Welcome to another issue of Progression magazine dedicated to providing information about the College of Science at Coastal Carolina University. The articles are indicative of the sincere interest our faculty have in the area of the sciences they have chosen to be the focus of their professional lives. We also hope that you will learn more about the activities of our students as they pursue their college careers.

It has been another busy year in the College of Science. We have settled in to "Science II," and, in opening this building, we have brought marine science back to the main campus after its long residence in the Coastal Science Center across Highway 501. This August, we started offering classes in another new building: Academic Classroom and Office Building II (ACOB2), which houses computing sciences, sociology, and recreation and sport management. In the last of our current construction projects, the Smith Science building renovation will be completed in November, and will provide space for mathematics, psychology, and physics and engineering science.

If you have any questions concerning our programs in science, or want more information on any of the articles, please do not hesitate to contact me or the specific authors. My phone number and email are listed below; you can also follow me on Twitter: @CCUScienceDean.

If you wish to make a donation to our college to support the work we do, please feel free to contact the major gift officer for the College of Science, Bryan Steros, at bsteros@coastal.edu.

I look forward to you coming to Coastal for a visit to see how our campus and programs have grown. We would love welcome you and show you around!

Regards,

Michael H. Roberts, Ph.D.
Dean
College of Science
Coastal Carolina University
843-349-2282
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DEPARTMENT OF PSYCHOLOGY
Terry F. Pettijohn II, Ph.D.
Department Chair
The Department of Psychology enrolls nearly 500 undergraduate majors. We offer a bachelor of science degree and emphasize the scientific nature of psychology and experimental research methods. Our 13 full-time faculty have expertise in a wide variety of areas, including experimental, social, developmental, cognitive, biological, school and clinical psychology. Our faculty are excellent teachers and active researchers in the field, presenting at conferences, contributing articles and books to the research literature, and sharing their findings and expertise with the media.

Through our research methods sequence, students gain extensive knowledge and experience by designing and conducting research. Motivated majors may find additional opportunities to join faculty research labs as research assistants.

Visit coastal.edu/academics/colleges/psych. Terry F. Pettijohn II can be reached at pettijohn@coastal.edu or 843.349.6447.

DEPARTMENT OF MATHEMATICS AND STATISTICS
James Solazzo, Ph.D.
Department Chair
The goal of the Department of Mathematics and Statistics at CCU is to improve students mathematical understanding and competence. However, we also strive to illustrate the importance of mathematics, both as an interesting and challenging subject on its own, and as a tool that can be applied to other disciplines. Our degree program in applied mathematics is designed to develop a high degree of mathematical proficiency as well as extensive reasoning and problem-solving skills.

We are committed to providing quality undergraduate teaching. In addition, we recognize the interdisciplinary nature of the modern mathematical world. Therefore, students may choose to concentrate their studies in analysis, applied mathematics, discrete mathematics, mathematics for secondary education or statistics while still obtaining a solid mathematical background.

Visit coastal.edu/academics/colleges/science/departments/math. James Solazzo can be reached at jsolazzo@coastal.edu or 843.349.2717.

DEPARTMENT OF KINESIOLOGY
Gregory F. Martel, Ph.D.
Department Chair
The Department of Kinesiology at CCU is a dynamic unit of faculty, staff and students who study and promote human movement (kinesiology) as applied to a variety of physical activity, sport and therapeutic settings. The department houses a major in exercise and sport science (EXSS), minors in EXSS and sport coaching, the Physically Active Living Skills (PALS) classes and the Community Fitness Testing program. Nationally, regionally and locally, there has been an increase in demand for kinesiology-related services and programs; this is reflected in the rapid growth the EXSS major since beginning at Coastal Carolina University in January 2008. The current enrollment of the EXSS major is approximately 700 students, third largest on campus.

Our role is to provide students with the knowledge, skills, abilities and attitudes for effective leadership in the field of kinesiology. We excel not only by teaching well, but by engaging students in hands-on research, community service projects, and field-based learning and leadership opportunities.

Visit coastal.edu/academics/colleges/science/departments/kinesiology. Contact Greg Martel at gmartel@coastal.edu or 843.349.2957.

DEPARTMENT OF SOCIOLOGY
Robert Jenkot, Ph.D.
Department Chair
This is an exciting time to explore the Department of Sociology. Sociology has a strong history of being student-centered in teaching and research. We offer our students a wide variety of educational opportunities to explore the social world and to take part in changing that world.

In order to maintain our student-centered approach to education, all of our professors are active researchers. We bring our experience with various topics into the classroom so that our students get to see what sociology is, how it works, and what it can be used for in the world around them. Importantly, our students are invited to work with our professors on research projects that might interest them.

Our students have access to professors who teach courses in: sexuality and gender; race and ethnic relations; social inequality; crime and deviance; religion; popular culture; social justice; health and medicine; sports; HIV/AIDS; juvenile delinquency; and the social relations of the South.

Visit coastal.edu/academics/colleges/science/departments/sociology. Robert Jenkot can be reached at rjenkot@coastal.edu or 843.349.2274.

DEPARTMENT OF BIOLOGY
Michael M. Pierce, Ph.D.
Department Chair
The Department of Biology is home to more than 530 undergraduate biology majors, 20 graduate students, 15 full-time faculty and three adjunct faculty. Undergraduate students in our department earn a Bachelor of Science in biology. We also offer other programs of study that prepare students for entry into various health professions. Our department participates in the Master of Science in coastal marine and wetland studies and offers courses for graduate students in education.

Students in our department have access to professors with expertise ranging from molecules to ecosystems. Faculty in the Department of Biology provide excellent opportunities for learning inside the classroom and out. Our faculty have varied research interests, and undergraduates can participate in that research.

Visit coastal.edu/academics/colleges/science/departments/biology. Michael M. Pierce can be reached at mmpierce@coastal.edu or at 843.349.6483.

DEPARTMENT OF HEALTH SCIENCES
Fredanna M'Cormack McGough, Ph.D.
Department Chair
The Department of Health Sciences is home to programs that incorporate evidence-based best practices for disease prevention, health assessment, health management, quality care and patient safety. Through community collaborations and diverse faculty research interests, students can participate in research activities that connect theory to practice.

The department offers Bachelor of Science degrees in public health, nursing (completion program) and health administration (completion program). The nursing completion program is committed to advancing the education of registered nurses to meet the local and global growing health care needs. The health administration completion program builds on foundation courses in associate degree and other four-year degree programs.

The public health program focuses on the art and science of promoting healthy communities and healthy behaviors and features four different areas of study:

- Public health with general cognate (designed for students with general health interests or those seeking graduate work in allied health careers)
- Public health with communication option
- Public health with exercise science option
- Public health with health services leadership

Visit coastal.edu/healthsciences. Fredanna M'Cormack McGough can be reached at fmcormack@coastal.edu or 843.349.2991.

DEPARTMENT OF RECREATION AND SPORT MANAGEMENT
Colleen McGlone, Ph.D.
Department Chair
The recreation and sport management department currently enrolls more than 300 majors and began offering graduate courses in sport management in Fall 2015.

Recreation and sport management professionals create, plan, market, implement and evaluate leisure and recreational activities in both the private and public sectors, as well as in both nonprofit and for-profit industries. In other words, our work is your play.

The program works with CCU Athletics in several
capacities and events and is the first in the country to partner with ticketreturn.com to train students on specialized ticketing technology and sales techniques. The faculty have a wide range of experience in the field which they bring to the classroom to enhance students’ abilities to connect theory and practices. In addition, the faculty maintain very active research agendas and endeavors in which students frequently assist. Visit coastal.edu/academics/colleges/science/departments/recreationandsportmanagement. Colleen McGlone can be reached at cmcgone@coastal.edu or 843.349.2989.

DEPARTMENT OF PHYSICS AND ENGINEERING SCIENCE
Brian Bunton
Department Chair
The Department of Physics and Engineering Science is a group of faculty and staff seeking to promote an atmosphere of scholarly endeavor that emphasizes the application of the scientific method in the generation of knowledge across its major and non-major curriculum in a liberal arts context. The faculty is committed to developing strong student competencies in physical science and its applications in a technology-rich, interactive, student-centered learning environment and to preparing students to successfully compete for employment or to succeed in graduate school. We take pride in our high-quality teaching using current pedagogic techniques, our proactive mentoring and advising, and our outreach to the local community.

We strive to be a focal point for disciplinary scholarship and expertise within the college, and to collaborate with our colleagues in the college to actively contribute to the advancement of science. The faculty supports the goals of the University’s Core Curriculum through general education courses in physics and astronomy.

DEPARTMENT OF COMPUTING SCIENCES
William M. Jones, Ph.D.
Department Chair
The Department of Computing Sciences offers three undergraduate degrees, serving roughly 400 actively enrolled majors as of Fall 2016: computer science, information systems and information technology. Both the computer science and information systems programs are accredited by the Accreditation Board for Engineering and Technology Inc., and we are working on obtaining accreditation for the IT program, which launched Fall 2014. We also launched our first master’s degree in Fall 2016. This completely online Master of Science in information system technology is a new and innovative program that is relatively unique in that it has a dual concentration in both security and data analytics.

While our faculty continues to focus primarily on quality undergraduate and graduate teaching, we have also seen recent strides in the last two years in externally funded scholarship and equipment totaling more than $400,000 in grants and contracts. Visit coastal.edu/academics/colleges/science/departments/cs. William Jones can be reached at wjones@coastal.edu or 843.349.4142.

DEPARTMENT OF CHEMISTRY
David Evans, Ph.D.
Department Chair
Our department is home to several disciplines within the physical sciences, including the fields of astronomy, physics, chemistry and biochemistry. Bachelor of Science degrees are offered in chemistry, biochemistry and applied physics.

We offer a dual-degree engineering program in partnership with Clemson University.

Whether you are here for a course in science as part of the core curriculum or you are interested in becoming a chemistry or applied physics major, please contact us with any questions you may have.

Visit coastal.edu/chemphys. David Evans can be reached at devans@coastal.edu or 843.349.2209.

SCHOOL OF THE COASTAL ENVIRONMENT
James O. Luken, Ph.D.
Interim Vice Dean
Associate Provost for Graduate Programs
The newly formed School of the Coastal Environment includes the Department of Marine Science, the Department of Coastal and Marine Systems Science, and the Burroughs & Chapin Center for Marine and Wetland Studies. The school offers a Bachelor of Science in marine science, a Master of Science in coastal marine and wetland studies and a Ph.D. in marine science. Students enrolled in programs offered by the school have access to a broad range of modern laboratory and field resources. Generally, research and education in the school target problems and issues in the coastal zone of South Carolina with multidisciplinary approaches. All of the degrees in the school stress research as a fundamental way of understanding. Furthermore, data and information generated by faculty and students are often used to inform natural resource policy and management decisions in the region. The Bachelor of Science in marine science is one of the larger undergraduate majors at CUC.

Visit coastal.edu/sce. James Luken (interim vice dean) can be reached at joluken@coastal.edu or 843.349.2235.

DEPARTMENT OF COASTAL AND MARINE SYSTEMS SCIENCE
Rich Viso, Ph.D.
Chair
The Department of Coastal and Marine Systems Science houses CCU’s marine and wetland programs. The doctoral program in coastal and marine systems science, the master’s program in coastal marine and wetland science, and the center all focus their resources and research on the complex and interconnected environments and processes found in the coastal zone. With the expanding coastal population and the increase in economies dependent on the world’s coastal resources, there is a growing need to advance the understanding of these interconnected environments and processes to help society best manage coastal resources and economy. This becomes particularly critical as the interfaces between land, sea and atmosphere and associated environments are particularly susceptible to changes in sea level, climate and societal modifications.

The graduate program’s focus is on training students to advance understanding of these complex systems, work across disciplines and strive to develop predictive capabilities to aid sound resource management. The region provides an outstanding natural laboratory, offering access to diverse fresh, brackish and marine settings. The department manages CCU’s Anne Tilghman Boyce Coastal Reserve at Wadet Island, an undeveloped barrier island and adjacent upland, as well as a new 54-foot research vessel and a fleet of small vessels. The school’s Waccamaw Watershed Academy maintains a certified Environmental Quality Lab.

Visit coastal.edu/cms. Rich Viso can be reached at rviso@coastal.edu or 843.349.4022.

DEPARTMENT OF MARINE SCIENCE
Jane Guentzel, Ph.D.
Department Chair
The Department of Marine Science is one of the largest undergraduate marine science programs on the East Coast. In addition to undergraduate studies, the department interacts with CCU’s coastal marine and wetland studies master’s program and the doctoral program in coastal and marine systems science. Lecture, laboratory and field experiences are integrated to provide an outstanding and well-rounded academic program.

With our ideal location near the coast and collection of research-active faculty committed to undergraduate and graduate education, our strength is in providing individual attention and hands-on opportunities for students.

Two major national reports, the Pew Oceans Commission and U.S. Commission on Ocean Policy, have documented the critical importance of marine science to our national health and well-being and called for increased efforts in marine science education, research and funding. This is truly an exciting and dynamic time.

Visit coastal.edu/academics/colleges/science/departments/marine. Jane Guentzel can be reached at jguentze@coastal.edu or 843.349.2374.
The Problem with Plastic

By Jane Guentzel, Ph.D., Professor and Chair, Department of Marine Science, Coastal Carolina University, and George Boneillo, Ph.D., Lecturer, Department of Marine Science, Coastal Carolina University

Photos by George Boneillo

Plastics are synthetically produced organic polymers that are long-lasting, lightweight and inexpensive, and, as a result, are found in a large amount of consumer products. These products include:

- plastic bags
- toys
- tools
- buckets
- clothing
- toothbrushes
- monofilament line used to make fishing nets
- polyester clothing
- small beads used to make facial cleansing scrubs

These small plastic beads are also used as the starting product for many larger plastic objects. Although many of the plastic products we use every day make our lives easier, the problem with plastic results from the accumulation of...
plastic litter in the environment. Plastics enter streams, lakes, rivers and the ocean from surface water runoff, wastewater treatment plant effluent, fall-out from the atmosphere, fishing and shipping. Because they do not degrade rapidly, plastics accumulate in these environments.

Plastic litter can be categorized into macro-plastic and micro-plastic. Macro-plastics are large items greater than 5 millimeters that include buckets, fish nets, bottles and basically any large plastic item that floats. Micro-plastic litter ranges from 0.3 to less than 5 millimeters and includes fibers, beads and secondary micro-plastics, which are small pieces of larger plastics that have broken apart. The accumulation of macro- and micro-plastics in aquatic environments can result in large areas of floating garbage.

A recent study has estimated that 15 to 51 trillion micro-plastic particles may be present in the global ocean\(^1\). Plastics float in water because they are less dense, or have a smaller mass to volume ratio than freshwater and seawater. The average density of plastic ranges from 0.8-0.97 gram per cubic centimeter, while the average density of freshwater is 1.0 gram per cubic centimeter, and the average density of seawater is 1.025 gram per cubic centimeter.

Plastic objects and particles are a danger to fish, birds, whales and sea turtles because they look like food to these organisms. Plastic bags often resemble jellyfish floating in the water and can be eaten by organisms in the ocean that feed on jellyfish, such as sea turtles. The ingestion of plastics by aquatic organisms and birds can cause blockages of the intestines, airways and gills.

Plastics can also accumulate other toxic organic pollutants such as PAHs and PCBs. These toxic chemicals stick to the outside of the plastic. When biota eat the plastic particles, they also ingest the chemicals on the plastic. These toxic chemicals accumulate in organisms and can cause neurological, hepatic and reproductive problems. Plastics also pose an external risk to birds and marine organisms. Biota can become entangled in fishing nets and plastic bags, rendering them unable to actively swim or fly. Plastic rings or nets can become encased around fish and birds, which can limit growth and mobility. Humans are also at risk with respect to the ingestion of micro-plastics. Plastic particles and fibers have been found in table salts\(^2\),

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A 335 micron net being pulled in the mouth of the Waccamaw River on Nov. 6, 2016.

A red microfiber found in the coastal waters near Myrtle Beach State Park.

A plastic band found wrapped around a sandbar shark caught in Winyah Bay, S.C., on April 27, 2017. CCU graduate student Caroline Collatos removed the plastic and returned the shark safely to the water.
The top picture shows a plastic bag found in the water at Myrtle Beach. The bottom picture shows a cannonball jellyfish that washed up next to the plastic bag.

Macro- and micro-plastic litter can be found in South Carolina rivers, estuaries and coastal ocean. A study conducted from September 2016 to March 2017 by George Boneillo and CCU undergraduates Kyley Dunmeyer, Dana Orr, Brittani Eaton and Emeline Ward found 50 to 250 pieces of micro-plastic per liter in near-shore coastal waters along the Grand Strand. That represents about 12 to 60 pieces of plastic per cup of water. Imagine drinking a cup of coffee that contains 60 small pieces of plastic!

CCU undergraduate Dillon King, Boneillo and Jane Guentzel collected samples from Winyah Bay and the Sampit, Waccamaw, Black and Great Pee Dee rivers in April and August of 2016. The whole water samples contained two to 25 pieces of plastic per liter, or about 0.5 to six pieces of plastic per cup of water. During February and March 2017, Guentzel and CCU undergraduates Orr and Meghan Richard collected water samples from the Waccamaw, Black and Great Pee Dee rivers further inland than King’s sampling sites in 2016. At these sites, the number of plastic particles per liter ranged from 30 to 376, or about seven to 89 pieces of plastic per cup of water. When integrated with water flow rates, these rivers may transport 93 billion to 1.7 trillion pieces of plastic per day to the coastal ocean. The dominant type of plastic particle found in all of these studies was plastic fibers/filaments (94 to 100 percent).

The United States Microbead-Free Act was signed into law in December of 2015. This act bans the use of microbeads less than 5 millimeters in “rinse off” personal care products 5 • While this law is a first step toward limiting micro-plastic use and release to the environment, it does not pertain to other types of micro-plastics, such as secondary micro-plastics and clothing fibers 5 •

A recent study has reported that between 0.025 and 0.1 milligrams of fibers per gram of fabric were released when polyester fabric was washed with or without detergent 6 • That would represent about 0.04-0.16 ounces of plastic per 100 pounds of fabric. If 10 million people washed 100 pounds of fabric each week for one year, that would represent the possible release of 1.3 to 5.2 million pounds of plastic fibers. Domestic washing of fabrics made from plastic may be a significant source of micro-plastics to the environment 6 •

The next time you wash your clothes or wear your polyester/spandex swimming suit to go swimming at the beach, remember that you may be a source of micro-plastic fibers to the environment! ☺

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What's up with math at CCU?

By James Solazzo, Ph.D., former Chair, Professor, Mathematics and Statistics, Coastal Carolina University, current Associate Provost for Assessment and Accreditation

For far too long, math requirements have played the role of gatekeeper or filter, often forcing students eager to major in science, technology, engineering and mathematics (STEM) to choose a non-STEM major, or possibly leave school altogether. In fact, nationwide, less than 40 percent of students intending to major in a STEM degree complete a degree in STEM (PCAST Report 2012). Although math is not the sole culprit for this mass migration from the STEM disciplines, in a practical way, freshman math courses traditionally required by colleges and universities have created a bottleneck on the path to degree completion. This is a common experience among students during their first two years of college, STEM or no STEM.

In an attempt to help more students achieve their degree and career goals, in fall of 2014, the CCU Department of Mathematics and Statistics launched the CCU Math Initiative (CMI) with the intent of eliminating this so-called bottleneck as well as changing the common perception that either you are good at math or you are not. Our department prefers to think of math as a pump, not a filter, and we firmly believe that all students can succeed in mathematics, and they should have access to a meaningful and engaging mathematical experience.

CMI uses a multifaceted approach that includes curriculum redesign and multiple pathways, an alternative math placement, and my personal favorite, Math Outreach (MO). CMI has successfully widened the math bottleneck at CCU. Let’s take a look at the three prongs of the CMI approach.

Curriculum Redesign and Multiple Pathways

Much of the current discussion on the need for reform in postsecondary math education is the result of a national conversation spurred by the 2012 President’s Council of Advisors on Science and Technology (PCAST) report, Engage to Excel: Producing One Million College Graduates with Degrees in Science, Technology, Engineering and Mathematics. The Council offered five ideas for improving STEM education, including a recommendation to “launch a national experiment in postsecondary education to address the mathematics-preparation gap.”

In a joint effort to address the recommendations in the 2012 PCAST report and modernize undergraduate programs in the mathematical sciences, the Mathematical Association of America (MAA), American Mathematical Society (AMS), American Statistical Association (ASA), Society for Industrial and Applied Mathematics (SIAM) and American Mathematical Association of Two-Year Colleges (AMATYC) united to write A Common Vision for Undergraduate Mathematical Sciences in 2025. If there is a take-away message from this report, it is “The status quo is unacceptable.” We agree.

Using A Common Vision as a starting point, our department has focused on revitalizing our 100-level math curricula. Of course we want to improve our students’ ability to solve problems, but we also believe it is important that our courses allow students to develop a greater appreciation for mathematics as well as an increased confidence to use mathematics. Revitalizing our curricula is more than just revising the content. The national organizations listed above have said that effective mathematics instruction requires students to be active participants. Many of my colleagues use or are experimenting with active learning models, flipped classrooms, and instructional technology to increase student participation during class time.

We have also widened the math bottleneck by introducing multiple pathways into our introductory statistics, business calculus and calculus courses. Our data show that the traditional prerequisite of college algebra is not the only pathway to a successful experience in the aforementioned courses. For example, Basic Concepts of Contemporary Mathematics, a course designed for humanities and fine arts majors, affords students in the humanities and the social sciences the opportunity to take
Yet the fact that all incoming freshmen have had at least algebra I, algebra II and geometry in high school begs the question, “Why are so many students placing into college algebra, which covers essentially the same material as algebra I and II?” One possible reason is that students typically take algebra I and II during their freshman and sophomore years of high school, meaning there is a potential two-year period with limited exposure to algebra before students head off to college. Another possibility is the timing of the math placement test. Students attending freshman orientation typically arrive at CCU after a long day of travel and spend the night in the residence halls free of parents. They would take the math placement test the next morning at 8 a.m. Hmmmm ... Fortunately, my colleague Keshav Jagannathan, Ph.D. Professor of Mathematics at CCU, learned about an alternative placement model, used at Valdosta State University (VSU), which places students into a math course using a formula that involves their high school GPA and SAT/ACT scores. Utilizing more than a decade’s worth of data related to CCU freshman success rates in entry-level math courses, Jagannathan successfully tailored the VSU model for the CCU incoming Class of 2020, a daunting task but one that came with a profound outcome.

This past year at CCU, more than 40 percent of the students in the Class of 2020 completed a terminal math course, that is, the final math course required by their chosen major. Compare this with just 17 percent the previous academic year. It will be interesting to see the graduation rates as well as the percentage of students retained in the STEM majors for the Class of 2020.

Math Outreach

In the Math Outreach (MO) program, approximately 14 to 16 faculty commit to two hours per week outside of the department conducting one-on-one mentoring opportunities for all students at such places as the HTC Center, Kimbel Library and the Math Learning Center. Students can attend any of the MO hours regardless of their instructor. The idea is to meet with the students on neutral ground, which provides faculty the opportunity to spend extra time getting to know the students.

As the students and faculty get to know one another, it is not uncommon for students to share such stories as, “I spent 20 hours studying for the exam, but I still got 50 on the exam!” This is the perfect opportunity for us to ask questions like, “Why then such a low test score?” and discuss ways to improve before the next exam.

Learning (studying) mathematics is an acquired skill that the math faculty have mastered over tens of thousands of hours during their own education and experiences teaching mathematics. We want to share these strategies for learning mathematics and performing well on exams, our own personal struggles with learning mathematics, and the success stories. Since MO’s inception in the Fall 2014 semester, more than 2,000 students have taken advantage of MO hours, with more than 70 percent of these students earning a passing grade. Of the 222 students who attended MO hours for Business Calculus during the Spring 2017 semester, 82.4 percent earned a passing grade.

Just as important as the improved pass percentages is the student-faculty bond that develops over several visits to MO. Faculty look forward to seeing these students in class the next semester or walking across campus. Students are quick to say hello, and probably the best compliment we can get is that they had a positive math experience!

James Solazzo can be reached at jsolazzo@coastal.edu or 843-349-2717.
We are surrounded by amazing people. People who can create and build and analyze and fix problems that are totally unique to being human. The only problem with being human is just that: We are only human. We are fragile. And our brains are one of the most fragile organs in the human body.

Because our brains are so fragile, sometimes they get hurt, or damaged, by something. Something from either outside the human body like a bullet from a gun, or from something inside the body like a clot in an artery (e.g., stroke). Typically, when the brain is damaged from something outside the body, it is known as a traumatic brain injury (TBI). On the other hand, when it is damaged by something from inside the body, it is known as an acquired brain injury (ABI). (Neurodegenerative disorders such as Alzheimer’s or Parkinson’s tend to not be classified as either one.) And there are varying degrees or severities of damage for both, from the injury being classified as “mild” (such as a concussion) to very “severe” (such as a loss of brain tissue). The location and severity of the injury are typically what are used to determine the prognosis, also known as the effects on the body.

And that’s where brain injury gets really tricky. You see, because every brain injury is almost entirely unique—that is, everyone experiences a brain injury in different ways—the effects on the body are also entirely unique to each person. Therefore, each person who has survived either an acquired or traumatic brain injury will receive a completely unique prognosis and ultimately have completely unique long-term effects on the body from the injury.

This article will not discuss the unique effects of brain injury. As stated before, they are based on the area of the brain that was injured and the severity of that injury. Should you want to read more about potential effects, please visit the website for the Brain Injury Association of America (www.biausa.org) and click on the link, “Living with Brain Injury.” That website provides high-quality information about brain injury such as potential...
causes, effects and treatments. Should you need additional information, contact the experts at our local chapter, the Brain Injury Association of South Carolina, at 1-877-TBI-FACT (1-877-824-3228) or email jdavis.biasc@gmail.com.

All that said, what do we know about brain injury in South Carolina? Unfortunately, the truth is we don’t know as much as we wish we did. And I know that because I am the chair of the Data and Information Systems Committee for the South Carolina Brain Injury Leadership Council (SCBILC). (The SCBILC is the state’s advisory body on brain injury as mandated under the Federal TBI Act of 1996.)

We know much less about the incidence of acquired brain injuries than traumatic. We do know that traumatic brain injuries are the No. 1 cause of death in South Carolina among those aged 1 to 44 years. We also know that there are thousands—but closer to hundreds of thousands—of people in South Carolina living with a significant lifelong disability due to a brain injury.

We also know that TBIs are on the rise in South Carolina, and have been for many years (see Figures 1 and 2). However, deaths caused by TBI have slightly decreased over the years due to improved acute medical care. However, that often results in more people living with serious lifelong disability due to the injury, which often puts additional strain on family caregivers or taxpayer-funded programs. Nonetheless, the number of people who were treated for TBI in major hospital settings in South Carolina is staggering: 282,295 people between 1998 and 2014. And the primary payers of the health services received were either Medicaid (9.9 percent), Medicare (28.2 percent), private insurance (35.8 percent), or patients were classified as uninsured/indigent (26 percent).

Many people who experience traumatic brain injury either seek acute medical care from non-hospital settings (e.g., primary care physician) or do not seek acute medical care at all. In fact, one research study found that 42 percent of those who experienced TBI did not seek acute medical care following their injury (Setnick & Bazarian, 2007). Those who were LEAST likely to seek acute medical care were those who were older, those who suffered a mild TBI (e.g., concussion), or those who were injured in their homes. Researchers concluded that the public should be made more aware of the signs and symptoms of a TBI and the benefits of seeking acute medical care following an injury.

As a result, my colleagues and I decided to explore just how many people in South Carolina receive health services for a TBI-related diagnosis who receive Medicaid benefits. (Those eligible for Medicaid benefits in the United States are typically those with very low or no income.) We were able to request data about Medicaid beneficiaries who receive health services for a TBI-

**During the years of 2010 to 2015:**

- a total of 125,413 people (non-duplicative) received health services for a TBI-related diagnosis in South Carolina using Medicaid benefits that cost Medicaid a total of $62,936,281.90.
- 29,401 of those patients were 0-5 years old
- 36,401 of those patients were 6-12 years old
- 20,271 of those patients were 13-20 years old
- 39,340 of those patients were 21 and older
related diagnosis from S.C. Healthy Connections under the Freedom of Information Act. We found that during the years of 2010 to 2015, a total of 125,413 people (non-duplicative) received health services for a TBI-related diagnosis in South Carolina using Medicaid benefits. By age group, there were 29,401 patients aged 0-5 years; 36,401 patients aged 6-12 years; 20,271 aged 13-20 years; and 39,340 patients aged 21 and older. And those health services cost Medicaid a total of $62,936,281.90.

We were alarmed by how many Medicaid beneficiaries received health services for a TBI-related diagnosis in South Carolina during such a short time span. We were even more alarmed by how many children received health services. The data confirmed what we were already thinking: That what we know about brain injury in South Carolina, and who gets treated for brain injury in South Carolina, is just the tip of the iceberg.

Stephen Firsing can be reached at sfirsing@coastal.edu or 843-349-6906.
The history of science begins in the 16th century and continues to this day. For the most part, this history reveals an expanding and generally accepted role of science as a method for understanding the natural world. However, recent controversies regarding global climate, vaccines, genetic engineering and other issues have caused some to question the motives of scientists and the utility of science.

Defending science in the public arena is not something we as scientists are used to doing. We assume, perhaps wrongly, that our work is universally valued and valuable. But perhaps now, we as scientists must be a little less concerned about doing science and little more concerned about how the general public perceives and interprets the results of our work.

With this in mind, I asked faculty in the College of Science to provide their definitions of science and also to state how science influences culture. Contrary to expectation, each definition is a bit different, which might be a good starting point for educating the public about science and scientists.

Science is the objective way we discover how the universe works. By teaching us problem-solving, we are better able to solve even nonscientific problems. By presenting difficult questions, it teaches us how to tackle thorny societal issues. Through science and its techniques is the only route to progress.

Science is the study of life and everything that supports, maintains or relates to living organisms. Science provides testable theories and explanations, but when science deals with people, the research cannot be applied the same way in every situation or to every patient. Science is everywhere in today's society, and influences what we eat, what we wear, how much sunscreen we put on and how we communicate with each other.

Science is a way of asking and answering questions. It is a repeatable, iterative process that continuously improves our understanding of observable, measurable phenomena. Using this approach allows anyone to contribute to a culture built on open, testable ideas about how we work, interact and relate to nature.

Science is the general field of inquiry that tests hypotheses through observation and experimentation to build upon and organize prior knowledge of the universe. Culture influences our values, morals, goals, expectations and approaches to doing science, as well as determining support for science through resource allocation and public attitude.

Science is absolutely vital for better understanding how to improve life on earth and mitigate stress on our shared environment. Earth's population has more than doubled in my lifetime (rising to more than 7.5 billion people) making the need for better science more important than ever to guide our culture.
I had it all.

I had a perfect house in a little city, a place where people loved and respected each other. I had a wonderful family that taught me to be a decent person and respect others. I lived close to both of my grandparents and I got double the amount of crunchy cookies and hugs. I was a great student and I had a lot of friends who I used to hang out with all the time. They were nice and they loved me.

Perhaps the most wonderful aspect of my life was my brother, who I adored having so close. I could feel his love in the way he picked me up after I scratched my knees. I could feel it in the way he got in front of a mad dog to protect me. I could feel his love in the way he would take care of me every time my parents left us. That love was so huge and intoxicating we would get under blankets and laugh just so that we would keep it there forever. ... Little did we know forever would last only 15 years.

So, we had it all. ... Then why give that up? Why did we throw away our little safe paradise in Albania so that we could live inside an unknown hell or heaven in the United States of America? For we gave up everything hoping to get a glimpse of an eternal happiness we thought existed.

The U.S. has always been viewed as a distant star that we looked at with hopeful eyes. Everyone thought that here every dream could come true. So we came here with our pockets empty but our hearts filled with ambition and hope. I know that my family risked so much to bring me here. They came to a place where they had no family, no job, and could not even speak the language! So I was and am determined to make it. I want to become someone who inspires others, makes them believe that there is hope, inspiration and passion all around us.

I found that hope, that dazzling light, when I found out about Summer Coastal Research Experience (SCoRE) at Coastal Carolina University.
My chemistry teacher at Myrtle Beach High School told me about this opportunity, and I seized it. I was hoping with my whole heart that I would become part of this research, which would open up so many doors to a future I longed for. I have always been passionate about the sciences, especially biology, as I love understanding how things in us and around us occur. This program, in addition to being beneficial for my future, would allow me to pursue my passion for science.

I decided to apply for a position and work under Professor Paul E. Richardson in his research regarding bacteriophages. I was taking advanced placement biology at the time, so I had briefly learned about bacteriophages. However, it was enough to make me fascinated with these microscopic pathogens.

When the day came for the interview, I could not contain my excitement. My father took the day off from work and we were on our way to CCU. I knew that this was going to be extremely important regarding me getting accepted or not, so I was scared. I was so scared my whole body was shaking and my appetite disappeared for the day.

When we got there, Richardson gave me the opportunity to visit the lab before the actual interview. I never thought I would be so excited about something. Have you ever had that feeling when you have goosebumps all over your body but you are not cold? You are just so excited about something that even your skin muscles are contracting with happiness. Well, that is how I felt.

It was so inspiring to look at the place in which I could one day potential develop my passion and let loose my curiosity. It was hard to contain my excitement for what my future might hold if I was accepted into the SCoRE program.

This is a happy story, because I clearly got in. But, like every happy story, mine had a low point, too. I found out I was going to get to go to Albania after two whole years. But if I got the job with SCoRE then I would not be able to travel to Albania and reunite with my entire family. A part of me was hoping I would not get in so God could make it easier for me to choose between SCoRE and Albania. But nothing comes easy in life; I got the job. I decided that Albania was not going anywhere, but my future was becoming my present so I had to invest in it. I decided to stay, even though it saddened me that I had to sacrifice my parents’ trip as well. They were happy not to go and proud to see me grow and make this decision.

I am finding my strength with my family and in the opportunities that were given to me, and I know that this strength will last forever. As the old saying goes: as one door closes, another door opens. You might not always know the direction that this world can take you, but sometimes it provides opportunities that can stoke the flames of the human soul and the passions that drive us. I’m on my way to my future in science, all thanks to Coastal Carolina University and SCoRE! 😊

For information about the SCoRE (Summer Coastal Research Experience) program, contact Paul Richardson, Ph.D., Department of Chemistry, at prichar@coastal.edu or 843-349-2598.
If you have ever been on a cruise or traveled to a resort town, you have probably encountered jewelry shops showcasing the precious blue gemstone tanzanite. This gemstone is only found in the northern part of Tanzania. Tanzanite, however, is not the only “jewel” one can find in Tanzania, a realization I quickly reached while I was visiting the East African country for three weeks in May.

Coastal Carolina University students taking public health courses and statistics will have the opportunity to experience the same when they travel to Tanzania in May 2018 as part of a study abroad experience. The students will explore the richness of a country that is diverse, both in its terrain and its people.

Tanzania is home to some of the most amazing sights and wonders that one could ever imagine, which is only heightened by the experiences of exploring the country and meeting with the people. The country officially became Tanzania on Oct. 29, 1964, when Tanganyika, on the African continent, and Zanzibar, an island off the coast of Africa on the Indian Ocean, merged. Zanzibar is considered a semi-autonomous archipelago, which was once home to Freddy Mercury when he was a child.

Zanzibar has a rich but turbulent history that includes occupation by foreign powers and the enslavement of African people. Starting in the 15th century, Zanzibar was part of the Portuguese Empire, but by the 16th century, the Sultanate of Oman had taken it over, ruling the islands for about 200 years. As focus turned to ending the enslavement
of African people, Zanzibar became a protectorate of the British Empire, and the end of the slave trade became a reality.

Zanzibar’s role in trade of spices and goods between Africa and the Middle East and the continual turning over of rulers has lent to its diversity of peoples and religions and to the development of a common language known as Kiswahili. Although Zanzibar is part of Tanzania, it is considered semi-autonomous, so although your Tanzania travel visa will grant you access, the Revolutionary Government of Zanzibar welcomes you.

The main island of Zanzibar has Stone Town, which is a beautiful town that is known for narrow streets that have markets and old historic buildings. You are instantly struck by the sight of large, beautifully carved front doors that are indicative of either an Arabic or Indian past, and, in some cases, are influenced by British presence. Stone Town is home to Christ Church, an Anglican cathedral built where an old slave market once existed and the altar of which is believed to be set upon a whipping post from the time. A monument is erected there in memory of the slaves.

From Stone Town, you can make your way by motorboat to Prison Island, which was a former prison for slaves but is now a place where you can observe the giant land tortoises and other wildlife. Zanzibar is known for its spices and fruits. Here, one can tour a spice market and learn about vanilla, nutmeg, cinnamon, cloves and myriad succulent fruits.

**DAR ES SALAAM**

Back on the mainland in the Eastern part of the country, you will find Dar es Salaam, which is the commercial capital of the country. When you arrive in Tanzania, after traveling for about 20 hours, making at least one stop along the way, you will probably land in Dar es Salaam, which used to be the capital city. Although the capital city is currently Dodoma (located more centrally), Dar es Salaam continues to house government and international offices. As coastal cities go, Dar es Salaam is hot and humid; however, it cools down a little between March and May when the rainy season is in effect.

In Dar es Salaam, you can travel to Oyster Bay, a beautiful area with picturesque beaches and statuesque buildings where high-level ministers who work in the Tanzanian government stay. This is also where the U.S. embassy is located. In the heart of the city lies the Muhimbili University of Health and Allied Sciences, which houses an extensive database of demographic and health data and where one can find students and faculty who conduct health research in areas of maternal and child health, HIV, environmental health, and more. Next May, we look forward to engaging with university faculty to understand...
public health good practices and concerns in the country and region.

The people of Tanzania are friendly and fiercely proud of the diversity of ethnic groups, religious affiliations and languages (more than 100). English and Swahili are the official languages; it is evident that Swahili is the language of the people. During my time there, I was able to pick up some words of the lingua franca, which is seen on posters and billboards and heard everywhere.

THE NORTH

Throughout the country are myriad lakes, rivers and national parks. To the north of the country, the gemstone tanzanite is mined. Also in the North are two mountains: Mount Meru and Mount Kilimanjaro. At more than 19,000 feet, Mount Kilimanjaro is the tallest peak in Africa and can be seen when you fly into Moshi. In the north, one can find Lake Manyara, home to giraffes and hippos, and the Serengeti, which is known for the wildebeest and zebra migration from May until July.

In addition, the Ngorongoro Crater offers spectacular views from the crater rim and is home to the big five (lion, elephant, buffalo, leopard and rhinoceros); other mammals such as hyenas, hippopotamus and wildebeest; as well as plentiful birds, such as ostriches, cranes, flamingos and secretary birds.

Traveling throughout the North, one has the opportunity to pass Massai villages, where the Massai tend their cattle and wildlife dressed in the colorful blankets that distinguish them from other groups of people in the region.

BAGAMOYO

I spent most of my time in Bagamoyo, a beautiful coastal town that has fishing villages. In the 18th and 19th centuries, Bagamoyo was a trading post for salt, ivory and enslaved Africans. Some say that the name Bagamoyo means “lose your heart,” which has a sense of foreboding of finality, as it was the
last stop before slaves were sent to Zanzibar to be sold to the Middle East and Asia. By the middle of the 19th century, the Germans used it as the capital of German East Africa; however, it was left abandoned when the capital was moved to Dar es Salaam. Today, amid the struggle of development, this town has become one of much promise and hope.

From a public health perspective, Tanzania, and specifically Bagamoyo, is an ideal setting to understand the social determinants of health. According to the 2016 United Nations Development Program Development Index Report, Tanzania ranks 151 out of 188 nations (compared to the United States, which ranks 10th). Consider the other data from the index report in the table below.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TANZANIA</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life expectancy at birth</td>
<td>65.5 years</td>
<td>79.2 years</td>
</tr>
<tr>
<td>Mean years of schooling</td>
<td>5.8 years</td>
<td>13.2 years</td>
</tr>
<tr>
<td>Gender equity index</td>
<td>129 out of 188</td>
<td>43 out of 188</td>
</tr>
<tr>
<td>Maternal mortality ratio</td>
<td>398 deaths per 100,000 live births</td>
<td>14 deaths per 100,000 live births</td>
</tr>
<tr>
<td>Adolescent birth rates</td>
<td>118.6 per 1,000 females ages 15-19</td>
<td>22.5 per 1,000 females ages 15-19</td>
</tr>
<tr>
<td>Female population with some secondary education</td>
<td>10.1 percent</td>
<td>95.4 percent</td>
</tr>
<tr>
<td>Male population with some secondary education</td>
<td>15.3 percent</td>
<td>95.1 percent</td>
</tr>
</tbody>
</table>

There are definitely some challenges in Tanzania that will enable a student to observe, analyze and compare to their current U.S. context and understanding. In addition, students will be able to observe research of current and re-emerging diseases. One of the biggest concerns of Coastal regions on the African continent is mosquito-borne illnesses. Bagamoyo is home to the Ifakara Health Institute, a state-of-the-art organization that is a leader in the study of mosquito-borne illnesses (malaria, dengue fever, filariasis and Zika), tuberculosis and HIV. I had the opportunity to tour the research and clinical trials facilities, where cutting-edge research is being conducted on drugs, diagnostics and vaccines for the aforementioned diseases.

**FUTURE OPPORTUNITIES**

For individuals interested in learning about public health concerns and practices in other countries, analyzing and interpreting statistical data, and understanding biochemistry, Tanzania is an ideal country for just that! Students participating in the Tanzania study abroad in May 2018 will have front row seats for this exciting opportunity to visit a country that boasts four of the Seven Natural Wonders of Africa (the Serengeti Migration, Ngorogo Crater, Mount Kilimanjaro and the Nile River) – a true jewel in Africa.

Fredanna McGough can be reached at fmcorma@coastal.edu or 843-349-2991.
Challenge and approach

Globally, an estimated 3 billion people live within 100 km of the coastal zone. For thousands of years, proximity to the coast has been essential for trade, transport, food and security. Recently, coastal erosion has threatened drinking water, property and lifestyle for the increased population along the waterfront. The coastal zone is naturally shaped by the continual ebb and flow of the ocean, an occasional storm and sea-level change. Additionally, human activities play a significant role in designing the modern coastal zone. Combined, nature and people create the variety of coastal landscapes observed on Earth.

The Department of Coastal and Marine Systems Science (CMSS) at Coastal Carolina University focuses on understanding the complexity of processes influencing coastal erosion through a variety of scientific disciplines. The dynamic nature of coastal erosion has provided our Issues and Applications graduate class the opportunity to examine the topic using a systems-science perspective. The purpose of this seminar was to describe the ever-changing coastal environment and offer insight into some of the factors contributing to change, based on an extensive literature study combined with intense group discussions. Here, we examine natural factors shaping the coast over long periods of time (sea-level change and longshore transport), natural drivers acting over short time scales (hurricanes and nor'easters), and human-related (aka anthropogenic) drivers (jetty construction and nutrient addition) that all affect the shape of the East Coast.

Modern coasts, shaped by nature and human interaction

The natural structure of a coastline can be comprised of a variety of barrier islands, beaches, lagoons and marshes which protect the mainland from offshore storm and wave impacts. Dependent upon the region, coastal environments
are comprised of soft sediment (sand or mud), rocky material or a combination of the two. The type of material might affect how an area will respond to natural and human-induced mechanisms that have the capacity to significantly alter the coast.

All U.S. coastlines are subject to similar natural drivers, such as sea-level rise, ocean waves, storms and sediment supplied from land. As sea level gradually rises, the impact of additional factors contributing to coastal erosion may become increasingly amplified. Extreme events such as hurricanes and nor'easters interact with everyday drivers, such as ocean tides and coastal currents. Especially the latter transports large amounts of sediment parallel to the coast (longshore transport). As a result, the coastal landscape is created by the rate of sediment removal, replenishment and rearrangement.

In addition to these natural drivers, human presence and activity may also cause substantial impacts. Within the U.S., more than 40 percent of the population is predicted to live along the coastline by 2020. To maintain pace with increasing coastal population and tourism, a majority of coastal engineering projects have resorted to hardening shorelines (including breakwaters, jetties, seawalls and groynes; Figure 1). Shoreline hardening provides temporary relief from coastal erosion and interferes with the natural dynamics at the same time.

Along the U.S. Atlantic coast, southern sandy coastlines transition into predominantly rocky shorelines to the north. To better understand how different coastlines and climates influence coastal erosion, we compared coastal regions along South Carolina and Maine. Both areas are influenced by longshore transport whereby sand is slowly and steadily carried along the coastline. In South Carolina, longshore transport predominantly moves sand to the south, whereas the northern region experiences a dominant northward flow. Also, southern coastlines are shaped by annual hurricane activity, while northern regions experience seasonal storm surges and nor'easters. Although the regions seem to be affected by similar processes, we have yet to examine the ultimate effect on coastal erosion.

**Natural coasts and erosion**

The coastline near Charleston, S.C., includes a 44-mile stretch of barrier island beaches spanning from Bull Island to Seabrook Island (Figure 2) that are ecologically, economically and physically dynamic. The coastline is comprised of easily transported sand and is moderately developed. Currently, sea level is rising along the South Carolina coast at a rate of 3.1 mm/year (0.12 in/year), which is larger than the average rate of global sea-level rise (1.6 to 1.9 mm/year or 0.07 in/year). Low-lying historic communities such as Charleston may face challenges with flood frequency predicted to increase as soon as 2030. From 1980 to 2010, Charleston Harbor has experienced an increase in sea level of 3.6 mm (0.14 in), already leading to frequent inundation of up to 3.5 m (11.5 ft) by ocean surges. Additionally, a beach volume loss of 5 m³/m (0.2 yd³/ft) is expected along the South Carolina coast due to sea-level rise, which threatens long-term resiliency of beachfront property in the state.

Although sea-level rise does affect the beach shape, other factors such as sediment supply, shoal bypassing (which is offshore sand migration along the shore and between inlets and beaches; Figure 2) and hurricanes have a more immediate effect on coastal morphology. Sediment supply from rivers, including the Santee/Winyah Bay system, deliver 0.43 million tons/year (860 million lb/year) to the coastline. Historically, shoal bypassing has revealed its overpowering effects on coastal morphology. One of the highest erosion rates along the South Carolina coast occurred before 1980 on Dewees Island due to the lack of shoal bypassing from Capers Inlet.

Since 1980, however, Dewees Island has shown accretion trends due to several bypassing events. Storm events, such as hurricanes, can also contribute to the shape of the coast by rapidly transporting large volumes of sand inland or far offshore. Sometimes, storms are so significant that new
inlets can be formed overnight where a once continuous coastline existed. In September of 1989, storm surge from Hurricane Hugo increased the height of the sea in Charleston by more than 10 feet. From Garden City to Folly Beach, the storm surge from Hurricane Hugo caused complete destruction of many dune fields. Similar effects were observed throughout Long Bay, South Carolina, as a consequence of Hurricane Matthew in 2016.

Moving toward the north, Portland Harbor is home to the largest population in Maine and is situated along a rocky coast which is marked by two major bays extending north and south of the harbor (Figure 3). Sandy beaches along the steep coast of Maine are scarce, with no more than 3 percent of shoreline length characterized as sandy. Interestingly, Portland Harbor represents a threshold for sandy beach existence throughout the state, with most sandy beaches located south of the harbor. Regionally, sediments are predominantly supplied by the Saco River at 10,000 m³/year (13,000 yd³/year).

The regional rate of sea-level rise is 1.8 mm/year (0.07 in/year), similar to the global average rate of rise. Although the Maine coast is considered to be one of the least physically vulnerable shorelines along the U.S. East Coast, more than 75 percent of the beaches are considered erosive with an average shoreline change of 60 cm/year (22 ft/year). Conversely, some areas are experiencing sediment accretion, accumulating sand and growing a beach.

However, strong seasonal nor'easters impact the Maine coast and much of the northeast, often causing 3.5 m (12 ft) high waves. Induced storm surges are greatest in winter to spring months, and certainly contribute to the shape of the coast.

**Engineered structures and coastal erosion**

The South Carolina coasts contain many manmade structures designed to protect the shoreline. Similar in effect to storm-driven transport, coastal construction has significantly altered the coastal sediment budgets via jetties and groynes upsetting the natural sediment dynamics and interrupting natural cycles such as longshore transport and hurricane action.

The consequence of sequestering sediment in some areas often starves other areas. The jetties in Charleston, for instance, prevent longshore transport across the harbor, which has likely resulted in the now sediment-starved conditions of Folly Beach requiring numerous nourishment projects (Figure 2). In January of 2014, the United States Army Corps of Engineers began a six-month project of pumping sand dredged from three miles offshore onto Folly...
Beach. The $30 million project is being funded primarily through the federal government, with the City of Folly Beach covering 15 percent of the cost (www.sciway.net). This is only one of the many beach nourishment projects that have occurred along Isle of Palms, Folly Beach and Seabrook Island. Overall, nearly $64.2 million has been spent on nourishment projects along these three beaches since 1980.

In the northeast, the construction of jetties has similarly altered the coast. In 1866, along the largest beach/marsh complex in Maine, two jetties were installed along the Saco River (Figure 3). The northern jetty has since been extended in length and height, resulting in one of the largest manmade features to extend into the Atlantic Ocean along the U.S. East Coast. Under the influence of the northern jetty, more than 2.3 million of sand has been transported offshore over the last 100 years. As a result of such transport, as much as 300 percent more sand was lost from the nearby Saco Beach relative to pre-construction estimates (considered to represent the material eroded by storms, waves and tides).

In summary, engineered structures such as jetties and groynes impact the natural movement of sediment along coastlines in both the north and south. In Charleston, jetties prevent longshore transport of sediment and thus starve the beaches usually supported by down-drifting sediment. Erosion rates after jetty construction were much larger than natural erosion rates before coastal construction occurred. Therefore, it seems in both geographic regions, the consequence of coastal construction results in a loss of shoreline due to the manmade feature.

**Nutrient loading and coastal erosion**

Nutrient supply is of particular concern ecologically as elevated nitrogen levels increase herbivory (eating) of salt-marsh plants. An overabundance of nutrients is one of the most prominent issues affecting coastal ecosystems throughout the United States. In particular, nitrogen-containing nutrients stimulate excessive plant growth in coastal waters, which often leads to poor ecosystem health and fish kills. Nitrogen compounds are introduced into the soil and air by fossil-fuel emission and agricultural fertilizer application. Nitrogen is then ultimately supplied to coastal ecosystems by rivers and also by acid rain.

However, different responses to excess nitrogen may be observed regionally because of dissimilar environmental conditions. A South Carolina case study displayed the interaction between the elevation of salt-marsh vegetation, sea-level rise and pollutant concentrations. The study concluded that a less productive marsh would be more stable over longer time scales as it will be less vulnerable to sea-level rise. If coastal wetlands are not able to endure sea-level changes, these environments may start to diminish through the loss of vegetation and root density, leading to further coastal erosion.

In the northeast, nitrogen is deposited from the atmosphere to the land in excess of 10 kg/ha annually. Astonishingly, from the atmosphere alone, the northeast receives nearly double a healthy annual dose of 5-10 kg/ha. Although nitrogen is required for plant growth, adding too much resulted in root loss and increased soil decomposition. For instance, moderate eutrophication is observed to result in the loss of vegetated wetland, caused by the expansion of open water and mudflats along a northeastern salt marsh as a consequence of a less stable flora. Thus, a combination of reducing marsh vegetation and increasing rates of nutrient-sparked organic-matter decomposition results in coastal erosion.

In summary, too high nutrient levels and enhancing coastal erosion are coupled. The nitrogen content in plants increases with latitude, meaning salt marshes at high latitudes are particularly sensitive to elevated nitrogen inputs. Coincidentally, the large population centers within the northeastern U.S. have a high potential for excess nutrient runoff, which may ultimately lead to accelerated coastal erosion.

**Reflection and application**

Coastal systems are ever-changing, shaped by natural and human activities which vary over space and time. Daily sediment transport along the coast due to longshore currents dominates the southeast. In contrast, the northeastern U.S. coast is predominantly morphed by strong seasonal storms. Since there is a difference in coastline morphology, the effect of human engineering is also dependent on region. In the southeast, jetties have a far-reaching effect on sediment transport, while rock outcrops along the northeast shorelines act as natural barriers, thereby reducing the large-scale effect of coastal engineering. Even human activities not intended to directly modify shorelines have effects on coastal environments. For example, an increase in nitrogen-containing nutrients increases plant growth, which, in combination with sea-level fluctuations, affects sediment stability along the coasts.

Coastal morphology is influenced by the intermingling of various natural and anthropogenic drivers, and we, just like Mother Nature, have an effect on the world around us. The “man in charge” is not only the man with the vote; activism at the individual and community level is vital to efficiently and effectively address coastal erosion. Individuals and communities have power as consumers and property owners to promote environmental justice and protect our underappreciated ecosystems.

Science is not a profession, but rather a way of seeking truth to make decisions regarding food and water security and property welfare. The coastline requires and deserves continuous monitoring in order to grasp a well-rounded understanding of coastal dynamics. With great scientific and economic power comes great scientific responsibility to perform objective research and communicate the results, empowering individuals and communities to shape their environmental legacies.
Presenting Psychology: Coastal Carolina University students and faculty present research in Atlanta

By Terry Pettijohn, Ph.D., Chair/Professor, Department of Psychology, Coastal Carolina University

The Department of Psychology continued its long tradition of offering opportunities for students to attend and present research at professional psychology conferences by taking a group of 11 students to the annual meeting of the Southeastern Psychological Association (SEPA) in Atlanta, Ga., in March 2017.

We had attended SEPA before and knew the type of programming offered, submission requirements, conference programming and deadlines. This allowed us to be prepared for the early fall (October) call for submissions and organize student research. SEPA is a wonderful opportunity for first-time presenters. It is a regional, student-friendly psychology conference, which is why we selected it.

We started getting students interested in the opportunity to attend and present almost a year before the conference, in spring 2016. We approached our current student researchers and let them know about the prospect to attend and present at the SEPA conference in Atlanta in 2017. A special obstacle this year was that the conference was scheduled in March over CCU’s spring break. This meant students (and faculty mentors) would have to forego plans to attend tropical vacation destinations, a trip home to see family and friends, or take time away from studies, and instead focus on psychological science over break. We prepared students at CCU before we left by having them read articles about conferences and having group discussions, so they knew what to expect.

We organized a group of 11 students and six faculty members to attend the SEPA conference in Atlanta. The faculty who attended were myself and Andrew Terranova, along with lecturers Kim Baker and Theresa Stanton. Stanton graduated from CCU (2002) as a psychology major, and she presented at the Carolinas Psychology Conference as a student. Visiting assistant professors Kelly Black and Kevin Carlson also attended and presented at the conference. We had a total of 11 CCU presentations at the conference, which was a couple more than our last visit to SEPA, and quite an impressive showing.

A couple of the students were presenting their senior thesis projects (Laura Fowler and Christy Whitehead), but the majority were presenting research generated from working in research labs with supervising faculty mentors. We covered topics ranging from politics to relationships, including...
CCU PRESENTATIONS AT SEPA 2017, ATLANTA, GA.

- "Risk-Taking and Logo Priming in College Students." Fowler, L. and Pettijohn, T. (faculty sponsor)

- "Personality, Infidelity, and Reactions to Engaging in Infidelity." McKenzie, S., Campbell, O., and Terranova, A. (faculty sponsor)

- "The Effects of Cell Phone Interference on Task Completion and Task-related Frustration." Whitehead, A. and Pettijohn, T. (faculty sponsor)

- "The Interplay of Gender Identity and Romantic Relationship Processes for Transgender and Gender Non-Conforming Persons." Carlson, K. and Millar, K

- "Personality and Traditional Gender Role Beliefs among College Student Voters in the 2016 U.S. Presidential Election." Campbell, O., Petschke, A., Romanik, L., and Pettijohn, T. (faculty sponsor)


- "Helicopter Parenting and Adjustment in Young Adulthood." Morehead, K. Finch, J., Whitehead, C., and Terranova, A. (faculty sponsor)

- "The Effect on Micro Test Pep Rallies on Introductory Psychology Test Scores." Baker, K. and Pettijohn, T.

- "Education Majors’ Personality, Moral Reasoning, and Responses to Student Bullying." Terranova, A. and Porter, M

- "The Contraceptive Attitude Scale: Updated Psychometrics for a New Generation." Black, K.

- "The Influence of Maladaptive Personality Qualities on Romantic Attachment in the Context of Hook-Up Culture." Carlson, K., Miller, K., and Schrenk, K.

Terranova and I drove the campus vans on the long trek, six-plus hours, to Atlanta. Conference activities were all conveniently on-site at the hotel. Students got to see how interconnected the field of psychology was. I knew several of the department chairs from other universities, and other CCU faculty knew colleagues and past research associates at the conference. Representatives from surrounding graduate programs offered useful advice about graduate school options to our students. Students attended interesting research presentations as well as professional development talks on how to get into graduate programs. There was also a special talk on the field of forensic psychology, including what forensic psychologists do and what you need to become one. We also got to catch up with past CCU psychology graduate (2012) Paige Naylor, who is finishing her final year at the University of South Alabama in a clinical psychology Ph.D. program, completing a year long field placement in Memphis, Tenn.

We ate several meals together as a group, which increased social connectedness and a sense of group cohesion. Faculty shared stories about previous conferences and how to get the most out of the conference experience. Research connects all of the subfields of psychology, and the conference experience provided students opportunities to develop, conduct and understand research in the discipline, build on knowledge and skills relevant to psychology, and reinforce the scientific nature of psychology.

Several students left Atlanta excited about the opportunity to attend and present at other professional conferences in the future. Olivia Campbell, Lucy Romanik and Avery Petschke won a Psi Chi Regional Research Award for their project investigating personality traits of voters and who they voted for in the 2016 election.

Upon returning to campus, we had a group of our presenters give a special presentation open to all majors and faculty on their SEPA experience. It was encouraging to see their excitement during their presentations about their trip, and we hope this enthusiasm is contagious to next year’s group. We are planning to attend SEPA again in 2018 in Charleston, S.C.

At Honors Convocation, a parent made a point to tell me how special it was that her daughter had the opportunity to present at SEPA and how the department had provided so many opportunities. We hope all of these students enjoyed the experience and it helps them gain graduate school admission, secure a job after graduation, and develop as a lifelong learner.

In closing, we would like to thank Coastal Carolina University, Dean Michael Roberts and Associate Dean Prashant Sansgiry in the College of Science for supporting psychology student research activities.

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Among the alligators, mosquitoes, biting flies and gnats, beneath the spartina grass, cypress trees, mud and sand of the Santee Delta, a rich history is preserved.

It is a history shaped by the interaction between the Santee River and the Atlantic Ocean over hundreds of thousands of years, driven by sea level and climate. The valley, which the modern Santee River currently occupies, was carved into older sediment and rock by the river itself during the last glacial period, ending some 15,000 years ago, when global sea level was up to 130 meters lower than it is today.

During this period, the Santee wound its way across the exposed continental shelf more than 80 kilometers to the shelf margin. Much of this record has been lost due to the erosional power of waves and tides, when the shoreline marched inland across the shelf as massive continental ice sheets at high latitudes around the world melted and global
Figure 1. 1778 map of South Carolina by James Cook. The Santee River, and its major tributaries the Wateree and the Congaree, can be seen winding through the state from its headwaters in the Appalachian Mountains to the delta at its mouth (red box).

Figure 2. Till J.J. Hanebuth (right) and Joshua Long discuss the details preserved within a small trench on a sand bar in the Santee River. It is from trenches like this that we gain insight into the depositional processes used to interpret sediment cores and seismic data where such direct observation is not possible.
sea level rose; however, in rare places on the continental shelf and within the modern delta, this history is partially preserved in the sedimentary record as remnants of ancient environments.

But there is another history of the delta, a human history, which dates back to the first documented Native American settlers within the delta nearly 3,000 years ago. Much as they are in modern coastal environments, these two histories are inextricably linked. As a geologist and a Ph.D. candidate in CCU's Department of Marine and Coastal Systems Science, I am part of a research group focused on unraveling this history as it is recorded within the river, marsh and coastal deposits of the Santee onshore and offshore. The research relies extensively on data acquired in the field, most of which we have acquired over the past year and a half.

The Santee River delta is located on the central South Carolina Atlantic coast between estuarine Winyah Bay to the north and the barriers and marshes of Cape Romain to the south. It is the only river-fed delta found along the entire east coast of the United States. Within the eastern U.S., the Santee River is second only to the Susquehanna River in terms of drainage area and water discharge. In spite of these unique characteristics, the Santee system remains largely under-investigated, with only a handful of geologic studies completed in the 1970s and '80s. It is both the uniqueness of this system and the lack of detailed study that makes it such an appealing target for scientific investigation.

Like many other coastal plain river systems within South Carolina and Georgia, the Santee River has been extensively modified by humans over the past 300 years. During only a few decades in the late 18th century, approximately 150 square kilometers of lowland forest along the lower Santee were cleared to make way for rice cultivation, dramatically altering the landscape for centuries to come. As a result, the islands and banks of the Santee are a mosaic of low-lying rice fields bordered by a network of artificial levees and canals.

During the 1940s, the Pinopolis and Santee dams were built, creating the largest lakes in the state of South Carolina and diverting much of the water, and sediment which it carried, from the Santee into the Cooper River and ultimately into Charleston harbor, some 60 kilometers to the south. While subsequent re-diversion has returned part of the flow to the Santee, the dams create a significant obstruction to sediment through-flow from the Santee's headwaters in the Appalachian Mountains and Piedmont to the delta region on the Atlantic coast. In contrast to these early anthropogenic changes, the modern Santee River and delta are sparsely populated with approximately 400 people living along its banks below Lake Moultrie and no modern development along its 25 kilometers of coastline.

There is a simple but eloquent expression in the field of geology that states "the present is the key to the past." It is through the lens of the present environment, within the channels, islands, marshes and beaches of the Santee, that we...
must view the record of its past. In other words, the physical, biological and chemical processes that govern the nature and distribution of sediments within this environment are the same today as they were in the past. If conditions are right, the record of these laterally adjacent environments will be preserved in a vertical succession as they shift in response to local, regional and global changes.

The long-term goal of our project is to document and interpret the natural and human history of this unique region of South Carolina. Our “SanteeAGES” research group (an acronym for anthropogenic, geologic and ecologic systems) was set up with this long goal in mind. To do this, we must evaluate the contributions of various coastal systems and scientific disciplines in an effort to understand how these parts are combined to create the beautifully complex environments of the Santee River and delta and the how these environments fit within a larger regional context.

My own dissertation research is but a part of this larger effort. I am focusing on the stratigraphy of the Santee region. For the majority of people reading this who likely don’t enjoy playing with rocks and dirt nearly as much as we do, stratigraphy is a discipline within the field of geology that focuses on the distribution of sediment (and rocks) in both time and space. More specifically, I seek to define a broad stratigraphic framework that will serve as the foundation for future research on the Santee and to begin to answer the questions of how, when and why the Santee has evolved as it has. Additionally, I hope to be able to quantify the sand budget of the Santee system which, prior to extensive damming, was likely one of the most significant in the region providing large volumes of sand to coastal South Carolina and Georgia. Stratigraphic studies such as this take the long view of environmental change. A detailed understanding of past changes (the drivers and products) can also help to predict how the system will respond to future change. Such predictions could and should be integrated into coastal governance and management efforts.

The integration of surficial data sets (i.e., the present) with subsurface data sets (i.e., the past) is a crucial component of the project. Topography, sea floor and river bottom bathymetry, sediment samples from beaches and channels, as well as shallow trenches are used to characterize the modern environment. Sediment cores and seismo-acoustic (Chirp) data constitute the subsurface data set. Sediment cores up to around 6 meters in length are described in terms of composition and sampled for lab analyses including XRF (to determine elemental composition), microfossils (diatoms...
and foraminifera provide insight into conditions at the time of deposition), stable isotopes (carbon and nitrogen are used to characterize the plant assemblages within the watershed) and palynology (pollen and spores from local plant communities). In addition to these paleoenvironmental indicators, samples are also taken for radiocarbon (14C) and Pb-Cs dating to provide a temporal framework for the overall environmental interpretation.

Chirp data is acquired by the emission of an acoustic signal, which travels through the sediment. This signal reflects off of surfaces within the sediment (based on changes in material properties) and returns to a receiver, where it is combined with previous signals and spatially referenced. The record that is created through this process provides an “image” of the subsurface delineating changes in sediment type as well as the extent of stratigraphic surfaces which can be used to define both depositional and erosional elements preserved within the subsurface. It is the understanding gleaned from the modern system combined with the detailed observations of the ancient system that is used to interpret the sedimentary record. It is this record that gives us insight into the history of the Santee, providing glimpses of ancient landscapes never before seen by people.

This sort of study is no small feat and requires the appropriate personnel and equipment in order to be successful. CCU has both of these, which was the primary reason I chose to pursue my degree at our school. My adviser, associate professor Till J.J. Hanebuth, and several other key faculty members possess years to decades of experience working on coastal, deltaic and marine systems in South Carolina and around the world. The school is well equipped with a fleet of small boats, as well as specialized equipment such as our Chirp sub-bottom profiler, a seismo-acoustic tool designed to image features below the river bottom or sea floor.

In addition to CCU faculty, regular collaboration with scientists from the South Carolina State Geological Survey and the University of North Carolina at Wilmington has provided valuable insight and assistance, particularly for aspects of my own research. Finally, most of this research would be impossible without the help of our group of boat captains, who are an indispensable resource and always willing to contribute.

This type of fieldwork isn’t easy. The days are long, starting before sunrise and ending well after sunset, and conditions can be physically and mentally taxing. Considerable planning is required to account for local tides, equipment and personnel. No matter how thorough the plan, its implementation is always a challenge.

With that being said, whether we are being swarmed by bugs while digging a trench, knee-deep in mud hauling gear onto an island, or waist-deep in a rising tide recovering a sediment core, there are few places I’d rather be and no better way to learn about the environment around us and explore the history that preceded us.

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Figure 6. Chirp line (above) through a large bar in the North Santee Bay and interpretation sketch of the internal features (below). The three colored intervals (brown, green and light blue) correspond to three distinct stages in bar growth separated by two prominent erosional surfaces.
The existing nursing program offered by the College of Science since 2011 is a post-licensure RN-to-BSN completion program. All of the students are registered nurses with a nursing diploma or a nursing associate of applied science degree. The Bachelor of Science in nursing completion program is aimed at seamless articulation for practicing nurses, and classes are scheduled online and on weekends to meet the needs of working registered nurses.

Every year, the nursing program receives dozens of telephone calls and emails asking about a traditional pre-licensure nursing program. Establishing a traditional nursing program is not feasible at this time, but because our partner technical college has an associate degree nursing program, we worked on an articulation agreement that provides the best of both worlds so students can finish a Bachelor of Science in nursing (BSN) in four years. The 2+2 Nursing Residential Bridge program is a collaborative program between Coastal Carolina University (CCU) and Horry Georgetown Technical College (HGTC). Students in this program live in CCU's residence halls while taking general education and nursing classes at HGTC for their freshman and sophomore years to earn an Associate of Applied Science in nursing, and then they take the national registered nurse (RN) licensing exam. Students who successfully complete these steps spend their junior and senior years taking classes at CCU to earn a Bachelor of Science in nursing.

Participation in this 2+2 RN-to-BSN program is highly competitive. Students first must meet all entrance requirements and be admitted to CCU. The 2+2 nursing program also requires that students have a minimum combined math and verbal SAT score of 1270 or a composite ACT score of 24. After completing the AAS in nursing at HGTC and successfully completing the national licensing exam, students will automatically be accepted into the BSN program to complete the remaining classes at CCU.

**The student experience**

Students live in Coastal Carolina University residence halls and enjoy all aspects of living on CCU's campus. First- and second-year students will complete general education courses at HGTC's Conway campus, which is adjacent to CCU's campus. Students complete AAS nursing courses at HGTC's Grand Strand campus and local area health care institutions. The Grand Strand campus is 13.5 miles (21.7 km) from CCU's campus. Transportation can be provided for the first semester, but students will need to provide their own transportation for future semesters.

After the first two years, students complete the national licensing exam for nursing (NCLEX-RN) in the summer after completing the AAS degree, and begin the RN-to-BSN program at CCU in the fall of the third year.

Seven students will pilot the nursing 2+2 program in Fall 2017, and we hope to double that number for Fall 2018. While taking classes at HGTC, those students may use all of Coastal Carolina University's student services, join clubs, attend athletic events, etc. When students begin taking classes at Coastal as juniors, they will be able to finish the degree requirements for the BSN in three to four semesters. In addition, qualified students may participate in the Honors Program and earn that designation for their diploma.

Both the HGTC nursing program and the CCU BSN completion program are accredited by the Accreditation Commission for Education in Nursing (ACEN).

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Have you ever worried that you’re not doing enough to keep your brain “in shape”? The topic of brain health is becoming more and more popular. It’s no secret that as we age, our susceptibility to neurodegenerative diseases, such as Alzheimer’s disease, increases. In fact, there is quite a large industry built on brain quizzes and puzzles to keep your brain sharp and functioning at its highest capacity.

Sure, that crossword puzzle or Sudoku is highly entertaining, and probably does help keep your brain firing on all cylinders, so to speak, but there might be another way to protect your brain and even retroactively make it stronger.

It has long been suggested that incorporating physical activity into everyday life results in improved health. In fact, it seems as if every day a new study is published touting the benefits of physical activity during every stage of life – from pregnancy to early childhood, through adolescence to later adulthood. The beneficial outcomes of regular exercise and physical activity range from physical (e.g., lower risk of cardiovascular disease, increased strength and flexibility, lower risk of falling) to mental (e.g., improved memory and cognition, better emotional regulation). Despite this, millions of U.S. adults remain essentially inactive and therefore do not reach the recommended levels of physical activity.

While the recommended guidelines from the World Health Organization for physical activity in older adults (65 years and above) are to get at least 150 minutes of moderate physical activity (or 75 minutes of vigorous-intensity physical activity) a week, research has frequently demonstrated that even engaging in activity as little as twice a week can yield significant benefits, especially in cognition.

So if you’re new to this exercising thing, or maybe you haven’t attempted any real physical activity since Reagan was in office, don’t fret! Getting up and moving just a couple times a week will yield positive benefits. In fact, adults in midlife who exercise regularly at least twice a week have a significantly lower risk of dementia in later life than those who are less active.

Additionally, physical activity helps reduce normal, age-related decline in cognition. Did you get to the store and forget what you needed? Not sure where you placed your keys? These little bouts of memory lapse are not uncommon, but can be slowed with regular physical activity.

Even better news: It’s never too late to get active. We know the risk of developing neurodegenerative diseases (like Alzheimer’s disease) increases with age, so it’s no wonder why scientists have begun researching the effects of physical activity on cognition, including memory, in older adults. More recent evidence shows even people who begin exercising after midlife have lower risks of developing dementia later in life than those who remain inactive. In fact, older adults benefit even more from physical activity than younger people when looking at cognitive functioning. Take that, youths!
The working hypothesis scientists hold regarding the connection between physical activity and the brain suggests regular exercise may actually increase blood flow to the brain. Additionally, exercise may increase brain plasticity by stimulating new connections within the brain. In fact, one research study in older adults with mild cognitive impairment found those who engaged in aerobic activity four times a week had an increase in overall volume and gray matter in the brain in some areas (decreases in gray matter is associated with Alzheimer’s disease).

But what does it mean to engage in moderate-intensity physical activity?

Actually, much of what you already do in your-day-to-day life may count as leisure time physical activity. Going for a walk around the neighborhood is an excellent way to get more active, even if it’s just for 10 minutes at a time. Gardening is another way to reach those physical activity recommendations. Going for a swim or dancing the night away will both help you reach your goals for physical activity. To be considered “moderate intensity,” you want to get a little warm and maybe feel slightly short of breath, but you should still be able to carry on a conversation with a friend.

To get the best results, include both cardiorespiratory exercises (e.g., walking, swimming, water aerobics) and muscle-strengthening activities (e.g., weight lifting, body-weight exercises like push-ups and sit-ups). Find a yoga class and get both activities in one class!

So, who’s ready to get moving? ☺

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Memory and Aging: What It Is and What It Isn’t

Most people as they get older experience from time to time what are often referred to as “senior moments.” In some cases, these are humorous experiences, but often they are not because of what they signal to middle aged and older persons: “This could be the first sign of Alzheimer’s disease.”

Indeed, Alzheimer’s is a common disorder that some, though not all, people experience, but this form of dementia is distinct from simply growing older. Additionally, it is important to know that failures in judgment also define Alzheimer’s disease, as is an awareness that one has forgotten a name, an address or a phone number. People with Alzheimer’s disease, particularly those whose illness is advanced, are often unaware that they have already asked a question several times. Thus, repetitive failures in memory without an awareness of the fact that one has forgotten something are concerns that should be explored with a specialist.

In contrast, normal aging, while often accompanied by an inability to remember a name or a date, is also characterized by a return of that which has been forgotten – the “ah-ha!” moment that we all experience when we are no longer trying to remember that name or date. At the minimum, educating oneself about what is and is not normal aging is important in understanding memory and aging. In this respect, the Alzheimer’s Association has much information that is publicly available regarding the difference between normal aging and Alzheimer’s disease.

Types of Memory and Aging

Memory is really memories – different types of memory exist, and each changes with age in a somewhat different manner and for different reasons. Moreover, memory also applies to our recall for what has already happened (retrospective memory) as well as what has yet to happen (prospective memory). In addition, we often separate memory for details (episodic memory) from memory for more general understandings, ideas and concepts (semantic memory).

Different memory structures exist:

1. Sensory memory, characterized by very rapid decay (half a second), is not really memory per se in that it is preattentive – it requires no conscious effort to employ. Some might describe this as almost photographic in nature. Assuming that persons do not have significant sensory (vision, hearing) loss, there is little decline with age in sensory memory.

2. Primary memory is limited to what we can consciously retain or hold in our heads at any one time (between three and seven words or numbers). Once the capacity of one’s primary memory is exceeded, something must be done with that information (e.g., a phone number, one’s Social Security number), or it will be lost. For example, in order to avoid losing information (e.g., a phone number), we might rehearse those numbers in repeating them over and over, or we might write them down in a notebook or planner. In addition, it is important to distinguish between active (repeating a list of digits that one heard back in reverse order) and passive aspects (repeating these digits back in the same order) of primary memory. Because it requires more effort and attention, we find greater declines with aging in active primary memory.

3. Secondary or working memory picks up when limits of primary memory have been exceeded. In order for something to exist in secondary memory, one must have processed it in a manner which allows it to exist so that it can be eventually transferred to tertiary (long-term) memory. Thus, depending upon how information has been processed, it will be easier to recall – it can be accessed when necessary. In secondary memory, age deficits are common, dependent upon how that name or date has been processed and the nature of what it is to be remembered. Primary and secondary/working memory are often collectively described in terms of short-term memory.

4. Tertiary (or long-term) memory is nearly unlimited in its capacity, and age declines in tertiary memory reflect the datedness and personal meaningfulness of that which we have stored. For example, we remember events from long ago because they are more personally meaningful to us, and they become more permanent in tertiary memory because we have spent more time assigning meaning to them. We talk about and think about them and write them down (all forms of rehearsal) as we do not want to forget, and in doing so, they become even more meaningful to us and thus more permanent, e.g., our children’s and grandchildren’s names, and of course, our own names! This permanence and meaningfulness of material in tertiary memory is commonly experienced in terms of being able to remember a significant life event (e.g., one’s anniversary) but not being able to remember what one had for dinner a month ago.
Memory Processes and Aging

We have noted several times that how a name or a date is processed influences whether we can remember it later, whether it exists in primary, secondary/working, or tertiary memory. What does this mean? We can think of how we process information as a series of steps or stages, each of which is dependent upon the other, and each of which ultimately influences whether something is learned and later recalled. Remember, one cannot recall that which has not been learned! He who learns nothing has nothing to forget!

The first process is termed registration. For something to be registered, it must exceed our sensory threshold. For example, did we even hear or see the information presented to us? Information does not exceed our sensory threshold for many reasons: We might be distracted and consequently not paying attention to what we are seeing or hearing, or we may fail to hear or see something because we have forgotten our glasses or hearing aids. Alternatively, it may have been printed too small or had little contrast (e.g., a restaurant menu read in a dimly lit room, the fine print details on a contract) and thus it is not seen at all. Perhaps the person speaking to us did not speak clearly or loudly enough, or spoke too quickly, undermining our hearing something that we may need to recall later. In each case, that information will simply not exist for us—it will not be available to us so that we can process it further because it did not exceed our sensory threshold.

The second and most important memory process (assuming that information exceeded our sensory threshold) is encoding. When we encode something, we assign it meaning. That it is meaningful to us is because of the manner in which we have encoded it. This encoding can take many forms: for example, using a rhyme (e.g., “Don’t scream, call Akim”) or an image (an image of a hammer to help remember Mrs. Hammerville’s name) to help us learn something so that we can recall it later. In essence, when we encode something, we are associating it with something that already has meaning. Hence, all memories that have been successfully encoded are associative in nature—something that is initially not meaningful (a name or a date) becomes so because of that with which we associate it. We will have more to say about encoding later.

The third memory process is storage. Storage reflects how items to be remembered have been encoded. Information is stored in an organized manner because we have a logical pattern or scheme that reflects our encoding of it, much like tabs on a file in a file cabinet. If the tabs do not make sense/are not organized in any coherent manner, the files they index are going to be more difficult to find, if we find them at all! At the minimum, it’s going to take us longer to find them because they were poorly organized in the first place!

We have all had the experience of looking for something in a familiar place, only to find it is not there. Perhaps we were distracted and put it down in an unfamiliar location. Likewise, shopping is much more efficient and indeed quicker if the items on our shopping list are organized in some manner (e.g., fruits/vegetables, meat, dairy products, pet supplies, cereal—each has a particular location in the store and we organize our list to reflect this). Thus, storage reflects how organized items to be remembered are. Their relationship to one another should be systematic and logical.

The last memory process is retrieval. Retrieval simply reflects the act or process of getting information out of storage. If the name or date to be remembered has been poorly encoded, it will not easily be stored, which will make it more difficult to locate. As older persons have more information (e.g., names, dates, addresses and phone numbers) to sort through, retrieving information that has been stored and which exists in addition to all the other names, dates, etc., we have accumulated over a lifetime will likely take longer and be more difficult. For example, who would most likely be able to recall the name of one’s first-grade teacher: a 7-year-old or a 70-year-old? Hence, encoding and storing an important address or appointment in a manner that is especially meaningful and organized is very important in retrieving it. We have all had the experience of where to lay our hands on an important document when we need it. If we have no special place for that document or have carelessly laid it down, it will be very difficult to find. The above memory processes (registration, encoding, storage, retrieval) determine whether information to be remembered passes from short-term to long-term memory.

Memory, Attitude and Aging

Though we do not always recognize it, our attitude toward our memory is as important as our memory skills per se to maintaining and improving our memory as we get older. This attitudinal aspect of memory is reflected in how we use our memory skills on an everyday basis, termed practical memory—how we cope with everyday living in using our memories.

Practical memory has four components:

- **Metamemory** — whether we under- and over-estimate our memory skills
- **Memory Self-Efficacy** — how much confidence we have in our memory skills
- **Memory Management** — strategies we use daily to maintain our memory skills
- **Memory Remediation** — how we go about improving our memories

It is important to recognize that memory improvement and memory loss are cyclical.

Regarding memory difficulties:

- Experience with failure leads to negative self-statements.
- Negative self-statements lead to emotional reactions (e.g., anxiety, alarm).
- Emotional reactions lead to a lack of self-confidence.
- Loss of self-confidence leads to further disuse of available skills.

In this respect, relying on technology (e.g., storing numbers or passwords on a computer or a phone) actually can diminish your memory self-efficacy in no longer requiring you to commit these items to memory. For all its wonders, in this case, technology can work against you by making you vulnerable to its availability in contrast to you making the effort to memorize a name or a number!
Your attitude is everything!
Everyone experiences memory difficulties from time to time. Importantly, with age, memory does NOT necessarily decline—you have control over whether your memory fails or not, and moreover, memory difficulties are episodic. They vary by persons, times and materials. It is also important to recognize that our memories do not function in a vacuum: They are impacted by the stresses we experience, whether we are depressed, anxious, tired, ill, or visually/hearing impaired or not. Medications sometimes interfere with memory in undermining attention, concentrations, and thus learning and memory.

Memory Improvement
The first step to learning new memory skills is to conduct an honest self-assessment.
Is your attitude self-defeating or optimistic about your memory and about life in general?
What is important enough to remember? (Sometimes writing things down is not only a good “Plan B,” but also strengthens associations that are key to recall. Use post-it notes and calendars if necessary.)
As registration is influenced by whether we are distracted or not, are you trying to multitask when trying to learn and recall something? Focus and organization are important, as is patience in learning new memory skills.

Do you accept that you will have difficulty from time to time in recalling things that you have done or will need to do? In learning new skills, maintain a relaxed and realistic attitude, proceeding slowly and deliberately. Be realistic—you are going to fail from time to time; improvement takes time!

Do you understand what you need to remember? Material that is new, difficult, complex or more rapidly presented is going to be more difficult to learn and recall.
Are you accurate and realistic about your capacity and skills in learning and recalling new information?
Do you have self-confidence in your ability to learn and recall information as well as in your ability to improve your memory?

What do you do when interacting with others who have important information that you must learn and recall? Listen carefully, pay attention, and ask others to say things again, more loudly, slower, or in a different way if necessary.

How do you listen? Focus on the meaning, not the sound of words in recalling them—search for meaningful associations in what you are reading or hearing.
Where do you begin? Rehearse/associate what you want to remember with something you already know.
MEMORY TRICKS

Method of loci
Associating things to be remembered with a journey you take daily.

DATE: Doctor Appt
Tomorrow Early/
CAT-Catsup, Apples, Tomatoes.

First letter cues
Peg words
One Son, Two Sue,
Three Sea, Four Door,
Five Hive.

Chunking
Social security number,
(nine digits is beyond most persons' capacity to recall- creating three “chunks” of digits is easier)

Associating things to be remembered with a journey you take daily.

Acronyms
KISS - keep it simple, stupid.

Rhyming
My car will shine at nine—I'll write with my pen at ten.

Create a word
“I heard a ‘quacker’ on the way to the store” (duck image)—crackers to buy at the store.

Create a story
Begin with “old MacDonald had a farm...” and embed what you want to remember into this story.

Create an acronym
MINT (meat, ink, navel oranges, tea) (better if it is a real word)

Categorizing
Fruits, vegetables, dairy products, cleaning supplies on a shopping list.

Be economical
Use memory aids whenever possible, but realize that in some cases, rote memory (simply repeating things over and over) is helpful as well.

Memory is associative
Strengthen those associations! Start with something that is meaningful, e.g., the song “Good Night Irene” serves as a cue for your new friend Irene.

Mnemonics
“She Makes Harry Eat Onions” - Great Lakes (Superior, Michigan, Huron, Erie, Ontario)

Concluding Thoughts

• Challenge yourself daily. Introduce variety into your everyday routines, and look for opportunities to develop and use your memory skills.
• Daily stimulate yourself mentally. Watch the evening news, "Wheel of Fortune" or "Jeopardy," or listen to NPR.
• Take care of yourself emotionally. Remain optimistic and resilient in the face of change; get help for any difficulties you are experiencing.
• Take care of yourself socially. Avoid loneliness and surround yourself with people you like.
• Take care of yourself physically. Proactively take care of your health.
• Stay positive. Focus on what you can do, not on what you cannot do. These are all essential to maintaining and improving our memory skills as we age.

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BRIAN LEE  
Assistant Professor, Chemistry  

Brian Lee joins the Department of Chemistry as an assistant professor. He earned his Bachelor of Science in chemistry from the College of William and Mary and his Ph.D. in biochemistry from the University of Maryland. His dissertation research focused on the structure and dynamics of HIV proteins. During his postdoctoral fellowship at the Scripps Research Institute in La Jolla, his research utilized biomolecular NMR spectroscopy for structural studies of zinc-binding proteins and protein-RNA complexes. As an assistant professor at Southern Illinois University, Lee continued his research on zinc-binding proteins that regulate gene expression. Most recently as a research assistant professor at Iowa State University, his research has focused on structural studies of virulence factors and antibiotic resistance in pathogenic bacteria.

MARLENA RYBA  
Assistant Professor, Psychology  

Marlena Ryba earned her Ph.D. in clinical psychology from the University of Tennessee. She has spent the last three years at Ohio State University as a postdoctoral researcher and fellow in the Comprehensive Cancer Center. Ryba teaches courses in general psychology, research methods, abnormal psychology and health psychology. Her research interests include evidence-based treatments of depression, behavioral medicine, and dissemination and implementation.

MELISSA PAIVA-SALISBURY  
Assistant Professor, Psychology  

Melissa Paiva-Salisbury completed her Ph.D. in clinical psychology from the University of Vermont (to be conferred Fall 2017), and a Master of Arts in forensic psychology from Roger Williams University. She teaches courses in statistics, psychology and the law, research methods, and abnormal psychology. Clinically, she is keenly interested in forensic assessment, the dissemination of evidenced-based approaches, and the incorporation of mindfulness into evidenced-based approaches. Her current research interests include the heterogeneity within psychopathy, callous-unemotional traits and the exploration of construct measurement.

MATTHEW MURPHY  
Assistant Professor, Psychology  

Matthew Murphy earned his Ph.D. and M.S. in experimental psychology from Tufts University. He teaches statistics, research methods, learning, animal behavior, cognition and biological psychology. His research investigates comparative animal cognition, primarily with pigeons, and includes topics such as false memory, lateral and frontal visual memory, spatial frequency perception, and abstracted relational learning. Murphy plans to start an animal behavioral research lab at CCU.

RYAN YODER  
Associate Professor, Psychology  

Ryan Yoder earned a Ph.D. in experimental psychology from Bowling Green State University. He teaches courses in sensation and perception, physiological psychology, and research methods. His research interests include the brain mechanisms underlying navigation and spatial learning, and the effects of congenital vestibular dysfunction on brain development. Yoder has a grant from the National Institute on Deafness and Other Communication Disorders investigating otolith-dependent brain functions in mice.

SCOTT V. CARR  
Assistant Professor, Physics  

Scott Carr joins the Department of Physics and Engineering Science from the West Coast with a Bachelor of Science from UCLA; he began his doctorate at the University of Tennessee at Knoxville and followed his adviser to Rice University, where he earned both a Master of Science and a Ph.D. He synthesized and studied high-temperature superconductors and specifically focused his investigation on the role magnetism plays in determining superconducting properties. Following his defense, he spent one year as a visiting assistant professor at Berry College, a liberal arts college in north Georgia, where he taught courses and worked with students to develop tangible, classical analogs to quantum mechanical phenomena.

SIMING GUO  
Assistant Professor, Engineering Science  

Siming Guo joins the Department of Physics and Engineering Science as an assistant professor of engineering science. He earned his bachelor's degree in engineering science from the University of Toronto and his Master of Science and Ph.D. in electrical engineering from the University of Illinois at Urbana-Champaign. His research seeks to use big data to improve the monitoring, modeling and situational awareness of the electric power grid.

GEORGE WESLEY HITT  
Assistant Professor, Physics  

Wes Hitt joins the Department of Physics and Engineering Science as an assistant professor of physics. He earned his Ph.D. from Michigan State University with a concentration in nuclear physics. His dissertation research was on charged-particle spectroscopy for measuring astrophysically important properties of radioactive nuclei. Following his Ph.D., he was a postdoctoral scholar at the National Superconducting Cyclotron Laboratory and from 2009-2016, was part of the founding faculty of Khalifa University, a new start-up in the United Arab Emirates. Most recently, he was visiting associate professor at Virginia Commonwealth University in the Department of Mechanical and Nuclear Engineering.

CHELSEA KAUNERT  
Assistant Professor, Recreation and Sport Management  

Chelsea Kaunert joins the Department of Recreation and Sport Management as an assistant professor. She earned her Ph.D. from Bowling Green University's School of Media and Communication. Her emphasis is in media and society and gender communication. She earned her master's degree in sport administration also from Bowling Green. Her research
focuses are in the area of media, gender and sport. She will be teaching moral and ethical reasoning in recreation and sport, media and public relations in sport, as well as gender and sport.

CRAIG MOREHEAD
Assistant Professor, Recreation and Sport Management

Craig Morehead joins the Department of Recreation and Sport Management from Northern Illinois University as an assistant professor. He earned his Ph.D. in sport and recreation management from Old Dominion University. He earned his master's degree in sport administration with a certificate in facility and event management from Western Kentucky, and his undergraduate work was in mass communication. His research interests include facility management, social media strategy and ticketing. He will be teaching area and facility management and financing sport and sales.

NICK SCHLERETH
Assistant Professor, Recreation and Sport Management

Nick Schlereth earned his Ph.D. in health, exercise and sport sciences with a concentration in sport administration from the University of New Mexico. While at UNM, he also earned his MBA with a concentration in strategic management and policy from the Anderson School of Management. Prior to the University of New Mexico, he earned his Master of Science in exercise science from The Citadel and his Bachelor of Arts in gerontology from the University of South Florida. He has previously worked in the various capacities with Chicago Bears, Cleveland Browns, Philadelphia Phillies, Under Armour, and most recently with ESPN working with the Gildan New Mexico Bowl. His primary research interest is strategic management in sport organizations and small businesses, especially in areas of community engagement. He is the associate executive director of the National Sport & Recreation Law Association. He will be teaching marketing in recreation and sport and program and event management.

JAKOB LAUVER
Assistant Professor, Kinesiology

Jakob Lauver joins the Department of Kinesiology as an assistant professor. He earned his Ph.D. in exercise science from the University of Toledo and has taught the past two years at Adrian College in Adrian, Mich. His area of research centers on neuromuscular activation and skeletal muscle blood flow.

JUSTIN GUILKEY
Assistant Professor, Kinesiology

Justin Guilkey joins the Department of Kinesiology as an assistant professor. He earned his Ph.D. in human bioenergetics from Ball State University and has recently taught at Miami University (Ohio) and at the University of Cincinnati at Blue Ash. His area of research focuses on the effects of physical activity on cardiovascular function and long-term health in children.

CHRISTINE ROCKEY
Lecturer, Kinesiology

Christine Rockey joins the Department of Kinesiology as lecturer. She earned her Master of Science in wellness from the University of Mississippi. She has most recently been teaching in the CCU Honors Program and for University College. She will coordinate and supervise all aspects of the departmental internship program.

BRET JARRETT
Visiting Assistant Professor, Marine Science

Bret Jarrett joins the Department of Marine Science as a visiting assistant professor. He is a geologist and marine scientist with more than 20 years of experience performing geological and geophysical studies. He holds an undergraduate degree in geology (Florida State University), and M.S. and Ph.D. degrees in marine science from the University of North Carolina at Chapel Hill and the University of South Florida at St. Petersburg, respectively. His Ph.D. research focused on the recent sedimentological development of the southwest Florida carbonate platform.

Following graduate work, Jarrett held two postdoctoral positions conducting marine geological research, as well as two visiting assistant professor positions in marine science at the U.S. Coast Guard Academy and Colby College. Most recently, Jarrett has conducted extensive marine studies throughout the Caribbean islands.

CECILIA S. KRAHFORST
Visiting Assistant Professor, Marine Science

Cecilia S. Krahforst joins the Department of Marine Science as a visiting assistant professor. She is a marine biologist who has research interests in the fields of ecology, fish behavior and physiology, and management. The emphasis of her work is on soundscape ecology and how human behaviors influence fish behavior and larval development. Previous research includes exploring how vessel noise impacts fish acoustic communication, habitat use, reproduction and fish development (sensory reception). Her teaching emphasizes the use of current research to help students understand how the lecture material ties into social values.

AMBER SCHLERETH
First-Year Adviser, College of Science

Amber Schlereth joins the dean's office as first-year adviser in the College of Science. She completed her bachelor's degree in physical education with a concentration in exercise science (2012) and a master's degree in exercise science with an emphasis in health and wellness (2014), both from the University of South Florida. Prior to working at Coastal, she worked two years as a health fitness professional for Health Fitness Corporation and was a group fitness instructor in Campus Recreation at the University of South Florida. Most recently, Amber spent three years living in Albuquerque, New Mexico, before relocating to Myrtle Beach, South Carolina, and becoming an academic adviser at CCU.
APPLIED MATHEMATICS
Jolie A. Even
Dominique E. Forbes
Alexander O. Foster
Adam D. Goga
Tyler J. Sullivan
Austin D. Wise

APPLIED PHYSICS
Anca Rusu

BIOCHEMISTRY
James H. Anderson IV
David Laws III
Rebecca L. Polaski
Joshua R. Squires
Melinda N. Tapia

BIOLOGY
Colton J. Aksomitus
Kaitlyn L. Benson
Stephen I. Burns
Brooke E. Campbell
Nicole E. Castelluccio
Christopher R. Ellis
Katelynn R. LaScala
Emilee M. Lowman
Milani R. Nicosia
Amber R. Phelps
Lisa Pieterse
Alison R. Solos
Emilie-Katherine G. Tavernier
Amy Abby L. Taylor
Bendrea Washington
Logan D. Willeford

BIOLOGY PRE-ENGINEERING
Alyssa A. Risner

CHEMISTRY
Mallory R. Byrne

COMPUTER SCIENCE
Computer Science
Michael P. Baney
Adam C. Baumlle
David J. Eastman
Hao Fang
Dakota K. Fulp
Megan L. Hickman
Laine R. Kehoe
William T. Kirby
Stephcn E. Penton
Alexandra L. Poulos
Anthony S. Rabon
Adam T. Smith
Joshua J. Westerhaus
Jun Kai Xing
YongJie Zhang

ENGINEERING SCIENCE
Mason I. Smith

EXERCISE AND SPORT SCIENCE
Andrea L. Baker
McKenzie L. Barch
Robert A. Battaglia
Amy M. Baumgardt
Morgan H. Benson
Monika Blackmon
Kevin J. Boatwright
Nicholas H. Bonoff
Mark A. Brame
Kayla M. Broom
Chandricka S. Bussey
Michael R. Cahill
Marissa E. Cain
Samyra A. Casterlom
Thomas D. Cokley
Emily E. D'Orsano
Amanda E. Daneker
Dallas A. Daniels
Morgan E. Divine
Amanda M. Doughty
Lauren E. Durant
Liam E. Emery
Ashley L. Engelhard
Kenneth D. Fenchel
Austin D. Godwin
Caitlyn T. Goodwin
Hannah C. Groh
Arnor S. Gudmundsson
Jessica R. Halford
Ethan M. Hayes
Mamie R. Henshaw
Andrea R. Hudson
Leandra D. Hurlbert
Hayley E. Jenkins
Silas J. Kelly

HEALTH ADMINISTRATION
Morgan J. Brown
Jill G. Shelley

INFORMATION SYSTEMS
Scott J. Chernoff
Khalil M. Cooke
Michael W. Eisenhardt
Brenden M. Goldman

Carolina J. Span

David T. Staples
Tyler H. Ta
Max M. Williams
INFORMATION TECHNOLOGY
Samuel M. Allen
Jeffrey A. Benjamin
Seth H. Gainey
Timothy L. King
Sean R. Timmons
Maria C. Sparacino
Kallie R. Stephens
Tavia L. Sturgill
Shaquelah M. Walters

MARINE SCIENCE
Jessica M. Ayers
Daniel J. Baker
Kylie G. Bostick
Ashley S. Brandt
Juliane G. Caughron
Abigail M. Chaney
Ariel Lillian T. Clark
Jesse G. Clark
Jessica N. Clark
Nicholas W. Conway
Marinda R. Cornett
Whitney D. Davis
Jacob M. Dietzel
Gabrielle M. Donatelli
John T. Durica
Alexis F. Echols
Savana M. Evans
Carly C. Fenstermacher
Georgia R. Ford
Kaitlin K. Gilliece
Bianna M. Grimes
Brion E. Harrison
Charlotte M. Hawkins
Samantha R. Hermann
Colin T. Hildebeidel
Anne E. Hobdy
Brooke E. Horist
Sophia M. Huss
Logan Jarrell
Griffin B. Keys
David A. Klett
Matthew T. Kurpiel
Gregory J. Lang
Madeleine A. Lee
Alyssa R. Lundy
Matthew J. McElgunn
John C. Moore
Christopher A. Moorman
Alexa A. Poirier
Haley N. Ray
Alexis N. Setta
Elijah N. Shaw
Madilyn D. Stanton
Heidi J. Stephens
Katherine N. Vanderpool
Winter E. Wahid
Hannah G. Wareheim
Emily A. Zielonka

PUBLIC HEALTH
Rachael E. Abels
Amber B. Anderson
Bethany A. Bebik
Kaitlyn T. Brown
Courtney A. Clasen
Kerry W. Dittmeier
Stephanie N. Edge
Natalie M. Fisher
Chante N. Gore
Lynette V. King
Destiny T. Lewis
Justin F. Lowes
Brenda A. Maloney
Dionne C. Parker
Judith N. Powell
Alexander J. Ratti
Jane M. Rowe
Whitney G. Seay
Sydney J. Smaldino
Lori N. Smith
Gina A. Vollarco

RECREATION AND SPORT MANAGEMENT
Matthew J. Andre
Danielle R. Angellillo
Katelyn R. Beaty
Terry A. Brown Jr.
Nicholas A. Buchta
Michael V. Carpenito
Elbert L. Chestnut
Cuyler F. Chiang
Jeffrey S. Clang Jr.
Philip R. Conte
Chelsea R. Crouch
David M. Cummings
Rachel E. Czarny
Ian A. Duffy
Lyndell J. Folsom
Ashley N. Fries
Brian P. Gardner
Destiny J. Garrett
Miranda L. Gatto
Patrick D. Graham
Nicole A. Heideman
Kyle J. Houle
Megan R. Hoverman
Christopher A. Howe
Javon J. James
Katie M. Kreider
Regan J. McComb
Jeremy A. McDonald
Tyler A. O'Dell
Nicole Reisert
Matthew D. Strange
Triston D. Thomas
Marcus D. Williamson

PSYCHOLOGY
Daniele F. Aguilera
Haley M. Banfield
Francesca R. Bellizzi
Anna R. Borinski
Andrew L. Bremser
Nicholas E. Burroughs
Delanya K. Campbell
Cameron R. Carroll
Caitlin M. Cramblit
Valerie L. Davis
Larissa N. DiNatale
Gabrielle R. Enerson
Sydney C. Gemmell
Brittany L. Griffin
Spring S. Haigler
Courtney C. Johnson
Margaret P. Kelly
Varton R. Kendirdjian
Emily V. McKenzie
Kaitlin E. Morehead
Megan V. Morton
Avery M. Petschke
Bryana M. Pilozzi
Claire M. Poeckes
Kaitlyn N. Powalie
Lexi M. Richardson
Katelyn M. Rohrbach
Lucille M. Romanik
John A. Rossano
Anna E. Seidel

SOCIOLOGY
Joshua Alberts
Hannah L. Arrington
Dallas D. Davis
Madison M. Fama
Jazmin N. Garcia
Kelby N. Huggins
Marlene A. Martinez
Krystina M. Millar
Hailey C. Minten
Matthew A. Mott
Avery J. Noel
Kerri A. O'Halloran
Nicholas P. Pietri
Nicole E. Pritchard
Lindsay D. Rhodunda
Judith R. Roberto
Katelyn M. Rudy
Erin Ryan
Matthew P. Sherfy
Rachel M. Teichman
Nicholas C. Whaling
## Dean's Honor List 2017

### Applied Mathematics
- Adrian L. Avalos
- Haley A. Bass
- Meghan E. Birchfield
- Krystal R. Bonaccorso
- Shaquille A. Dixon
- Lindsey E. Doyle
- Daniel C. Hine
- Tyler V. Keane
- James H. Mabry
- Cannon R. McIntosh
- Zachary R. Prezuhy
- Natasa Savovic
- Matthew T. Smith
- Dalton O. Watts

### Applied Physics
- Hannah E. Arnold
- Tatum N. Dodds
- Austin E. Finley
- Tanner D. Hanes
- Tarron T. Jackson
- Ian F. Lackey
- Jose A. Lopez
- Shawn S. Scialabba
- Timothy O. West

### Biochemistry
- Joseph M. Carr
- Michael C. Dear
- Samara L. Elia
- Taylor N. Hinds
- Rebecca D. Howie
- Benjamin D. Kennedy
- Felipe D. Mendoza Ramirez
- Amy A. Powers
- Brandon M. Reyes
- Travis R. Roberts
- Rebeccah D. Rodger
- Trevor G. Smith
- Lisha Van Onselen
- Marena R. Willeford
- Synques C. Williams
- Breana J. Wilson

### Biology
- Haley E. Alexander
- Hermes A. Alillari
- Lauren R. Angello
- David W. Barr Jr.
- Nicholas D. Bautz
- Kathryn L. Beem
- Zachary T. Belger
- Francis D. Bevevino
- Brianna N. Birch
- Brian W. Carlson
- Lamek R. Carmichael
- Daijah B. Chatman
- Chase M. Chessario
- Jessica K. Cooper
- Madison P. Cornell
- Elisabeth M. Cox
- Lorenzo D’Angelo
- Kaeli E. Day
- Ashley L. DiPalma
- Jenna R. English
- Erica N. Evans
- Alyssa Ferchen
- Valentina Fernandez
- Benjamin V. Flo
- Tyla E. Foster
- Tyler C. Frey
- Natalie L. Gauger
- Savannah L. Gill
- Kayla R. Gorniak
- Chase A. Gunter
- Kamden B. Hall
- Ashley N. Ham
- James J. Hatton III
- Samantha A. Helmenstine
- Evan N. Hendrickson
- Chelsey D. Hill
- Cody L. Hyatt
- Joshua J. Jenkins
- Destiny A. Johnson
- MacKenzie A. Keim
- Ashley N. Kindie
- Alexander L. King
- Hannah R. Kri
- Taylor A. Landstrom
- Katelyn A. Lavigne-Safa
- Macailyn Maciel-Melendez
- Megan L. Maples
- Victoria Martinez
- Christina M. Mclean
- Justin C. McNabb
- Jessica B. Meade
- Quajeneke M. Melton
- Bryce T. Middleton
- Kyle R. Miles
- Jared T. Miller
- Yousuf T. Mohammad
- Robert E. Mordente Jr.
- Andrew L. Nye
- Autumn L. Otto
- Naisha I. Pacheco
- Jair R. Perez Villacorta
- Kamille A. Piacquadio
- Morgan A. Pike
- Olivia I. Post
- Shannon M. Prather
- Emily F. Presley
- Nathaniel A. Quiles
- Brendon J. Robinson
- Emily R. Shirley
- Rachel M. Simons
- Kassidy E. Smith
- Rachel F. Stevens
- Justin R. Swim
- Karli A. Tavares
- Rachel E. Unger
- Nicole A. Van Dzura
- Kyle J. Walton
- Austin R. White
- Mitchell C. Wimberley
- Jarrod M. Worley
- Ruth L. Wright
- Zymani A. Wynn

### Biology Pre-Engineering
- Justin K. Henry
- Dean M. Robertson

### Chemistry
- Nehemiah K. Stafford

### Computer Science
- Desmond J. Alleyne Jr.
- Patrick L. Boronski
- Brandon L. Chriswell
- Rodolfo J. Croes
- Hailey R. Crouse
- Natasha O. Fett
- Casey J. Fleck
- Brianna M. Getman
- Tracy Gilliard Jr.
- Terence A. Grove
- Harpa G. Hreinsdottir
- Christopher S. Imes
- Steven N. Johnson
- Tyreek F. Jones
- Anakin S. Kinsey
- Xinna Li
- Gregory C. Mottola
- Dominic L. Mozeika
- Cassidy R. Shadduck
- Jamarcus L. Smith Jr.
- Bradley W. Stemmle
- Dylan E. Wallace
- Bernard M. Williams

### Computer Science Pre-Engineering
- William D. Conroy
- Bryan A. Dilone
EXERCISE AND SPORT SCIENCE

Anthony P. Abajian
Mary Frances Aini
Faith E. Aldridge
Sara E. Alexander
Elizabeth M. Allard
Alexis A. Alvino
Austin B. Arakelian
Jacob H. Avant
Caitlyn A. Baber
Derriel S. Banyard
Journie N. Barbour
Matthew J. Beaird
Breanna E. Beatty
Ryan E. Bennett
Raven N. Birch
Lauren A. Brotherton
Sydney V. Brown
Charles W. Buckley
Cheyenne A. Buksch
Alexa A. Calder
Emily C. Calderon
Jalen E. Carr
Jordan L. Carter
Sammie R. Carter
Monica L. Castriotta
Amanda V. Cervenka
Claire A. Chapman
Taylor M. Cicholski
Catlyn S. Cody
Bernise B. Cohen
Christina E. Coley
Stefanie C. Collazo
Jalen E. Carr
Jordan L. Carter
Sammie R. Carter
Monica L. Castriotta
Amanda V. Cervenka
Claire A. Chapman
Taylor M. Cicholski
Catlyn S. Cody
Bernise B. Cohen
Christina E. Coley
Stefanie C. Collazo
Jacob D. Condon
Christain J. Cooper
Sean M. Cortes
Nicolette M. Cotcher
Taylor M. Creagh
Meral N. Culver
Hubari F. Cunningham
Robert M. Deane
Toula M. Deleón
Taylor A. DeLeost
Gregory P. DeLoache
Brea N. Dennis
Corey M. Dirks
Victoria E. Donaldson
Kaelea M. Drake

HEALTH ADMINISTRATION

Michaela E. Kaltwasser

INFORMATION SYSTEMS

Cain A. Lilly
Kenneth B. Lilly
Arnold J. Martin III
Spencer C. Pounds
Lorenzo M. Rice Jr.
Tyler J. Shobe
Michael A. Tessari
Hunter R. Wegner
Michael J. Wegryn

INFORMATION TECHNOLOGY

Alaina B. McLeod
Garrett E. Mikos
Daniel B. Miranda
Matthew R. Monteoleone
De’Marquis Muscove
Shaun E. Ralko
Megan N. Redman
Demisha L. Robertson
Shamarius D. Rucker
Bayley A. Schultz
Connor M. Seay
Alan S. Siceloff
Kiera D. Tyree
Ethan T. Varn
Deondre J. Williams
MARINE SCIENCE
Stella G. Adams
Molly J. Aeschliman
Mary E. Akers
Elana J. Ames
Joshua C. Ashworth
Skyla C. Bailey
Cory Bauerlien
Amanda M. Becker
Freya K. Bennett
Olivia S. Bertelsen
Annie R. Boyd
Frances K. Bozak
Kayla E. Brotemarkle
Matthew T. Buzzendore
Marianna L. Cahill
Olivia N. Cannon
Shani Caplan-Chernoff
Taylor G. Chase
Amanda L. Coleman
Camryn J. Collette
Briana R. Coulter
Madison A. Dahle
Natalie A. Daining
Justin C. Daniels
Cassandra D. Davin
Sarah N. Davis
Breanna T. Decriscio
Annamaria Deitz
Erin T. Dempsey
Erika L. DeSalvio
Lauren M. Dick
Samantha K. Dickert
Erin M. DuMontelle
Joshua C. Dusci
Garrett M. Elmo
Alyssa N. Evans
Quentin R. Faulkner
Ashley M. Ferrell
Rebecca G. Ford
Maria G. Garavuso
Jakob S. Gessay
Lauren Giordani
Nicholas W. Govostes
Tyler S. Gregory
Keita-Iknenna E. Gresham
Ashley M. Grimm
Jasmine A. Gross
Danielle E. Guy
Kylie N. Haigh
Lezah N. Hanna
Bailey K. Harding
Peyton D. Hartenstein
Megan N. Harvey
Steely J. Hays
Jessica L. Headlee
Kyle R. Heffner
Amy K. Hogge
Mackenzie T. Huff
Alana M. Jaroska
Michael J. Kamin’skis
Lanie R. Karstrom
Chloe R. Keller
Dillon E. King
Andrew P. Kline
Logan S. Klinepeter
Emily B. Klouda
Jennifer M. Knight
Jessica J. Lacey
Annessia M. Larrick
Alyssa M. LeCaire
Soﬁa A. Lee Lopez
Christina M. LeFevre
Kaylin M. Leroy
Cinnamon I. Lieberg-Strayer
Sarah M. Logan
Benjamin C. Loh
Kristen E. Lynch
Austin P. Mack
Sierra T. Mahoney
Jessica L. Marshall
Jordan E. Matthews
Victoria L. McFarland
Kelsey L. McLeod
Jacqueline D. McMillen
Christian T. McNabb
Katharine J. McNaught
Hannah E. Meiklejohn
Rachel L. Minnick
Hunter G. Moore
Brendan R. Morgan
Melanie J. Mullikin
Mallory E. Mumford
Jessica T. Myers
Heston L. Neal
Riley M. Norman
Malarie R. O’Brien
Jack J. O’Neill
Ross L. Ogden
Joshua A. Onorato
Benjamin J. Onufer
Dana M. Orr
Emily E. Otstott
Christopher L. Pierpont
Samantha E. Pope
Kaelen M. Reed
Cameron J. Remalia
Joshua D. Roberts
Jasmine R. Rodriguez
Elizabeth A. Ross
James C. Santore
Benjamin O. Sargalski
August J. Schoenfelder
Bethany R. Schoppert
Alex J. Schweinberg
Benjamin W. Skeen
Braeden T. Slade
Marie R. Smith
Jared A. Smith
Jasmine M. Smith
Abigail E. Spangler
Sarah E. Spittler
Nora L. Stanley
Brittany E. Stein
Sophia A. Tellman
Kinsey A. Thompson
Broderick J. Todd
Daniele A. Trepont
Christine N. VanDeen
Alexis N. Villarreal
Christopher D. Wankowicz
Kayla L. Washington
Hannah C. Weinberg
Kerry L. Wheeler
Winter G. White
Courtney L. Williams
Lovenia Williams
Colten R. Winter

MARINE SCIENCE PRE-MAJOR
Alexandra N. Brown
Ariel S. Crum
Madelyn V. Farrow
Ava A. Hall

PHYSICS PRE-ENGINEERING
Steven T. Manz III

PSYCHOLOGY
Alexis C. Adams
Cora J. Allard-Zach
Adriannna Bacote
Yanika S. Benfield
Megan Bennie
Benjamin W. Billand
Aly enne A. Boekhoudt
Rebecca E. Bova
Hayley E. Brokaw
Laquasha S. Brown
Janelle G. Burgess
Skylar D. Byrd
Jake G. Cadigan
Olivia L. Campbell
Karen Carazas
Anna C. Carpenter
Katherine E. Clark
Blakeney C. Coleman
Kelsey N. Corbin
Payton R. Crawford
Shakeria S. Cuthbert
Taylor M. Dawsey
Jacqueline R. Depippo
Dakota B. Dobrzynski
Ashley M. Dressel
Madison M. Farr
Katie L. Fender-Davis
Kimberly A. Ferrer
Jacqueline E. Finch
Peyton L. Fogarty
Courtney A. Goodwin
Taylor M. Hudson
Kayla D. Hunter
Jeremiah B. Hunt
Shi’Tavia L. Johnson
Kaicey J. Julien
Megan A. Kalmbach
Adrian B. Kelley
Renee M. Kisic
Jenna M. Kortensides
Kendall L. Kreager
Dylan T. Kyle
Alan H. Lam
Domenick A. Larosa
Essence D. Lincoln
Ja’Quella S. Livingston
John T. Luong
Tyler M. MacDonald
Nyla A. Manley
Holly L. Maples
Tyler A. Marsh
Kyle S. Massood
JosShawna A. McAbee
Casey J. McAndrew
Lacey D. McGuire
Lyndsey D. McLamb
Alexa P. Medd
Zachary R. Merkle
Zackery R. Messetler
Jenna M. Mize
Brooke A. Moen
Leah J. Moore
Autumn L. Mulcahy

PUBLIC HEALTH
Lizeth Alcantar
Javon E. Allen
Erika E. Barresi
Nathan R. Bell
Celeste R. Benson
Storm L. Berberoglu
Austin T. Bradley
Perri A. Budd
Michelle M. Cabrera-Santana
Sophia L. Cacciare
Breanna R. Combs
Isaiah E. Dooley
Gary M. Dunlap
Amada B. Fineran
Maddison A. Franco
Darastus L. Glover III
Kirsten L. Good
Nia D. Greene
Julia E. Hagerud
Whitney C. Harris
Lauren Heald
Cynthia P. Hoxie
Zachary N. Infinger
Brittany A. James
Alia N. Johnson
Aubree A. Johnson
Chynna C. Jones
Simiya S. Kelly
Autumn M. Lamp
Jerricah K. Leichter
Danielle Limatola
Maddison P. O’Leary
Nijah S. Payne
Katelynn S. Price
Bi: Yelle D. Prince
Taylor L. Rahach
Angelina M. Santoro
Victoria E. Schroeder
Brianna A. Shelley
Shaniqua L. Johnson Woodbery
Mary H. Lammers

RECREATION AND SPORT MANAGEMENT
Matthew A. Alberghini
Bryson T. Alexander
Colleen E. Benedict
Preston W. Burgess
Tyler Carter
Allyson L. Clark
Sydney E. Demer
Taylor B. Ealser
Thoburn S. Fauver
Andrew T. Ferreira
Trace J. Fulmore
Kaylee J. Goodell
Paul G. Hartleb
Caleb H. Hemmers
Ronald L. Honickel
Megan P. Kilpatrick
Katherine S. Kilroy
Samuel E. Kyzer
Matthew W. Lacovara
Noah B. Lare

SOCIOLOGY
Amber J. Adams
Chantel O. Ancrum
Kelsie M. Antunes
DeMara L. Barr
Rebekah K. Booth
Alexis R. Bothe
Evan M. Broderick
Zachary T. Byrd
Jordan E. Christensen
Cheyenne L. Cudd
William Dickerson
Aaron M. Dressel
Kira A. Elton
Brayden P. Flynt
Mallory O. Foshee
Tyler C. Gill
Jordan W. Gore
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