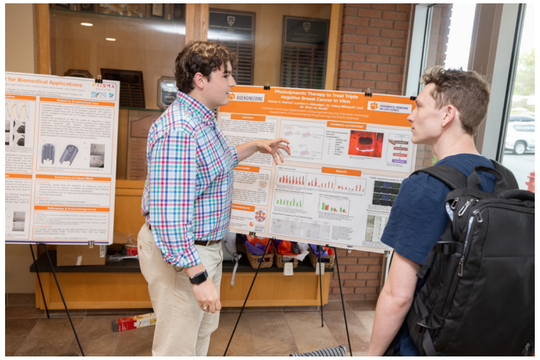
Sebastian Saenz

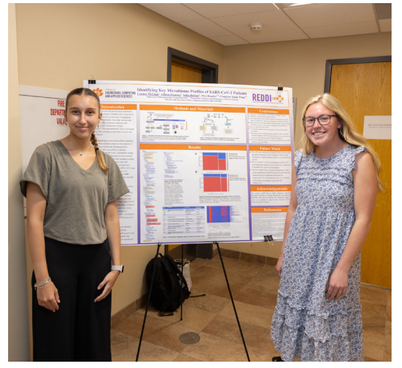
The idea for Lab-A-Thon was first brought up in the Spring of 2022. It was one of many ideas thrown out in a brainstorming session. At the time, there was yet to be a plan, logistics, or concrete idea of how it would even look or work. The following semester, we began to test the waters to see if this could become an established event for the Department of Bioengineering. Unfortunately, our efforts fell short, and we could not put on our event. However, we were able to learn about which areas needed improvement. Finally, in the Spring of 2023, we hit the ground running to ensure the first Lab-A-Thon would come to fruition. Through a joint effort between the Bioengineering Student Advisory Council and faculty, we created a plan of action.

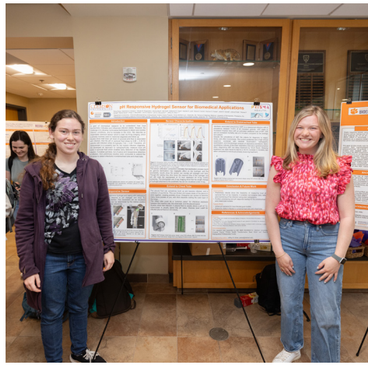
This event was made to be both a networking and informational event. Creative Inquiries from the Department of Bioengineering would be able to showcase their research and projects to promote their CI and recruit new members while competing for cash prizes. On the other hand, this gave the underclassmen a front-row seat to all the department's research projects and provided them with in-person presentations, demonstrations, and Q&As. After countless months of planning, the day of the event arrived. Will it go smoothly? Will people enjoy it? Will we be able to do this again? These were all questions we had. The event took place in the Watt Family Innovation Center on campus inside its beautiful auditorium, and luckily, the event started off strong and continued to do so. We were fortunate to have students and faculty attending and a strong list of CIs ready to present their hard work. Following the presentations, we held a live vote and crowned the winners of our first-ever Lab-A-Thon!

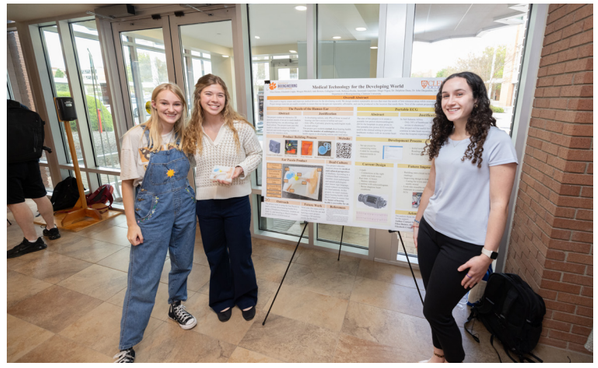
This past semester we were very fortunate to hold our second Lab-A-Thon in Rhodes Annex with an even larger audience and pool of CIs presenting. The success of this event is a testament to the dedication of our students and faculty to innovation and networking. It demonstrates the capabilities of our students and the opportunities the department gives us to further our intellectual endeavors. The Bioengineering Student Advisory Council plans to host Lab-A-Thon every semester to continue to showcase excellence in our department.

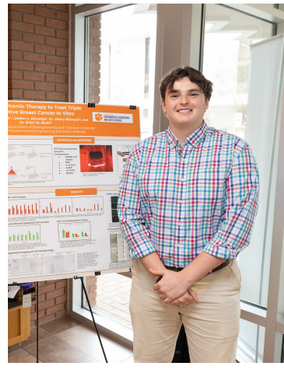


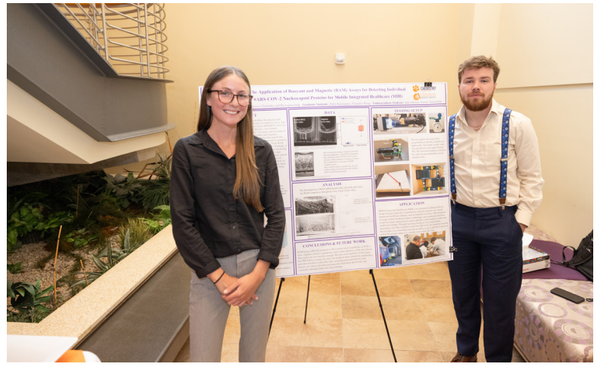


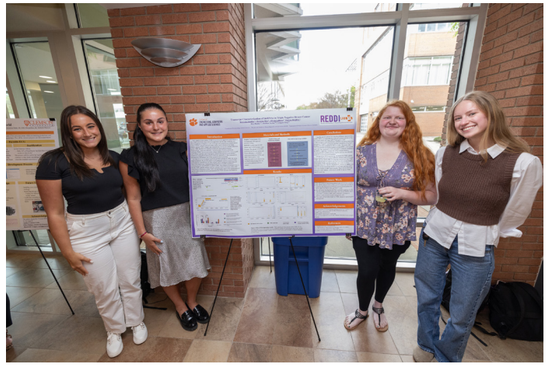


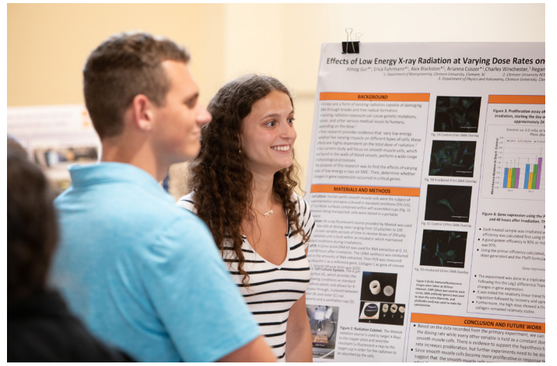












Department of
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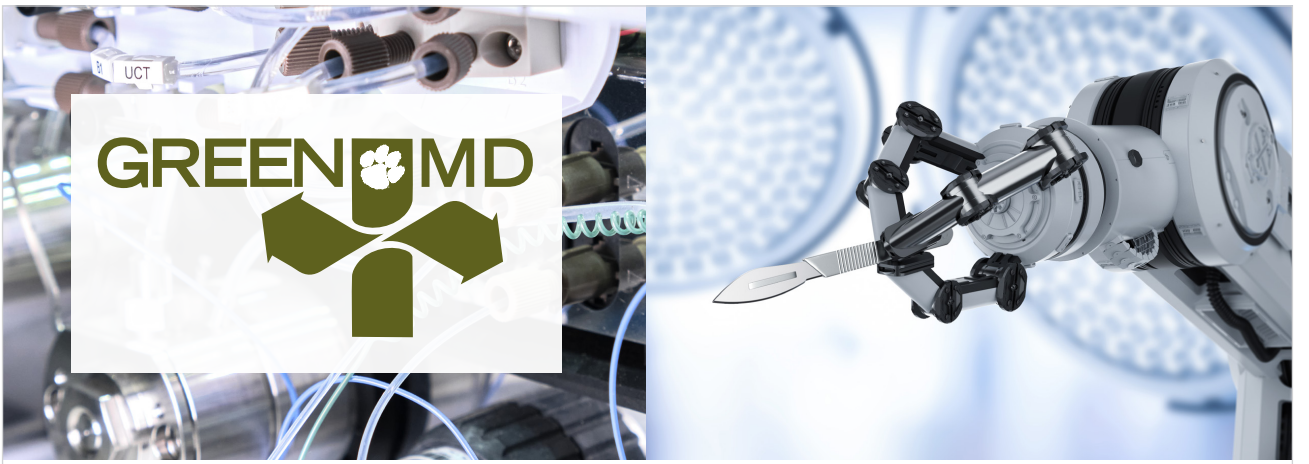

M.S. in Medical Device Reprocessing

Offered as an online degree by
the Department of Bioengineering
in collaboration with
the Department of Industrial Engineering

Overview:

The Master of Science in medical device reprocessing, designed by industry experts, educates students from across the STEM disciplines to optimize and validate biomedical technologies supporting safe reuse of medical devices and healthcare products.

- The first advanced engineering degree program in medical device reprocessing in the U.S.
- **"GreenMD"** signifies the medical device industry's aim to achieve sustainability in production and use of healthcare products.

Reprocessing is a regulated practice that involves cleaning, disinfection and sterilization of both reusable and approved single-use medical devices. Specialists must know advanced technologies and specialized process control systems for handling contaminated medical devices and rendering the reprocessed devices safe for reuse.

clemson.edu/cecas/departments/bioe/academics/graduate/mdr.html

Program Goals:

Enhance the readiness of globally engaged students to be innovative industry leaders in sustainable biomedical technology through training in modern reprocessing and sterilization technologies, quality science and human factors in healthcare

Program Outcome:

- Earn a graduate M.S. non-thesis degree online
- Complete experiential learning through an industry internship (BIOE 8900) or mentored medical device reprocessing research (BIOE 8510)