KEEPING UP WITH THE EDUCATIONAL MOMENTUM OF THE COLLEGE OF SCIENCE
@message from the dean

In this issue Progression, we provide more information on the activities of the students and faculty in the College of Science at Coastal Carolina University. I hope that upon reading these articles you will fully appreciate the breadth of the activities in our College.

This has been a very busy year in the College of Science. “Science II” has recently been completed and we are getting very close to having all our Departments located on the main campus. With marine science moving into Science II in the summer of 2016, computer science is the only undergraduate science program that remains across U.S. 501. Their move is planned for the summer of 2017 when “Academic Building II” is completed adjacent to the Wall Building.

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

As we look toward the completion of all our science construction projects, I look forward to you coming to Coastal for a visit to see how our campus and programs have grown. We would love to show you around!

Regards,

Michael H. Roberts, Ph.D.
Vice President for Research and Emerging Initiatives
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03 Departments and Chairs

13 Coastal in Tuscany: Studying Astronomy

17 What is Recreation and Sport Management at CCU?

19 On the Road with Experiential Learning

21 Fractals Rock

25 Bridging the Gap

27 The Swain Scholar Update

29 FROM DARKNESS INTO LIGHT

33 The Bench to Bedside Initiative

37 VOYAGE INTO THE DEEP

39 Can Active Gaming Reduce the Risk of Falling in Older Men and Women?

41 Put Your Wheels on

43 They Say the Best Criminals are Never Caught...

45 Positive and Successful Aging

49 "Early to Bed, Early to Rise, Makes a Man Healthy, Wealthy and Wise"

53 Teaching Mathematics in Africa

55 What is an RN-to-BSN Completion Program?

57 Cruising Around the Iberian Peninsula

61 President's Honor List 2015
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.

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/science/departments/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 HEALTH SCIENCES
John Yannessa, Ph.D.
Department Chair
CCU’s health promotion major is one of only 21 programs in the nation and the first in South Carolina that has been awarded approval by the Society for Public Health Education and the American Association for Health Education. This prestigious designation is an indication of academic rigor, program quality and high academic standards in the field of health education.

Our health promotion program features five different areas of study:
- Health promotion with general cognate (designed for students with general health interests or those seeking graduate work in allied health careers)
- Health promotion with a communication option
- Health promotion with an exercise science option
- Health promotion with a health services leadership option
- BSN completion program

Visit coastal.edu/academics/colleges/science/departments/healthsciences. John Yannessa can be reached at yannessa@coastal.edu or 843.349.6460.

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 degree in biology. We also offer other programs of study preparing students for entry into various health professions. Our department participates in the master of science in Coastal Marine and Wetland Studies program 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 mpierce@coastal.edu or at 843.349.6483.
DEPARTMENT OF KINESIOLOGY
Gregory F. Martel, Ph.D.
Department Chair

The Department of Kinesiology at Coastal Carolina University 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 Kinesiology 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 of 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. In the fast-growing world of kinesiology, students will find our department opportunities to learn to grow and to lead.

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

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 cmglone@coastal.edu or 843.349.2989.

DEPARTMENT OF CHEMISTRY AND PHYSICS
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.

DEPARTMENT OF COMPUTING SCIENCES
William M. Jones, Ph.D.
Department Chair

Computer sciences offers a B.S. in computer science, a B.S. in information systems and a B.S. degree program in information technology.

The department has been engaged in elevating the level of scholarly research conducted by its faculty. With more than 13 peer-reviewed publications in 2012 and more than 40 since 2009, CSIS faculty have been successful in conducting research in a broad range of fields, including parallel and distributed systems, software engineering, image processing, multimedia classification, cybersecurity and CSIS education.

Visit coastal.edu/academics/colleges/science/departments/cs. William Jones can be reached at wjones@coastal.edu or 843.349.4142.

SCHOOL OF COASTAL AND MARINE SYSTEMS SCIENCE
Paul Gayes, Ph.D.
Director

The School of Coastal and Marine Systems Science houses CCU’s marine and wetland graduate programs and the Burroughs & Chapin Center for Marine and Wetland Studies. 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 school manages CCU’s Anne Tilghman Boyce Coastal Reserve at Waties 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. Other research concentrations in coastal and atmospheric processes, coastal ecology, coastal geologic and geophysical studies also maintain an array of advanced instrumentation and technical resources. Faculty and staff frequently engage in regional and national technical and environmental panels affording students glimpses of real world application.

Visit coastal.edu/scmss. Paul Gayes can be reached at ptgayes@coastal.edu or 843.349.4015.
Faculty, staff and students at the School of Coastal and Marine Systems Science at Coastal Carolina University have been busy working on several projects for the past year, including several extended research cruises on the Coastal Explorer vessel as well as multiple projects on federal and other vessels.

**Offshore mapping**

One long-term project involved mapping areas of potentially important biological habitat (essential fish habitat) and sites of significant cultural resources in regions where there is interest in building future wind energy farms.
This study, funded by the U.S. Bureau of Ocean Energy Management through the S.C. Sea Grant Consortium, was led by Paul Gayes, director of the School of Coastal and Marine Systems Science (SCMSS). Partners on the study included Camelia Knapp from the University of South Carolina's Earth Science Research Center and Jim Spirek from the S.C. Institute of Archaeology and Anthropology, who conducted camera and scuba diver validation of interpretations of the regional geophysical survey.

The Coastal Explorer was specially designed to support the School's integrated geophysical sea floor mapping system. With this system, 100 percent data coverage can be achieved in an area from 11-16 miles offshore of the City of North Myrtle Beach and south of Winyah Bay.

These areas are being considered for future development of wind turbines that would be used as a source of clean electrical energy for our region and state. Following up on previous SCMSS studies establishing wind resource potential, this study was the beginning of environmental and cultural resource investigations to further refine the best areas for future energy production that also minimize disturbance of essential fish habitats or significant cultural resources, such as shipwrecks. This work kept the Coastal Explorer offshore for most of the summer, running its multi-beam, chirp sub-bottom profiler, side scan sonar and magnetometer.

**NOAA model testing and data collection**

On a related project, SCMSS faculty Gayes, Rich Viso and Jenna Hill spent two weeks on board the National Oceanic and Atmospheric Administration (NOAA) ship the Nancy Foster to help test a fishery habitat model developed by NOAA.
Chris Taylor from NOAA, a specialist in the application of acoustics techniques to the characterization and quantification of fish resources, led the cruise. Marine and wetland studies graduate students Amanda Roach, Marylee King and Karsen Schottleutner also participated.

The geophysical mapping formed the basis of Roach’s master thesis, which explores the character of the geologic framework and the extension of the Pee Dee and Santee River systems across the continental shelf during the last lowstand in sea level and changes that have occurred as the sea has risen to its present level. The geophysical data helped her and the team test NOAA’s habitat model. While on the ship, SCMSS staff and students also deployed one of the school’s ocean buoy systems to begin broadcasting wave, current, wind and other conditions at the new South Carolina artificial reef established in honor of Ron McManus.

McManus, a longtime friend and supporter of the school, was a driving force for artificial reef development at the Jim Caudle Artificial Reef. The data from the buoy is relayed through satellite to campus and posted on the school’s Long Bay Observation System website every two hours (bccmws.coastal.edu/lbos).

**Wind energy research and the Southeastern Wind Coalition**

Efforts to validate models and finance future wind farms require physical data at elevations where marine wind turbines operate on the order of 100 meters above the water surface. As a result, SODAR, a sonic technology that measures wind velocity and direction up to 400 meters above the surface, are particularly valuable to the wind initiatives.

One SODAR was installed at Waites Island through a consortium led by the Southeastern Wind Coalition, and a second SODAR from SCMSS was installed using the Coastal Explorer at the Frying Pan Shoal Light Tower off the North Carolina coast, establishing a transect from the beach 25 miles out in an area prime for future wind energy farm development.

SCMSS, as part of the Southeastern Wind Coalition, is the lead for the Department of Energy’s Southeastern Wind Resource Center. The school is coordinating the expertise and resources of James Madison University, N.C. State University, Clemson University, Coastal Carolina University, Georgia Tech, the Florida Energy Systems Consortium, and Navigant Consulting with the goal of serving as a science-based objective resource to aid societal discussions and consideration of wind energy research potential.

Schottleutner, through the Southeastern Wind Coalition’s professional track, worked on a range of wind energy initiatives, one of which involved establishing and coordinating the transect data with the project partners and SCMSS Observing System network.

She sailed on NOAA’s Nancy Foster to help with the buoy deployments and other habitat-related studies tied to advancing wind energy initiatives. The data from the instrument transect will also be used to further validate the school’s ocean/wave/atmosphere model system developed by SCMSS faculty member Shaowu Bao and his team of colleagues and students.
Studying wave forces and microplastics

A set of acoustic and current sensors (AWAC) on loan from the National Renewable Energy Lab partners in Colorado were deployed from NOAA's ship the Foster about 25 miles offshore of Cape Fear, N.C., near the Frying Pan Shoals Light Tower as part of a Department of Energy-funded study of the wave forces that future wind farm structures should be designed to withstand in our area.

This study was a collaboration between Savannah River National Laboratory, SCMSS, the Department of Energy's National Renewable Energy Lab, and MMI Engineering to refine wave forcing and design standards for future structures built offshore in the southeastern U.S.

While on the Foster, SCMSS staff also collected water samples for colleagues at Clemson, who are studying the distribution of microplastics in the region. Clemson researcher Stefanie Whitmire and National Park Service colleagues processed the samples collected on the cruise.

SCMSS Ph.D. student Samantha Ladewig worked with Bao and Clemson colleague Alex Chow on modeling the dispersal of microplastics in the region and will also benefit from the groundtruthing afforded by the sampling.

Folly Beach geophysical survey

The Coastal Explorer also spent a week completing a geophysical study off of Folly Beach, assisting the Corps of Engineers with planning for a beach nourishment project. The geophysical survey evaluated sand resource potential along the seaward edge of the Stono Inlet ebb tidal delta.

Notable SCMSS events

- Rich Viso and Rick Peterson recently completed some field work and participated in a National Science Foundation review of the Georgia Long Term Ecological Research Site at Sapelo Island, Ga., where Peterson, Viso and students have been studying groundwater processes and influences in the marsh system. They also completed geophysical surveys of the creek system.
- SCMSS research professor Len Pietrafesa and research scientist Tingzhuang Yan traveled to Washington, D.C., to receive an award from the Defense Advance Research Project Agency (DARPA) after the SCMSS team placed within the top teams out of more than 500 worldwide who participated in a DARPA challenge to develop effective mathematical approaches to predicting complex system behavior. The challenge was to model and predict expansion of the infectious disease CHIKV. The SCMSS team received a monetary award and has been invited to write proposals to further develop and apply their technique.
- Peterson attended a workshop in Brazil that led to cooperative proposals and student exchange opportunities with FURG (Federal University of Rio Grande).
- Till Hanebuth has been leading an initiative to develop an exchange program for geo-oriented master's students with the University of Kiel in Germany. He will be traveling to Japan to deliver a research paper.
- Erin Hackett has continued a cooperative with Roanoke College that supports one of their undergraduate physics majors to work with Hackett over the summer. The cooperative gives Roanoke students the opportunity to gain research experience alongside SCMSS faculty and students, as well as provides high-achieving students an opportunity to become familiar with SCMSS as a potential choice for further graduate study.
Experienced in Psychology at CCU

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

When the psychology faculty first learned about the Quality Enhancement (QEP)/Experiential Learning (EL) program to be implemented at Coastal Carolina University, our initial reaction was, “We’re already doing that!” Indeed, through our research methods sequence and internship supervision, our faculty have been engaged in experiential learning with students since we began offering a psychology degree at CCU.

For many years, Linda Palm, Ph.D., has supervised select students in a structured applied behavior analysis (ABA) internship through South Carolina Interventionists with Debbie Wardell. Students apply learning and counseling principles to aid clients with autism, ADHD and other mental/behavioral problems. Other faculty have supervised many other great internships for students who apply psychological principles in mental health facilities, government agencies, schools, local businesses and community organizations.

Faculty in our department firmly believe that research involvement and subsequent conference attendance are both factors that facilitate retention among students.

We have a long history (more than 30 years) of taking students to professional psychology conferences to present research at state, regional, national and international conferences. Joan Piroch, Ph.D., Tony Albiniax, Ph.D., and Palm have guided hundreds of students through research presentations at the Carolinas Undergraduate Research Conference in Raleigh, N.C., which is one of the oldest student research conferences in the country. We also always encourage our students to present at the Undergraduate Research Competition on our campus. This past year, psychology major Jennifer Soyke-Tester won second place in the poster competition for her project “The Effects of Fixed and Free Play Interaction with a Robotic Dog on Student Emotional State.”

Since coming to Coastal, I have taken students to the Association for Psychological Science (APS) conference each year in cities including Boston, Mass.; Chicago, Ill.; Washington, D.C.; and San Francisco, Calif. This past May, I traveled with psychology major graduates Anthony Carrone, Gabriela Brito and Jamie Glass to New York City, N.Y., to present at APS. Carrone presented his senior thesis project (PSYC 497-Applied Research in Psychology) on mindfulness, and Brito and Glass presented
research on facial feature analysis of rhythm and blues singers and how they fluctuate with the economy. We had an excellent time at the conference.

While attending a previous APS conference in Washington, D.C., Andrew Terranova, Ph.D., and I were discussing the conference at a local dining establishment and how beneficial it was for the students who traveled with us (Glass presented research with me and Angela Evans presented research with JongHan Kim, Ph.D.). We are interested in continuing to promote a culture of research within the Department of Psychology to involve more students in endeavor. We believe offering more opportunities for students to travel and attend professional conferences would help achieve this goal.

The next year, Terranova and I developed a QEP proposal for the College of Science to take a group of students to a conference. We researched different options and selected the Southeastern Psychological Association (SEPA) Conference since it was a regional research conference and the location was nearby in Hilton Head, S.C. The conference was in March 2015. We estimated that between 10 and 20 students would travel with us to the conference. We received approval for funding and began to promote the trip to our students in the spring of 2014. The conference due date for proposals was October 2014, so we offered a number of independent study courses supervised by Terranova, Kim and myself, which were offered in Fall 2014 and Spring 2015. Some students were actively engaged in our research labs; a few others were not, but were interested in attending the conference to learn more about research. Besides research, in the independent studies we discussed topics such as professionalism at a research conference, how to maximize the conference experience and what to expect at SEPA. Among the three faculty members and 12 student researchers, a total of nine research proposals were accepted for presentation at the conference.

Six presentations were posters, and three were oral presentations.

Terranova, Kim, myself and 15 students traveled to Hilton Head in two campus vans. Conference activities were on-site at the hotel, which was convenient for all of us. Although not included as part of the initial goals of the experience, students connected with other students and faculty mentors socially, which increased social connectedness and a sense of group cohesion. We wore our Coastal attire and gathered in a room one night to watch the CCU men's basketball team play in the NCAA Tournament. Students compared academic experiences and institutional support for research with other students and faculty at the conference. They shared information about research, graduate school plans, internships, and other relevant professional development issues and ideas. One of our students had the opportunity to meet a faculty member associated with an M.S. psychology graduate program to which our student had applied. The student attended a presentation session to learn more about the faculty member's area of research and had the chance to interact with the professor after the presentation. The student was subsequently accepted into this M.S. program a month after the conference. Faculty in our department firmly believe that research involvement and subsequent conference attendance are both factors that facilitate retention among students.

Given that empirical research is the common thread that binds all of the subfields of psychology, the conference experience provided students with opportunities to develop, conduct and understand research in the discipline, and build on knowledge and skills relevant to psychology. Students experienced formal training to prepare a conference presentation, present their research to an audience, and attend and actively participate in
Coastal Carolina University
Presentations
•
Southeastern
Psychological Association
March 18-21, 2015
Hilton Head, S.C.

"Aggressive Driving and Music Preferences"
Gloria Inman and Terry Pettijohn II (faculty)

"The Effect of Occupational Stigmatism on Seeking Help for Mental Illness"
Courtney Akins, Sonja Schreck, Abby Boytos and JongHan Kim (faculty)

"Facial Features, Attractiveness, Conservatism, and Femininity of U.S. Congresswomen"
Gabriela Brito, Jamie Glass and Terry Pettijohn II (faculty)

"Psychopathy and Sexual and Romantic Infidelity"
Suzanne Crass and Sharayah Swank
(Andrew Terranova, faculty adviser)

"Personality Traits, Prosocial Behavior, and Coercive Behavior on College Campuses"
Amanda Barber and Andrew Terranova (faculty)

"Psychopathy and Academic Dishonesty"
Sharayah Swank and Suzanne Crass
(A. Terranova, faculty adviser)

"Psychopathy and Indirect, Physical, and Electronic Aggression in College Students"
David Barker, Mathew Felitto and Andrew Terranova (faculty)

"When can Biomedical Information and Abusive Family Background be Effective in Court?"
Abby Boytos and JongHan Kim (faculty)

"Tattoos and Risk Taking Behavior in College Students"
Anthony Carrone (M. Brenneman, faculty adviser)
additional conference sessions. The conference experience reinforced the scientific nature of psychology and motivated students to participate in future conferences and pursue graduate studies. More broadly, we hope the students who attended the conference shared their experiences with others on campus to promote and enhance a culture among psychology students where members value the completion and dissemination of empirical research on psychological topics.

We look forward to offering additional opportunities for our students to engage in psychological research and attend professional research conferences in the future. Group planning was a challenge and included managing conference submissions, registration, lodging, meals and transportation for a group this large. It was also a challenge to maintain student commitment to the project since submissions were due in October and the conference was not until March. While three psychology faculty members participated in this first EL project, we hope to encourage other faculty to become involved in the next proposed activity.

As I shared with the Coastal Carolina University board of trustees in May 2015, we are very grateful for this QEP/EL opportunity. We would like to thank CCU and Dean Michael Roberts in the College of Science for supporting psychology student research activities. 

Terry Pettijohn can be reached at 843-349-6447 or tpettijo@coastal.edu.

Terry Pettijohn (left) and JongHan Kim (right).
(above) Jamie Glass (left) and Gabriela Brito (right) at APS in New York City.
Coastal in Tuscany:
Throughout history, observations of the patterns and movements of the stars and planets have played a crucial role in the calendar of everyday life. Religious holidays, harvest times, civic celebrations and other important events were all set by taking measurements of the changing heavens. Indeed, the Catholic Church was a substantial benefactor to many scientists and astronomers since the church relied so heavily on astronomical measurements. Many churches included large-scale astronomical instruments and depictions of the heavens in their art and architecture.

Astronomy (in part) addresses our understanding of how the position of the sun in the sky changes during the day and throughout the year, how the position of the sun changes seasonally with respect to the distant stars, how the planets move, and how the relative positions of the sun, Earth and moon cause the phases of the moon. By making precise measurements, you can use these concepts to fix yourself in time and in place.

Imagine how you would determine the time of day in the 17th century. How would you figure out when Easter is? How would you know when to plant potatoes? Today we have fairly sophisticated mechanisms for precisely determining these things: You'd probably check your cellphone for the time or date and have reminders set for other important dates, like Mother's Day. If you lived in the 17th century, the church would tell you when Easter is, but you would not necessarily have a convenient calendar to refer to. In historical times, people used the regular motions of the sun, moon, stars and planets as their calendars.

This rich history and the role that astronomy has played in everyday life were the focus of a study abroad course I taught in Summer 2014 titled "The Astronomical in Daily Life: A Field Study." The course was part of a travel program offered through Coastal Carolina University’s Office of International Programs. Students and faculty traveled to Arezzo, Italy, and spent three weeks living and studying at the Accademia dell’Arte, housed in the 16th century Villa Gladiola in the Tuscan hills above Arezzo.

The course included weekend trips to Florence and Rome, as well as local excursions to a working vineyard, olive oil producer and other points of interest. Mornings at the villa were spent in the classroom, learning the science of astronomy and discussing the places we’d be visiting on field trips. Afternoons were a mix of site visits, lab activities and free time to visit the local gelato shop.

During the course of a day, from Earth’s perspective, the sun sweeps out an arc as it rises and sets. At noon, the sun is at its highest point in the southern sky in the northern hemisphere. Any stationary object will do, then, for determining the time; we just need to look at the shadow. Over the course of a day, the shadow will change with movement of the sun. These stationary objects are called gnomons; sundials are a common example of these.

Students first spent a sun-soaked day at the villa tracing the path of the sun using a stick and paper. From this, we were able to determine local noon, or the time of day that the sun is at its highest point in the sky.

Students were also challenged to find references to astronomy in the art and architecture of Arezzo. They first found an 1886 sundial on the facade of a local restaurant on the square of the
Basilica of San Francesco (Picture 1). Students also found a 14th century clock on Piazza Grande, built by master clockmaker Felice de Fossata, which tells time, shows the phases of the moon, and depicts the sun and the moon orbiting Earth (Picture 2). The clock tower was designed by Giorgio Vasari for the Lay Fraternity of Santa Maria della Misericordia, a charitable body established by the Dominicans in 1262.

In Florence, students visited Santa Maria Novella Church, which has two astronomical devices on its south-facing facade, a gnomon and an armillary sphere. The gnomon has several brass bars running at different angles to the church surface, and along the sides there are many markers for dates and times, determined by observing where the shadow is positioned. The armillary sphere consists of two metal circles, one perpendicular to the ground and one tilted at an angle with respect to the ground (Picture 3). This tilt takes into account Earth's tilt and the latitude of the church. Because of Earth's tilt, the sun is never directly overhead for all latitudes greater than the Tropic of Cancer, which includes part of Europe and the continental United States. At local noon, the shadow of the perpendicular circle will appear as a line; before or after it will be an oval. On the day of the vernal equinox, the shadow cast by the tilted circle on the facade will nearly be a straight line, but a small sliver of sunlight passes through the center, on the left before the equinox, and to the right after. If the equinox occurs during the day at that location, you can see this in the subtle changing of the shadows cast by the armillary.

Santa Maria Novella is also famous for its art and architecture and historical significance. Most famously, it contains “The Holy Trinity,” a pioneering 15th century Renaissance fresco by Masaccio commissioned by the Lenzi family, which displays his new ideas about perspective and mathematical proportions. The cadaver tomb below carries the epigram: “I was what you are, and you will be what I was.” The pulpit, commissioned by the Rucellai family in 1443 and designed by Filippo Brunelleschi, has particular historical significance; from this pulpit came the first attack on Galileo Galilei, leading eventually to his indictment for heresy.

More detailed information about the motion of the sun through the year and the relative orientation of the sun to Earth can be gained from carefully tracking the sun. From Earth's perspective, the sun's orbit moves up and down the sky, and the length of the day increases and decreases. The longest day is the summer solstice, the shortest is the winter solstice, and the autumnal and vernal equinoxes are the days when the night and day are closest to being equal in length, and when the sun sets closest to due west. During the autumn and winter, the sun sets south of west; during spring and summer, the sun sets north of west.

A meridian line uses a small ray of light to mark the position of the sun's image on the floor of a darkened room, such as a church. Students observed two examples of this during their studies. The first example was in Florence in the Torrino at La Specola, part of the Museum of Natural History of the University of Florence. The meridian line was constructed in 1784; along the floor is a copper bar that has the signs of the zodiac and months marked in it (Picture 4). The date is measured by observing the image of the sun cross the meridian line at local noon. Our tour coincided with local noon, so we were able to observe the image of the sun passing over the meridian line. The top floor of the Torrino offers a 360-degree view of Florence and houses an 1841 telescope (Picture 5).
In Rome, students also visited the Basilica of St. Mary of the Angels and Martyrs and the meridian line therein (Picture 6). The basilica was built inside the ruins of a fourth century Roman bath. The church's interior was designed by Michelangelo in the 16th century and is itself an architectural treasure. The meridian line was commissioned by Pope Clement XI and built in the 18th century by Francesco Bianchini to check the accuracy of the Gregorian calendar. The church was a good choice because it had an unobstructed southern exposure, was large enough to allow for a full line to track the sun's position all year, and because the thick Roman walls had centuries to settle.

What can we learn from these measurements? By comparing the positions of the fixed stars to the sun's position, we can see that the sun moves around the heavenly sphere of the fixed stars, along a path that is marked out by the constellations of the zodiac. As the sun moves around, it spends about a month closest to each constellation. When the sun is in Capricorn, you can't actually observe the constellation Capricorn because it's up during the day.

In addition to the practical applications, such as setting a calendar, observations of the motions of the planets, moon, sun and the fixed stars also led to philosophical conclusions about the order of the universe. The Greek philosopher Ptolemy constructed a predictive Earth-centered model of the universe, consisting of celestial spheres that carried the celestial bodies around Earth. This was the accepted view for centuries. Images of Ptolemy's universe are found throughout art and architecture; one example students observed was Domenico di Michelino's 15th century "Comedy Illuminating Florence," a fresco inside Florence's duomo depicting Dante and his levels of hell, all under the Ptolemy's celestial spheres (Picture 7).

As measurements became more precise, anomalies between the observed positions of heavenly bodies and those predicted by Ptolemy led first Copernicus, then Galileo, to assert that a sun-centered universe made more sense. It was this shift in world view – that observation should override philosophical concerns – that represented a formal break of science from religion.

In addition to sites related to the course, students also visited iconic Italian attractions such as the Coliseum, the Pantheon, the Forum and the Trevi Fountain in Rome; the Uffizi, Boboli Gardens, Galileo's and Michelangelo's tombs, and the David in Florence; and traveled to Pisa and the Amalfi coast. They also experienced local culture and cuisine (there is always space for gelato!), rounding out a trip that was both educational and rewarding.

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

The types of settings and organizations in which CCU alumni have found employment include: commercial recreation, sport tourism, city parks and recreation programs, national parks, university and college athletics, and professional sport settings. Additionally, they work in a variety of jobs within those settings, including sales, ticketing, public relations, event management, facility management, sport information directors, activity leaders, camp directors, fundraising, operations managers, media directors, outdoor educators and program coordinators.

The recreation and sport management program

Sport as a business continues to expand rapidly. This expansion has led to an increased need for employees who understand the complexities of the sport environment. Organizations continue to seek employees who understand the multivariate world of sport and its connections to business, education, media and philanthropic entities.

The recreation and sport management program meets the unique needs of individuals who seek entry into careers that manage public parks and recreation programs, and work with municipal recreation programs, sport organizations, agencies and facilities. The curriculum offers a strong theoretical foundation combined with real-world experiences. Program coursework focuses on creating a broad-based foundation for the planning, organizing, directing, leading, and evaluation of sport and recreation organizations, agencies and facilities.

The purpose of the RSM program is to prepare future leaders of the sport industry through critical examination of both academic and practical applications of management principles in various segments of the sport industry. The program faculty seeks to challenge, engage and cultivate students in becoming skilled and knowledgeable sport managers. The program has five core objectives:

1. Prepare students to work in a variety of sport and recreation settings.
2. Produce graduates who utilize critical-thinking skills to solve problems and issues in recreation and sport management settings.
3. Produce graduates who demonstrate an understanding of the issues and principles of law as they apply to recreation and sport settings.
4. Prepare students to assess the effectiveness of strategies used by sport organizations when developing managerial strategies related to overall organizational success.
5. Develop students’ understanding of basic management strategies used to maintain or improve facility and venue operations.

The curriculum

A student majoring in RSM at Coastal Carolina University will gain opportunities to study, analyze, evaluate and lead within the dynamic fields of recreation and sport. Students acquire the foundational skills, knowledge and experience for successful entry into an array of sport and recreation settings. All students complete 58 credit hours of specific RSM major courses in areas such as risk management, program and event planning, leadership, facility management, and research and evaluation. The program culminates in a semester-long internship.
The student experience

The RSM program includes several experiential and out-of-class opportunities which involve engagement with the local community. The major is career-oriented and emphasizes the transfer of skills, theories and knowledge to the workplace. To this end, students participate in a variety of hands-on and field-based projects throughout the program. Several courses utilize service-learning principles to collaborate with local agencies or departments to sponsor recreation or sport-related events in the community.

Students are able to tailor their curriculum based on their career goals by selecting 15 hours of RSM coursework related to various industry-specific skills. Students may further tailor their program by selecting courses (or a minor) in other disciplines that increase their knowledge base and marketability. Additionally, each student is required to complete a semester-long capstone experience of 480 hours in an internship aligned with the student’s career goals. RSM majors study legal issues in recreation and sport management, sports marketing and promotion, recreation and sport leadership, and arena and facility management. Graduates of the program move on to careers as athletic or marketing directors, event managers, sports information directors, outdoor educators, and recreation directors.

For its ability to provide an array of amateur, recreational and competitive sports to all ages, Myrtle Beach was named South Carolina’s “Sportstown USA” by Sports Illustrated magazine in 2013. This affords students and faculty unique opportunities for experiential learning activities, which the program uses to set itself apart from other schools. From the first class students take as RSM majors (Introduction to Recreation and Sport Management) to the capstone internship, students are consistently exposed to and expected to participate in learning activities that provide valued experience combined with networking connections with organizations outside of CCU. These activities are worked into various course curricula and expose students to different skill-building opportunities, including leading activities, marketing and promoting events, creating and implementing events, evaluating programs, coaching youth sports, and providing recreational opportunities for people with disabilities.

A growing industry

The sport industry continues to be a large and fast-growing part of the nation’s economy. Recent data from the Bureau of Labor and Statistics (2012) indicate that sport-related jobs are expected to increase 23 percent by 2018, a much larger increase than many other employment sectors.

South Carolina has experienced rapid and continued growth in the sport industry. In 2010, the U.S. Census Bureau estimated the sport and entertainment industry generated approximately $189.4 billion in annual revenue. South Carolina generates approximately $1.4 billion in yearly revenue from the sport and entertainment industry. The U.S. Census Bureau reported in March 2014 that Myrtle Beach, S.C., was the seventh fastest-growing metropolitan area in the United States. This growth brings with it a need for additional infrastructure, education, and recreation and leisure services. Sports events represent an estimated $132 million in direct spending in the Myrtle Beach area alone (visitmyrtlebeach.com, 2013). The region has seen widespread and significant expansion in the building of sporting facilities, including four major new sport facilities opening in the last three years in the Myrtle Beach area, representing more than $75 million in new facilities. It is estimated that the Myrtle Beach area generates more than $35 million in sport and sport tourism-related revenue on an annual basis (Beale, 2013).

The RSM program provides research and public service in high-demand fields indigenous to the local community and region (e.g., sport tourism, minor league sports, school-based athletics, etc.). Moreover, Coastal Carolina University is geographically unique; there are 18 top minor league sport markets within a five-hour radius of the University (Sport Business Journal, 2013). Additionally, there are 33 professional sport teams within a 500-mile radius. These professional and minor league organizations have expressed a need for highly trained individuals who understand the complexities of recreation and sport organizations.

The continued growth of sport and recreation at all levels indicates a steady demand for competent, well-trained employees. As South Carolina’s economy grows regionally and statewide, there will be an increased need for educated and experienced employees. Statewide growth will create a need for employees who possess the experience and education that CCU’s RSM program provides.

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On the Road with Experiential Learning

By Deborah G. Perkins, Associate Professor of Sociology and Director of the Social Justice Research Initiative

In Fall 2013, the Social Justice Research Initiative (SJRI) expanded opportunities for experiential learning beyond the traditional classroom as I, along with sociology professor Hephzibah Strmic-Pawl and 20 Coastal Carolina University students, piled into vans and converged on Washington, D.C., in commemoration of the 50th anniversary of the March on Washington. We arrived on the morning of Aug. 28 and assembled with a multitude of people on the steps of Georgetown Law School in preparation for the mile-long march. We watched the torch being passed, so to speak, as participants from 50 years earlier linked arms with young students from Alabama State and made their way down the steps to lead the march. We marched the entire route with thousands of others and listened as Presidents Obama, Clinton and Carter, among other key speakers, spoke of the gains of the past 50 years and the work still ahead of us.

CCU students left knowing that this experience was not only a commemoration of events that transpired 50 years earlier, but a commitment to continue working for justice regarding voting rights, jobs and a fair economy, workers’ rights, criminal justice issues and Stand Your Ground laws, women’s rights, and LGBTQ rights. Our students expressed appreciation for the opportunity to be part of this historic moment and reflected on their experiences: senior psychology major Raven Vaught realized that we’ve made progress but still have a long way to go; Bridget Kelly, a senior sociology major, realized that we still do not live in a post-racial world 50 years later, despite what we hear and are told; sophomore psychology major Shawnte Posley reflected that if the 1960s generation could successfully counter what they went through, then we can definitely fight for equality now; and Ali Cohen, junior education major, pondered what we could do at CCU to foster social justice and change.
In Spring 2014, I taught a special topics course that I had developed, Social Justice. This course utilized sociological concepts and theories to explore issues of power, privilege and oppression relative to socio-economic class, race/ethnicity, gender, sexuality and religion. The experiential learning component for the course was a weeklong volunteer commitment with the Appalachian Service Project (ASP), an organization that serves economically poor families in Appalachia who are in need of housing repairs.

Our online class met face-to-face for the first time on a Sunday morning in the parking lot outside of Brittain Hall to travel to Guyan Valley, WVa., in service of ASP. The uncomfortable silence and nervous energy among virtual strangers soon dissipated with the six-hour car ride to our destination. Upon arrival at ASP, we discovered that we were among approximately 75 other students from universities throughout the country who also had embarked on ASP for an alternative spring break. We were directed to bunk-style housing (which I haven’t slept in since Girl Scout camp!) and given a list of required chores for the week, including kitchen, bathroom and groundskeeping duties. Within a few minutes of receiving their assignments, my students let me know in no uncertain terms that they had not signed on for this. I explained to them that community is all about working together for the common good and that clean toilets and showers would serve us all well throughout the long week ahead.

Our team of 12 was split into two crews and we worked on separate projects throughout the week. My team constructed a wheelchair ramp for a family with disabled family members, and the other team dug a trench and built a rear porch at the home site of a cancer patient and her family. We quickly learned that ASP’s mission is much more than home repairs; the program is also designed to build and sustain relationships with the families being served and to instill in students a call to action and a responsibility to give back to the community.

During the evenings and after long days of manual labor, ASP staff and local artisans enriched us about the history and culture of Appalachia and its people. On two evenings, we gathered and read aloud selections from our text, and then discussed and reflected on the literature in context of our experiences onsite. I witnessed, firsthand, students grasping critical and difficult sociological concepts by connecting them with lived experiences at ASP. In addition to their academic growth, by the end of the week our students developed lasting bonds with one another, ASP staff and the families with whom they worked. Undoubtedly, this was one of the most powerful and rewarding experiences of my teaching career. Likewise, my students spoke highly of the experience and noted the value in fostering their classroom learning and knowledge:

- The experience was life-changing to say the least. — Erika Buchanan, senior, sociology
- As we’ve been learning about the different types of privilege in class, I saw the difference in privilege for myself there...I had no idea that I was privileged until I got to West Virginia where I realized that a lot of these people can’t do the things that I did. — Stanley Davis, senior, interdisciplinary studies
- This experience epitomizes the reasons why I chose to become a sociology major. I feel as if my time here has allowed me to apply the knowledge I have gained throughout my college education. I have seen those who have fallen victim to the realities of social injustice and now understand that although these issues may not be something that can be solved instantaneously, change is possible through small steps such as these. — Evan Krinzman, junior, sociology
Fractals Rock

By Jamie Hedges, Mathematics Lecturer, Coastal Carolina University
Patterns have been an important part of human life for centuries because human beings love to have order. We love to decorate our clothes and homes in patterns because they are measurable and predictable; we know what is going to come next. We teach young kids to recognize and follow patterns as soon as they start school. This education continues in geometry and algebra in higher grade levels. Slopes of functions make patterns easy to follow.

However, there have been some patterns that we could not explain. Mathematicians called these patterns “pathological curves” because they are so crazy they could not otherwise be described. They would pop up from time to time over the centuries but were never analyzed too much. We didn’t want to disrupt the order in our lives. With the invention of the computer, we were able to see that these “pathological curves” were not crazy at all. They did have order, and they were predictable. They would, in fact, become vital to our modern lives. These “pathological curves” are now known as fractals.

Beniof Mandelbrot coined the term “fractal” in 1975. He took the term from the Latin word fractus, which means broken. A fractal is a shape that is broken into pieces over and over again. Fractals have self-similarity, which means if you look at the image from far away or zoom in to just a small piece of the image, it will look the same. Imagine a head of broccoli. If you took a picture of just a floret of broccoli and then zoomed in on that picture, it would have the same visual characteristics of the entire head of broccoli. Another example of self-similarity is a mirror maze. When you stand in a mirror maze, you see copies of yourself that seem endless. Some of those images of yourself may look smaller, but they still look like you.

Fractals show up in our history long before we had a word for them or computers or Mandelbrot to help us analyze them. In 1883, George Cantor created a fractal that is now referred to as “Cantor’s Set.” He started with a straight line. He then split that line into three equal pieces and removed the middle piece (leaving what looked like a line, a space and another line all of equal lengths). He repeated this process until it looked as though his lines turned into specks of dust. With each new picture, he removed a middle third of the lines from the previous picture. Quickly, his page was filled with more empty space than lines. However, if he held up a magnifying glass to just one piece of his new picture, it would look like one of the earlier pictures (line, space, line).

This idea of taking one line and making it break up an infinite number of times until you were left with dust intrigued Cantor.

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**Human beings love to have order.**

He began to study infinity and made some remarkable new discoveries about the size of infinity. Mathematicians had always believed that every set of numbers or objects that were infinite were the same size. Cantor theorized (and proved) that some sets, the irrational and real numbers in particular, are larger than other sets that are infinitely large.

Artists had also used the idea of the fractal to represent things like the universe of God. In real life, a broccoli floret does not continue on forever. However, it consisted of mathematically created fractals, they do continue on forever. They can be both infinitely large and infinitely small. Several artists and cultures used this idea of infinitely large and small at the same time to represent the divine. God is both the infinitely large creator of the universe and infinitely small enough to be inside everything on Earth (even tiny little ants).

In the painting “God the Architect” (aka “God the Geometer”), you can see an image of God holding the universe. In this painting, the universe is seen as the fractal. The universe is infinitely large to us, but is infinitely small to the divine. This painting was created in the middle of the 13th century, well before there were any documented “pathological curves” or methods to analyze fractals, but the unknown artist of the painting still had the idea of infinity and self-similar patterns.

Ron Eglash, an American ethno-mathematician (he studies how mathematics and cultures intersect), has also observed how ancient African civilizations used the idea of fractals and infinity to represent their deities. Some tribes built their villages in fractal patterns: The temple or holy building began the fractal shape, and all the other buildings formed a pattern around it. Social norms of the village dictated that the closer you were to this temple, the more holy/clean you were. Eglash asked if he could see this center village space since it was the original shape
of the fractal, but he was told that the building was so special
only the priest could enter to clean it. It was the house of God.
The fractal started in one building and grew larger from it (this is
opposite of Cantor’s Set, which grew smaller, but remember we
can have infinitely large numbers and infinitely small numbers).

In another village, members built their huts in a fractal pattern
within the village walls. The most important elder had the largest
hut, and smaller huts of similar proportions surrounded the
erver’s hut, then even smaller huts surrounded those huts. The
closer your hut was to the elder/center hut, the more important
you were to the village. Inside each home, there was a small
hut (in similar shape to the large huts) in which “spirit people”
resided. In each case, the idea of social order was tied to these
fractal models.

Let’s examine more modern developments. Mandelbrot
worked for IBM when the company developed some of the first
computers. He decided to see if computers could help him come
up with an equation for a pattern he had been analyzing in the
stock market. He wanted to look at what he would come to call
the “roughness” of the shapes/patterns he was seeing. Using the
new computing power, Mandelbrot was able to come up with an
equation that, when plugged back into itself over and over again,
would create the pattern he was seeing. Mathematicians call this
idea recursion.

Think about a good, old-fashioned function machine ( f(x) )
from algebra class. You learned how to plug things in for x.
At first it was just a number, then maybe another variable.
Finally, you learned how to plug in a whole other equation.
With self-similarity, we are going to plug in our original
equation (or some slight variation of it) over and over again.
The computer allowed Mandelbrot to visually see what a
mathematically created fractal would look like. Very similar to
plotting a point on graph paper, the computer used recursion
to generate many iterations of Mandelbrot’s fractal and then
plotted those points.

Mandelbrot published several books that led to the popularity
of fractals, most notably his first, The Fractal Geometry of Nature
(1982). These books also allowed others, not necessarily in
the field of mathematics, to understand fractals. This led to
the discovery of all the places that fractals already existed, and
Mandelbrot’s works provided the vocabulary to identify and
describe them.

Empowered by the command of the fractal concept, during the
past 30 years we have discovered many ways the fractal can be
useful. One way that affects almost the entire world is the use of
fractals in cellphones. Before we had smartphones or Bluetooth
phones, cellphones had antennas located on the top of the phone.
The antenna was there to transmit sound waves to the phone.
Present-day phones do not have such antennas; it was discovered
that antennas shaped as fractals were able to transmit different
frequencies of waves. This allowed for phones to use phone waves
as well as Wi-Fi and Bluetooth. In fact, it has been proven that
not only is the fractal the best way to transmit all these different
types of waves, but it is the only way that one device can transmit
different waves in such a small space. A fractal can be printed small
and as thin as a sticker, which is placed inside the phone itself
(usually under the battery). By using fractals instead of antennas,
our phones are saved from having individual antennas for each
type of phone wave it needs to transmit!
Computer-generated imagery (CGI) and digital arts have also made use of fractal patterns when creating landscapes. Imagine needing to create a mountainous scene. A CGI artist could start with a triangle, then run it through a fractal program. That program would take that triangle and manipulate it to look rougher. This could be done over and over again until there were many rough triangles on the screen. Before long, it would be an entire series of mountains. If the artist did not like the final look, he could just change the computer formula slightly to create a different roughness to the repeated triangles. The first computer-generated planet was created using fractals.

Within the last year, astronomers discovered that the rings of Saturn follow a fractal pattern. The pattern is similar to some of Cantor's Set. Doctors have discovered that our blood vessels, heartbeats and eye movements follow a fractal pattern. These discoveries have allowed doctors to make advancements in medicine, including trying to create an artificial eye that will allow people to regain lost vision abilities. Our eyes do not survey a room from right to left or up and down. It has been known for some time that the eye darts around the room to take in all the information. However, it was not until mathematicians discovered the secrets of fractals that doctors were able to determine what the eye movement pattern was. Now, doctors are trying to create a prosthetic eye that will mimic this pattern and transmit the data to the brain.

Mathematicians and scientists have come a long way with fractals in the last half-century. What we once thought of as unpredictable and pathological in nature is now helping humankind progress in many aspects of life. This discovery of a new way to create a pattern has opened up an entire new aspect of the field of mathematics known as chaos theory. There is no telling what will come next.

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A group of Coastal Carolina University graduate students led by Coastal and Marine Systems Science research professor Tom Mullikin traveled in September to the nation's capital as part of a comprehensive fact-finding and information-sharing study program aimed at forming the nexus between, as is said, “good science and good policy.” The study trip – the Washington, D.C. Policy Intensive – introduced the group to the dynamics of congressional, legislative and federal executive-level rulemaking processes during meetings with key officials who briefed, answered pertinent policy questions and generally extended themselves to Mullikin, other faculty and students.

An “experiential learning environment” developing a “firsthand understanding of the application of sound science in complex statutory and regulatory matters,” the scheduled meetings included a day-one lecture and “probing examination on the intersection of science and policy” by CCU’s Pam Martin, Ph.D., an author and professor of politics and international relations. Martin’s expansive body of work has for years focused on global environmental politics, energy, sustainable development, and international relations and policy.

Martin’s lecture was an important introduction to that intersection before beginning the following day’s meetings on Capitol Hill, says Mullikin, an author, attorney and internationally recognized global-environmental expert.

“The intensive program was an effective means by which we connected our graduate-student scientists to the policy arena so that they might be able to create relevancy to their bench science,” says Mullikin. “I asked the class the age-old question: ‘If a tree falls in the forest and no one is there to hear it, will it make a sound?’ As early as 1710, philosopher George Berkeley in his work, ‘A Treatise Concerning the Principles of Human
GRADUATES FROM OUR PROGRAM WILL LEAVE WITH A CLEAR UNDERSTANDING OF HOW TO CREATE RELEVANCY TO THEIR BODY OF SCIENTIFIC WORK.

Knowledge, posited a similar question. And in our discussions with these probing 21st century scientists, I explained that I wanted their science to be relevant – I wanted their tree to be heard."

According to Mullikin, "As the global population has continued to burgeon, it has become increasingly important for dispassionate peer-reviewed and credible science to be a key part of policy debates. Graduates from our program will leave with a clear understanding of how to create relevancy to their body of scientific work."

The CCU group embraced both the relevancy and the illuminating importance of the nexus between policy and science.

"It was very interesting to learn the various methods lobbyists and politicians used to bring environmental issues to public, along with private, entities in a way that was understandable and relatable to issues they cared about," says Yianni P. Laskaris, a graduate research assistant at CCU. But, he adds, "for a graduate student rooted in science, it was eye-opening and frankly scary to see how few staff members of our congressmen and senators had scientific backgrounds. There needs to be more progress made in bringing science to the table."

Fellow graduate student Patrick Mears agrees, adding that the trip was not only “a great experience” in terms of meeting with those directly involved “in creating policy,” but “it really drove home the point that those contributing to the political process need to be backed with sound science and interpreting need to be scientifically literate.”

The two-day travel and study – Sept. 25-26, 2014 – included travel discussions directed at furthering student-thesis topics. Day one, faculty and students enjoyed accommodations at the Renaissance Washington, D.C. Downtown Hotel; and dinner and Dr. Martin’s lecture at the historic Willard Hotel, where President Lincoln and his generals spent many an evening in strategic council during the American Civil War.

Day two began with a breakfast brief by Jason Waskey with White House NGO Climate Action. This was followed by addresses and briefings held first at the offices of Akerman Senterfitt, LLP (federal legislative and policy lecture by senior stakeholders Rick Spees and Jeannie Morin); then the office of U.S. Rep. Jeff Duncan, R-S.C. (key insights from congressional staff by legislative assistant Caleb Paxton); a visit to the office of Sen. Lindsey Graham, R-S.C. (key insights from U.S. Senate staff by legislative aide Scott Graber and legislative assistant Jessica Phillips Tyson); and lunch at the historic Hay Adams Hotel, which has catered to presidents and all manner of political leaders, diplomats and celebrities since 1928.

The Intensive concluded with a special briefing at the White House, “executive branch insights,” from senior White House staff lecturer Rohan Patel, a special assistant to the president and deputy director of Intergovernmental Affairs at the White House.

Like Laskaris and Mears, CCU graduate student Bryan Andrew Keller refers to the study trip as “eye-opening and career-changing.” Quoting Antoine de Saint-Exupéry, Keller says, “If you want a ship, do not drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea.”

The meetings “with lobbyists, congressional staffers, campaign organizers and a special assistant to the president provided keen insight on how to use our own research to influence environmental policy,” Keller says. “The benefits of this class will be long-lasting and quantifiable, evident by the students’ influence on state and federal environmental policy.”

All agree, the Washington Policy Intensive was a wholly successful, tangible effort that will begin bridging the gap.

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The Swain Scholar Program is a unique scholarship program which fulfills the wishes of donor Kenneth E. Swain. Scholarship recipients establish student-driven community health outreach and research projects to improve the health of Horry County residents. The scholars are charged with developing and presenting a series of educational outreach programs that highlight guidelines for healthy lifestyles raised by the research findings. The Swain Scholars are comprised of selected undergraduate students from the health sciences, biochemistry, biology, exercise sport science, recreation sport management and chemistry programs in the College of Science at Coastal Carolina University.

Three senior-level students are part of the Swain Scholars program at Coastal Carolina University's College of Science: DeVaraiy White, an exercise and sport science major from Sumter; Christina Auth, a health promotion major from New York; and Briana Laws, a biology major from Myrtle Beach. The Swain Scholar program includes conducting community health outreach and research projects designed to improve the health of Horry County residents.

For our first-year Swain research project, Analyzing Perceptions of Recreational Needs in Horry County, we partnered with the Horry County Department of Planning and Zoning and identified the need for an updated recreational needs assessment. We worked with senior planner Leigh Wood Kane and discovered that the last recreational needs assessment was conducted in 1999. Since then, more than 100,000 people have moved into Horry County. Therefore, the overall purpose of our project was to gather community feedback that will be used to make Horry County and city government officials more aware of the recreational needs of the community.

We created the Enhancing Horry County and Health and Recreation Initiative to analyze community feedback, collaborate with community stakeholders, provide research-based education, and promote awareness about the health and social benefits of recreation.

The initiative includes a theory-based analysis from the Stages of Change component of the Transtheoretical Model. By surveying what stages of change our target population was in, we could better determine their readiness to adopt, maintain or increase their levels of physical and recreational activity.

We analyzed both quantitative and qualitative results based on the following five research questions:

- How does participation in Horry County recreation compare to the state and the nation?
• What recreational facilities will Horry County residents benefit from having access to?
• What environmental and personal barriers restrict individuals from participating in recreation?
• Which stage of change are people in?
• How does perceived health status differ due to stage of change and also participation in physical and recreational activity?

We utilized two different modes of obtaining the answers for these research questions: focus groups and a needs assessment survey, which were conducted in conjunction with Horry County personnel.

The needs assessment survey was designed in partnership with the Horry County Department of Planning and Zoning and the Parks and Recreation director. Previous needs assessments and surveys from other counties were utilized to model the Enhancing Horry County Health and Recreation Initiative Survey. This survey was active online Jan. 14, 2015, through April 1, 2015, after gaining Institutional Review Board (IRB) approval. This survey consisted of 46 questions that were multidi­rectional, meaning individuals were only asked questions that pertained to them. Participants were asked about demo-

The recreational outlets most frequently used by residents are public beach accesses, walking or biking paths, and nature trails.

This also gave us a value comparable to the survey results. Funding for new facilities and programs as well as thoughts on communication of recreational activities going on in their respected areas were also discussed in these groups.

Based on our results, approximately 88 percent of Horry County residents claimed to participate in recreational activities within the community. The recreational outlets most frequently used by residents are public beach accesses, walking or biking paths, and nature trails. According to the survey, the types of recreational facilities Horry County residents believed they would benefit from having access to include a multi-use gathering site, an ice skating rink, and more nature trails. An example of a multi-use gathering site would be an amphitheater or a facility that could be used for large meetings, concerts and sporting events.

Reasons for not participating in county recreation included being too busy, a lack of knowledge about programs or facilities, and the desired programs not being offered.

A T-test was conducted by splitting the results into two groups based on stages of change. Using an alpha-value of 0.05, we found a significant difference in how the two groups ranked their overall perceived health. Group one consisted of those who currently engage in physical activity (preparation, action and maintenance stage), and group two consisted of those who do not currently engage in physical activity (pre-contemplation and contemplation stage). Individuals in group one were more likely to rate their overall health as “very good” while group two rated their overall health as “fair.”

The survey results based on our research questions were presented at the 2015 Undergraduate Research Competition. At the competition, we were able to bring awareness as well as show the correlations between recreational and physical activity with perceived health status and stage of change. We were also able to present our findings to the Horry County Parks and Open Space board, which brought awareness and detailed the recreational need within Horry County. These results will be further analyzed and used to design an updated recreational needs assessment for the Horry County community.
Coastal Invertebrate Zoologists explore Smithsonian collections

By Juliana Harding, Assistant Professor of Marine Science, Coastal Carolina University

It is unusual to schedule the meeting time for a marine science class field trip at 10:30 p.m., especially with the expectation that the return time will be at least 30 hours later. Yet that was the rally time on the night of Dec. 3, 2014, for the Coastal Carolina University Marine Invertebrate Zoology students who went on a field trip to the Smithsonian Institution National Museum of Natural History. Seventeen students and five faculty members participated in the end-of-term collections tour and museum visit on Dec. 4.

I teach Marine Invertebrate Zoology (MSCI 478) each fall in the Department of Marine Science. The course presents an overview of the taxonomy, biology and ecology of the major groups of marine invertebrates (animals without backbones) with an emphasis on form and function. Through a combination of lectures, laboratory examination of live and preserved specimens, and field trips, students become familiar with mollusks, echinoderms, arthropods and other faunal groups. The course is intense, but most students find it both interesting and rewarding.
In the words of a CCU marine invertebrate zoology alumna, “When I went to the beach with my family during Thanksgiving break, I actually knew what I was talking about ... and I couldn’t stop talking. My parents were somewhere in between astonished and exasperated because they couldn’t get a word in edgewise! Their tuition dollars at work!”

Our Smithsonian trip was planned with two objectives in mind. I wanted to provide opportunities for the students to 1. meet and talk with the Invertebrate Zoology curators about their jobs, research and career paths – to essentially learn from the experts – and 2. see firsthand the museum collections and their relevance to the state of knowledge within the field. This kind of immersion experience is a powerful learning tool. This year’s trip was, hopefully, the beginning of an annual tradition for Marine Invertebrate Zoology students.

We arrived on the National Mall in Washington, D.C., as the sun was rising on a clear day. Before we entered the Smithsonian, we took a brisk walk to the U.S. Capitol for group pictures with the National Mall and the Congressional Christmas tree in the background. Note the smiles on those faces – it was 7:30 a.m., and we were already having fun! The students’ spirit of adventure and enthusiasm was palpable as we trotted back to enter the National Museum of Natural History.

Mike Vecchione, a National Oceanic and Atmospheric Administration/National Marine Fisheries Service adjunct scientist and curator at the museum, met us and took us on a tour of the Ocean Hall before the exhibit opened (Figure 3). Besides being a world expert on cephalopods (nautiloids, cuttlefish, squid and octopods), Vecchione helped plan the Ocean Hall and shared all sorts of interesting anecdotes about both the specimens and the process of designing a major Smithsonian exhibit. His comments sparked the interest in many of the CCU students who had never thought about applying their marine science education in this way. As Coastal marine science students progress through their curriculum, the emphasis is on an interdisciplinary approach that integrates biology, geology, chemistry and physical oceanography to understand coastal and marine processes. From my perspective, it was delightful to watch my students absorb and integrate information, apply their interdisciplinary knowledge, and then ask good questions as part of the conversation.

Research presentations from Research Zoologists within the Division of Invertebrate Zoology followed the Ocean Hall tour. Vecchione, Chris Meyer, Allen Collins and Karen Osborn shared aspects of their current research as well as details about how they arrived at their professional positions.
Mike Vecchione, National Museum of Natural History curator, shares his experiences as well as details about various specimens.

While these presentations touched on topics we had covered in class, they provided a whole new perspective on many aspects of the biology for specific groups, as well as applications of the scientific method in pursuit of real-life research questions. The students found the presentations fascinating and thoroughly enjoyed the opportunity to interact with the curators.

After lunch, we took a quick tour of the Division of Invertebrate Zoology’s dry collections on the way to Vecchione’s lab. The sheer number of specimens, as well as the diversity and coverage from around the globe, is impressive! We stopped briefly to see examples of modern research labs as well as representative fauna that we’d talked about in class.

Did you know that the eyeball from a giant squid (Architeuthis) is the largest of any living animal? We didn’t either until we saw the one in Vecchione’s lab. The squid eyeball was one of the highlights for many of the students on a day when we collectively indulged our inner science nerds. After a round of picture-taking with the eyeball, we hustled to catch the shuttle to the Museum Support Center.

The National Museum of Natural History is home to an extensive collection of specimens that are stored in alcohol, including many of the type specimens (specimens from which the original taxonomic species descriptions were made). Most specimens that are stored in alcohol are maintained at the Museum Support Center (MSC) in Suitland, Md. Researchers investigating animals can ask for access to the collections, but the MSC is rarely accessible to the general public. We were privileged to take a tour of the cephalopod collections with a fellow who has personally collected and described many of the type specimens!

The MSC is organized into essentially football field-sized vaults that house specimens from major vertebrate and invertebrate groups, as well as anthropological artifacts. On the way to see the squid, we met Cheryl Bright, the Invertebrate Zoology Collections manager, who showed us the modern lab that visiting scientists use to examine specimens from the collection and explained some of the commonly used facilities. As we moved through several labs full of cephalopods and other invertebrates collected from all over the world and dating back to the mid-1800s, the students were surprised at the sheer diversity of the collections as well as by the fact that we don’t actually know what all the specimens in the collections are yet. While we were in the cephalopod type specimen collection, after Vecchione had told us the collection history for some of the specimens, it was a thrill for students to look at the specimens and see his name on the labels within the jar. Yes, we really were with a cephalopod expert in the squid collections actually looking at newly described species!

In their own words...

Coastal Invertebrate Zoology students describe their Smithsonian experience.

What was the best thing about our trip?

My favorite part of the trip was getting to handle the giant squid and learning more about it.

-Bobby A.

If you are asking about the favorite thing I saw, it would be all of the giant squid and being able to touch one. But besides that, being able to talk to Mike and listen to him talk was awesome.

-Adam Y.

I loved exploring through the Ocean Hall at the Smithsonian because it was colorful, fun and educational at the same time.

-Kellie S.

The best part about our trip was being able to see a completely new career path available to us. It was nice to be able to talk to Dr. Vecchione, hear about how he got to his position, as well as ask him for advice!

-Tiffany B.

My favorite part of the trip was being exposed to possible job positions in fields I may be interested in later in my career. I also enjoyed touching the giant squid! It was amazing.

-Macy C.

The best thing about this trip was seeing what goes on behind the scenes of the Smithsonian and all the species it has on record.

-Kaitlin A.

The greatest part about our trip to the Smithsonian was Dr. Vecchione’s personal tour through the Ocean Hall exhibit. There is a wealth of information in this exhibit, and as Dr. Vecchione said, not all of the information can be included in the descriptions. It was awesome to learn facts and gain perspective behind some of these displays.

-Ariana B.

Were you surprised by anything you learned?

What I was surprised about was all the samples they had for species. I knew they were going to have a lot, but I didn’t suspect the numerous shelves full of them. It really puts into perspective how many inverts there are, and that there are more to find.

-Amanda B.

I was surprised at the amount of unidentified specimens in their collections.

-Adam Y.
Our last stop at the MSC was the lab where very large specimens are kept. While several different kinds of squid and octopods were visible in a large display case, another highlight of the trip for many students was the opportunity to actually examine and touch a real giant squid and see up close all those details we had talked about in class and throughout the day with Vecchione. Once back at the National Museum of Natural History, we had the opportunity to spend more time in the Ocean Hall and other exhibits.

As twilight fell, we walked up to the Washington Monument and enjoyed the view of the National Mall once more. While we were looking down at the Ellipse and the White House, the National Christmas tree was illuminated for the first time in 2014, providing yet another pleasant surprise on our adventure. As we walked back to board our "Rooster bus", we discussed our day. The students had thoroughly enjoyed meeting the curators, learning about their research and seeing specimens while gaining a whole new appreciation for museum collections and how the collections are used in research. We headed home with visions of invertebrates dancing in our heads! What better way to start exam week and the holiday season? 🎄

Acknowledgments
Special thanks go to Mike Vecchione for hosting us throughout our day at the Smithsonian. Thanks are also extended to Chris Meyer, Allen Collins, Karen Osborn and Cheryl Bright, as well as Trish Mace and Jennifer Collins for sharing their time and expertise with us and providing opportunities to explore the research and collections. Thanks also to the other Coastal faculty members who chaperoned our 36-hour adventure: Robert Young, Sharon Gilman, George Bonelllo and Margaret Stoughton. Our trip would not have been possible without the support of Dr. Mike Roberts (dean, College of Science) and Jane Guentzel (chair, Department of Marine Science) as well as the logistical assistance from Walter Showers, Susan Soucy (both with the Department of Marine Science) and Nyoka Hucks (College of Science).

I was also surprised by curator Chris Meyer because his research is brilliant to come up with a way to make a digital database for biodiversity. The idea in itself is a great one, but how he was able to grow an artificial reef and blend up certain organism’s DNA to find individual DNA within many was amazing.
-Kellie S.

I was surprised at the scale of their collections! Being at the Marine Support Center was incredible. I honestly had no idea how large and how diverse the collection at the Smithsonian was.
-Tiffany B.

I was surprised to see the only preserved giant squid eye in the world and to touch a preserved giant squid. Not many people can say they have done either of these, and I'm glad to say I did both.
-Kaitlin A.

Did the trip help you understand/relate to things that you've learned in Invertebrate lecture and lab?

The trip definitely helped me reconfirm what I knew and... helped me see the real world applications of what we are learning and helped me to understand what I could possibly do with my degree.
-Bobby A.

The trip helped me understand how people work on papers, and how they can go to the Museum Support Center and use specimens and the library to write papers. I also learned how the naming of species can continuously change when new species are found.
-Amanda B.

I think that going on this trip helped me realize the knowledge I already have. When the curators were giving their talks, I was able to understand their language and what they were saying!
-Tiffany B. and Macy C.

Seeing the specimens in the “who’s related to whom” section helped me to visually place representatives from class into evolutionary context.
-Ariana B.
Technical knowledge and competencies are integral components of every undergraduate program of study. However, to successfully achieve the goal of becoming a health care professional, students also may need better development of social skills and capabilities in order to be competitive in the classroom and workplace. Data demonstrate that the period of college/university study following high school graduation, but prior to admission to a health professions training program, is particularly critical for students interested in health careers.

High school and college students in South Carolina, particularly underrepresented minority (URM) students and those from rural and medically underserved regions, face significant barriers in the form of economic and educational disadvantages. Many high schools in South Carolina have a large percentage of economically and/or educationally disadvantaged students as evidenced by economic status indicators and standardized test scores (S.C. Department of Education, 2011). The economic disadvantage is striking, with 179 of the 236 high schools (76 percent) reporting poverty indices above 60 percent (S.C. Department of Education, 2014). Nationally, 42.6 percent of SAT takers in the class of 2014 met the SAT College and Career Readiness Benchmark. In South Carolina, 35.1 percent (33.2 percent among public school students) of test-takers met the benchmark. Data for underrepresented
Since knowledge is power, the more the students know, the greater their potential for success.

minority students in South Carolina are especially concerning. Only 9.1 percent of African American and 27.5 percent of Hispanic test-takers met the benchmark (College Board, n.d.).

Advanced level math and science courses are more readily available at larger South Carolina high schools, but students in the smallest and most rural high schools do not consistently have access to honors courses. College Board statistics indicate that, nationally, four out of five black or African-American students do not enroll in AP subjects for which they are qualified, or attend schools that do not offer an AP subject of interest (College Board, 2012).

Racial disparities that exist in the enrollment in AP courses and successful completion of AP exams provide an indicator of the pre-existing academic disparities between white and African-American students within enrolled undergraduate populations. African-American students who attend college often struggle more than their non-minority peers to achieve academic excellence and may be inadequately prepared to effectively complete high-quality application packets for admission to health professions educational programs.

This situation has significant implications for the future of the clinical workforce. The Institute of Medicine has examined lack of diversity in the current health care workforce. Data from the U.S. Census project (2004) demonstrate an even greater need for workforce diversity as the demographics of the population continue to shift toward more URM residents, especially in South Carolina. A diverse health care workforce is critical to the provision of high-quality, accessible service care to increasingly diverse communities.

In response to this disturbing trend, the South Carolina Area Health Education Consortium (AHEC) in collaboration with the Medical University of South Carolina (MUSC), Coastal Carolina University (CCU) and five additional undergraduate colleges in the state have partnered to bridge the gap in the health care recruitment and retention pipeline, and help URM students achieve their academic and career goals. Supported by a three-year grant from The Duke Endowment, the South Carolina AHEC and its partners have developed and implemented the Bench to Bedside Initiative. Bench to Bedside (B2B) activities emphasize and promote long-term academic success, personal growth and professional development for URM undergraduate students. The programmatic infrastructure currently connects faculty members and staff of the partnering undergraduate institutions (Claflin University, Clemson University, Coastal Carolina University, Francis Marion University, South Carolina State University and Winthrop University) and MUSC academic medical center faculty to establish a sustainable network of guidance and support for the self-identified pre-health program participants.

Faculty members from MUSC and the South Carolina AHEC collaborate with faculty at CCU along with faculty and career counselors on the other undergraduate campuses to:

- assist with the early identification and academic/personal development of talented URM undergraduate students through personal development seminars and mentoring sessions;
- provide activities, including interactive intercollegiate video conferences, networking summits and individual student projects to engage undergraduate students in experiences pertaining to health-related conditions that are particularly prevalent in medically underserved and minority populations; and
- build the foundation for a sustained dialogue and relationships between undergraduate students/faculty and health professions students/faculty in the fields of health disparity research and practice.

AHEC’s South Carolina Health Occupations Outreach Learning System (SCHOOLS), a video conferencing network, is used to deliver a large component of the B2B programming, reducing geographic barriers to training and access to resources. The South Carolina AHEC provided CCU and four of the seven B2B campuses with the technology and accessibility for the utilization of SCHOOLS. The SCHOOLS network uses an existing broadband infrastructure with HIPAA-compliant security protocols to disseminate educational content and facilitate communication.

The B2B seminar content includes a focus on “high priority” diseases or conditions that have disproportionately negative outcomes in underserved and minority populations. The content for the student success seminars includes background on the health care topics, critical-thinking exercises and personal development strategies. The student seminars, which are conducted over the SCHOOLS video conferencing network,
A diverse health care workforce is critical to the provision of high-quality, accessible service care to increasingly diverse communities.

Karen Aguirre, associate dean in the College of Science, acknowledges the benefit of B2B to Coastal Carolina pre-health students. "CCU's science programs are pleased to partner with SC AHEC and the B2B program. B2B offers supplemental classroom instruction in an interactive distance setting, allowing students to participate from their home campus, along with peers at other South Carolina campuses, in Socratic dialogue with MUSC and physicians, nurses, physical therapists, social workers and other leading health professionals. Additionally, students receive professional development training in smart social networking, optimal study techniques, and important 'how-tos,' with programming centered on scheduling and preparing for MCATS, GREs and other pre-professional exams, writing a successful personal statement, preparing for interviews, and embracing resilience when they need to take a deep breath and try again. These critical skills are not always learned in the classroom."

An annual face-to-face summit on the campus of the MUSC academic medical center campus includes:

- advising workshops for undergraduate career counselors designed to provide information and support undergraduate professional staff and faculty charged with advising students;
- faculty development networking opportunities for undergraduate and health professions faculty to exchange information and ideas for improvement and sustainability of the program;
- individual student advising sessions with health careers program representatives; and
- student activities designed to promote and highlight student B2B projects.
The 2014 Summit agenda included a research symposium as a competitive platform for undergraduate students enrolled at the B2B partner campuses to present research. Future benchmarks include sustaining the Summit and Research Symposium as an annual event. Since the December 2011 implementation, CCU joined Winthrop University to provide a credited enrollment opportunity for pre-health students. The BIOL 121 course, Bench to Bedside: An Introduction to Health Careers, was offered spring semester 2014 as a hybrid live/distance education course with one-hour elective credit. The course offers an introduction to various careers in health, and common preventable conditions that negatively affect the health of South Carolinians; reviews prerequisite courses required for admission and success in health career training programs; and provides insight into activities that impact admission into health professions training programs. A combined 17 students from CCU and Winthrop enrolled in the course tactically designed to sustain the grant-funded Bench to Bedside Initiative. Student feedback supported the development and inclusion of BIOL 122, Bench to Bedside: An Introduction to Health Careers Two in addition to BIOL 121 as a Spring 2015 offering.

“Coastal Carolina’s College of Science is also pleased to partner with Winthrop University and offers matching scholarships for students interested in enrolling in coursework aimed at medical career exploration and other appropriate pre-professional development,” Aguirre says. “Since knowledge is power, the more the students know, the greater their potential for success.”

The existing South Carolina AHEC data system is used to track and assess program outcomes. Short-term accountability measures include student/faculty participation and satisfaction with the student seminar series and the annual summit, as well as the number and quality of student projects. Three hundred and four (304) undergraduate students from across the state have participated in B2B seminars.

The Bench 2 Bedside Initiative is also strategically designed to collect longitudinal data. It is anticipated that a minimum of 50 percent of the students participating in the B2B program will succeed in gaining admission to health professions training programs within three to four years. A national student-tracking database will be utilized to follow the academic path of the B2B participants during the grant period and beyond. 

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As a graduate student of Coastal Carolina University's Coastal Marine and Wetland Studies program, I heard many stories of professors conducting at-sea research expeditions. However, I suspected the biggest boat I'd be doing any research from would be a canoe. After all, my research focus is on residential stormwater ponds. Although I am passionate about conducting research directly applicable to local communities, I always yearned for the opportunity to live at sea for days, maybe even weeks, and be completely immersed in scientific exploration of the bottom of our oceans.

This dream became a reality when Richard Peterson (assistant professor at CCU's School of Coastal and Marine Systems Science), my research adviser, received an opportunity to go to the Gulf of Mexico for a week on the E/V Nautilus for research. To his dismay and my good fortune, he had already committed to a research conference in Brazil. Less than a month after I received the news, I was Mississippi-bound for my first full week at sea.

I was to board the E/V Nautilus, part of the Ocean Exploration Trust's nonprofit organization was founded by Robert Ballard—the same Ballard who discovered the Titanic! The Nautilus is equipped with a remotely operated vehicle (ROV), Hercules is surrounded by six thrusters that allow pilots to navigate it in any direction from the comfort of the control room on board. Furthermore, Hercules is equipped with a high-definition camera and two manipulator arms designed for collecting targeted samples.

In addition to conducting scientific research, the ships streams all of the live video and audio from each exploration for viewers of all ages to listen in and watch the dive discoveries as they take place (nautiluslive.org). Educators chat with viewers in real-time to answer a variety of questions ranging from life aboard the ship to science-related questions about current research. Video interviews were conducted with schools and aquariums with the intention of inspiring future generations to appreciate and study science, technology, engineering and math disciplines. Knowing that the research documented aboard the Nautilus was being shown in classrooms, laboratory offices

By Samantha Corley, CCU graduate student, Coastal Marine and Wetland Studies
and living rooms around the world added to my enthusiasm of being a part of this wonderful opportunity.

When I arrived in Gulf Port, Miss., the deck was cluttered with activity. Scientists, crewmen and engineers from all backgrounds buzzed around deck, each with their own mission. Dodging crates of equipment scattered on board, I was introduced to Chip Brier (associate scientist at Woods Hole Oceanographic Institution), the scientist I would be working under throughout my sail aboard the Nautilus. He gave me a quick tour of the sleeping quarters, lavatories, weight room and common room. After I was shown the basics, he took me to the room where all the magic happens, the control room. There were a slew of keyboards, monitors, joysticks and chairs crowded in a windowless room.

"Be mindful of your activities in this room," Briar said. "Everything you and I see and hear in this room will be broadcasted live to viewers around the world."

The control room looked dark and intimidating, but once the ROV deployed, it lit up with commotion and quickly transformed into my favorite place to be. The final stop on the tour was the lab where I would spend most of my time running samples and carefully archiving others for work to be done when we returned to shore. It was a tight room in which three scientists were crammed. Noticing how much individual equipment each of us had, we joined the others on board and focused on our own mission of setting up the lab.

The objective of this particular cruise was to further understand and predict the transport of oil and gas released from the seafloor. This scientific understanding is critical for making informed decisions for oil spill responses and mitigation plans, ultimately resulting in significant financial and environmental savings. The Groundwater Discharge Measurement Facility at CCU uses naturally occurring geochemical tracers to constrain input rates of water that has traveled through the land (e.g., groundwater), ultimately discharging into surrounding water bodies.

Previous research conducted by Peterson indicated that these isotopes are rich in hydrocarbon reservoirs. This suggests the isotopes may allow for quantification of discharge rates and determination of how quickly hydrocarbon materials are transported through the marine environment.

Additional research conducted on board included examining the nature and composition of the liquids and gases seeping from benthic vents along the seafloor. Both video and direct samples were taken of the water and gas bubbles ascending through the water column. Capturing discharged fluids and gases immediately upon injection into the marine environment and with increased distance from the vents aids in understanding how quickly these materials distribute throughout the water column. By using the ROV Hercules, we were able to take high-precision samples at distinct locations, including directly above hydrocarbon seeps. Without the aid of such sophisticated technology, these questions would remain unexplored.

As quickly as it began, my adventure aboard the Nautilus ended. Being immersed in science and focused on individual tasks at hand caused the week at sea to flash by. The trip at sea may be over, but the work continues as the samples collected aboard the Nautilus are still being analyzed at CCU’s Groundwater Discharge Measurement Facility.

I myself am back to focusing on our neighborhood’s stormwater ponds. Though I thoroughly enjoy conducting science literally ‘in our own backyards,’ I continue to have my ears open for another opportunity to go to sea and research the deep unknown of our oceans.
CAN ACTIVE GAMING REDUCE THE RISK OF FALLING IN OLDER MEN AND WOMEN?

By Gregory Martel, Ph.D., Chair/Professor, Department of Kinesiology, Coastal Carolina University
The traditional balance exercises provided the most time on balance training, followed by the Wii Fit Balance Board, then the Xbox Kinect.

Although many studies have examined the impact of strength training and the performance of balance exercises on fall risk and occurrence, there has been recent interest in investigating the possible benefits of another type of activity on fall risk: active gaming.

Active gaming (i.e., "Dance Dance Revolution," Xbox Kinect, Nintendo Wii, etc.) has exploded in popularity in recent years and requires participants to play digital video games while also performing physical movement (Mears and Hansen, 2009). An interesting aspect of active gaming is that individuals are playing video games while also experiencing the benefits of performing physical activity. Theoretically, this may encourage individuals to participate more consistently in activities that enhance balance since the games may be more fun and entertaining than a traditional exercise program.

Faculty members Brooke Towner, Stacey Beam, Tim Meyler, Will Lyerly, Lisa Barella and Greg Martel recently presented preliminary data at the Southeast Chapter of the American College of Sports Medicine's annual conference in Jacksonville, Fla. The purpose of the study was to compare the effects of traditional balance training, the Wii Fit Balance Board and the Xbox Kinect on balance performance, fall risk and physical functional activities involving sitting, standing, and walking in older men and women. After being randomly assigned, the men and women had their balance and fall risk tested on a computerized Biodex Balance System before and after six weeks of participating in either traditional balance exercises such as those used by physical therapists, the Wii Fit Balance Board or the Xbox Kinect.

Both balance tests performed on the Biodex Balance System required the volunteers to stand on a balance platform that required them to adjust and shift their weight to maintain balance while performing computer-based tasks. Physical function was also examined before and after training using the Timed Up and Go Test (Podsiadlo and Richardson, 1991) and the Sit to Stand Test. The Timed Up and Go Test measures the time it takes for an individual to stand up from a standard armchair, walk approximately 10 feet, turn, walk back and sit down again. The Sit to Stand Test indirectly assesses leg strength and endurance and required the men and women to sit with their arms folded across their chest, then stand up fully and sit down five times as quickly as possible.

Although the data are preliminary and based on relatively few participants, neither the Wii Fit nor the Xbox Kinect improved the time it took for participants to complete the Timed Up and Go Test or the Sit to Stand Test. However, the Xbox Kinect did lead to a significant improvement in fall risk, but did not show any improvements in the test measuring balance performance. Although the Wii Fit Balance Board did not lead to significant improvements in fall risk or balance performance, the men and women improved their score on the balance performance test by nearly 26 percent, and it took 16 fewer seconds on average to complete the test.

A comparison of the two active gaming systems to the traditional balance exercises revealed that there were significant differences between the amounts of time actually spent performing the activities. The traditional balance exercises provided the most time on balance training, followed by the Wii Fit Balance Board, then the Xbox Kinect. The active gaming systems had less activity time due to the men and women having to stop and wait while the video games were reset or changed to a different game or level of difficulty. Interestingly, the Xbox Kinect provided the least amount of actual activity, but was the only training method to show statistically meaningful improvements! Although these findings are preliminary, the early results are interesting, to say the least.

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Most people who live in our area believe that increasing bicycling would lead to improved quality of life. This was a key finding from a recent Swain Scholar study, the Horry County Community Bicycling Survey, conducted by undergraduate students from the College of Science at CCU. The development of this survey involved collaborations between our University, city and county governments, and a local grassroots bicycling group. The survey was available online in the spring of 2014, and we analyzed responses from 1,057 county residents. Ages ranged from 18 to over 80 years with 72 percent reporting their age as 40 or older. We found 91 percent of Horry County residents believe that encouraging bicycling in our community will lead to a higher quality of life. Furthermore, we found bicycling is a common activity for those living here, with 85 percent reporting they had ridden a bicycle in the past year. For those who bicycle, the top two responses for weekly mileage were: 1 to 5
The beauty of cycling is that it can be done by most anyone at any age and at all fitness levels. (32 percent of participants) and 5 to 10 miles (24 percent). Most (53 percent) reported riding their bike an average of one to three days per week.

This local support for the positive qualities of a bicycle-friendly environment has not historically been embraced by our state through allocation of funds for bicycle and pedestrian projects. According to a recent report by the Alliance for Biking and Walking, South Carolina ranks 48th for per capita spending on bicycle pedestrian projects. This may have a direct correlation with the high bicycle and pedestrian fatality rates we have in our state. Nationally, we rank sixth bicycle fatality rates and 4th for pedestrian fatality rates. In order to encourage people to walk and bike, we must create environments which are favorable for safe physical activity. Our study found that the two main reasons people feel their personal safety is threatened when riding bicycles are distracted motorists (63 percent of respondents) and motorist behavior (61 percent).

Since safety is a key consideration when trying to facilitate increased outside physical activity, future plans for transportation should carefully consider encouraging outside physical activity in planning. We found only 11 percent of residents report being satisfied or very satisfied with how their city/town is designed for making bicycle riding safe and convenient. Also, the main reason why people do not bicycle in Horry County is due to safety concerns. In particular, county residents said they are discouraged from bicycling due to lack of bike lanes (82 percent of respondents), unsafe road conditions (81 percent), and the speed and volume of traffic (76 percent). Because most serious bicycling accidents and deaths involve head trauma, wearing a helmet is essential. In Horry county, only 49 percent of residents report using a helmet for every ride. Of these, half do not own a helmet and 24 percent do not believe one is necessary for short rides. This is an area where awareness and education should also be focused. Especially since 11 percent of those who ride bicycles in Horry County said they have been injured in an accident with a motor vehicle.

Speaking of safety, we do know there is safety in numbers. When more people bicycle, drivers are more aware of them. Our study found a strong need for additional driver education about the rights of cyclists (85 percent agreed) as well as more enforcement of traffic laws for drivers (74 percent agreed) and more enforcement targeting bicyclists (58 percent agreed). Drivers should be more aware of the rights of cyclists. Likewise, all cyclists should obey traffic rules and not assume that drivers necessarily see them.

The beauty of cycling is that it can be done by most anyone at any age and at all fitness levels. Calories burned vary based on body size and gender, but, in general, moderate cycling burns around 400 to 500 calories an hour and hard cycling efforts can burn more than 800 calories an hour. Although cycling is a great physical activity because it is not weight-bearing, it is recommended you also add walking, weight-lifting or other exercises for bone health.

One additional benefit of promoting bicycling and pedestrian-friendly communities is the positive economic impact it can have for Horry County. Multiple studies now show that pedestrian and bicycling infrastructure can have lasting effects for local economies. Multiple studies show increased sales from businesses when people bike and walk because they make more frequent visits to businesses than car traffic. Other studies have found that property values increase when residential areas are in close proximity to safe bicycling and walking areas. Furthermore, shifting from motorized traffic helps reduce traffic congestion and saves time and fuel.

In summary, we have a long way to go to make Horry County bicycle-and pedestrian-friendly. Many of our residents realize the benefits of outdoor activity. In fact, 85 percent reported they would ride their bicycle more frequently if better bicycle infrastructure was available locally. One day, hopefully, drivers, pedestrians and bicyclists will peacefully coexist together on safer roads, bicycle lanes, paths and sidewalks.
The best criminals are never caught...

By Robert B. Jenkot, Associate Professor and Chair, Department of Sociology, Coastal Carolina University

While it is generally accepted that older citizens behave lawfully, some do take part in a variety of criminal behaviors. Examples of crimes committed by the elderly include selling prescription medication and the mercy-killing of loved ones (e.g., spouses suffering from terminal illness), yet these behaviors are rare compared to the entirety of crime rates in the United States. Reports of older criminals break with our notions of those who carry the designation of "aged" – a grandmotherly/grandfatherly figure with a ready smile. As a result, there is often a reaction to criminal behaviors based on the cultural frame of care or compassion for the elderly that tends to conceptualize the elderly offender as an outlier rather than a partial result of our social structure and the inherent inequality within it. Furthermore, crimes committed by the elderly are not separate ly reported in national statistics. As a result, we know very little about the crimes that elderly citizens commit. Here's some of what we do know.

Criminal Behavior Over Time

Using developmental criminology concepts, delinquent behavior is anticipated to begin about age 13 to 15, and a corollary "aging out" of crime follows. In the United States, people start to age out of crime beginning in their late 20s. Once young adults begin families, start career paths and generally "settle down," they slow (and often cease) any criminal behavior in which they had been involved. For example, illicit drug use makes child care and career effectiveness difficult. Former illicit drug users frequently cease delinquent behavior as their priorities change in order to maintain a household. Additionally, connections to drug dealers become tenuous once out of school (high school and university), so as the supply of drugs drops and personal responsibility increases, involvement in criminal activity drops.

Following this causal relationship, by age 60, the majority of older citizens are not involved in the crimes of youth (gangs, drugs, robbery, etc.). We can easily expect that older members of the community are less likely able to run from the police or to take part in antisocial behaviors that necessitate physical strength, agility and being able to overpower a victim (Benson 2002; Shover and Thompson, 2001; Laub, Nagin and Sampson, 2001).

Closely linked to the idea of "settling down" with age is the drop in behavioral aggression with age. Violent criminals' behavior usually stabilizes over time. While this may be a combination of psychological influences on the aging process, we see fewer violent acts committed by the elderly. The reduction in violent crimes by the elderly due to a decrease in aggression leaves property crime as the only illegitimate means to both earn money and persist in criminal behavior.

Criminal Social Capital and Near Groups

There are crimes committed by elderly citizens that do not cause us to react with care nor compassion. These kinds of crimes are often linked to changes in social status and also provide the opportunity to either take part in novel criminal behaviors or persist in existing non-violent crimes. Recent research explores the idea of "criminal social capital." Like social capital,
where a person gains status and worth through their work, experiences and social interactions over time, criminal social capital anticipates that criminals who persist and succeed in their behaviors gain social capital within their criminal subculture. Criminal social capital can be used like social capital to gain access to new and more beneficial interactions (in this case, new and more criminal endeavors).

Using the idea of criminal social capital, it is easy to imagine a youthful thief who is successful gaining confidence and a positive criminal reputation over time. Once that thief is less physically able to sneak around (due to increasing age), he/she may become a fence (one who sells stolen goods), a coordinator of thefts, or just use connections (criminal social capital) to persist in criminal behavior in a variety of ways.

Steffensmeier and Ulmer (2003) provide clear evidence of this process. In an extended interview with a dying thief, they learned how a lifetime's network of connections to informants, co-conspirators and skilled criminals enabled this thief to persist in his crimes. He progressed over time from simple theft, to selling low-quality stolen goods (stereos, golf clubs, etc.), to selling stolen goods with a higher profit margin (jewelry, high-end electronics, etc.). As the thief’s network grew, his crimes grew, which in turn increased his criminal social capital.

A criminal usually cannot persist in criminal behaviors on his/her own. Instead, criminals work with close associates in their relative criminal field (burglary, fencing stolen goods, smuggling, extortion, etc.). This group of associates has been termed a "near group." A near group can have qualities that resemble a gang, but it is less organized and focused more on crime than the maintenance of the group as a coherent unit. This near group can provide a network of trusted supporters for any variety of criminal endeavors. Additionally, the norms of behavior within the near group provide a means to persist in criminal behavior. Consider Warr’s (2002) explanation of peer pressure (which can persist throughout one’s life): Membership in a group necessitates being loyal to the group and its members. This loyalty serves to maintain and support any existing social network. Additionally, belonging to a group necessitates holding status within the group. These concepts combine to provide a way for a career criminal to persist in crime, be supported in criminal efforts, and gain status (increasing criminal social capital) within his/her near group.

Older criminals who hold criminal social capital are, by default, tied into their local communities and can identify instances (opportunities) where action can be taken (positive or negative). It is important to consider the effects that social bonds can have on offending adults. While criminals may often lack the positive social bonds that assist in social control, adults involved with criminal behavior—through near-group relations—have established strong bonds with other criminals in their social networks. Therefore, as chance life events happen (i.e., the inability to pay for unexpected medical treatments), these antisocial bonds can provide the means to close the financial gap. An aging criminal population experiences the same type of life events of any aging population, so the ability to respond to them outside of legitimate ways is necessary.

While actual criminal behaviors may change due to the effects of aging, the perpetrators may still persist in their criminal ways, efforts that can be inadvertently supported by the lack of legitimate support services for the elderly in America. In order to qualify for many social services, the individual must have had legitimate employment to obtain such services as Social Security benefits, unemployment benefits, etc. Therefore, the commission of crimes may be the only method of income an aging criminal may have.

ORGANIZED CRIME AND WHITE-COLLAR CRIME

The main goal of any career criminal is profiting while minimizing the risk of arrest or death. There are two forms of criminal behavior clearly connected with establishing a career as a criminal. The first form, organized crime, historically follows a career path that begins with juvenile delinquent acts and graduates to more profitable crimes, eventually becoming part of an organized crime group. The second form of criminal career, white-collar crime, utilizes a lifetime of social capital to commit fraud, embezzlement, or other forms of corporate or political crimes.

Some of America’s most well-known mafia figures died or were imprisoned while still leading their criminal organization. For example:

- Carlo Gambino, leader of the Gambino family of New York, died while in power at 74 years old.
- Carlos Marcello, mafia chief of New Orleans, was incarcerated while still in power at 73 years old.
- Thomas Lucchese, leader of the Lucchese family of Brooklyn, died while in power at 67 years old.
- Santo Traficante, mafia chief of Tampa, died while in power at 72.

Concerning white-collar crime, the more successful criminals need to have acquired the social capital to rise to positions that enabled them to manipulate or access the material that was the criminal event. Consider:

- Bernie Madoff’s investment swindle ended when he was convicted at age 72.
- Kenneth Lay’s accounting fraud led to the Enron scandal; he was convicted at 64 years old.
- Bernard Ebbers, the chief executive of Worldcom, was convicted of corporate fraud at 63 years old.
- President Richard Nixon was 61 years old when he left office over the Watergate Affair.

There is no evident similar pattern of women as career criminals. Most of the characters are often arrested or killed as they approach 50 years old. The singular exception is Griselda Blanco, known as La Madrina (the Black Widow) and the Cocaine Godmother, who was deported to Colombia following her 20-year prison sentence. She was 69 when killed, but there is no evidence that she was active in the Medellín Cartel at the time of her death.

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Successful aging is perhaps a goal for most people, both young and old. Most of us want to age well and look for ways to do so, yet aging well can be a difficult goal to reach given the faulty beliefs and stereotypes about older people and the aging process. By subscribing to those beliefs, people often become the victim of their own biases and lack of knowledge about the aging process, further undermining the odds of them aging well. Indeed, we live in an ageist culture, i.e., one which both explicitly and implicitly separates younger and older people. This lack of interaction between different generations often leads to misperceptions of one another and to a lack of communication borne of a paucity of knowledge and fears about aging. This undermines opportunities for meaningful relationships between generations – relationships that are based upon mutual sensitivity to, trust in, and respect for each person’s individuality.
That we first look at adults as individuals who happen to be of a certain age is based on the fact that as we age, the magnitude of differences between individuals increases. Consequently, chronological age becomes less relevant to understanding adults and older people, especially as they enter their 60s, 70s and 80s. This increased diversity among individuals across increased chronological age is referred to as the "fan effect." This diversity is in direct contrast to the generalizations we might make about younger, middle-aged and older people. Such generalizations, or stereotypes, are therefore inaccurate because they do not take into consideration the diversity among people that exists in adulthood.

Defining successful aging: three important dimensions

What does it mean to age well? While successful aging as a concept continues to elicit debate and discussion, it has remained a core assumption pertinent to how we age that has guided gerontological research and practice throughout the last 30 years. In a series of landmark writings, Rowe and Kahn (1997, 1998) defined successful aging in terms of three key components.

The first of these is having a low probability of disease and disease-related disability; this refers not just to the presence or absence of disease, but also to the presence or severity of risk factors for disease, as in living a healthy lifestyle via getting regular exercise, eating a balanced and nutritious diet, or avoiding and/or learning to cope with stress.

The second key component of aging well is having high levels of cognitive and physical functioning. This refers to not just what people could do, but what they actually do on a daily basis to maintain health and vitality, prevent decline, and both maintain and enhance their physical health as well as intellectual health and vitality. Examples include going on a diet, beginning an exercise program, reading, returning to school to earn a degree, attending lectures, listening to educational programs, enrolling in lifelong learning classes, solving challenging crossword or Sudoku puzzles, or taking steps to improve memory skills. Indeed, much research indicates that cognitive functioning can be enhanced in later life in several ways; for example, by reducing our anxiety about failure, in acquiring new skills, or in forming new collaborative relationships at work, in retirement, or in the context of everyday life.

The third dimension of successful aging is being actively engaged with life. This refers to having meaningful and satisfying interpersonal relationships and engaging in productive activities with others, as in being involved in family activities, seeking enriching and fulfilling relationships with friends, neighbors or co-workers, as well as providing instrumental and emotional support to them in times of need.

Successful aging and positive spirituality

A last and more recently recognized dimension of successful aging is having positive spirituality. Spirituality reflects a belief in a higher power that guides us through life, feeling connected to self and others, and being able to draw on our inner resources, such as strength or peacefulness. Though people may express their spirituality in uniquely public and private ways, being
community-oriented and other-focused as well as purposefully involving oneself in the lives of others are often manifestations of spirituality. Likewise, being religiously involved in a formal sense (i.e., through prayer and church attendance), though distinct from spirituality, can provide opportunities to participate in community activities which are positive in nature and contribute to the quality of one's life as well as others' lives.

Examples of positive spirituality, which gives our lives meaning and purpose, include doing volunteer work, serving on community boards and committees, and being actively involved in the work of one's church. Research suggests that positive spirituality predicts better health, enhances quantity and quality of life, lessens depression and loneliness, enhances immune system function, and helps one cope in the face of illness and loss (Sadler and Biggs, 2006).

Successful aging is dynamic and multidimensional in nature

It is clear that successful aging is a complex, multidimensional concept where each of the above four domains influences and is influenced by the other. For example, poor health may limit one's contact with others or prevent one from taking a daily walk with a spouse or a friend. Likewise, being isolated from others robs one of the stimulation of having engaging and stimulating conversations, as when people discuss current events or politics. Being isolated from others may undermine opportunities to travel, attend a lecture or a book club with others, or prevent one from engaging in collaborative decision-making or problem-solving, as when persons seek advice from friends or family. Thus, as these examples illustrate, the domains of successful aging interact in dynamic ways and may have positive or negative consequences for individuals and their families.

An awareness of aging well is reflected in the importance that younger, middle-aged and older adults place on their health, remaining physically and mentally active, and on social relationships. Likewise, having a purpose in life; setting and achieving important personal, educational, family and job-related goals; and being able to adjust to life's challenges (e.g., poor health or disability, divorce, death, becoming a caregiver, losing a job) are all manifestations of our efforts to age well. Successful aging reflects positive efforts to proactively cope with these challenges, contributing to and reflecting personal resilience – the ability to bounce back from adversity and grow personally from having dealt with what life offers us.
Observations on aging well

Successful aging takes effort – it does not happen naturally nor on its own. People who age well are proactive in making choices about their lives, and they hold individualistic feelings about things that are important to them – family, work, retirement, health, relationships with others, spiritual beliefs, etc. Such people are committed to aging well each and every day and engage in behaviors daily that reflect this commitment. People who age well live in the present – they find something to enjoy each and every day. They are not consumed by what has happened in the past, nor are they preoccupied with what may or may not happen in the future.

People who age well adapt well to change and to events over which they have no control. In these respects, the SOC (selection, optimization, compensation) theory of adaptation to aging has been influential. The SOC theory proposes that people are selective about those areas of life and those relationships in which they invest their efforts and feelings. As it applies to relationships, this is termed socioemotional selectivity (Carstensen, 1995). This selectivity allows them to optimize their skills, enhance the quality of their lives, and contributes to feelings of well-being and life satisfaction. Optimizing permits them to utilize their cognitive and emotional resources to compensate and cope with physical decline, stress and loss (Baltes and Baltes, 1990).

Individuals who age well understand the importance of distinguishing between normal aging – those aspects of aging that are intrinsically linked to biological changes and heredity – and pathological aging, those aspects of aging which are influenced by disease, lifestyle, diet, activity levels, depression or loneliness. Consequently, they recognize that the manner in which they age is unique to them and that people age at different rates, borne of differences between persons in heredity, life experience and strategies they use to help them cope with life events.

Successful agers are knowledgeable about aging, and they do not subscribe to the many negative myths and stereotypes of growing older; for example, that aging is all downhill, that older people cannot change, or that aging is characterized by depression, loneliness, and a bleak future filled with loss and decline. Alternatively, successful agers recognize that positive stereotypes of aging can be equally harmful – that old people continually are reminiscent about the past and take a rocking-chair approach to getting older, withdrawing from life to make room for younger people.

Persons who age well understand that many aspects of aging are indeed under their control – that aging is modifiable, and people can change their behavior and therefore lower their risk for disease (e.g., blood pressure, levels of physical activity, body fat percentage) and increase the quality of their lives. In addition, the knowledge that chronic stress undermines the immune system’s ability to respond to infection and fight illness is critically important in coping with stressful life experiences that sometimes accompany the aging process. Successful agers know that they can acquire and maintain new skills and attitudes toward what happens to them. They create new opportunities to learn new things.

Aging well is about variety; variety is challenging and stimulating. However, too much or too little variety predicts poorer functioning; matching the demands on us to our skills and abilities is key. Find your comfort zone, and then push the limits every now and then! Aging is also about how we respond to stress and change. Accurately assessing events with which we must cope, ascertaining our resources in doing so, and adapting helpful coping strategies are all key skills to develop in learning to cope with stress and change. Treasuring old relationships and developing new ones, being open to new experiences, being flexible, and becoming resilient (bouncing back after adversity, patience in doing so) are also important.

Perhaps most importantly, aging well is about attitude. Adopt a realistic but positive and optimistic attitude about aging. Have self-confidence in your ability to change, adapt and learn. Exercise control over these aspects of life that you can, and do not buy into aging stereotypes. Define your own aging; do not allow others to do that for you. Make a commitment to age well on a daily basis – begin today!

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Life would be so simple if this quote by Benjamin Franklin was actually true. While the concepts in the statement cannot be overlooked in terms of wellness, many more components come into play. Focusing on all of the components of wellness does not guarantee a lifetime of health, wealth and wisdom, but it is a step in the right direction.

Wellness is a relatively new term. Thirty years ago, health was defined as "the absence of disease." At that time, diseases were only considered to be physical illnesses, and they did not include mental illness, alcoholism or other addictions. Today, wellness incorporates many more aspects of our overall health, and many wellness models have been proposed since. Here, we will examine the most comprehensive wellness model.

The wellness model to the left depicts eight different components of wellness: social, emotional, occupational, environmental, intellectual, spiritual, financial and physical. Social wellness focuses on how to connect with community and people. Emotional wellness looks at the actions taken in response to feelings. Finding work that is self-fulfilling and contributes to the community ensures occupational wellness. Examining one's impact on the environment is environmental wellness. Intellectual wellness means feeling stimulated and staying open to new ideas, while spiritual wellness refers to understanding place and purpose and where the mind goes for relief. Having a healthy relationship with finances and spending and making good consumer choices enables financial wellness. Physical wellness refers to the role taken in maintaining the body for strength, vitality and energy. While these definitions may clarify each component, they do not give instructions on how to “be well.” Here are some suggestions for each of these components.
SOCIAL WELLNESS

Finding ways to feel involved is imperative to social wellness. There are many options to find ways to connect:

- Join a church.
- Volunteer.
- Take classes.
- Join a gym.
- Find a club that interests you (book, hobby, fitness, etc.).
- Try new things.

In addition to these things, staying connected with current contacts is important. Instead of always texting or emailing, plan to meet friends in person. If that cannot be done, Skype or FaceTime with family and friends. Often the people with the fewest real social contacts have higher rates of depression.

PHYSICAL WELLNESS

There are three essential components to physical wellness. These include managing nutrition, getting enough sleep and getting enough physical activity. Basic guidelines for good nutrition include:

- Drink enough water.
- Eat a primarily plant-based diet free of meats high in fat and cholesterol.
- Eat primarily whole-grain breads and cereals.
- Eat nuts regularly.
- Eat breakfast regularly.
- Choose healthy fats.
- Keep a caloric balance in order to maintain a healthy weight.

While these tips are helpful, sometimes they are difficult to put into action. Planning is essential when trying to maintain a healthy diet. Eating well might entail weekly shopping trips followed by packaging up snacks and prepping meals. When it comes to nutrition, failing to plan is planning to fail!

Sleep is also an aspect of physical wellness. Sleep is difficult because not everyone requires the same amount of sleep, but everyone requires an adequate amount. Some sleeping tips include:

- Establish consistent sleep and wake schedules, even on the weekends.
- Create a regular, relaxing bedtime routine.
- Create a sleep-conducive environment that is dark, quiet, comfortable and cool.
- Find a comfortable mattress and pillows.
- Use your bedroom only for sleep and sex. No watching TV, using a smartphone or computer, or reading in bed.
- Finish eating at least two to three hours before bedtime.
- Get regular exercise.
- Avoid caffeine and alcohol close to bedtime.
- Give up smoking.

The final aspect in physical wellness is physical activity. The U.S. Department of Health and Human Services recommends that adults get at least two hours and 30 minutes of moderate-intensity physical activity per week. Further, it suggests that more benefits can be obtained if activity is increased to five hours of moderate-intensity physical activity per week. In addition, adults should also do at least two days per week of muscle-strengthening exercises. By including physical activity in daily routines, weight gain is kept in check, and the risk of developing type 2 diabetes, high cholesterol and high blood pressure are all reduced. Exercise also allows for ease of movement in daily activities, including grocery shopping, walking up and down stairs, and maintaining balance.

While being physically healthy will likely prolong life, if our lives are not fulfilled in other areas, we can suffer and not have quality of life. This is where the other components of wellness play a crucial role.
OCCUPATIONAL AND INTELLECTUAL WELLNESS

Being occupationally and intellectually well requires soul-searching. If work does not bring fulfillment, it may be time to change focus. Mental stimulation via additional education might be the spark needed to move on to a new job via promotion or a new line of work altogether. Challenging queries into opinions and ideas can hone intellectual skills, too.

EMOTIONAL WELLNESS

Many illnesses encountered today have nothing to do with having a fever or a cold. Many of our diagnosed illnesses are emotionally driven, including depression, bipolar disorder and panic attacks. While some of these are chemically driven and medication is a medical necessity, keeping emotions in check may keep these conditions from exacerbating. Having a social network has been shown to help with these illnesses, and finding active ways to deal with stress can help as well. Some people rely on religion to help them through these times, others seek the help of a counselor and others take prescription medications. All of these methods can be helpful and sometimes the best results are achieved by a combination of all of these methods.

One of the main reasons for emotional distress is stress. It is important to look at stressors in a new light. Interestingly, many times stress is self-induced; reactions to stressors are a choice. What some may see as a stressor, others may see as a minor inconvenience. In the same way, what caused stress 10 years ago might not be a bother today. If running late for an appointment, traffic can induce a ton of stress. If it is a beautiful day and the windows are down and music is on and we have no place to be, stress can be greatly reduced. One thing that is important to note is that too much negative stress can have a negative impact on the immune system. Stress releases cortisol, which causes the body to hold on to fat. Keeping stress in check can help efforts to be well.

Thirty years ago, health was defined as "the absence of disease."
SPIRITUAL WELLNESS

Spiritual wellness does not necessarily mean having a relationship with a god or a specific church, though it can mean that. Being spiritually well means connecting with a purpose, seeing beauty in nature, finding peace in decisions, feeling guided and forgiving others. Many times, the spiritual connection found in going to church also helps to build social connections, an example of how these components of wellness can overlap.

FINANCIAL WELLNESS

Last but not least, financial wellness is the final piece of the wellness pie and also the component that could allow the “wealthy” part of the Benjamin Franklin quote to come to fruition. Depending on age, wealth can mean a variety of things. The younger the individual, the more valuable it is to start smart financial planning. Getting into debt at a young age can be debilitating later in life or if a layoff occurs. Investing early pays great dividends because of the way investments have the potential to compound. Thoroughly examining all purchases before buying them is imperative, and buying things only when they are needed and not necessarily wanted can help, too. The older the individual, the more important it becomes to be financially conservative, unless earlier financial planning has been profitable.

While it would be wonderful to simply go to bed early and wake up early and become healthy, wealthy and wise, it is evident that we have to put forth a little more effort than that.

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Soazzo, Abdelhameed El-Shaarawi and Yann Ranorovolanalo at Ngorongoro National Park.

Ngorongoro National Park

(left to right) Solazzo, Abdelhameed El-Shaarawi and Yann Ranorovolanalo at Ngorongoro National Park.

Giant outdoor market

Solazzo (right) at a giant outdoor Tanzanian farmers market.

The plains of Tanzania
Jim Solazzo has a new favorite greeting and a new favorite country.

"Jambo!" is how you say hello in Swahili, the language of the Tanzanians in East Africa. Solazzo, associate professor of mathematics at CCU, recently returned from Arusha, Tanzania, where he participated in Africa's Next Einstein Initiative (NEI), a core program of the African Institute of Mathematical Sciences (AIMS).

During his 25-day stay, he taught an intensive three-week course in advanced linear algebra with applications to coding theory and signal processing. Thirty-nine African students who are working on their master's degrees in the mathematical sciences participated. The students hailed from 10 different African countries, including Ghana, Cameroon, Senegal, Kenya and Sudan.

"Language was not an issue," says Solazzo, who picked up a few Swahili words here and there. "All the kids who participate in the AIMS program in Africa know English."

The training was a "24-hour learning experience" where students and teachers lived together in a six-story hotel, often working together into the wee hours on mathematical problems. "I assigned them a lot of work," says Solazzo, who rejoined the students nightly from about 9 p.m. to midnight before "begging them to go to bed and get some rest."

In addition to Solazzo, there was another professor and another lecturer, each teaching a two-hour course daily Monday through Friday. The students were ages 22 to 29, with 13 women and 26 men. "They were the brightest and best students, very motivated," says Solazzo, who can't wait to go back next year.

During his free time, he went on some trips to the Ngorongoro Conservation Area, a deep, volcanic crater about 12 miles in diameter where elephants, wildebeests, giraffes and other African wild animals live protected and free.

"When I told people I was going to Africa, they mostly thought of Ebola and health risks," says Solazzo, who plans to take his family with him next spring. "You probably have a higher risk of getting Ebola in Dallas. The country was just breathtaking, and the people are so friendly."

AIMS is a pan-African network of centers of excellence for postgraduate training, research and outreach in mathematical sciences. The Tanzania center where Solazzo worked is in its inaugural year. The vision is to lead the transformation of Africa through innovative scientific training, technical advances and breakthrough discoveries that benefit the whole of society. The mission is to enable Africa's brightest students to flourish as independent thinkers, problem solvers and innovators capable of propelling Africa's future scientific, educational and economic self-sufficiency.
Coastal Carolina University began offering the nursing major in the spring of 2011. One local employer of nurses developed a plan to increase the percentage of baccalaureate-prepared nurses employed in its facilities, and the College of Science stepped up to help fill that need. As a profession, nursing is unique in that there are varied pathways to enter professional practice. Graduate nurses can enter nursing from diploma, associate degree, baccalaureate degree, accelerated/second-degree baccalaureate programs, as well as Master of Science programs. Graduates of all pre-licensure nursing programs are eligible to complete the same national licensing exam, and, if successful, hold the same license. There is no differentiation in the license based on academic preparation, and usually there is no differentiation in salary—two things that have discouraged many potential nurses from pursuing the longer and more expensive baccalaureate pathway.

The 2010 Institute of Medicine (IOM) report on the future of nursing recommends raising the proportion of baccalaureate-prepared registered nurses to 80 percent by 2020. At this time, less than 40 percent of the registered nurses (RNs) licensed in South Carolina have a Bachelor of Science in nursing (BSN). The IOM report also recommends core knowledge for all registered nurses, continuation of lifelong learning, and seamless transition for increased education across the career ladder (IOM, 2010). In addition, the American Nurses Credentialing Center (ANCC) Magnet Recognition Program includes the BSN staffing mix in the criteria during the evaluation of a potential Magnet facility (ANCC, 2013).

Neither IOM nor ANCC say the 80 percent mark should be a hiring benchmark, and there are a variety of options to achieve the 80 percent goal. While some hospitals plan to achieve it by only hiring BSN-prepared nurses, there is wide geographical variation in that hiring trend.

**Overview**

In October 2010, the IOM and the Robert Woods Johnson Foundation (RWJF) launched a two-year initiative to respond to the need to assess and transform the nursing profession. The Future of Nursing: Leading Change, Advancing Health proposed four key messages: nurses should practice to the full extent of their education and training; nurses should achieve higher levels of education and training through an improved education system that promotes seamless academic progression; nurses should be full partners with physicians and other health care professionals in redesigning health care in the United States; and effective workforce planning and policymaking require better data collection and information infrastructure (IOM, 2010). As the single largest group of health care professionals in the United States, nurses can and should play a fundamental role in the transformation of our profession, and of the health care system in which we provide nursing care. The full report and report briefs are available at www.iom.edu/nursing.

In 2010, eight percent of RNs in South Carolina held a diploma as their highest academic credential, and 51 percent held an associate degree (SC Nurse Supply Factsheet, 2010). A total of 32 percent of
S.C. nurses hold a baccalaureate degree, with only eight percent holding a master’s degree, and one percent holding a doctorate. Transitioning from 32 percent of the South Carolina nursing workforce holding a BSN to 80 percent of the workforce holding a BSN will require the collective efforts of both employers of nurses and universities.

Focus on education

The focus on education addresses both changing student demographics and changing complexities of patient care and patient care settings. Nursing curricula need to reflect the changing demographics of the nursing profession, such as community-based care, chronic disease care, care of the aging population, evidence-based practice, and competencies in decision-making, quality improvement, systems thinking and team leadership. In addition to the better educated workforce needed to support the changing health care environment, an increase in the proportion of nurses with a BSN creates a workforce ready to move on to the master’s and doctoral levels, required for nurses who want to serve as primary care providers, nurse researchers and nurse faculty.

The IOM report also states that the variety of current educational pathways to an RN license contribute to the diversity of the nursing workforce by providing opportunities for academically and socially disadvantaged women and men, including those from diverse backgrounds, to prepare for a professional career in an economically stable field. The IOM report goes on to state that the increased and evolving demands of a complex health care system require a more educated nursing workforce, while acknowledging the barriers to educationally and financially disadvantaged students trying to enter a pre-licensure bachelor's program. One wide interpretation of the report is that nursing should continue to prepare nurses at the associate degree (ADN) level to encourage opportunities for a more diverse workforce, but then those ADN-prepared nurses need to continue their education at the baccalaureate level and beyond. RN-to-BSN completion programs are one way to accomplish that.

Achieving the 80 percent ratio

The IOM report discusses traditional RN-to-BSN programs, traditional four-year BSN programs at universities and some community colleges, articulation agreements, and programs that allow for automatic and seamless transitions from an ADN to a BSN program. The report does not state that a BSN should be the only entry requirement for initial licensure. Some states have statewide RN-to-BSN articulation agreements, as well as bridge programs or other educational pathways between undergraduate and graduate programs—specifically programs such as LPN-to-BSN, ADN-to-BSN, and ADN-to-MSN programs designed to facilitate academic progression to higher levels of education.

Achieving the 80 percent benchmark will require changes to the educational system to include educating diploma and ADN students that their programs are starting points for their professional education and to develop RN-to-BSN programs that not only enable seamless transition, but also recognize that RNs who are employed in the health care workforce have far more demands on their time than a traditional baccalaureate student. Coastal Carolina University’s RN-to-BSN program is making those changes. Our RN-to-BSN program is offered in a hybrid format, and class meetings (about twice a month) are on Saturdays. Faculty visit first semester and last semester students in the ADN program at Horry Georgetown Technical College to encourage them to pursue a BSN at any institution available to them, and to provide the information about the seamless transition available to Coastal due to our articulation agreement. In addition, nursing faculty visit area hospitals several times a year for marketing and recruitment to explain the program to nurses who are working in those agencies, and we have spoken to local professional associations.

While there is much literature that supports the BSN as the educational standard for practicing nurses, traditional BSN programs will need to make themselves more attractive to males and minorities or the nursing profession will decrease in diversity at a time when the diversity of the United States continues to increase. The RN-to-BSN completion program at Coastal has an ideal opportunity to help maintain the diversity of the existing RN workforce while also providing opportunities for progressing to a baccalaureate degree.

CCU’s RN-to-BSN completion program is one successful example of implementation of the IOM recommendations for seamless transition in the educational system and for increasing the number of baccalaureate-prepared nurses, and increasing the potential pool of applicants to nursing graduate programs. The program began with 11 students in January 2011, and had an enrollment of 55 students in the major in January 2015. Since the RN-to-BSN completion program accepted our first RN students, CCU’s program has added almost 100 baccalaureate-prepared nurses to the local and regional workforce.

References

The seaward extension of the coastal zone, or the continental shelf, is much less visible and, thus, much less understood and more a matter for concern than the shores themselves. We use this natural resource intensely every day — for recreational and commercial fishing, cargo and human transportation, constructional and beach-nourishment sand dredging, runoff and sewage water disposal, material dumping, and offshore energy production by hydrocarbon exploitation or wind power. The continental shelf seabed deposits represent the most proximal sink for continental material on the marine side, while storing sands, muds, organic matter and contaminants. At the same time, they serve as a highly diverse habitat for benthic life and as a natural material source for sands that feed the white Grand Strand beaches.

Geologists like to reconstruct past climatic, oceanographic or sedimentary processes as an analogue to modern of future environmental conditions and changes. Thus, continental shelf research has by its nature a high socio-economic relevance. What this type of research requires is an ocean-suited vessel, an expensive endeavor. Those vessels are
equipped with high-quality seismo-acoustic instrumentation for the visualization of internal structures in the water column, the seabed topography, and the sub-bottom deeper depositional architecture. Also, sediment sampling and coring is an integral prerequisite, plus an enthusiastic scientific team. Bringing all this together promises great results and great fun. I personally consider offshore research to be a great privilege, as I am aware that this sort of investment of tax money is a great commitment for best state-of-the-art research.

Geological processes do not know political borders, but require the work at those geographical locations where the respective processes of interest can be best understood. The U.S. Atlantic shelves are, for instance, generally characterized by low sediment availability and to certain extent by storm events. The type of locality needed to study the processes that have ultimate control on sediment dispersal and deposition dynamics is located, however, off northwestern Spain because this region is centered inside the main track of approaching winter low-pressure storm systems.

Due to these circumstances, we conducted a two-week cruise with the German research vessel Meteor to the northwestern Spanish/Portuguese waters (September 2014). The group of participants from six inter-national institutions (CCU, MARUM/Germany, University of Vigo/Spain, Hydrographic Institute/Lisbon, University Tallinn/Estonia, SYS-University/China) covered a wide range of scientific expertise of physics, oceanography, hydrodynamics, geology and sediment modeling. Learning to understand the scientific language of each other was a prime challenge on the cruise, but the results were more than exciting.

Among other targets, we investigated a confined, 50-kilometer-long elongated depocenter which is located in mid-shelf position at 100-140 meter water depth. These depocenters or mudbelts (most of them are actually built up by fine sands and coarse silts) represent an especially sensitive habitat because they form under hydrodynamically calm conditions; thus, they act as a cradle of life for fish larvae. From our previous studies, we know that only 35 percent of the river suspension load supplied to the ocean does settles in the mudbelt zone. The majority of the suspended sediments, approximately 65 percent, passes through the shelf system and disappears forever in the deep open ocean. The human impact on the budget of this fine-grained material is heavy, whether the distortion is related to river damming leading to a 90 percent reduction of modern sediment discharge to the ocean, or to the chronic bottom trawling activity which leads to massive artificial resuspension of the seabed sediment and its lateral dispersal. A scientific consultation in terms of management or preservation strategies of these shallow-water depocenters is difficult, however, since the understanding of the processes that control the place where these deposits form is extremely sparse.

During the aforementioned 15-day cruise last September (acronym GALIMOS), the School of Coastal and Marine Systems Science was represented by the author as chief scientist, its director Paul Gayes and master’s student Aundrea Dolan. We focused on the structuring of the water column in an attempt to unravel how hydrodynamic elements interact with local seabed topography. We ran numerous acoustic profile surveys, placed a frame (mooring) with sensors on the seabed for 10 days, and took a large number of water samples and sediment cores.
One major finding of this expedition was the presence of a number of internal interfaces at intermediate depths within the water column. These interfaces seem to serve as a medium of travel for internal wave trains. These wave trains themselves transport energy to the seabed where they hit the ground, leading to local, intense sediment resuspension. This process seems to compete with the storm scenarios, during which the surface-wave base deepens significantly (even down to 150 meter water depth!). Luckily (though a bit inconvenient for the human beings on board), a three-day storm system passed through our study area when the sensor-bearing frame was moored on the seafloor. The data sets we received are of unique value and promise outstanding interpretations (and may justify the 50 k€ damage the mooring experienced later on because of an intentional dredging action by a hostile trawler...).

In addition to the previous experiences, we studied the dynamics of fine-grained depocenter formation in March 2015. The German research vessel Poseidon brought us to the Gulf of Cádiz (southern Spain) for 15 days. It was an honor to lead this campaign as the chief scientist, accompanied by two master’s students of our school, Mary Lee King and Matthew Kestner. This collaboration between CCU, MARUM at the University of Bremen/Germany, the University Granada (Spain) and the Spanish Geological Survey (Madrid) focused on a series of confined depocenters that are the product of multi-source fluvial sediment supply and oceanographic processes that still need to be elaborated. Each of these sediment depocenters is assumed to have an individual formation history and therefore contains highly valuable and sensitive information concerning the regional sediment distribution dynamics, the variability of the various oceanographic forces (sea level, currents, storm waves, tides, internal waves), and the climate-related continental runoff/riverine sediment supply.

The superordinate scientific targets of this cruise (acronym: CADISED) were to:

1. develop a comprehensive sedimentary-stratigraphic model on the origin of locally confined deposits on the shelf;
2. broaden the poor knowledge on sediment depocenters with special emphasis on their development dynamics;
3. calculate, as the most significant aspect, a marginal-marine sediment budget along defined time slices for late-glacial, deglacial and Holocene times;
4. use Holocene highstand muddy depocenters as sensitive archives with the aim to reconstruct past environmental variability at best temporal resolution in a regional (and Atlantic-wide) context; and
5. quantify the influence of the involved forcing mechanisms in terms of oceanography, morphology, material input and neotectonics.

The research vessel Poseidon has been in operation since 1973 but is still in very good shape due to the diligently undertaken technical maintenance. This 60-meter-long multipurpose research vessel is large enough for up to three-week lasting offshore expeditions, and the crane infrastructure allows for 6-meter-long gravity and vibro coring. On the other hand, the vessel is so small that the 10 scientists on board had no other choice other than to work as an integrated unit with each other; there was always a job for any occasionally free hand. Besides the extended acoustic surveying we took about 45 sediment gravity and vibro cores all over the Gulf.

The following post-cruise sampling party, in late summer 2015 in Bremen, brought all participants together again. We shared the material and came up with the best suited analytical strategy, as well as enjoyed some great German beer, bread and sausage nights. This party (the sampling party) was organized by our colleagues at MARUM, where two of the worldwide largest core repositories are located. They maintain 230 kilometers of IODP cores and 30 kilometers of gravity cores, mainly taken from the Atlantic Ocean realm. By combining the different acoustic data sets with the information extracted from the sediment samples, we are optimistic that we will get a meaningful estimate of the material budget in the Gulf of Cádiz for the modern system as well as, in lower precision, for the evolution during the past 20,000 years.

Ahoy! ☀

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