NC STATE

THE NEW

Engineering

MAGAZINE FALL / WINTER 2023

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There was a lot to be proud of. Over 100 years, the College of Engineering grew to nine departments and three affiliated departments; moved campuses; expanded its faculty, Nehemiah Mabry, an NC State civil staff and student body; and produced outstanding engineers and computer scientists who have made important impacts across the world.

Some of these past and ongoing accomplishments were highlighted on PBS North Carolina's Sci NC TV show over the fall. Four episodes that aired from Oct. 19 to Nov. 30 took viewers inside NC State's virtual reality core, almost every NC State engineer lab, shared the history and exciting updates from the on-campus nuclear reactor, explored NC State's efforts to make phosphorus use sustainable and tagged along with SolarPack, NC State's student-run team that builds and races a solar-powered car. A fifth episode featuring alumna Christina Koch will air the next 100 years. Affixing the notes soon, and a 30-minute special focused solely on NC State Engineering will come out in 2024.

These segments were produced by Minnow Media in association with

100 years celebrated, and **100** more to come

Alexander Isley, and they feature engineering Ph.D. graduate and rising star in STEM-based media. All segments can be watched on NC State Engineering's YouTube channel at youtube.com/@NCStateEngineering. They capture the imagination and innovation on campus, in the past and present.

But true to NC State Engineering's or computer scientist who reflected on this 100th anniversary wanted not just to talk about the past, but to also look ahead to a very bright future.

At a 100th anniversary celebration on May 3, attendees wrote out their dreams for NC State Engineering for to a rocket that had been previously launched by NC State's High-Powered Rocketry Club, they shared what they think NC State Engineering can do by 2123.

"Get us to Mars!"

"Adaptable and resilient infrastructure"

"Reverse engineer the brain"

"Replacement of laptops with AR glasses"

"#1 engineering school in the U.S."

"Grow a functional. implantable human brain from stem cells"

"More industry collaboration"

"Continue to recruit the brightest students and faculty for our future world"

"Think BIG"

The College has a lot of exciting years ahead if its faculty, staff, students and alumni can make all of these dreams into reality.

College climbs in undergraduate rankings

NC State University and the College of Engineering both rose in the U.S. News and World Report annual rankings of U.S. colleges and universities.

For 2024, NC State was ranked 60th in the United States on the main Best National Universities list. It moved up one place to 28th among public institutions.

For engineering specifically, NC State was ranked 30th on the list of Best Undergraduate Engineering Programs, moving up three spots from last year. Among public institutions, NC State ranked 17th for its engineering program. Its computer science program moved to 50th, rising four spots from last vear's ranking

This is the best-ever showing for NC State in the U.S. News and World Report rankings.

For undergraduate specialties, NC State ranked seventh in biological and agricultural engineering, 12th in industrial engineering, 15th in environmental engineering, 17th in chemical engineering, 20th in materials engineering, 21st in civil engineering, 25th in both computer engineering and mechanical engineering, and 26th in electrical engineering. NC State has traditionally ranked very high in nuclear engineering, but U.S. News and World Report did not release a nuclear engineering undergraduate program list for 2024.

The Best Colleges list, published annually by U.S. News and World *Report*, assesses more than 1,500 public and private colleges and universities on a set of 19 weighted indicators. Over the past several years, NC State has made significant strides in the overall rankings – jumping a total of 32 spots since 2017 to this year's ranking of 60th best in the nation.

NC STATE Engineering

I'm honored to introduce myself to you as the Louis Martin-Vega Dean of your College of Engineering. I joined NC State on Aug. 1 after 14 years as a faculty member and later chair in the Department of Chemical Engineering at the University of Washington. You can learn a little more about me in the profile story on page 16.

It's been a whirlwind few months as I've met so many people and learned so much about our teaching, research and extension work and its impact on North Carolina. The warm welcome that I have received has confirmed for me that I'm in the right place, and I'm so excited to get to work building on our strengths and addressing our challenges with a goal of making this the best college of engineering it can be.

In introducing myself to our alumni over the past few months, I have been able to share my great love of all things science and technology and my core belief in the potential of an engineering degree for changing the lives of our students and their families. Likewise, I've been truly impressed to learn about all the ways our College of Engineering faculty members pursue groundbreaking projects directed at translating new discoveries to tangible real-world solutions to some of our most pressing issues.

I was attracted to NC State Engineering because of the parallel commitments to fulfilling the mission of serving state residents as a public institution alongside a deep dedication to excellence in research and discovery. It's also an institution that benefits from a tremendous amount of support from state leaders who realize its value as the flagship STEM university in North Carolina.

As we wrap up a yearlong celebration of the **100th anniversary** of our College, those strengths are easy to see: this is one of the preeminent public colleges of engineering in the country with a strong interdisciplinary research program in one of the premier places to live in the United States.

The College is growing its enrollment by 4,000 students and adding more than 100 new faculty positions, thanks to legislative support through the Engineering North Carolina's Future initiative. We received great news in the most recent biannual North Carolina budget, with a commitment to recurring funding to support our growth. That means help with faculty and staff hiring, but also money for physical growth, including for building renovations and for a new engineering building on Centennial Campus.

We also received outstanding news this fall from the Department of Defense, which awarded NC State **\$39.4 million** to serve as the leader of a regional innovation hub in wide bandgap semiconductors. The regional hub, Commercial Leap Ahead for Wide Bandgap Semiconductors, or CLAWS, also includes North Carolina Agricultural & Technical State University, as well as six industry partners.

That growth is also one of our challenges, as we try to guickly build up the infrastructure needed to accommodate more students while still offering the same great experience to all. We are also still working through the long tail of impact that Covid has had on our students and continue to innovate in our classrooms to meet students where they are at and prepare them for success.

Moving forward, I am looking for ways to engage with our alumni community. I hope that you will reach out to me or others within the College to learn how you can stay involved and help us strengthen the Pack.



Jim Pfaendtner, Ph.D. Louis Martin-Vega Dean of Engineering

FROM THE **DEAN**



NC STATE

Engineering

M A G A Z I N E Vol. XVII, ISSUE II

DEAN Jim Pfaendtner

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Questions?

Contact Brent Lancaster at bwlancas@ncsu.edu







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Wolfspeed, Inc., formerly Cree, is building the largest silicon carbide materials production facility in the world. The company was started by NC State materials science and engineering alumni.



ON THE COVER

Jim Pfaendtner is taking the helm as the College's new dean. More on **page 16**.



What is operations research?

Operations research (OR) is a discipline of problem-solving and decision-making that uses advanced analytical methods to help improve systems, processes or organizations. The key is the decision-making piece. OR builds on the basic understanding of the functioning of complex systems of technology and management through mathematical models for the purpose of not only predicting system behavior, but beyond that, optimizing system performance under economic and technological constraints.

NC State's Operations Research Program is unique due to its diverse range of faculty members. How does that influence the program's curriculum and research opportunities?

This is a huge strength of the program. In addition to the wide range of courses students can count toward their degree, it offers faculty members a way to advertise new courses to students who may be interested. Special topics courses change all the time and can be agile to new trends in the discipline.

For Ph.D. students, it means their advisor could come from literally any department. This leads to a diverse range of dissertation topics, from analyzing NASCAR driver and pit crew communication to studying OR applications for the U.S. Army aviation air movement operations. Our seminar series invites speakers from many different backgrounds, and we bring in industry speakers and alumni so that students can see the places where they could work after graduation.

What are your short-term goals for the program? Long-term goals?

As the permanent director, I will focus on three key areas with short-term and long-term goals for each. The first area is recognition, so increasing awareness about the program outside NC State and making sure the faculty and students know about available resources. The next is relationship building. which includes community building between faculty members and students, but also reaching out to industry and alumni. Last but not least, I will focus on reputation, which is different from recognition and speaks to our excellence and impact.

As a community building example, short-term I would like to host events for alumni to meet each other as well as our current students, but long-term I would

CORRECTION: In the spring / summer 2023 issue, a College of Engineering timeline gave an incorrect year for the first Black undergraduate students' arrival at NC State. Those students began classes in 1956. We regret the error.

QUESTIONS FOR MARIA MAYORGA

Maria Mayorga is the new director of NC State's Operations Research Program, which was founded in 1970. It offers four degrees and includes faculty members from 16 departments. She is the Goodnight Distinguished Chair in Operations Research, a University Faculty Scholar and professor of personalized medicine in the Edward P. Fitts Department of Industrial and Systems Engineering with a joint appointment in the Department of Business Management in the Poole College of Management.

> like to establish an advisory board that includes alumni, industry partners and other stakeholders.

How are engineering and OR related?

Engineering and OR are intimately related. Engineering provides us with a host of application areas or the "problems," as well as with some of the domain-specific knowledge and methods needed to solve those problems. For example, from civil engineering we may be interested in long-term planning of water infrastructure. We would need to understand how the facilities operate and what the costs and objectives are from civil, but we could apply optimization methods from OR to help recommend decisions.

Who should consider a degree in OR?

If you like math, statistics or computer science, OR is a great option. Even if students do not have a STEM background, if they like to analyze problems and come up with systematic ways to solve them, they can come up to speed.



Asheville-based mechatronics engineering program produces well-

rounded engineers and a close community

VINSON WILLIAMS.

mechatronics engineering '21. couldn't decide between mechanical and electrical engineering.

"It sent me down a rabbit hole why can't I do both?" he said. "And I found mechatronics and robotics."

Mechatronics engineering, a combination of mechanical engineering, electrical engineering and computer science, offers students a breadth of skills and knowledge that prepares them for careers in a wide range of industries, especially in increasingly automated fields.

Williams started researching mechatronics, and he found a program that seemed to be a great fit: the Joint Bachelor of Science in Engineering (JEM) degree with a mechatronics engineering concentration offered jointly by North Carolina State University and

the University of North Carolina at Asheville.

Based fully in Asheville — there is no mechatronics engineering degree program on NC State's campus in Raleigh — the program had small class sizes and was located in a place that, as Williams put it, seemed pretty nice.

"It's definitely an interesting degree, and it's been super helpful." said Williams, who is now a Ph.D. student in aerospace engineering at NC State. "It's like, you can build a robot from scratch — you know how all the pieces work together."

LOCALLY GROWN

There are two parts to the Joint NC State / UNC Asheville Engineering Programs: the 2+2 program, where students begin at UNC Asheville and then transfer to NC State to finish their engineering

degrees, and the mechatronics engineering program. Both were established in part because of support and input from local industry partners that wanted to foster more engineering talent in western North Carolina.

The two universities began piloting a mechatronics engineering program in 1998, with degrees awarded by NC State. In 2004, the University of North Carolina System developed the official JEM program. Students stay on UNC Asheville's campus, but graduate with a degree from both institutions.

"They are just as much NC State students as the students who are here [in Raleigh]," said Linda Krute, director of distance engineering education programs at NC State.

Students take liberal arts and other core science and math classes through UNC Asheville. Their engineering classes are taught by

NC State faculty members. Some are taught in person by an NC State faculty member based in Asheville, while others are streamed live from Raleigh to their classroom.

UNC Asheville is the UNC System's sole liberal arts and sciences university. Many of the engineering students who come through the program are interested in the "why" behind what they're building, explained Linnea Linton, associate director of the Joint Engineering Programs.

"I've seen our students develop a very strong ethical idea of 'How will my work as an engineer impact society, impact the environment, impact any various numbers of ideas?'" she said. "And I think that comes from the very strong liberal arts core at UNC Asheville."

Many students come from around the state, country and world because they are drawn to this

unique program.

Others are settled in western North Carolina. and some have families. The program makes it possible for them to land an engineering job close to home, which is one of the program's original goals

Western North Carolina native and alumnus Eli Buckner is an assistant teaching professor at NC State based in Asheville. He earned a B.S. in mechatronics engineering in 2016, and a Ph.D. in electrical engineering in 2021 from NC State.

He is one of the many who chose the program because he wanted to stay in the area, while still getting an engineering degree from NC State. As a student, he enjoyed getting to know his classmates, and now as a professor, he likes the close-knit environment.

"The community becomes really a very, very good part about this program," he said. "Because you get that guality of education in engineering from NC State, but you get to stay small, which a lot of students prefer."

The joint program is not without its challenges. As dual-enrolled students, they have to navigate two different schedules, including different start dates and breaks. But it brings them closer together. Buckner said he made a lot of memories on UNC Asheville's campus taking engineering classes while the non-engineering students were on spring break

A GROWING FIELD

The need for mechatronics engineers is increasing as electrical and mechanical systems become further integrated.

David Ramsey, director of the Joint Engineering Programs, said he would like to follow the same growth rate as the College of Engineering: a 40-percent increase over five years to about 300 students.

Earlier this year, Ramsey got a call from a South Korean company starting an electric vehicle battery manufacturing plant a few hours away in Georgia.

"They love the idea of mechatronics engineers for their factory," he said. "This is a heavily automated, robot-centric facility more like a semiconductor cleanroom than anything else. And they think mechatronics engineers are ideal for what they're going to have to do in the workplace to control all this automated equipment."

Local support has been an integral part of the program, with companies offering internships. The Industrial Advisory Board helps guide the program and spread awareness of mechatronics engineering. Many students attend UNC Asheville with plans to accept an engineering position in western North Carolina.

But ultimately, the program's goal is to prepare students to be competitive at a national or international level.

"As we graduate students today, some choose to stay in the area and help local industry," Ramsey said. "At the same time... they're able to compete on a national stage, and they can go to big name companies, anywhere in the country or even in the world."

"...You get that quality of education in engineering from NC State, but vou get to stay small, which a lot of students prefer."

ELI BUCKNER



Maya Clinton is the first Black woman to graduate from her program, but not the last

WHEN MAYA CLINTON started at North Carolina Central University (NCCU) in 2017, she already knew she would transfer to NC State University.

A Durham native. Clinton had strong family ties to NCCU, commonly referred to as Central. When her mother came across a dual degree partnership between Central and NC State during her own time at NCCU, she immediately approached Clinton about it.

"I've always wanted to do engineering," Clinton said. "That was where I was looking at first, but in high school I really fell in love

with physics and wanted to find a way to do that more. So as my mom was graduating Central, she found out about this program and said, 'Hey, you're very interested in physics. This program will let you do both.""

Clinton graduated from NC State in May 2023 with a dual degree from both universities in physics and mechanical engineering. During her time at NC State, she was an engineering ambassador and did undergraduate research.

Clinton's twin sister went to NCCU and graduated with a history degree in 2020. She came to NC State later for a dual master's in

public history and library science and just graduated with her public history degree.

"My twin sister keeps me in line and keeps my head on straight," said Clinton. "And the community I've had, even going back to professors who believed in me and pushed me forward."

Though Clinton knows that she, too, wants to come back to NC State to get a master's degree in electrical engineering, she's taking a gap year first.

"I've had a couple things concerning my health, so I'm taking some time to get myself together and focus on those things," she said. "Over the summer I went back to Central to help out with a program that I participated in when I first came called Research, Development and Innovation."

Since then, she has started as a Research and Development Engineer in the Brain Stimulation and Engineering Lab at Duke University in the School of Medicine.

She is the first person to graduate from the program with that set of degrees as well as the first Black woman to complete the program. There are several Black students in the program who will graduate in the coming years, but Clinton spoke about how it felt to be the only one in her year.

"I've definitely had some imposter syndrome," she said. "But I know I'm smart. I know I can do this type of work. Whenever I get discouraged, I look back on all the successes that I have had and remind myself that I've done so much."

Meet the embedded counselors on Centennial Campus

MIRANDA LIU AND HANNAH

LAVASOUE may be new to NC State University, but they already have their routine.

Every Tuesday from 2-4 p.m., the embedded counselors find themselves in room 3001 of Engineering Building II, where they talk to members of the College of Engineering (COE), help people fill out intake forms and more.

As embedded counselors, Liu and Lavasque provide intentional support for the COE community on top of the services provided by the NC State Counseling Center.

"Students are paired with the service that aligns with their specific preferences or needs," said Liu. "This can include individual counseling, groups and / or workshops. The piece that we're adding on top of the many counseling center services is being around the students, faculty and staff, learning the specific stressors, strengths and difficulties so we can better advocate for the students."

Liu, who graduated with a Master of Social Work from NC State in 2015, is a licensed clinical social worker and worked in outpatient therapy for over seven and a half years. Lavasque graduated with a Master of Arts in Art Therapy and Counseling from Southwestern College in Santa Fe. New Mexico. in 2016, but she does have several NC State alumni in her family. including some from the COE.

The goals of the embedded counselors program are lowering

the barrier to entry for mental health services and decreasing stigma around mental health. The embedded counselors program is based on similar programs at the University of Michigan and The Ohio State University. All colleges at NC State now have or are hiring embedded counselors.

"Our main counseling center is absolutely incredible and offers so many wonderful services, and care is often hardest to access when we need it most," said Lavasque. "As many people know, there is a stigma related to mental health and accessing mental health services, and the fewer steps we can put between a person and the services they need, the more likely they are to be able to overcome that stigma and ask for help."

Aside from the drop-in space, Liu and Lavasque also plan to explore the groups offered through the counseling center; attend outreach events and postventions provided by COE, the counseling center and prevention services; and get connected with larger COE events. "We are so excited to be able to offer our support to the COE as we settle into these new roles," said Lavasque. "Miranda and I are new to this community, and while we have ideas on how to best serve and support the COE, we also want to hear from you, to learn what you need, because the best support we can possibly give will be the support you need, not the support we have decided you need."

PACK POINTS



HANNAH LAVASQUE (TOP) AND MIRANDA LIU

K-12 students from eastern NC explore AI in new camp



IT'S A FRIDAY MORNING

in early August, and students from eastern North Carolina are hard at work in a classroom on Centennial Campus. They are developing code to control a Sphero up, spins and rolls.

Their task? Work in teams to successfully guide the robot through two obstacle courses made of different colored squares.

"That's a lot of coding," said Keith, an energetic student from Pitt County who walked the courses before starting to work with his team. "Sounds hard."

But with some thought. planning and reliance on what they'd learned earlier in the week, the students measured the distance between the course elements before using paper-based blocks to develop their code, which was then scanned by a tablet and uploaded to BOLT. Everyone watched with anticipation as each group successfully navigated BOLT through the obstacle courses. Keith even added a "victory dance" to his robot, programming it to spin three times and light up in rainbow colors when it crossed the finish line.

These students are the first group to go through a weeklong artificial intelligence (AI)-focused camp organized

by NC State University researchers. The camp was funded by the Innovative Technology Experiences for Students and Teachers program under the National Science Foundation (NSF) grant "Engaging Rural Students in Artificial BOLT, a robotic ball that lights Intelligence to Develop Pathways for Innovative Computing Careers" (NSF DRL-2148680). Most of the activities took place in Pitt County, where the students live, through a partnership with the Boys & Girls Clubs of the Coastal Plain. It culminated with a one-day visit to NC State.

> Even before Chat Generative Pretrained Transformer — or ChatGPT. a natural language processing chatbot - became wildly popular in late 2022, interaction with AI was becoming increasingly common. The NSF has emphasized a need for more K-12 learning experiences with AI. Through this grant, which runs from 2022-25, NC State researchers will engage with more than 500 students and 20 teachers.

"This project is looking at bringing AI learning activities to K-12 students with a focus on the middle grades," explained Bradford Mott, principal

investigator (PI), senior research scientist in NC State's Center for Educational Informatics (CEI) and adjunct assistant professor in the Department of Computer Science. "And a unique aspect of the project is that we're using game design and playful activities as a way of introducing students to those AI concepts."

LEARNING THROUGH PLAYING

An Al-focused camp was new for into the games, which can help the computer science department, and existing computer science camps had limited exposure to AI learning experiences, explained Veronica Cateté, assistant professor of computer science and

co-PL But the emphasis on game design is a common approach in computer science education activities. Games are fun, they engage both teachers and students,

and they can be tailored to users' interests. Each day of the camp focused

on different fundamentals of AI education: perception; representation and reasoning; machine learning; natural interaction; and AI ethics. These fundamental concepts are the backbone of AI Play, an AI-focused learning environment software platform that the researchers are developing as part of this grant.

"We think teaching some AI concepts about natural language processing is particularly important for K-12 education," said Wookhee Min, research scientist and co-PI. "So one activity is about creating conversational non-player characters in games. Students can

create their own question and answer pairs and experience how AI works based on the question / answer pairs. They can ask any questions to the non-player characters. Behind the scenes. Al is operating to understand what the student asked and generate responses."

By developing their own question / answer pairs,

students will be able to infuse their own interests and personalities increase their interest.

Using hands-on activities in Al Play, students can also learn about pathfinding for non-player characters, machine learning and generative AI to create language or images automatically.

As more students use AI Play, Min and other researchers will continue to refine the software. By next year, all the different concepts will be integrated into a single system.

"And AI ethics is a pervasive concept across all these activities." Min said.

BROADENING ACCESS TO AI LEARNING EXPERIENCES

Students in rural communities have less exposure to computer science compared to students in urban areas. Danielle Boulden, a former CEI research scientist and co-PI who consults on the project, used to work in eastern North Carolina schools.

"There are definitely disparities in access to computer science, and even more so with artificial intelligence now," Boulden said.



PACK POINTS

Jessica Vandenberg, a

research scientist for CEI, said the team conducted interviews with teachers and students in rural communities to get a baseline understanding of what they knew about AI. In general, students knew more than teachers, who were pretty forthright with saying they didn't understand much about AI. "We want to help build up their competency," Vandenberg said.

To broaden access beyond camps, there will be professional development opportunities to support teachers in integrating Al learning experiences in their schools. Experiences from conducting the first camp in Pitt County are directly informing the professional learning being planned for teachers.

Ultimately, the goal is to improve awareness of AI to help students and teachers understand AI and the ethical implications of using it, as well as to help foster student interest in computer science.

The team is now analyzing data collected during the camp to iteratively refine the AI learning activities in an effort to scale and broaden reach during the coming vear.

> "...we're using game design and playful activities as a way of introducing students to those AI concepts."

BRADFORD MOTT



TOP: AMY ISVIK DANCES DURING A PREVIOUS TRIP TO RWANDA BOTTOM: MERIEM LAROUSSI, SECOND FROM BOTTOM LEFT, HOLDS UP "WOLFIES" (WOLF FARS) WHILE WORKING AS A STUDENT LEAD ON AN ALTERNATIVE SERVICE BREAK TRIE

Fulbright scholars head to **Rwanda**

WHEN MERIEM LAROUSSI AND **AMY ISVIK** applied for Fulbright

grants last year, they didn't know they would both end up in Rwanda. In fact, Laroussi said, "I had no

idea Amy was applying until we both won."

The Fulbright program provides approximately 8,000 scholarships annually for graduate study, to conduct research or to teach

English abroad. This year, 11 NC State students were awarded 2023 Fulbright Scholarships, a new record. The other students are traveling to Denmark, South Korea, Taiwan and more.

Laroussi is a 2023 master's graduate in industrial engineering and won the English Teaching Assistant (ETA) Grant. Isvik is a Ph.D. student in computer science who received the Fulbright grant for study and research. Both have been to Rwanda on previous trips with NC State.

"That's why I chose Rwanda," Laroussi said. "I already have connections there which will allow me to enhance my impact on the community."

Because of the accelerated bachelor's / master's program, Laroussi graduated with her master's degree this spring. She taught as a teaching assistant both semesters and did other activities through the Women and Minority Engineering Programs (WMEP).

"We have a program on campus called the Alternative Service Break," she said. "Every year, they offer short-term, service-based experiences in different locations. WMEP partners with Student Leadership and Engagement every year to do one in Rwanda centered around STEM outreach.

"I was one of the student leads this past year for that experience. In March 2023, we led a trip to Rwanda and we worked in four primary schools, mostly fifth and sixth grade in Musanze, a city in northwest Rwanda."

Laroussi plans to teach at a private, all-girls school in Kigali and focus largely on teaching English fluency and cultural context to STEM students.

In Isvik's Ph.D. program, she does both research and teaching. At NC State, her research has focused on computing-infused lessons, in which teachers bring in a programming element or the ability to learn computing and computer science concepts into a core area class or elective.

"For example, we work a lot with Reedy Creek Middle School [in Cary, North Carolina] and we had a food web simulation where they

coded a food web in block-based programming language, so they learned both about coding and the things they have to learn at the same time," said Isvik.

"That's nice because not all students get to take computing classes or camps. The biggest factor on if you'll take those classes in high school or college is if you've taken them previously, so putting it into a core class means that everyone gets to try it out."

In Rwanda, Isvik is training teachers to use computing-infused lessons in their math and science classes, providing support for those teachers and looking at what the difference is in support and new barriers that these

teachers might face. Several schools in Rwanda do offer coding classes. but it tends to be specialized and not open to all students.

Isvik is partnering with University of Rwanda College of Education and the African Center for Excellence in Teaching and Learning Math and Science, but she hopes to do her research outside of university spaces as well.

"Based on the reality of where research happens, most of the schools where this has been tested out are school districts near universities, often a little more privileged than other school districts," she said.

Isvik arrived in Rwanda in

MAE postdoc wins firstplace prize in annual research image contest

SHUANG WU. A

POSTDOCTORAL RESEARCHER in the Department of Mechanical and Aerospace Engineering (MAE), won a first-place prize in

the graphics and data visualization category of NC State's annual Envisioning Research contest. His illustration. "Caterpillar

Inspired Soft Crawling Robot," depicts a caterpillar-like soft robot that can move forward, backward and dip under narrow spaces. It was featured in a paper published in March 2023 in Science Advances, of which Wu is first author. Yong Zhu, the Andrew A. Adams Distinguished Professor of MAE, is a corresponding author.

The researchers drew inspiration from a caterpillar's biomechanics

to mimic its local curvature in the robot. Caterpillars curve their bodies differently when they pull themselves forward than when they push backward.

The caterpillar-bot's movement is driven by a novel pattern of silver nanowires that use heat to control the way the robot bends, allowing users to steer the robot in either direction. It is made of two layers of polymer. The bottom layer contracts when exposed to heat, while the top layer expands. The silver nanowires are embedded in the top layer, and multiple lead points within the pattern provide spots where researchers can apply an electric current to generate movement.

PACK POINTS

September and will be there for nine months. Those with the English Teaching Assistant Grant like Laroussi are in Rwanda from October until July.

"I want to come at it from a lens that's not imperialistic and more, 'What am I learning from them and what are they learning about the U.S.,'" Laroussi said. "For ETAs, we work very strongly with the U.S. embassy in the host countries."

She continued, "I couldn't have done it without the support of the faculty and staff at NC State, who really encouraged me to apply. I was not going to do it on my own. It's been a very supportive community overall."





The Barrie S.

PACK POINTS

4

MORE THAN SEVEN YEARS after

the discovery of elevated levels of harmful chemicals in the Cape Fear River that provides drinking water for 1.5 million people, NC State University researchers who brought awareness to this public health issue are continuing to pursue a broad range of research initiatives with the goal of ensuring a cleaner environment and safer drinking water.

Researchers have been trying to find answers to the public's many questions about the longterm effects of these chemicals on our water, food and health. One of many important issues being addressed by NC State researchers is how to remove "forever chemicals" from drinking water.

Detlef Knappe, S. James Ellen Distinguished Professor of Civil, Construction, and Environmental Engineering, was one of the first to bring attention to per- and polyfluoroalkyl substances (PFAS), after publishing a 2016 paper on elevated levels of PFAS in the Cape Fear River watershed. He is now deputy director of the NC State Center for Environmental and Health Effects of PFAS.

PFAS consist primarily of carbon and fluorine atoms. Over 14,000 PFAS structures are known, but health effects for most PFAS are not well understood. Of the few PFAS that have been extensively studied, adverse health outcomes include cancer, immunotoxicity, ulcerative colitis and high cholesterol.

Known as "forever chemicals." many PFAS are extremely difficult to break down and are widely found in water and soil. They are used in a variety of consumer products including non-stick pans, food

packaging and firefighting foam. In 2023, the U.S. Environmental Protection Agency proposed nationwide drinking water standards to limit human exposure to six PFAS.

SCALING UP WATER TREATMENT PROCESSES

According to the Environmental Working Group, an estimated 200 million people in the U.S. could be drinking water containing PFAS. Improving and scaling up water treatment methods is therefore a top priority.

Several ongoing and recently completed projects are focused on granular activated carbon (GAC), which is an adsorption medium made from wood, coconut shells or coal. It is the most widely used method to remove PFAS from drinking water.

Water treatment facilities process millions of gallons of water per day. On an average day, the City of Raleigh treats approximately 50 million gallons. Selecting costeffective treatment materials and optimizing process design are critical to assuring the affordability of drinking water. Knappe's research supports design engineers and drinking water providers in this effort to optimize the use of GAC.

In one project, Knappe and his research team are developing experimental approaches to predict GAC performance from benchscale experiments. In the lab, GAC particles are crushed to be about 13 times smaller than they are in fullscale treatment systems to speed up experiments. The researchers can simulate 170 days of full-scale operation in a one-day bench-scale column study. In conjunction with

mathematical models, Knappe's research team can predict GAC treatment effectiveness for a wide range of PFAS, drinking water sources and GAC types.

NC State is working together with Arizona State University on another related project to see what's happening inside of GAC particles. Particles are sectioned with a focused ion beam under cryogenic conditions and then examined using scanning electron microscopy and energy dispersive X-ray spectroscopy. Understanding what's happening inside these particles will help develop better mathematical models to predict how PFAS are removed by GAC and how much GAC is needed to meet a water provider's needs. In another project, one of Knappe's master's students developed a GAC treatment database and a machine learning model to predict GAC performance from readily available data for pollutant properties, GAC characteristics and water quality. Researchers are also exploring ways GAC can be reused, which could help reduce PFAS treatment costs. GAC can be thermally reactivated and reused,

but researchers are still trying to understand how PFAS respond to thermal reactivation.

"Until 2013 or so, I rarely "We are trying to understand reached out to people who were whether PFAS-laden GAC can be not water treatment professionals safely reactivated by identifying or academic colleagues. Now reactivation conditions at which I can almost not imagine doing research where I wouldn't interact PFAS are completely destroyed," Knappe said. "It is important to not with people living in communities introduce products of incomplete impacted by environmental destruction into the air and to contamination," Knappe said. "It's assure that the reactivated GAC very rewarding to conduct research product can be reused safely and that helps answer questions people in impacted communities have." effectively. Thermal reactivation and subsequent reuse of GAC reduces

"It's very rewarding to conduct research that helps answer questions people in impacted communities have."

DETLEF KNAPPE

costs to drinking water providers and is likely preferable to disposing spent GAC in landfills."

While working on improving large-scale water treatment is critical, the most frequent question Knappe gets from people living in affected communities is which home filtration system to install.

To answer this question, NC State and Duke University researchers looked into the effectiveness of home filtration systems in a 2020 open-source paper that has been viewed more than 50.000 times. Under-sink reverse osmosis and two-stage filters effectively removed PFAS to the reporting limit of analytical methods, whereas activated carbon filters used in pitchers, refrigerators and faucets resulted in partial PFAS removal.























TOP, LEFT TO RIGHT, MILAD ABOLHASANI LINA BATTESTILLI, MICHAEL DICKEY, ASHOK GOPALARATHNAM, CHRISTINE GRANT, RACHANA GUPTA, ISMAIL IVENÇ, JULIE IVY, JEREMIAH JOHNSON, BERT KELLY AND JUN LIU.

Battestilli. Johnson and Liu receive Outstanding **Teacher Awards**

Three faculty members in the College of Engineering were named recipients of the Outstanding Teacher Award for 2022-23.

Lina Battestilli is an associate teaching professor in the Department of Computer Science; Jeremiah Johnson is an associate professor in the Department of Civil, Construction, and Environmental Engineering; and Jun Liu is an associate professor in the Department of Mechanical and Aerospace Engineering (MAE).

The award recognizes excellence in teaching at all levels and is a prerequisite for being considered for the Board of Governors Award for Excellence in Teaching and the Alumni Distinguished Professor Award.

Gopalarathnam receives Alumni Distinguished Undergraduate **Professor Award**

Ashok Gopalarathnam.

professor in MAE, received the NC State Alumni Distinguished Undergraduate Professor

Award, a prestigious honor that recognizes excellence in undergraduate education.

As an instructor for undergraduate and graduate courses in aerospace engineering and a member of the aerospace engineering curriculum committee, Gopalarathnam is guided by several goals: to tap into students' enthusiasm for engineering and science; to impart important engineering skills; to use technology to promote student involvement; and to develop approaches for systematic improvement to the aerospace engineering and mechanical engineering curricula.

"A majority of undergraduate students in engineering choose their programs because of their enthusiasm for the subject," said Gopalarathnam. "They are driven by a vision of working on their favorite gadgets, devices or vehicles."

Güvenc. Abolhasani receive **2023 Alcoa Foundation Awards**

Ismail Güvenç, professor in the Department of Electrical and Computer Engineering (ECE), received the 2023 Alcoa Foundation Distinguished Engineering Research Award. The award recognizes a senior

faculty member for research achievements made over a period of at least five years at NC State. Güvenç was honored for his research contributions in contemporary 5G and Next-G communication technologies using statistical signal processing, communication theory, optimization theory and wireless testbeds.

Milad Abolhasani.

associate professor in the Department of Chemical and **Biomolecular Engineering** (CBE), received the 2023 Alcoa Foundation Engineering Research Achievement Award. The award recognizes young faculty members for significant research contributions during the preceding three years. Abolhasani was recognized for his research contributions in the Kelly receive development of the self-driving fluidic laboratory for accelerated discovery and manufacturing of advanced functional materials and molecules.

Dickev receives **NC State Alumni** Rachana Gupta, teaching professor in ECE; Julie Ivy, Distinguished now an emerita professor in Graduate the Edward P. Fitts Department of Industrial and Systems **Professor Award** Engineering; and Robert Kelly, Alcoa Professor in CBE, were Michael Dickey, professor awarded the 2023 Blessis in CBE, received the Alumni Outstanding Undergraduate Distinguished Graduate Advisor Awards from the Professor Award, a prestigious College of Engineering. The award recognizes recipients' honor that recognizes excellence in graduate outstanding commitment to ensuring students are

education.

FACULTY HIGHLIGHTS

Dickey also received the 2023 NC State Outstanding Engagement Award. The award is designed to encourage and recognize outstanding extension, engagement and economic development activities by NC State faculty members and is, "directly parallel in intent to the University's Outstanding Teaching Awards."

Dickey's other awards include the Alumni Association Outstanding Research Award, the Alumni Distinguished Undergraduate Professor Award and the Alcoa Foundation Distinguished Engineering Research Award.

Gupta, Ivy and 2023 Blessis Outstanding Undergraduate **Advisor Awards**

academically and personally supported by routinely giving their time and effort to advising, counseling and mentoring individual students and student groups. It is also a tribute to George H. Blessis, a faculty member whose interest in undergraduate education and advising serves as an example today.

Grant elected Fellow of the American **Society for** Engineering Education

Christine Grant, professor in CBE and the College's inaugural associate dean of faculty advancement, was elected a Fellow of the American Society of Engineering Education (ASEE).

Grant has been a lifelong advocate for broadening participation, promotion and retention of people in science, technology, engineering and mathematics. She has served as a mentor and role model for women, particularly women from underrepresented groups in engineering, from students to faculty members, and has been recognized widely for her mentoring efforts. She also served as the 2022 president of the American Institute of Chemical Engineers.

Jim Pfaendtner brings a passion for engineering education to NC State

THE NEW DEAN

WHEN JIM PFAENDTNER stood to welcome a room of first-year engineering and computer science students during a program on campus in August, he began with some common ground.

Just like you, Pfaendtner said, I am new to NC State. He was three weeks into his term as the Louis Martin-Vega Dean of Engineering and told the students that they probably know more about the University than he does.

During his remarks, Pfaendtner mentioned the achievements of previous engineering and computer science graduates, but acknowledged that even those high achievers had to struggle at times. He emphasized what a life-changing experience college can be and sought to combat the feeling experienced by some students in STEM courses that they shouldn't be there — often referred to as imposter syndrome — by assuring them that "you belong here, and we could not be more excited to welcome you." He highlighted the importance of mental health and how he has learned to manage his own challenges.

Pfaendtner comes to NC State University from the University of Washington (UW), where he served most recently as chair of the Department of Chemical Engineering (CHE) and the Steven R. and Connie R. Rogel Endowed Professor. He succeeds Louis Martin-Vega, who led the College for 17 years before stepping down as dean in summer 2023.

Pfaendtner takes the helm at an important time for the College. Martin-Vega's lengthy tenure included growth and improvement across the board, from enrollment and national rankings to research capacity and diversity. Most of the College has now made the move to Centennial Campus.



SUS

And thanks to a state initiative called Engineering North Carolina's Future, the College aims to grow its enrollment by 40 percent over the next few years. In looking for an engineering dean, NC State leadership hoped to find the perfect person to lead the College through that growth and build on the positive momentum in place.

During the first-year welcome, Pfaendtner went on to deliver a message of encouragement for students that may have struck a different tone than the one sometimes given by deans of previous generations. Talk to older engineering graduates, and they sometimes relate a similar memory. A dean gathers first-year students together early in the school year and offers an ominous warning about the difficulty of the degree program: look to your left, look to your right --those students will not make it through this program.

Pfaendtner offered a different take on that message, built for a different world of STEM education that still offers a rigorous educational program but with supports that were not there for previous generations and with an increased focus on student success.

Look to your left. Look to your right, went this new version of the message from the dean.

"Here's the awesome thing, every one of you has a spot in NC State's College of Engineering," the new dean said. "We picked you for a reason. You individually earned your spot."

A DEAN IN THE LAB

Like many career engineers, Pfaendtner can point to childhood memories of taking things apart and trying to put them back together again. In one memorable case, it was a computer that his father, a manufacturing engineer, brought to their home in western Michigan. Dad returned to find the computer's innards spread out on the kitchen table.

"There was no internet, so I didn't know how to put it back together," Pfaendtner recalls. "We eventually got it back together, but it didn't make Dad very happy."

He earned a bachelor's degree in chemical engineering from the Georgia Institute of Technology and after a few years in industry, Pfaendtner decided that research and teaching were his calling. He did a Ph.D. at Northwestern University and, after a postdoctoral fellowship, Pfaendtner joined the faculty at UW in 2009.

He rose guickly in academic administration, first as director of the graduate program in CHE and as associate vice provost for research computing, then as chair of his department in 2019.

Pfaendtner's research involves using computer simulations to better understand molecular science. with a range of applications that includes energy storage and wearable health-monitoring technology. It's an exciting time for the field, he said, because



of recent advancements in computing capacity and artificial intelligence.

The new dean plans to continue his research program in NC State's Department of Chemical and Biomolecular Engineering, just at a smaller scale. He wants to carry on several projects and be involved in training new researchers, but also sees it as part of his onboarding process.

Ratner recalls a time during the latter parts of the "There's no better way for me to know what it's like Covid pandemic, when the staff and faculty had to be a professor at NC State than to do research at NC been through the ringer trying to balance work and State," he said. personal lives, that Pfaendtner asked the people in his When appointed as department chair at UW, department to share goals with him.

Pfaendtner made two commitments: that he would continue teaching and that he would continue his research program, said Elizabeth Nance, Jagjeet and Janice Bindra Endowed Career Development Professor in the same department. That commitment earned a level of buy-in and understanding from colleagues in the department, said Nance, who earned her undergraduate degree in chemical and biomolecular engineering from NC State before getting a Ph.D. at Johns Hopkins University.

"He was trying to show that you can be a holistic administrator," Nance said. "Yes, it's a hard thing to do, but as an administrator it's very impactful."

THE RIGHT PLACE

Pfaendtner has also committed to be the faculty advisor for the student CrossFit Club on campus (it's a to as many students as possible. high-intensity exercise program that mixes cardio and As he told those first-year students on campus. NC State Engineering's new dean feels that he is in exactly strength training and gives participants a chance to connect with each other). He also enjoys video games the right place. (PlayStation is his platform of choice) and is active on "I'm not exaggerating when I say this is my dream social media (we've listed his handles on page 18 so job. I'm so thrilled to be here and so excited to work you can follow along). with you."

Colleagues like Nance describe an energetic, engaging leader who is people-oriented and interested in building systems that make others successful. He is decisive, but won't make that decision without thorough input from his team, said Daniel Ratner, professor of bioengineering and associate dean for academic affairs in UW's College of Engineering.

"The first thing he said was 'You're going to tell us what you're not going to do this year and still be sustainable." Ratner said. "I loved the fact that he was asking that question."

Ratner, in an interview during summer 2023, also identified Pfaendtner's love of teaching and mentorship, his love of being a professor.

"Jim loves being faculty," Ratner said. "His identity is faculty. He is faculty."

Pfaendtner describes a personal calling toward higher education and identifies another core belief: "Engineering degrees are the most important thing for

upward social mobility. I believe it in my bones."

In NC State, he saw an institution that's on the rise and that is very good at what he loved about UW: equal commitment to the missions of both groundbreaking research and serving the people of the state by offering an education that can be life changing



DOE grant brings renewed energy to NC State COE in more ways than one

othing energizes the engineering community like fusion. Scientists have seen fusion startups crop up around the country in recent years as fusion becomes less of an experimental, fundamental science program and more of an energy program.

plant within the next one and a half decades," said Florian Laggner, assistant professor in the Department of Nuclear Engineering (NE). "The most ambitious would say, like, we want to turn on a fusion pilot plant before the 2040s."

Neutral beam sources are one of the primary systems used to generate the extraordinary temperatures and pressures needed to sustain fusion reactions. Creating new and sustainable designs for neutral beam State comes in. sources at the Department of Energy's (DOE) DIII-D National Fusion Facility is no easy task, but Laggner, along with Amanda Lietz, assistant professor, and Steven Shannon, professor, are up to the challenge.

The trio was awarded a \$2.1 million DOE grant, which comes at an exciting time for fusion research. Several experimental facilities around the world have set new

operations records recently, and the fusion effort has also benefited from an infusion of early-stage venture funding from the private sector.

On Dec. 5, 2022, the National Ignition Facility at Lawrence Livermore National Laboratory conducted its first-ever controlled "That means deployment of a fusion power fusion experiment, which involved producing more energy from fusion than the laser energy they used to drive it, a key milestone in the broader fusion effort.

> Fusion is when two light nuclei combine to form a single, heavier nucleus and release a large amount of energy. Before two positive nuclei can overcome repulsive forces and collide in a fusion device, they must be heated to temperatures hotter than the sun. which is where the new research out of NC

> The primary heat source at DIII-D is the neutral beam injectors, which produce beams of neutral particles traveling at over 10 percent of the speed of light. The beams require a large quantity of ions, the source of which is the focus of this work.

Neutral beam ion sources already exist, but are inefficient and limited in the amount of ions they can produce. At NC State, the



STEVEN SHANNON, AMANDA LIETZ AND FLORIAN LAGGNER ARE LEADING A DOE GRANT THAT FUNDS THE DEVELOPMENT OF NEW AND SUSTAINABLE DESIGNS FOR NEUTRAL BEAM SOURCES

main task is creating more efficient, innovative and reliable neutral To round out the team, Lietz does computational modeling beam sources for DIII-D. of low-temperature plasmas for a wide variety of applications, The present technology for such sources was largely developed including medicine, chemical processing and computer chip in the 1980s, said Laggner. "So we're opening the book again and production. looking at 21st century technology." "This is a large project with a lot of expensive hardware In the last few years, NC State has received grants around purchases and big design decisions." said Lietz. "One of the best fission materials for education and plasma system manufacturing, ways to make good design decisions before you spend a bunch with one from the Oak Ridge National Laboratory dedicated of money on equipment is to use physics-based modeling. to fusion. Never before has the College of Engineering had an "We want to get as much of the power as possible into the experiment onsite that directly contributes to one of DOE's bigger plasma," she continued. "Everything else is just waste. We fusion facilities. will also model the plasma itself, and we really want a nice, Laggner works largely on high-temperature plasmas in magnetic uniform ion beam coming out of this source, which will then be neutralized and become a neutral beam, since you need neutrals confinement fusion devices, plasma edge physics, plasma diagnostics and auxiliary systems, like neutral beam ion sources. to cross the magnetic fields in the fusion plasma." Shannon's research focuses primarily on the industrial The three plan to use the grant to hire undergraduate students. applications of plasma discharges, including the development of graduate students and postdoctoral researchers; purchase the next generation plasma sources to support the microelectronics necessary equipment; and more. The students and researchers will have expertise in a range of related topics, from fusion heating industry, where a guarter of the steps required to fabricate computer chips rely on plasma technology, and developing new systems to industrial plasma manufacturing and plasma modeling. plasma applications for the next generation of material and device Laggner and Lietz, who brought new research expertise when fabrication. they started at NC State in 2022, are excited to work with Shannon "The ion source design needs to be improved upon to what to establish NC State as a major player in fusion energy research. eventually might be a commercial fusion plant, so our job is to "We strive to establish a world-renowned facility where we take a closer look at how this plasma is formed and try to find a would then provide engineering contributions to advance fusion energy," said Laggner. "So that's the reason why this is a big more efficient, reliable way to generate a plasma that can run for longer periods of time without having to be replaced or updated," thing in the sense that NC State hasn't been on the map within the fusion program at all. And now we have a significant project he said. "We want to leverage the lessons learned making that has high relevance in the U.S. and international fusion efficient and reliable plasma sources in electronics manufacturing

to improve the efficiency and reliability of fusion reactors." community."

<u>ENGINEER</u>

Through the Engineer Your Experience (EYE) Program, undergraduate engineering students can make opportunities their realities. EYE funding supports study abroad, professional development, conferences and workshops, service trips, technical certifications and more. Since 2019, 3,369 students have received support from EYE. Last year, the EYE Program spent just over \$1 million, the highest amount to date.

The application process starts each semester on the first day of classes. For more information, contact Shelly Hoover-Plonk, the program coordinator, at engrfundrequest@ncsu.edu and check out go.ncsu.edu/eye.

"We are proud to see the number of students taking advantage each year," Hoover-Plonk said. "The EYE Program is meant to support undergraduate engineering students to take advantage of these various high-impact experiences for professional growth while they are at NC State."



TRAVELING AS A PACK

In May, EYE covered hotel expenses for the Formula SAE team's four-day competition in Michigan. Formula SAE is an intense time commitment for students. They build a car from scratch each year, and then race it. Having support from EYE frees up funds for other needs, like fuel and parts for their car.

"It's like a full time job, especially

in the leadership positions," said

Scott Davis, a senior mechanical engineering major and co-captain of the team. the industry that you can really only get by doing Formula SAE."

"I love making stuff, and I've learned so much,″ said **Eve** Frazier, a junior computer science "Also at the competition, running for the first time. the sound of the engine - I think everybody on the team gets a giddy feeling."





As outreach chair of the Quantum Computing Club last year, Hannah Braswell wanted to find a conference to help club members make connections and learn more about how quantum computing is becoming more involved with data analytics, Al and machine learning. Braswell, who is a junior majoring in electrical and computer engineering, landed on the International Supercomputing Conference (ISC) 2023 in Hamburg, Germany. She applied for EYE funding to help offset the costs. As a member of the EYE student advisory committee, Braswell

encourages all undergraduate students to use the program. "EYE has so many capabilities for funding that people are so unaware of," she said. "Funding flights and hotels was one of the most resourceful things in the world." Braswell attended with two other club members, who were among the few undergraduate students there. They made sure to

put themselves out there and talk to as many people as they could, learning about both academia and industry while also getting to do some traveling in Europe.



CULTURAL EXCHANGE IN ALASKA

Shaun Deardorff, a senior majoring in aerospace engineering, has been to Alaska four times over the past several semesters because of the friends he made during his alternative spring break trip that EYE funded in March 2022. He traveled to a small village called Hoonah, a primarily native Tlingit community in Alaska where NC State has had an ongoing relationship for over 20 years. Along with other students, Deardorff taught art classes at the local school and encouraged students to consider higher education and careers in STEM.

Deardorff has returned to visit friends, who have taken him crabbing, seal hunting and swimming with humpback whales as well as shared traditional stories and ceremonial garments. "It was very reciprocal," he said. "We were there helping the school, but they also helped us a lot. We learned more about the beautiful Tlingit culture, and it was a really unique and profound

exchange of ideas and service."



Since their inception, the **Minority Engineering Programs** (MEP) have focused on developing and delivering support services that assist in recruiting, retaining and graduating Black, Native American and Latinx/e and Hispanic American students in the NC State University College of Engineering. This year, the College celebrated the success and impact of MEP with a weekend of events on Nov. 10-12.



Laying the Foundation

In 1982, recognizing the hurdles that existed for Black students enrolling in and graduating from NC State, the University hired Bobby Pettis as the first minority coordinator for the College of Engineering. Pettis was responsible for recruiting Black students and increasing their graduation rates in the College. He was also in charge of the tutoring and writing assistance programs. His efforts and success in the College of Engineering served as the model for establishing African American coordinators in each college at NC State. The African American coordinator positions - which still exist today as diversity directors / deans — focus on support for all underrepresented students in each college. Pettis served as minority coordinator until his passing in 1990.

Pettis was succeeded by the following individuals who helped lay the groundwork for this program:

Thomas E. H. Conway, Jr. served as director of recruiting and minority services from 1991 until 1993, when he became the assistant dean for student services.

Stephanie G. Adams, now dean of engineering at the University of Texas at Dallas, became the third director of the minority services program in 1993.

Wendy Blue served as interim director in January 1995 until Tony Mitchell's arrival.

Tony L. Mitchell led the program from 1995 until his retirement in 2011.

Angelitha Daniel led the program from 2011 to 2022, when she was appointed the inaugural assistant dean for diversity, equity and inclusion.

Javon Adams currently serves as interim director of the Women and Minority Engineering Programs (WMEP).

The efforts of these individuals laid the foundation for a transformational program that continues to be a top producer of B.S. degrees awarded annually to historically

STATE ENGINEERIN

event, so we hope to ee evervone in fall by filling out the MEP mepalumnisupporterform

underrepresented students in engineering and computer science.

Continuing the Legacy By Creating Community

The mission of MEP is the same today as it was in 1982. Specialized programming aimed at recruiting, engaging, networking and launching students into their professional careers is the foundation of the program's success. A summer bridge program, first-year orientation courses, mentoring, tutoring and advising of the affinity student groups all aid in historically underrepresented students' academic, personal and professional growth before and after graduation.

Four decades later, the College continues to increase the number of underrepresented students enrolling. For 2023-24, the percentage of first-year students identifying as Black, Latinx/e and Hispanic American, Native American and Pacific Islander is 17.6 percent (up from about 10 percent a decade ago). Over the last four years, MEP's programs and partnerships have been updated to cater to the whole student and ensure they have a place that welcomes and embraces them as family.

Time to Celebrate: MEP40 Celebration Weekend

This year, the College of Engineering marks 100 years of service to the state of North Carolina. The College commemorated the Minority Engineering Programs during the MEP 40th Anniversary Celebration Weekend held Nov. 10-12. In celebrating our past, present and future, we hosted alumni, current students and community partners for a MEP Family Reunion and honored our past and current MEP leadership at the MEP 40th Anniversary Gala.

As the College of Engineering celebrates its 100th anniversary this year, we're continuing to recognize the amazing people who have made our College what it is today. In May, we gathered to commemorate our 100th year with a night that highlighted all things NC State Engineering. In a tent lit to look like the blue light of NC State's on-campus nuclear reactor, NC State engineers and computer scientists from our past and present gathered to reminisce on our last century and share their hopes for the next.

It is our alumni, faculty and staff members, students and friends who have helped make the NC State College of Engineering what it is today. Their stories are all part of the rich history of our College. Below are just a few excerpts from stories that have been shared with us. You can share yours at go.ncsu.edu/yourcoestory.



"Going to NC State and being in the College of Engineering was one of my best decisions. I found so many friends who were like-minded to myself and are still my friends to this day, and it is cool to see how their careers and lives have grown. I have friends from the Women in Science and Engineering (WISE) Village, as I joined WISE in 2013, so it has been 10 years since, so those are also special. I take pride that I still get to work with different professors at NC State and the Institute for Transportation Research and Education (ITRE) as my career keeps molding. I have special memories of Mann Hall with the Department of Civil, Construction, and Environmental Engineering that cannot be replaced or replicated. Engineering will continue to evolve and change as we all will and has given me a lot of joy in my life and career."

"Looking back now, I cannot help but feel a great sense of privilege for having been a part of this exceptional graduate research group, the **Department of Materials Science** and Engineering, and the College of Engineering as a whole. The experience was not only intellectually enriching but also incredibly enjoyable. It fostered lasting friendships that have endured for over two decades. ... Hopes for the next century would be for the COE to attain even greater heights, continue to make breakthroughs in STEM and other related areas, cultivate a culture of entrepreneurship at all levels and most importantly train students who can continue to solve important problems for mankind and make a real difference."

DIPANKAR GHOSH Ph.D. materials science

and engineering '05

"I was unprepared for it and the school knew it. ... What sustained me were the things I could do as part of a team. ... I became very proud of my school and extremely happy that it gave me a chance to swim. I had a wonderful 50-year career because of it. When I cleaned out my last office upon retirement, I left two handwritten questions on my white board: 'What do you think we should do?' and 'Who else should be involved in this decision?' Those lessons in humility and inclusion were hard won in my four years at NC State."

CHUCK KLEEBERG,

B.S. mechanical engineering '71

"I learned to stretch beyond what I thought I could do. I realized my potential and formed lasting friendships and connections. My hope for the next generation is that they will do likewise. Don't limit vourself but seek to do great things in ways not thought of before!"

> **DIONNE TATUM LYDE**, B.S. industrial engineering '93

EMILY FERREIRA, B.S. civil engineering '17

NORTH CAROLINA STATE COLLEGE







GROWING AT WOLFSPEED

NC State-born company continues to pay off for North Carolina

THE FOUNDERS OF CREE, INC. started a company based on the potential of silicon carbide, a finicky but promising compound long employed as a abrasive but with the potential for much more.

Used since the 1800s for sandpaper and grinding wheels and as a hard and durable ceramic for automotive brake pads or turbine blades, silicon carbide is also a semiconductor that is particularly we suited for efficiency at high operating temperatures.

"That's what it was born from the stars for," said , a Cree co-founder and NC State materials science and engineering alumnus. "As a power electronic semiconductor."

Cree is now Wolfspeed, Inc. and the focus has shifted from using silicon carbide to make LED lights to using it to make semiconductor wafers for power electronic devices. In 2022, Wolfspeed announced

	plans to build a manufacturing campus in Chatham
	County, about 50 miles west of NC State. The company
า	intends to invest \$5 billion and create 1,800 new jobs
	by 2030. It will be the largest silicon carbide materials
	production facility in the world and represents the
	largest economic development project in North
	Carolina's history.
ell	The company feels strongly that silicon carbide,

which it has 36 years of experience working with, will soon power everything from electric vehicles and fast chargers for them to 5G wireless infrastructure and renewable energy capture and storage.

"It's going to be the next power semiconductor," Edmond said. "We are going to replace all silicon power with silicon carbide. And the industry knows it."

It all started in a laboratory in the Department of Materials Science and Engineering (MSE) at NC State.

beyond the lights

Cree was founded in 1987 by Edmond, John Palmour, Neal Hunter, Thomas Coleman, Calvin Carter and Eric Hunter. Five of the six were MSE alumni.

The company was born out of the lab of **Robert Davis**, now an emeritus professor in MSE. Davis had begun work with silicon carbide as a semiconductor and had received funding from the Office of Naval Research to study it for microwave applications. The Cree founders worked on different aspects of silicon carbide for their Ph.D. and master's degrees — and, in Carter's case, as a postdoctoral scholar helping run Davis' lab — but were collaborating every day. Those roles would carry through when they started the company.

Cree was founded over lunch at a restaurant on Hillsborough Street next to campus. Neal Hunter and Eric Hunter maxed out their credit cards and Neal took out a second mortgage so that they could hire Edmond as the first employee.

At the time, LED lights were the most commercially viable end-use product for the work that the founders had done at NC State. Blue LED lights were not being produced to the extent that red and green ones were (combine those three and you could create a full-color LED display). Cree saw an opportunity to produce blue lights with silicon carbide, and later with gallium nitride on a silicon carbide substrate.

The years of success as an LED-lighting company gave Cree valuable experience with creating silicon carbide crystals and wafers, an intensive process because the material wants to form at one of 200 different structures and there's only one that you want. The payoff, though, is significant: silicon carbide and gallium nitride, so-called wide bandgap semiconductors, are 10 to 15 percent more efficient than current silicon semiconductors. When

As lighting became more of a commodity, the company began to shift its focus to high-power semiconductor devices. Wolfspeed has now sold off its LED and microwave businesses to focus exclusively on these devices.

"This world is going electric, and silicon carbide for anything over 100 volts saves you energy," Carter said. "It can handle a lot more power in the same area than silicon can, so it keeps things small and light. That's a big deal." very near and de "This world is going electric, and silicon carbide for anything over 100 volts saves you energy... It can handle a lot more power in the same area than silicon can, so it keeps things small and light. That's a big deal."

-CALVIN CARTER

close to home

The company and its founders have maintained their ties to the University, including with a name that's a nod to the NC State Wolfpack.

NC State's strength in research on wide bandgap devices, including collaborations with Wolfspeed, helped the University land the lead role in the PowerAmerica National Manufacturing Innovation Institute in 2014. Now, Wolfspeed is one of six companies partnering in a \$39.4 million Department of Defense regional innovation hub led by NC State. The hub, Commercial Leap Ahead for Wide Bandgap Semiconductors (CLAWS) is funded by the federal CHIPS Act and is focused on wide bandgap devices.

When the company made the decision to build the materials facility in Chatham County, proximity to NC State's research and workforce was one of many reasons that staying close to home made sense.

And several of the Cree founders have stayed connected to the College and NC State, giving their time and making philanthropic gifts to support scholarships and fellowships.

"NC State, that's a special place," said Edmond. "It's very near and dear to my and all the founders' hearts."



5



When Cree, Inc. was started, each of the six founders had a role. John Palmour's was to work on advanced devices.

Palmour stayed involved with Cree, now Wolfspeed, as long as any of the founders. When he passed away in November 2022 at the age of 62, he was serving as the company's chief technology officer and had been a driving force behind Cree's transition from an LED lighting manufacturer to a silicon carbide power semiconductor company.

"This was JP's baby," said John Edmond, a fellow co-founder of Cree and NC State engineering alumnus. "It's sad to lose such a great friend, but also to have him not see where this thing is going. He was the heart and soul of that business."

Wolfspeed's new manufacturing facility under construction in Chatham County will be named the John Palmour Manufacturing Center for Silicon Carbide. The company has also honored Palmour's legacy while investing in future leaders and discoveries and adding to the Palmour family's legacy of philanthropy at NC State. A gift to the University by the company has established the John Palmour Distinguished Professorship in Materials Science and Engineering (MSE) as well as the Wolfspeed Endowed Scholarship in Memory of Dr. John Palmour. The scholarship will provide need-based support for undergraduates in MSE, where Palmour earned his bachelor's degree (1982) and Ph.D. (1988).

Palmour and his wife, Nancy Palmour, a 1985 alumna of the College of Humanities and Social Sciences, had previously established the Palmour Family College of Engineering Fellowship Endowment and the Palmour Family Extraordinary Opportunity Scholarship Endowment for engineering students. They also have been generous supporters of the University's Greatest Needs Fund and the Wolfpack Club's Student-Athlete ImPack Program.

A member of the National Academy of Engineering, Palmour was a strong advocate for research collaborations between industry, faculty members and students. He played a key role in helping bring the PowerAmerica research center to NC State, served two terms on the University's Board of Visitors and participated in activities such as a 2022 panel discussion about the College of Engineering's role in driving the state's economy, held at James B. Hunt Jr. Library.

Palmour was named a Distinguished Engineering Alumnus by the College of Engineering in 2009. In 2015, he was elected to the inaugural class of the MSE's Hall of Fame, along with his father, Hayne Palmour III, a 37-year professor of ceramic engineering at the University and an NC State alumnus himself.

EATURES

JOHN PALMOUR, SECOND FROM RIGHT, SPEAKS DURING A PANEL DISCUSSION AT THE JAMES B. HUNT JR. LIBRARY ON NC STATE'S CENTENNIAL CAMPUS IN OCTOBER 2022.



Bilbro Faculty Senior Award honors student resilience



GRIFE BIL BRO

Professor Griff Bilbro could explain complex physics and electrical engineering concepts in ways that made them accessible to just about anyone — "an uncanny ability to share some of the most complicated ideas as if they were drawn in crayon and stick figures," as one of his former students put it. He was positive, he was compassionate, and he was considerate of each student's learning style and situation.

Bilbro, who passed away in 2016, left a mark on hundreds of NC State University students, especially those in the Department of Electrical and Computer Engineering (ECE), where he worked for 32 years. He worked with dozens

of Ph.D. students and taught many undergraduates. He influenced some students to pursue academic careers, helped others realize it was possible to finish their degrees and succeed in industry, and made students feel like their success mattered.

"He had such respect for his students," said Carla Savage, who was married to Bilbro for 34 years and is a professor emerita of computer science at NC State.

Bilbro taught two physics-heavy classes, ECE 422: Transmission Lines and Antennas for Wireless and ECE 403: Electronics Engineering, to juniors and seniors. The students worked hard to succeed in those challenging classes, many while working multiple jobs, supporting families or coming back after time off from classes.

To honor his dedication to his students' wellbeing and success, Savage created the Griff L. Bilbro Faculty Senior Scholarship, which is given to a student who receives the ECE Faculty Senior Scholar Award to partially support the student's needs in their final year of undergraduate studies. The first was awarded last year.

Both Bilbro and Savage always wanted to help students get everything they could out of their education, and they recognized that easing the financial burden could help make that possible.

"I wanted to memorialize the students and their hard work and resilience." Savage said. "I know that word is overused now, but they were really tough and strong and worked hard, and Griff was so supportive of them. I wanted to honor that. I thought that captured his spirit more than anything."

AN UNPLANNED TEACHING CAREER

Bilbro and Savage met as undergraduate students at Case Western Reserve University in Cleveland. He majored in physics, and she majored in mathematics. During their second year, they were in the same symbolic logic class, which ended in the early evening.

"If we walked slowly enough, the cafeteria was open for dinner, so we'd have dinner together," Savage said.

Both attended the University of Illinois Urbana-Champaign for graduate school. Bilbro earned his M.S. in physics in 1975, and Ph.D. in physics in 1977. Savage earned her M.S. and Ph.D. in mathematics, also in 1975 and 1977.

After Illinois, she knew she wanted to teach at a university. He wanted to move away from cold weather. They spent one year together in Austin, Texas, for her postdoctoral position, and then moved to Raleigh, North Carolina, where Savage joined NC State's Department of Computer Science in 1978 and Bilbro worked for RTI International. Their children, Rebecca and Lucas, were born in 1982 and 1984.

too. Bilbro had a long record of outstanding teaching and was elected to the NC State Academy of Outstanding Teachers in 2001. He was named the Institute of Electrical and Electronic Engineers Undergraduate Teacher of the Year in 2006. The pair enjoyed working at the same university, and they maintained separate schedules to stay flexible for their children. Some students took a class taught by Bilbro and a class taught by Savage without knowing they were married. But they would sometimes meet for lunch or to stroll around campus together.

Nino Masnari, who was dean from 1996 to 2006, once told Savage that people in his office liked seeing her and Bilbro holding hands and walking through campus.

"I was really embarrassed." she said. "I wasn't even aware that we did it. You know, it wasn't a that. But it must have been unconscious sometimes." They talked often about their teaching and strategies. Sometimes one would ask the other for advice, though Savage remembers it was usually her asking him how he might approach a situation. "He really could make hard things easy," she Thanksgiving dinners. Everybody has a story about That's who he was."

public display of affection. I don't remember doing said. "For anybody, even my family, you know, at Griff. He would never talk down to anybody. He always assumed that whatever he wanted to say, he could say it in a way that you would understand.

Bilbro also joined NC State in 1984 and enjoyed a 32-year career with colleagues and students in the ECE department.

"Whenever Griff met someone and heard about their problems, he would think, 'Oh, you know, I know what we can do. We could apply this, we could model it this way," Savage said. "He really enjoyed applying math and physics to solve problems in engineering."

His research interests were broad, beginning with his early work in phase transitions with William McMillan at Illinois, through his work in image processing algorithms and neural networks with Wesley Snyder at NC State, and his later work with Robert Trew in semiconductor device modeling. He loved research — more than anything except for his kids and even more than going on vacation, Savage said — and this led to his love for teaching,

"I wanted to memorialize the students and their hard work and resilience. ...Griff was so supportive of them. I wanted to honor that." CARLA SAVAGE



KEN TATE, LEFT, WITH TONY MCLEAN BROWN

Brown family makes transformational gift

Computer science alumnus and Hall of Fame inductee Tony McLean Brown and the Brown family recently made a \$1 million pledge to the Department of Computer Science (CSC) to create a named distinguished professorship, a named graduate fellowship and a named undergraduate scholarship. The transformational gift pledge announcement was made as part of NC State University's fifth annual Day of Giving, helping the CSC department set an all-time single day giving record with total gifts and pledges exceeding \$3.8 million.

Not only is this one of the largest gifts in department history, it is also unique in that Brown specifically directed that the donation was being made in the honor of Ken Tate, director of engagement & external relations for CSC. Brown has worked closely with Tate for more than two decades in supporting various needs across the department and the University.

When fully funded, the transformational gift will help create the following:

Brown Family Distinguished Professorship in Computer Science:

Once \$667,000 is given, matching state funds in the amount of \$334,000 will be sought from the Distinguished Professors Endowment Trust Fund to create a \$1 million distinguished professorship endowment.

Brown Family Graduate Fellowship Enhancement for Computer Science:

\$227,000 will be dedicated to the creation of this endowment which will provide funds to

be used to supplement stipends for newly admitted graduate students in the CSC department to strengthen recruiting efforts.

Ken Tate Scholarship for Student Success in **Computer Science:**

\$60,000 will be appropriated to create a scholarship in Tate's honor, and annual funds will be used to provide merit- and need-based scholarships for CSC undergraduates with a preference toward students participating in the Computer Science Ambassadors program.

Brown is a principal partner and director of strategic investments at Public Consulting Group, Inc. (PCG). For almost four decades, he has helped build the technology solutions for PCG's healthcare, human services and education practice areas.

But Brown's legacy goes far beyond his professional accomplishments. His adventures include running with the bulls in Spain, as well as the Boston Marathon, Africa's Comrades Ultra-Marathon and the Leadville Trail 100. Credentialed as a professional boxer, professional bull rider, jet pilot and NASCAR late model stock car driver, Brown authored A Happy Guide to a Short Life: A Response to Ms. Quindlen's Fine Book. published in 2007. At his core, he is fully aware that he has been blessed, and he focuses on leveraging his passion to advance multiple volunteer and philanthropic efforts to help people and make a positive difference in the world.

In 2022, Brown was inducted into the NC State Computer Science Alumni Hall of Fame.

"Ken and I have known each other for a long time, and our relationship is very special to me." Brown said. "He has been a fantastic ambassador for the Department of Computer Science and has an incredible capacity to bring people together to do 1978."

good for NC State students. Our family wanted to do something to honor all he has done for the computer science department and the University before he retires. Ken is one of the finest individuals that I've met at NC State...and that goes all the way back to

When asked about the donation made in his honor, Tate said he was humbled beyond words. "I've been blessed to be in this role for more than 22 years now, and even more blessed to be in a position to help incredible people like Tony use their passion and resources to help other people." When Tony told him of his plans, Tate said the news brought tears to his eyes. "Those of us who work in service roles like this do it for the love of the job, and the opportunity to make a difference in someone's life. Over the vears. I've received some very nice 'thank you' notes. accolades and hugs, but I have to admit that this show of appreciation really tops the cake."

Gregg Rothermel, head of the CSC department, highlighted the transformational nature of a gift like this in the department's quest to move from great to exceptional.

"We are so thankful to the Brown family for their support, as this is really a 'Triple Crown' high-impact aift." he said. "Distinguished named professorships are essential to our efforts to attract and retain the very best talent. The graduate fellowship will help so many grad students who are feeling the pain of the high cost of living in Raleigh. And the scholarship to honor Ken Tate is simply a heartwarming and fitting tribute to a man who has meant so much to the success of our department."

The initial installment of \$250,000 arrived in June, allowing for the launch of both the scholarship and graduate fellowship endowments, and includes cash funds so that awards can be made to students starting in the 2023-24 academic year.



18th fittest woman in the world

"Every single cut I was in danger of being done, but I didn't let that scare me or stop me from achieving my goals."

SHELBY NEAL

Inhale belief, exhale doubt.

That mantra helped Shelby Neal, engineer and CrossFit athlete, become one of the top-20 fittest women in the world. She finished 18th out of 40 women at the 2023 NOBULL CrossFit Games, the highest level of CrossFit competition.

Neal graduated from NC State University in 2021 with a B.S. in chemical engineering with a nanoscience concentration, and she was one of the few athletes at the competition who has a full-time job outside of training for competition. She has been working toward qualifying for years.

"Every time I began questioning myself or being down on myself, I tried to literally focus on my breathing and with each breath thinking this mantra," she said. "Big breath in and big breath out. Pushing all the negative thoughts out... Then repeating positive things back to myself. It helped me so, so, so much because it was also tied to a physical action."

The 2023 CrossFit Games started Tuesday, Aug. 1, and ran through Sunday, Aug. 6, in Madison, Wisconsin, Qualification starts with The Open, an online round open to all competitors - more than 300,000 participated. About 10 percent of participants are selected for a second online round, and from there a certain number of athletes are selected from each region. Neal is based in the northeast region, which sends 60 people to the semifinals. In each semifinal round, anywhere from two to 13 athletes move on to the CrossFit Games.

The point of CrossFit competition is to find the fittest person there. Athletes are tasked with intense physical workouts, most of which they don't know about until the competition begins. This year started with mountain biking, which Neal enjoys.

But by just the second task, she was asked to do something she'd never done before: flip a 350-pound rectangle called "the pig" for a challenge called "The Pig Chipper." Neal was nervous she'd be the only person who couldn't do it. But she did. And then she did it 19 more times, while completing physical gymnastics challenges in between.

Heading into the final round of cuts, Neal knew she was on the brink of not making it to the final. Ten athletes were cut after six workouts, and 10 more would be cut after the ninth, which was Olympic weightlifting. Athletes had two attempts to complete a one-rep-max snatch, lifting a barbell from the ground to above their head in one motion, and a one-rep-max clean and jerk, lifting the barbell above their shoulders and then raising it above their head.

Neal lifted 183 pounds for the snatch, and after missing an attempt at 191 pounds, she moved on to the clean and jerk. She was agonizing over what weight to choose, and decided to go with a weight she knew she could hit. When she lifted 240 pounds successfully, she did an impromptu twirl, holding back tears of joy and feeling relief in knowing she'd given everything she had. It was enough to put her in the final.

"Every single cut I was in danger of being done, but I didn't let that scare me or stop me from achieving my goals," she said.

She also has the additional challenge of balancing a full-time job with her training. She is a patient-specific design / process engineer at restor3d, a Durham, North Carolina-based medical device company and additive manufacturer that makes personalized 3D printed orthopedic implants. She usually works from about 8 a.m. to 5 p.m., spends three hours each weekday in the gym, and spends four to six hours in the gym on weekends. Neal grew up in Wake Forest, North Carolina, and competes and coaches at 12th State CrossFit in Raleigh. She knew from an early age she was interested in science, technology, engineering and mathematics (STEM) fields, and she attended Wake STEM Early College High School. By ninth grade, she had decided on studying engineering. With her high school's proximity to NC State, her college choice was easy. She found her interest in 3-D printing in college, and she worked as a medical 3-D printing student engineer in the Center for Additive Manufacturing and Logistics (CAMAL) during her undergraduate vears.

Thinking about the biomechanical processes also helps her coaching, which in turn helps her be a better athlete. "I feel like people believe me a little bit more because I'm an engineer, even though they shouldn't," she said with a laugh.

Neal has been training since 2014. Growing up, she was a gymnast, which helped set her up with a good strength foundation for CrossFit.

"My gymnastics coach talked about [CrossFit] a lot," she said. "She talked about how difficult the workouts were, and how she did 100 pull-ups in a workout, which is a very common workout that CrossFitters do every year called Murph. It just got me excited. I didn't understand how anyone could possibly do that, so I wanted to trv it."

The Murph starts with a one-mile run, followed by 100 pull-ups, 200 push-ups and 300 squats, and finishes with another one-mile run. It's intense, and other CrossFit workouts are even harder. But Neal wants to push herself to her limits.

Neal sees connections between engineering and CrossFit. Both are challenging, and both require efficiency.

"Crossfit movements are ... very similar in that the most efficient way to do them is the way that makes biomechanical sense," she said. "So, using engineering and physics to figure out what's the easiest way to do this movement, the best technique, it makes sense biomechanically."

ANNUAL GIVING ENGINEERING FOUNDATION

Have you made your annual gift to the College of **Engineering?**

Gifts from generous alumni like you keep our **College of Engineering** moving forward into the next 100 years. Your donation is a great way to make sure the opportunity that meant so much to you is there for students today.

HOW TO GIVE

- Make your gift online at go.ncsu.edu/engineering-giving
- Use the return envelope included in this magazine to pay by check
- Make a gift over the phone by calling 919.515.7458

GIVE TO THE ENGINEERING LEADERSHIP FUND Gifts made to the Engineering Leadership Fund support Collegelevel initiatives.

JOIN THE DEAN'S CIRCLE

Annual gifts of \$1,000 or more qualify for membership in the Dean's Circle, the College's leadership annual giving program. For alumni up to 10 years after graduation, gifts of \$250 or more gualify. go.ncsu.edu/engineering-deanscircle

If you have already made your annual gift to the College of Engineering, please accept our sincere thanks. If you have questions or would like to learn more about your giving options, contact Hannah Kunkel at heallen3@ncsu.edu.





Starting in January, the College of Engineering will bring alumni and students together for the College's annual Engineering Interest Circles Program with a new name: Engineering Mentorship Circles (EMC). This is the first year the program will be offered in person as well as virtually to keep it as accessible as possible.

In addition to offering in-person meetings, EMC will also take place over the course of four weeks instead of three based on feedback from previous years.

"It's an engagement opportunity for both students and alumni to participate," said Hannah Kunkel, assistant director of development, alumni engagement & stewardship. "So it's a time where students can come to gain career advice, or graduate advice or resume advice.

"Students can come with a large range of questions, and so you can learn from other students, as well," she added. "We've also heard from alumni that younger alumni really enjoy having more seasoned alumni in the same group because there's been collaboration and overlap there, as well."

Rob Glass. a former EMC alumni lead, led the conversation with his alumni and student circle when he participated in 2022. Glass, who graduated with a bachelor's degree in chemical engineering in 1981,

PHILANTHROPY

said that his students were mostly juniors and seniors and seemed very interested in what he and his fellow alumni had to sav.

"I have really enjoyed participating in the Engineering [Mentorship] Circles," said Glass. "It is a very easy way to give back to people who will be the next leaders in our society."

Robert Kobrin, a biomedical engineering student, Park Scholar and National Academy of Engineering Grand Challenge Scholar who previously participated in EMC, said that the biggest takeaway from his experience was how engaged the NC State Engineering alumni network is.

"I remember seeing the opportunity get sent out and thinking that it would be interesting to hear from other students and alums," he said. "During the endof-program celebration, all of the circles got together on Zoom and you could see just how many had taken the time to come talk to current students.

"It was a great way to engage with other engineering students and alumni without the pressure of formal introductions and cold emailing that alum contact can involve," he added. "Everybody in my circle was super friendly and ready to share about their interests."

Registration is open, and interested alumni can register at go.ncsu.edu/ emc24 or by scanning the QR code.



LASTING **LEGACIES**

Naming a space in a College of Engineering building leaves a long-lasting mark. Generations of students, faculty members and staff members will be reminded of the generosity of donors who help make their research and educational experiences possible.

This map highlights a few recently named spaces in Engineering Buildings II and III. There are a number of naming opportunities available in those two buildings, as well as in Engineering Building I and in Fitts-Woolard Hall.

To learn more about naming opportunities, please contact **Griffin Lamb**, assistant dean of philanthropy for the College of Engineering, at **grlamb@ncsu.edu**.

Engineering Building III

MANN ATRIUM

The Mann Atrium in Engineering Building III was named by Gerald (Gerry) and Edna Mann. Walk in there any weekday, and you'll find students doing their homework or socializing in between classes. The Manns wanted to name a space in honor and in memory of their family. They want to inspire younger generations to continue learning and stretching themselves to higher places.

Mann received his BSME degree from NC State University in 1952. Six years later, he founded the American Testing and Engineering Corporation, known as ATEC Associates, Inc. The company grew to 1,500 employees by the time it was sold in 1996. Mann then worked with his children to grow Mann Properties LLP, a real estate company he started in 1972. He received the Distinguished Engineering Alumnus Award in 2003 and was elected to the Department of Mechanical and Aerospace Engineering's Hall of Fame in 2013.

Engineering Building II

KOLBAS LABS

In Engineering Building II, rooms 1030 and 1032 are named for Robert Kolbas, who was a beloved professor, colleague and former department head in the Department of Electrical and Computer Engineering (ECE) for 35 years. He taught his last lab class in room 1030 — ECE 426: Analog Electronics Laboratory.

These are not the only rooms named after Kolbas, who passed away in 2020. In continuing his long legacy of supporting students, he and his wife, Yan Kolbas, made a gift to the Kolbas MakerSpace, an initiative he helped get off the ground in 2017. This most recent gift to the College helps provide the materials and tools needed for the MakerSpace, as well as supports students' academic pursuits and an annual ECE social event. Kolbas is remembered for his dedication to his students and love for teaching.

HASSAN MAE ADMINISTRATIVE SUITE

The space for the Department of Mechanical and Aerospace Engineering's (MAE) administrative team was named in honor of Hassan A. Hassan, who passed away in 2019 and was a professor in the department from 1962 to 2018. His family wanted to recognize his legacy and commitment to the department in a visible way to students, faculty and staff members and others who visit.

Hassan was a central figure in the creation of NC State's aerospace program in the 1960s. His aerospace research in understanding key physical processes like reacting flows and boundary layer transition / turbulence drove Hassan and his students to develop computational simulation models, many of which reside in NASA's in-house codes. Until the early 1990s, he accompanied students to NASA Langley Research Center each summer to work on research problems side by side with NASA researchers. In 2015, the MAE department established the Dr. Hassan A. Hassan Distinguished Lecture Series. Hassan's son, Basil Hassan, serves on the NC State Engineering Foundation Board of Directors.





From the board

Learn more about the work of the NC State **Engineering Foundation**, Inc. Board of Directors

The NC State Engineering Foundation (NCSEF) was established in 1944 to aid and promote, by financial assistance and otherwise, engineering education and research at NC State. A board of directors made up of alumni and friends of the College of Engineering works with the College's development staff and the dean of engineering to set the Foundation's agenda. The board is led by President Deborah B. Young, CE '77, and Vice-President Scott Stabler, MAE '82.

REFLECTING AND TRANSITIONING

The Board of Directors helped the NC State College of Engineering celebrate its 100th anniversary in 2023. Many members were able to attend a 100th celebration on May 3, which brought together engineering alumni, faculty and staff members, and students to recognize the College's century of achievements and look ahead to all the exciting accomplishments in the future.

Young, board president, spoke at the event, which recognized all nine engineering departments and the three affiliated departments. The event space was lit blue to look like the inside of NC State's nuclear reactor, and exhibits included a student-built rocket and equipment used for research decades ago. PBS North Carolina previewed its TV series on the College's 100th anniversary, and episodes aired this fall.

Among all the reflection and celebration, the board also helped send off Louis Martin-Vega, who officially

stepped down from his position as dean July 31, 2023, and then welcomed Dean Jim Pfaendtner, who started Aug. 1, 2023. The new dean joined NC State from the University of Washington (more on page 16). As board president, Young was on the search committee. The board is excited and looking forward to working with, assisting and getting to know Dean Pfaendtner as he transitions into his new role.

Board members helped organize two virtual Meet the Dean events open to all alumni in September 2023. Alumnus Tim Humphrey, EE '96, hosted the domestic event on Sept. 19, 2023. Hosted in a fireside-chat conversation style, Pfaendtner shared with alumni his background, goals for the future and what he's enjoyed the most so far about NC State. Deval Parikh, board member and CHE '94 and economics '95, hosted the event on Oct. 4, 2023, for international alumni. At this event, alumni spoke with Parikh and Pfaendtner about how to increase global engagement.

According to Young, one of the qualities the COE and the NCSEF board pride themselves on is the ability to make smooth, seamless transitions.

"In 2006, Dean Martin-Vega made the transition; now Dean Pfaendtner in 2023 is beginning the transition," she said. "It is inevitable that change will come. With everyone coming together, our College will continue to be a world-leading engineering school and reach new goals. We welcome Dean Pfaendtner, and we wish him the best."

Formed in 2018 by the NC State

from their last degree earned. The

have a way to stay connected to the

molded me into who I am today," said

Wilbanks is the only new YAAB

member to have graduated in 2012,

her degree. Abby Lampe, a former

industrial and systems engineering

major, graduated most recently,

in 2022. Lampe is now a financial

This year, new members of

and biomolecular engineering.

"I'm thrilled to extend that

connection by serving fellow and future

alumni on the Young Alumni Advisory

Board," said Baldauff. "Go Pack!"

payments at PwC.

services associate with a focus on

YAAB represent four departments:

biomedical engineering, mechanical

and aerospace engineering, industrial

Caroline Baldauff, who graduated

in 2021, is an industrial and systems

and systems engineering, and chemical

making her the furthest out from

Wolfpack.

in 2012.

CAROLINE BALDAUFF Industrial and Systems Engineering '21 Senior Associate Platform Engineer

Engineering Foundation, the Young Alumni Advisory Board (YAAB) consists of NC State alumni who are at SAS Software fewer than 15 years post-graduation

JACK HALASZ

program was created to encourage Business Manager support from the growing population of College of Engineering young alumni, many of whom are thrilled to

JORDAN HJELMQUIST

Biomedical Engineering '14 "I'm very excited to get involved Senior Manager, Plant Planning Lead (Global Supply Chain) at Pfizer with the Young Alumni Advisory Board to help give back to the university that

ABBY LAMPE.

Maggie Wilbanks, who majored in mechanical engineering and graduated

MORGAN MALICK Chemical and Biomolecular Engineering '15 Manager, Global Manufacturing

and Technical Operations at Veloxis Pharmaceuticals

SAMUEL MCINNIS Mechanical Engineering '18 Asset Leader for Clearwater Paper Corporation

MATT PLESS

Mechanical Engineering '16 Senior Solutions Engineer, Financial Services at SAS

RIDDHIMAN SHERLEKAR

engineering grad who remains Industrial Engineering '19 connected to NC State through Stat Senior Data Scientist at Cisco Crew for women's basketball.

MAGGIE WILBANKS

Mechanical Engineering '12 Technical Staff at Sandia National Laboratories

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BOARD ADDS NINE NEW MEMBERS

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CAROLINE BALDAUFF



JORDAN HJELMQUIST



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PHILANTHROPY



ABBYLAMP





RIDDHIMAN SHERI EKAR



MAGGIE WILBANKS

Foundation Year in Review

GIFTS AND NEW COMMITMENTS BY GIFT SOURCE, FISCAL YEAR 2022-23



The NC State Engineering Foundation, Inc. led another successful fundraising year for the College of Engineering.

Fundraising totals to the College were \$22,858,897 during the 2022-23 budget year. The College has invested in projects like Day of Giving, raising a record \$6.5 million from 1,661 gifts in March. These donations are critical to the growth and development of the College's programs that round out and enhance students' experiences while at NC State.

The annual giving program raised a total of \$577,920.25 from 5,446 donors for the College of Engineering Leadership Fund. The Dean's Circle, the College's leadership annual giving society, has 516 members. These donors help support the College's top priority: our students.

Endowments to the College generally fall into one of three categories: scholarships, named professorships and fellowships. There are now 64 permanently endowed named professorships and \$78.7 million in total endowed scholarships. Total endowment support for the College is \$229.6 million as of June 30, 2023, including directly owned assets as well as endowments held outside of the Engineering Foundation.

These fundraising achievements took place as the College celebrated its 100th anniversary in 2023 — a time of pride in NC State Engineering's accomplishments and of anticipation toward aspirations for the future.

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Engineers find work in many fields: transportation, NASA — and YouTube. Alumni Rhett McLaughlin and Link **Neal** combined their creative natures and engineering problem-solving skills to become Internetainers, as they call themselves.

The duo, known professionally as Rhett and Link, own Mythical Entertainment and star in two awardwinning daily YouTube shows, Good Mythical Morning and Good Mythical *More*. Their main channel has 18.5 million subscribers. They also host their own podcast, Ear Biscuits; starred in two seasons of a YouTube Premium series; and wrote two books.

They visited in May to deliver the commencement addresses for the Department of Civil, Construction, and Environmental Engineering and the Edward P. Fitts Department of Industrial and Systems Engineering (ISE), although they did so separately and not as a duo.

any career field.

vour heart."

future.

"It's so common for people to arrive at points in the future and be disappointed, regardless of whether things go right or wrong, that we've

Neal graduated with a degree in industrial engineering in 2001 before working at IBM. With the graduating class, he laughed about ISE-specific terminology before offering advice for

"Err on the side of action instead of certainty," Neal said during his address. "If you keep waiting for 100 percent certainty, you might be lulled into a position where you're not listening to your heart and following

After a lunch of Bojangles, McLaughlin, who graduated in 2000 with a degree in civil engineering before working at Black & Veatch, addressed a graduating class wearing a mix of caps and hard hats and encouraged them to envision their

come up with all kinds of cliches and advice that you've heard before." McLaughlin said. "The bad news is you're going to be disappointed in your future. Thank you. Good night. The good news is we've all been here before."

After the ceremonies, McLaughlin and Neal toured Fitts-Woolard Hall, home to both of their departments. During the tour, they met faculty members and students who showed off their technology and research.

In the Cave Automatic Virtual Environment, they shrunk down to the size of a bug and up to the size of a whale. They rode Segways around a classroom and tested out a driving simulator. All along the way, they spoke with students who were already fans, one of whom even brought his own copy of *The Book of Mythicality* for the two to sign, and took photos with an army of new fans, or as they call them, Mythical Beasts.

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SHARE YOUR COE STORY

We're gathering memories from our COE community to celebrate 100 years

As we wrap up this 100th anniversary year, there's still time to share your story on our website. We wouldn't be where we are without our students, alumni, faculty and staff members and friends. In honor of a century of NC State Engineering achievements, we are gathering stories and memories from our community to share on our website.

> Share yours at go.ncsu.edu/yourcoestory or by scanning the QR code with your phone.

