



CEE News

CIVIL & ENVIRONMENTAL ENGINEERING Department

LETTER FROM CEE Department Chair



The past few months have been filled with many triumphs. In April, our ASCE Student Chapter took First Place in the Carolinas Conference competition, bringing home several trophies including First in the concrete canoe, steel bridge, and innovation categories. We're proud of their success and thankful for all the support they've received from alumni and industry in the Charlotte metro area and beyond. Each of these teams will be traveling to ASCE Student Chapter National events throughout the US. We wish them well!

Also in April, we celebrated one of our very own, Dr. David Young, with a big retirement send-off. David has been with the University for 34 years. He's worn several hats during those years: CEE Chair (18 years), director of the IDEAS (Sustainability) Center, Director of the INES PhD Program, and Associate Director of the Energy Production and Infrastructure Center (EPIC). Read more about his retirement reception on page 5.

We also say farewell to our academic advisor, Sarah Sonefeld. Sarah will be relocating with her family to South Carolina. In the less than two years she's been part of the CEE team, Sarah has helped countless students. One student (Michael Cook, featured in a student spotlight on page 4) credits Sarah as a key influence in his successful transition from military life to the College. Thanks, Sarah. You will be missed.

Our Center for Advanced Multimodal Mobility Solutions and Education (CammSE) continues to do well. Cammse Director Dr. Wei Fan and his team are now researching ways to make autonomous vehicles safer. You'll want to read more about their research (page 7).

On page 6, there is an article about our 6-month visit from Irish architect and researcher Roisin Hyde. Her research on high-performance concrete was a perfect fit for our department. The grey lump you see below is a sample of the product her work will yield. If you'd like to visit or collaborate with any of our research efforts please reach out via phone or email.

As you can tell, the Spring semester has brought a lot of positive excitement. Unfortunately, it has also brought sadness. As you may know, on April 30, a lone gunman opened fire in a classroom and took the lives of two UNC Charlotte students, Riley Howell and Reed Parlier, wounded four, and forever impacted the entire campus.

We grieve the loss of Riley and Reed but we also celebrate them and protect their memories. The day after the tragedy, more than 7,500 members of the UNC Charlotte community gathered for a student-led vigil in Halton Arena on campus. In the words of Chancellor Philip Dubois, Niner Nation is defined by compassion, courage, and community. A 14-member advisory board called the Niner Nation Remembrance Commission has been assembled to provide guidance as we move forward.

The outpouring of support from the city, state, and other colleges and universities in and outside the state have been phenomenal.

We are *all* Charlotte Strong.

John Daniels
Professor and CEE Department Chair



CEE @ A GLANCE

UNDERGRAD STUDENTS:

423

DOCTORAL STUDENTS:

70

MASTERS STUDENTS:

41

FACULTY MEMBERS:

25

UPDATED: MAY 2019

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RESEARCH UPDATE

“WE’RE GOING TO NATIONALS...AGAIN!” ASCE Student Chapter News:

The UNC Charlotte American Society of Civil Engineers (ASCE) Student Chapter had great results at the 2019 Carolinas Conference, winning First Place Overall at the competition held April 5-7 at North Carolina State University. The 49er engineers also placed first and qualified for national championships in the Concrete Canoe, Steel Bridge, and Innovation competitions. A summary of the conference results is given below.

“What a result,” says Dr. Janos Gergely, faculty advisor for the ASCE Student Chapter. “[They] exceeded expectations at the ASCE Carolinas Conference. Wow. I am so proud of our students, representing our program and school so well, competing against NCSU, Clemson, Duke, Georgia Tech, Citadel, USC, etc. They, and all of those who helped them in the CEE office, labs and otherwise have done an outstanding job preparing the 50+ students.”

HERE ARE THE RESULTS:

- Conference Overall: 1st Place
- T-shirt: 1st Place
- Freshmore: 1st Place
- Transportation: 3rd Place
- Innovation: 1st Place (National competition to follow!)
- Steel Bridge Overall: 1st Place (National competition to follow!)

- Concrete Canoe:
 - Design Paper: 1st Place
 - Final Product: 1st Place
 - Women’s Sprint: 1st Place
 - Men’s Sprint: 1st Place
 - Overall: 1st Place (National competition to follow!) ♦



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ALUMNI: Share Your News

Please send us news of your latest accomplishments, awards, or recognition. Email your announcement to the department at cee.dept@unc.edu. Be sure to include your: Name, mailing address (if updated), company name, degree, major and class.

SPOTLIGHTED: Publications & Presentations

AWARDS

Olya Keen (PI), HDR, Inc (2019-2020), "Collimated beam and water quality testing for design of UV system upgrades at Sugar Creek and Irwin Creek wastewater treatment plants" \$72,617

JOURNAL AND CONFERENCE PAPERS

Chen, Z. and Fan, W. (2019) Modeling Pedestrian-Vehicle Crash Severity in Rural and Urban Areas: Mixed Logit Model Approach, *Transportation Research Record - Journal of Transportation Research Board*, <https://doi.org/10.1177/0361198119842825>, pp. 1-12, Paper 19-02356

Chen, Z. and Fan, W. (2019) A Multinomial Logit Model of Pedestrian-Vehicle Crash Severity in North Carolina, *International Journal of Transportation Science and Technology*, Volume 8, Issue 1, pp. 43-52

Huang, Z.Y., Xu, R.H., Fan, W., Zhou, F. and Liu, W. (2019) Service-Oriented Load Balancing Approach to Alleviating Peak-Hour Congestion in Metro Network Based on Multi-Path Accessibility, *Sustainability*, 11, 1293, <http://doi.org/10.3390/su11051293>

Jiang, Z.B., Gu, J.J., Fan, W., Liu, W. and Zhu, B.Q. (2019) Q-Learning Approach to Coordinated Optimization of Passenger Inflow Control with Train Skip-stopping on a Urban Rail Transit Line, *Computers & Industrial Engineering*, Volume 127, pp. 1131-1142

Kennedy Neth, N.L. and Keen, O.S. (2018) Using size-exclusion for improved extraction of trace organic compounds from landfill leachate. *Waste Management and Research* DOI: 10.1177/0734242X19842929

Li, Y. and Fan, W. (2019) Pedestrian-Injury Severities in Pedestrian-Vehicle Crashes and the Partial Proportional Odds Logit Model: Accounting for Age Difference, *Transportation Research Record - Journal of Transportation Research Board*, <https://doi.org/10.1177/0361198119842828>, pp. 1-16, Paper 19-02385

Liu, P. and Fan, W. (2019) Modeling Head-On Crash Severity on NCDOT Freeways: A Mixed Logit Model Approach, *Canadian Journal of Civil Engineering*, <https://doi.org/10.1139/cjce-2018-0262>, Vol. 46, No. 4, pp. 322-328

Rezaei, A., Gibas, C., Clinton, S., Lulla, A., Lambirth, K. and Keen, O. (2018) Microbiomes of anaerobic and aerobic biodegradation of pharmaceuticals in municipal wastewater. NC Microbiome Symposium, Durham, NC

Wang, X., Munir, M. and Keen, O. (2018) The role of environmental buffers in potable water reuse, AWWA International Symposium on Potable Reuse, Austin, TX

Yu, M. and Fan, W. (2019) Optimal Variable Speed Limit Control in Connected Autonomous Vehicle Environment for Relieving Freeway Congestion, *ASCE Journal of Transportation Engineering, Part A: Systems*, 145(4): 04019007, <http://doi.org/10.1061/JTEPBS.0000227>

PRESENTATIONS

Fan, W., Integrated Connected Autonomous Vehicles Platooning and Optimal Variable Speed Limit Control on Freeways, The Chinese Overseas Transportation Association (COTA) 21st Annual Winter Symposium, Chinatown (M3), Marriott Marquis, Washington DC, Sunday, January 13, 2019.

Liu, P. and Fan, W., Exploring the Impact of Connected and Autonomous Vehicles on Freeway Capacity Using Microscopic Traffic Simulation, Paper 19-05196, The 98th Annual Meeting of the Transportation Research Board, January 13-17, 2019, Washington, DC.

Li, Y. and Fan, W., Pedestrian-Injury Severities in Pedestrian-Vehicle Crashes and the Partial Proportional Odds Logit Model: Accounting for Age Difference, Paper 19-02385, The 98th Annual Meeting of the Transportation Research Board, January 13-17, 2019, Washington, DC.

Chen, Z. and Fan, W., Modeling Pedestrian-Vehicle Crash Severity in Rural and Urban Areas: Mixed Logit Model Approach, Paper 19-02356, The 98th Annual Meeting of the Transportation Research Board, January 13-17, 2019, Washington, DC.

Tajalli, M., Mirheli, A., Hajbabaie, A., Hajibabai, L. and Fan, W., Utilization Measurement of Highway Fleet Equipment: Dump Trucks, Paper 19-02690, The 98th Annual Meeting of the Transportation Research Board, January 13-17, 2019, Washington, DC. ♦

STRUCTURAL FORENSICS: NIJ.gov Featured Fellow

Jonathan Moss is a Ph.D. candidate in Infrastructure and Environmental Systems (INES) at UNC Charlotte. He started his doctoral research as a graduate research assistant in a National Institute of Justice (NIJ) funded project that was already in progress.

According to Jonathan, NIJ funding enabled him to collect an "extensive experimental database for my dissertation as well as develop the computational framework for the numerical simulations for post-blast structural forensics." He is working with CEE Associate Professor Matthew Whelan. The original 2017 award of \$46,094 was supplemented by \$46,526 in 2018.

"The Graduate Research Fellowship (GRF)," Jonathan continues, "is enabling me to build on this prior work in order to complete my doctoral dissertation on this topic, which due to the challenging nature, I would likely not have been able to do without the external support that has allowed me to focus my time and energy exclusively on this research."

The NIJ GRF Program supports doctoral students engaged in research that advances the NIJ mission. The goal of the GRF program is to increase the pool of scholars engaged in research that addresses the challenges of crime and justice in the United States, particularly at the state and local levels. This NIJ program has two tracks: Social and behavioral sciences, and STEM fields. ♦

More at <https://www.nij.gov/funding/fellowships/graduate-research-fellowship/pages/fellow-bios.aspx#moss>
COE Newsfeed



PURSUING Their Dreams

IN THE LAND OF MAGIC



Kyle Indingaro chose CEE at UNC Charlotte because he knew he wanted to play a role in designing and constructing tangible products that could bring value to the surrounding infrastructure. After seeing the incredible facilities offered at UNC Charlotte in a hub for engineering (Charlotte, NC), he knew a degree from UNC Charlotte could take his career any direction he desired. The prospect of pursuing an engineering degree under the guidance of experienced and dedicated faculty helped solidify his choice.

"I believe we hold ourselves accountable to people rather than [intangibles like] grades," Kyle shares, "so when we have leaders who truly care about our success, it pushes us to showcase our appreciation for their time and energy - as athletes attempt to win for their respected coach, students will try to succeed in the classroom for their dedicated instructor. Thanks to the faculty here in the CEE department, I not only understand what it takes to personally succeed but also what it takes to be a leader for others during their quest for growth."

Kyle had the opportunity to work at Disney World in Orlando, Florida as a project engineering intern. During his 10-month internship, he was heavily involved in construction management within the Disney resort hotels. He oversaw everything from design and planning to implementation and project close-out. He was constantly relying on his UNC Charlotte education, reviewing engineering drawings to comprehend the entire project scope or constructing a cost-benefit analysis for feasibility purposes. While he was able to build upon his technical skills during his internship experiences, UNC Charlotte laid the foundation necessary to have success at one of the most globally recognizable companies in the world. What a dream it will be working there after graduation! Way to go, Kyle. ♦

TAKING A NONTRADITIONAL PATH



Ingenuity. That's the first word that comes to mind when **Michael Cook** thinks of what engineering is all about. Innovation, creativity, and problem solving were also qualities that drew him to this career path.

Admittedly, his journey to civil engineering has been a long one. In high school, he says he "really wanted to get into engineering." Many of his high school teachers and family members suggested he enter the field but he wanted to see the world more than pursue a college degree right after high school graduation. "I was not prepared for four to five more years of the classroom setting."

This decision led him into a career in the Air Force and construction. Two years ago, he was offered the option to attend college through a Veterans Affairs (VA) program for disabled vets. His first choice was civil engineering. It was still his dream to complete the degree. The time was finally right. Through the VA program, he was eased into college life by first attending community college, then transitioning to UNC Wilmington where he proved his academic abilities. Last year, he transferred to UNC Charlotte to finish his degree.

His wife, children, and extended family have been extremely supportive. Each weekend he makes the four-hour trip back home to re-integrate into their lives. He's also had wonderful support from his VA counselors and UNC Charlotte advisors.

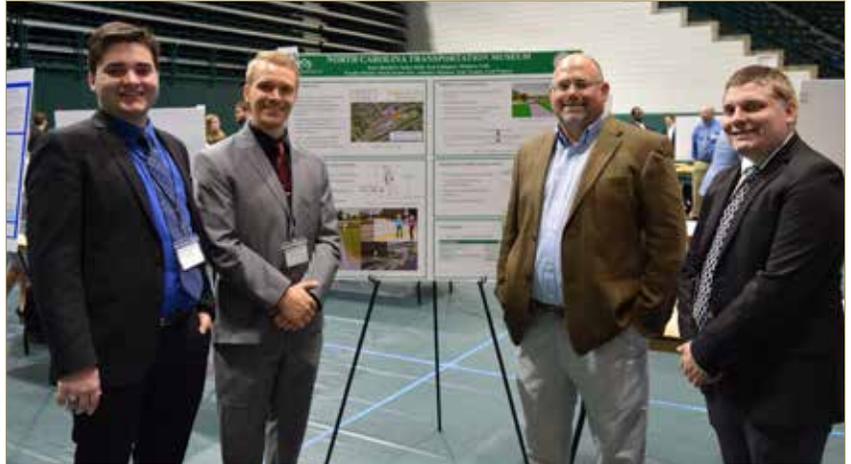
Michael's dedication and cheerful attitude is an inspiration to us all. We wish you much success, and look forward to seeing you walk across the stage next Spring. ♦

SENIOR DESIGN Expo 2019

The College of Engineering held its Spring semester Senior Design Expo on May 6. Teams who started in fall 2018 presented their completed two-semester projects, while teams who started in spring 2019 presented their first-semester design-concept posters.

Students gain valuable life lessons from this innovative, hands-on learning partnership with area industries but it's also a technical competition. First place this year went to the NASA Student Launch team. Students on this team were involved in designing, building and testing a reusable rocket with a scientific payload. The project required documentation of proof-of-concept for designs, community outreach, and oral presentations to NASA engineers and staff.

One of our 13 CEE teams, pictured to the right with their faculty mentor, was an Expo Finalist. The objective of their project was to enhance multi-modal safety, mobility, and access within and around the NC Transportation Museum in the Town of Spencer. ♦



(Left to Right) James Kelly, Kyle Indingaro, David Naylor (faculty mentor), and Matthew Nolfo

Source: COE News Feed

MANY THANKS: David Young Retires

On April 26, 2019, we celebrated **Dr. David Young's** 34 years of service to the University. He was a professor in the UNC Charlotte Department of Civil and Environmental Engineering, which he chaired for 18 years. His core classes consisted of Advanced Structural Analysis, Forensic Engineering, and Power Plant Design.

In addition to his years as CEE Chair, he also served as the director of the IDEAS (Sustainability) Center, Director of the INES PhD Program, and Associate Director of the Energy Production and Infrastructure Center (EPIC). Dr. Young has published widely, with more than 100 articles and reports to his credit. He has conducted research in the area of structures and materials, with much of his work funded by industry.

He is a registered professional engineer in NC and SC with 12 years of structural design and project management experience with several A/E consulting firms. He also started and managed his own forensics engineering firm for 12 years, and he continues to consult and give seminars. He supports and promotes the engineering profession by teaching review sessions for the FE exam and the PE exam and by serving on committees for ASCE and NSPE. Both have recognized his service to the education and engineering professions over the years with several awards including ASCE Outstanding Service and PENC Distinguished Service.

It has been said that David sees every situation as an opportunity. "He is the quintessential optimist," said one colleague. "His persistent positive outlook has left an indelible mark on the college. In a world of wrong-spotters, he points to what's right and inspires others to follow."

During his retirement celebration this past April, many remarked on David's astounding work ethic as well as his inspirational service to not only the University but also to the greater Charlotte area. His wife, Gloria, three of their four adult children, and most of their grandchildren were in attendance among the 100+ guests from the academic community. He's pictured here sitting in a rocking chair, a gift from the Department via Charlotte Douglas International Airport. EPIC gifted a stained glass window hanging, suitable for display in his mountain home overlooking the Blue Ridge Mountains. Slow down, Dr. Young. Sit a spell and enjoy the view. You've earned it. Many thanks and best wishes. ♦



Sources: COE Website, Faculty/Staff
Photo: Christine Biela

SUSTAINABLE COLLABORATION: Fulbright from Ireland

Roisin Hyde is an Architect and a Doctoral Research Student at Queen's University Belfast in the area of Novel Materials, Architecture and Design (NoMAD). She received her Bachelor of Architecture from University College Dublin and practiced for over 15 years in the areas of Sustainable Design and Conservation Architecture.

Her current research focuses on the development of a prototype, cement-free, geopolymer concrete facade panel through the use of innovative automated technologies including Materials Characterization, 3D Laser Scanning, Point Cloud Modelling and 3D Printing. A chartered member of the Royal Institute of the Architects of Ireland, Roisin came to UNC Charlotte to produce a high-performance, geopolymer concrete. This special chemically-activated binder, with its unique molecular nanostructure, will reduce the need for Portland cement concrete, the second most used material on Earth. Using Portland cement, while traditionally acceptable, is bad for the environment. The amount of carbon dioxide released during the production of traditional concrete is equivalent to emissions from 581 million cars per year. The emissions from the method Roisin espouses uses industrial by-product and waste materials to deliver reductions in associated emissions of 70-90% compared to conventional methods.

Why Charlotte? To collaborate with UNC Charlotte. Primarily it was previous work done by Dr. Brett Tempest on geopolymer concrete panels as part of the US Department of Energy's Solar Decathlon back in 2013 (the first of its kind in the world). Roisin also embraced the opportunity as a Fulbright Visiting Researcher to partner with a wider network of academics including Prof. Rachel Dickey, Alex Cabral, Prof. John Diemer, Jon Watkins, Prof. Haitao Zhang, Prof. Mary Lou Maher, Prof. David Wilson and Johanne Okerlund at UNC Charlotte. In a few short months, she made connections with industry partners like Gerdau Steel, Martin Marietta, Sunrock, Lehigh Hanson, Smooth-On, West Virginia Alloys SpaceX and the Boring Company (Los Angeles). In collaboration with the UNC Charlotte College of Computing and Informatics, Roisin delivered a workshop on Photogrammetry and 3D Printing to 5th graders at a local school.



Roisin, ready for her morning commute



In addition to technical site visits, Roisin's taken in many US landmarks and networked with Irish dignitaries stateside. "I feel very much at home here," she shares. For the remainder of her 6-month visit, she's looking forward to building upon her skills in material characterization, 3D printing, laser cutting, milling, rubber molding, and microscopic analysis. As far as technical standards go, she will be complimenting her foundation in UK and European standards (BS, EN, ISO, and ETAG) with US-based ASTM and ACI standards and testing methods. All in all, sounds like a rewarding visit. View Roisin's FulbrightDublin TEDx talk: https://youtu.be/oq_he4a51cY ♦

Sources: Roisin Hyde, UNCC.edu Newsfeed, TEDx.com

SAFER, MORE RELIABLE Autonomous Vehicles

Lee College of Engineering researchers are working now to develop variable speed control systems to optimize the current state of human-driven vehicles, the mixture of human-driven and self-driving vehicles, and the future state of all self-driving vehicles, so as to harmonize traffic speeds, improve operational efficiency and enhance safety.

Students and faculty from the UNC Charlotte Center for Advance Multimodal Mobility Solutions and Education (CammSE) began the research of integrating variable speed limit controls with connected and autonomous vehicles to relieve freeway congestion in the fall of 2017. To date, the team has published four papers on its research, the most recent being an article in Journal of Transportation Engineering.

“There are two main technologies involved in the research,” said CammSE Director **Dr. Wei Fan**, a full professor of Civil and Environmental Engineering at UNC Charlotte. “First there is Connected Autonomous Vehicles (CAV) and then there is Variable Speed Limit Control (VSL). We are looking to optimize traffic flow scenarios ranging from 100 percent human-driven vehicles to 100 percent CAV using VSL.”

The Society of Automotive Engineers uses a ranking system of Levels 0-5 to classify autonomous vehicles based on their capabilities. Level 0 (L0) is the current state of driver-controlled vehicles. As autonomous capabilities such as hands-off steering and breaking increase, the ranking numbers increase. L5 vehicles are those that will be fully autonomous and integrated (and also most likely connected) with other vehicles and the surrounding infrastructure.

“L3, where some functions are controlled by the car under certain conditions but drivers are still necessary to take over in an emergency, is a very reasonable possibility in the next five to 20 years,” Dr. Fan said. “L 5 is perhaps still another 50 to 100 years away.”

The term connected vehicles refers to cars that can send and receive outside information through GPS and other systems. Connected vehicle information can include speed, location, acceleration and deceleration. Such information can be shared between vehicles (vehicle-to-vehicle or V2V) or between vehicles and the infrastructure (vehicle-to-infrastructure or V2I). Transportation engineers can then use this information to improve overall traffic flow through systems such as variable speed limits (VSL).

“The goal is to ‘harmonize’ traffic flow using VSL,” Dr. Fan said. “VSL changes speed limits based on real-time traffic data. Such systems are already deployed worldwide, in the United States, Germany, England and Sweden. VSL uses advanced algorithms to determine optimal speeds for maximum vehicle throughput and improved safety.”

Dr. Fan’s group is working to optimize such VSL systems by improving the algorithms. Working with data collected from Los Angeles Interstate 5, they are using computer modeling to analyze multiple scenarios ranging from the current to future states that integrate V2V and V2I possibilities.

“Our computer models allow us to add CAVs of various levels into the equation,” Dr. Fan said. “VSL optimization of the CAVs is then done by plugging multiple scenarios into the equation and seeing what works best. So far, our research is showing that VSL can mitigate bottlenecks, smooth out traffic flow (and as a result reduce tailpipe emissions), and improve safety.”

The research also shows that as more CAVs of increasing autonomy are introduced into the equation, traffic flow improves even more. One reason for this is CAVs can follow one another much closer than human-driven vehicles, which can almost double road capacity.

“The research is developing some very promising results,” Dr. Fan said. “It’s been a very good project to date, and from here will go further and look at how CAV can improve highway and secondary-road capacity.” ♦

Source: COE News Feed

See also: <https://asc.library.org/doi/10.1061/JTEPBS.0000227>

and <https://cammse.uncc.edu/>



Dr. Fan working with INES Ph.D. student Zijong Lin

“The goal is to ‘harmonize’ traffic flow using [technology].”

GRAD STUDENT RESEARCH UPDATES:

Xueying Brown, one of Dr. Olya Keen’s doctoral students, won the university three-minute thesis competition (both 1st place and people’s choice). She then represented UNC Charlotte at the national level at the Conference for Southern Colleges where she was one of the 8 finalists of the 45 schools competing. Fateme Barancheshme, another Dr. Keen doctoral student, received a competitive grant from a SUEZ company that includes a 6-month instrument rental and travel to a conference.

Visit cee.uncc.edu
for more information

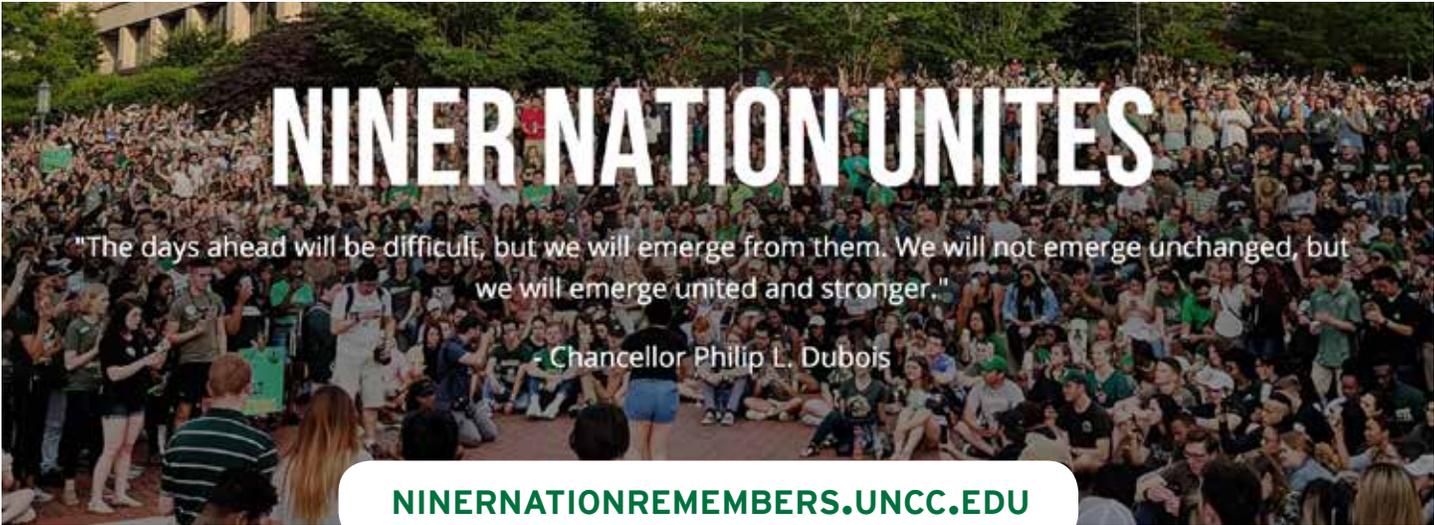
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NINER NATION UNITES

"The days ahead will be difficult, but we will emerge from them. We will not emerge unchanged, but we will emerge united and stronger."

- Chancellor Philip L. Dubois

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