In this issue of Progression magazine, 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.

While there is construction going on all around the University campus, the College of Science recently celebrated the formal groundbreaking for our next major construction project. The construction site has been cleared for the new 65,000 square-foot "Science II" building, and the initial foundation work should have commenced by the time you are reading this issue of Progression. The completion of this building in the spring of 2016 will finalize the realization of the "Science Quad" and begin the final stage of consolidating all of our undergraduate science programs onto the main campus. The culmination of this process will be the renovation of the Smith Science building and the construction of the next Academic Classroom building, this one to be located adjacent to the Wall Building.

If you have any questions concerning our science programs or want more information on any of the articles in this issue, please do not hesitate to contact me or the specific authors. My phone number and e-mail are listed below; you can also follow me on Twitter @CCUScienceDean. If you wish to make a donation to support the work that we do, please contact the gift officer for the College of Science, Bryan Steros, at bsteros@coastal.edu.

I hope you all had wonderful holidays, and I look forward to seeing you at Coastal Carolina University.

Regards,

Michael H. Roberts, Ph.D.
Vice President for Research and Emerging Initiatives
Dean – College of Science
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The Department of Marine Science currently enrolls approximately 800 majors and 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 newly emerging doctoral program in Coastal and Marine Systems Science. Marine science is an interdisciplinary field that uses biology, chemistry, geology and physical oceanography/atmospheric science in the study of the ocean. Lecture, laboratory and field experiences are integrated to provide an outstanding and well-rounded academic program. Within marine science, you may choose to concentrate your studies in one of the following areas: marine biology, coastal geology, marine chemistry, atmosphere/ocean dynamics or marine analytical technology.

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. Some of these study opportunities include offshore wind energy, the development of hypoxia in the coastal zone of Long Bay, S.C., mercury cycling and bioaccumulation in aquatic plants, the development of genotypic tracers of pollution sources for S.C., population structure and feeding ecology of sharks in S.C. estuaries, foraging interactions between birds and bottlenose dolphins in S.C. salt marshes, coastal salt marsh ecology, and oyster reef restoration.

As a marine science major, you are encouraged to get involved with research or internship experiences, which can help you get into graduate school, get a job or make contacts within the discipline of marine science. Each year, many of our students work individually with faculty to complete semester-long independent research projects or internships for credit. More than half of these students present their findings at state, regional, national and international scientific conferences.

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. Please visit the Department of Marine Science website at coastal.edu/marine/. Jane Guentzel can be reached at jguentze@coastal.edu or 843.349.2374.

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. Students are encouraged to present findings at local, regional and national conferences and pursue journal article publication with faculty mentors. Motivated majors may find additional opportunities to join faculty research labs as research assistants. Students may also choose to participate in internships with mental health facilities, counseling centers, community organizations, government agencies and businesses. Research and internship experiences enhance student career prospects for employment and graduate programs.

Please visit the Department of Psychology website at coastal.edu/psych. Terry F. Pettijohn II can be reached at pettijohn@coastal.edu or 843.349.6447.

This is an exciting time to explore the Department of Sociology. Due to recent growth in both Sociology and Psychology, we have split our combined department into two freestanding units. 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. Aside from our long-standing concentrations in Social Justice, Criminology, and Health and Medicine, we also offer minors in Criminology and Sociology. Further, we house the Social Justice Research Initiative where our students work with faculty to make positive changes on our campus and in the larger community. Additionally, we have a wide variety of internships available to our students.

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 presented their work at regional and national conferences, and some have had their work published, too. The Sociology Department also affords students the opportunity to join AKD, the International Sociology Honors Society.

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. Clearly, with coursework like this you can expect some very interesting classes.

We encourage you to explore our revised Sociology Department website. Robert Jenkot can be reached at rjenkot@coastal.edu or 843.349.2274.
Welcome to the Department of Mathematics and Statistics at CCU. Our primary goal as educators 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.

A degree in mathematics opens up many exciting job opportunities in business, industry, government, actuarial science, technology and education. Furthermore, the mathematics degree lays a solid foundation for continued study at the graduate level in any of the mathematical sciences.

At Coastal Carolina University, 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. We also offer motivated students the opportunity to do research at the undergraduate level.

Please visit the Department of Mathematics and Statistics website at coastal.edu/math. James Solazzo can be reached at jsolazzo@coastal.edu or 843.349.2717.

In the Department of Kinesiology, Recreation and Sport Studies, our business is to study human movement through a variety of applications, and business is good. Under the KRSS umbrella, graduates of the exercise and sports science (EXSS) major are trained to assess, design and implement individual and group exercise programs. Graduates of the recreation and sport management (RSM) major learn to manage recreation and/or sport facilities, supervise and plan indoor and outdoor recreation and sporting events, and develop recreation and sport services among diverse settings and populations. To keep pace with our growing enrollment, we have added four new faculty members this year. KRSS is now the largest academic department on campus, housing almost 1,000 undergraduate majors.

Exciting things are happening in both the EXSS and the RSM programs. We have moved the RSM program back to our "home" base and are excited to be collaborating in the same physical location. We have added additional laboratory facilities to better facilitate experiential learning in EXSS lab courses. EXSS continues to conduct meaningful research in areas such as balance training, active gaming, cognitive training and motor timing.

EXSS faculty and students also provide real-world experience and service-in-fitness assessment and prescription. RSM faculty continue to challenge and engage students through a wide variety of active research and experiential learning in areas such as sport marketing, hazing, college sports and senior sport participation. Given all the things our faculty and students are doing, I extend an invitation for you to join our momentum.

Please visit the Department of Health Sciences website at coastal.edu/health-sciences. John Yannessa can be reached at yannessa@coastal.edu or 843.349.6460.
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 take pride in providing excellent opportunities for learning inside the classroom and out. Our faculty have varied research interests, and we provide opportunities for undergraduates to participate in that research.

Please visit the Department of Biology website at coastal.edu/biology/. Michael M. Pierce can be reached at mpierce@coastal.edu or at 843.349.6483.

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 the Department of Chemistry and Physics website at coastal.edu/chemphys/. David Evans can be reached at devans@coastal.edu or 843.349.2209.

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS
William M. Jones, Ph.D.
Department Chair
The Department of Computer Science and Information Systems at CCU has recently been updating and expanding its curricular offerings. In addition to the two existing undergraduate degree programs, a B.S. in computer science and a B.S. in information systems, the department has recently designed and implemented a new B.S. degree program in information technology.

The faculty has worked closely with Horry Georgetown Technical College in an effort to leverage its existing two-year program in computer technology as a natural feeder for the new four-year IT program here at CCU. The S.C. Commission on Higher Education reviewed the complete proposal during the spring of 2014. Once approved by SC CHE and SACS, CCU began offering this new degree in the fall of 2014.

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 over 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, cyber security and CSIS education.

This fall, we welcomed a new member to our department, Cory Nance, a lecturer of computer science and information systems. After graduating from CCU with a B.S. in Computer Science, Cory earned a masters degree from Georgia Southern and obtained valuable experience as an employee at Horry Georgetown Technical College, prior to taking a position here at CCU. We look forward to working with him and to his future contributions to our department.

Please visit the Department of Computer Science and Information Systems website at cs.coastal.edu. 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 the 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 our 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.

Please visit the SCMSS at coastal.edu/scmss/. Paul Gayes can be reached at pgtayes@coastal.edu or 843.349.4015.
Your health is public health.
The health of your family is public health.
The health of the world population is public health.

Public health has a clear vision: healthy people in healthy communities. It exists to promote physical and mental health and to prevent disease, injury and disability. It functions to improve the living conditions and lifestyles of everyone. It connects us all to the central idea that each and every person deserves to live a life that is rich and meaningful and that provides them with resources to attain the basic necessities of life.

Public health workers know that knowledge is useful to promote health, prevent disease and help people discover how to live their best lives. Public health workers know that there are multiple interconnected factors that contribute to human health. Behavioral choices such as diet and exercise contribute about 40 percent. Genetic makeup such as predispositions contribute about 30 percent. Social circumstances such as education or socio-economic status contribute about 15 percent. Medical care such as access or quality contributes about 10 percent. And environmental conditions such as chemical, biological or physical hazards contribute about 5 percent.

Public health workers also know that about 95 percent of money spent on human health goes directly toward medical health care services (i.e., diagnosis and treatment of disease), while only 5 percent is spent on initiatives to improve health and prevent disease, injury and disability. As a result, leading experts on population health from the Robert Wood Johnson Foundation in Princeton, N.J., have made a bold statement:

"Policy makers need to begin thinking in terms of the health agenda rather than a health care agenda."  

It is therefore the responsibility of public health workers to be smart, ethical and resourceful. At the same time, it is the duty of public health workers to protect our health by safeguarding the places where we live, work and play through methods and activities that are grounded in science. According to the U.S. Centers for Disease Control and Prevention (CDC), the first ten public health achievements of the 21st century included prevention of disease by vaccines, prevention and control of infectious diseases, tobacco control, maternal and infant health,
motor vehicle safety, heart disease prevention, workplace safety, cancer prevention, childhood lead poisoning prevention, and improved public health preparedness and response. These accomplishments alone have saved billions of dollars in U.S. medical care services because people are living longer and healthier lives because of efforts in public health.  

There are many different career choices in public health. However, public health workers often work and study along five interconnected disciplines as defined below by the Association of Schools of Public Health (ASPH).

**Biostatistics**
the development and application of statistical reasoning and methods in addressing, analyzing and solving problems in public health, health care, biomedical, clinical, and population-based research.

**Environmental Health Sciences**
the study of environmental factors including biological, physical and chemical factors that affect the health of a community.

**Epidemiology**
the study of patterns of disease and injury in human populations and the application of this study to the control of health problems.

**Health Policy and Management**
the inquiry and practice concerned with the delivery, quality and costs of health care for individuals and populations; also the managerial and policy concern with the structure, process and outcomes of health services including the costs, financing, organization, outcomes and accessibility of care.

**Social and Behavioral Health Sciences**
the behavioral, social and cultural factors related to individual and population health and health disparities over the life course; also the development, administration and evaluation of programs and policies in public health and health services to promote and sustain healthy environments and healthy lives for individuals and populations.

The preceding disciplines represent the field of public health. Careers choices in public health can be found in all three work sectors: public, nonprofit and private. Individuals who work in the public sector work with federal, state, county or city government agencies or organizations. Individuals who work in the nonprofit sector work with organizations that provide services for public good to supplement or support public sector agencies. And workers in the private sector work with corporations, companies or other organizations operated by private individuals or groups to make a profit (money) for the owners, shareholders or the company. Additionally, public health workers often work alongside others in the health professions. Careers in the health profession work with individuals to diagnose and treat disease, often in medical or rehabilitation care facilities. Examples of such careers are nurses, physicians and physical therapists. For more information about careers in health, visit our website at www.coastal.edu/healthsciences/careersinhealth.

There is a current shortage of workers in public health to meet the needs of the local, national and global community. It is therefore the mission of quality and progressive educational institutions such as Coastal Carolina University to train the next generation of smart, ethical and resourceful public health workers.

Stephen Firsing can be reached at 843.349.6906 or sfirsing@coastal.edu.

**References**


Walking in the Footsteps of Charles Darwin

by Sharon L. Gilman, Ph.D.,
Associate Professor, Biology
Strangely, according to the most recent poll from the Pew Research Center (2014), more than a third of U.S. adults take a rather dim view of the whole idea of evolution of life on earth. I am not one of them. I love the idea. If one was charged with populating a changing planet, I cannot think of a better way to do it than via natural selection where the organisms with the right adaptations for their time and place reproduce and carry on, and those with the wrong adaptations do not. And so life changes through time to match changing conditions on earth. It’s a beautiful system.

I had the great good fortune, thanks to CCU, to visit the cradle of this idea this summer: the Galapagos Islands. Pam Martin, CCU associate professor of politics, lived in Ecuador and still collaborates with her former institution, the Universidad de San Francisco de Quito. At her suggestion, CCU has been pursuing an effort to enhance our partnership with USFQ, which runs the Galapagos Academic Institute of Arts and Sciences (GAIAS) in partnership with the University of North Carolina Chapel Hill. The GAIAS campus is on San Cristobal Island in the Galapagos. To do this, CCU developed a three-year initiative in 2012: Student-Faculty Engagement in Cooperative International Research Program at USFQ.

The goals for the program are:

1. To continue to fulfill the mission of our campus to create global citizens.
2. To encourage students to study abroad and/or experience the world outside of CCU and the U.S.
3. To provide quality academic instruction in a global environment.
4. To encourage faculty to broaden their research and teaching beyond CCU and their traditional geographic locales.
5. To develop common programs, initiatives, research and teaching between our institutions.

Cathy Scott, CCU assistant professor of elementary education, and I applied to this program, asking for travel support for us to explore opportunities related to environmental and science education in the Galapagos. The program also provides a stipend for travel for a CCU student to participate in the GAIAS study abroad program, so we requested that support for a science student with whom we could work. In addition, we applied for a Professional Enhancement Grant to help defray travel expenses. It was my job to first go survey what we might be able to do related to environmental

San Cristobal, Galapagos Islands, Ecuador
education. Our first student, Shannon Westrom, a biology/marine science double major, will be exploring some of those programs firsthand this fall and reporting back, and Scott will visit her sometime during the semester to make sure things are on track.

This past June, I set off for 10 days in Ecuador, my first trip south of the equator. Faculty at the Cumbaya campus of USFQ just outside Quito invited me to do a seminar for teachers there. Unfortunately I don’t speak much Spanish so they were obliged to let me conduct this in English. Even so, about 30 teachers participated. The Ministry of Education in Ecuador is in the process of updating curriculum and teaching throughout the country, and there is a push beginning this summer to design curriculum specific to the Galapagos. So my workshop entitled, “Using the Biology of the Galapagos Islands to Teach Natural Selection,” was particularly timely.

I then set off for San Cristobal, the easternmost island in the archipelago. While there I met with Diego Quiroga, the USFQ co-director of GAIAS. He would like CCU faculty to put together an interdisciplinary class that could be taught during a summer semester at GAIAS featuring a service-learning component. We are thinking that maybe our students could help develop an after-school program for kids targeting sustainability issues in the islands, both along the coast and in the more rural highland communities. I also spoke with Gianni Arismendy, the educator for the National Park Service in San Cristobal. Unlike our national park system, in the Galapagos a person cannot enter the parks without a qualified guide so it is a bit more difficult, for example, to take a class into the park if you are a teacher. And like national parks everywhere, funds are short. Arismendy already works with GAIAS and welcomed further opportunities to collaborate on community outreach.

Interestingly, although San Cristobal is not very large (about 215 square miles), it is a volcanic island with a big change in altitude from the coast to the highlands. The climate is therefore quite diverse, and so are the people. While along the coast the focus is on tourism, the highland residents tend to be more concerned with farming. So they are also interested in environmental sustainability, but as it’s associated with the landscape more so than with tourism impacts. For example, dealing with invasive plants and animals is a big issue for them. I met with Geovanny Sarigu, who manages both Hacienda Tranquila, a conservation and reforestation non-profit, and the Book Bus that is part of a developing community center/library for the highland community. So far he has a website (haciendatranquila.com) the building, a few shelves of books, a couple of very old computers, the enthusiasm of the residents, and an infectious enthusiasm of his own. He would welcome any sort of help, so we could certainly involve ourselves and our students in this project.
I also got to visit the most populated island, Santa Cruz, and met with an environmental lawyer, Hugo Escheverria. Ecuador has written into its constitution that, essentially, nature has rights, too, not just people. As a lawyer, Escheverria tries to apply this. My favorite example he gave had to do with a case of illegal shark fishing off Santa Cruz. The case was still in the works, but he explained he'd written a “Friend of the Court” brief arguing that the poachers should be prosecuted in part on the grounds that sharks have a right to live. Not that sharks couldn’t ever be fished, of course, but that they had a right of their own to be fished legally. It was very interesting and very different from our own country where it seems corporations increasingly have rights and nature is often discounted.

Santa Cruz generally seemed to be a bit more progressive in terms of sustainability than San Cristobal, and it was an interesting comparison to see both. For example, on the streets in Santa Cruz, the public trash receptacles came in sets of three: one for plastics and metals, one for paper and one for compost. And I was told there is a superhero there, Recycliman, who fights non-recycling villains and teaches kids why this matters.

As a tourist, I got to experience firsthand the environmental education that goes on for, arguably, the most disruptive invasive species of all: us. My guides were all very knowledgeable and informative about the flora and fauna and geology of the islands, but they also brought up conservation issues. They talked about how damaging feral cats can be and the fact that sea lions and seals are susceptible to some of the same diseases that affect dogs. They kept us on the trails to minimize damage to the landscapes. We conserved water and recycled. We learned that there are tight restrictions on even Ecuadorans moving to the islands in an effort to minimize the resident population. In my experience, it seems that Ecuador is responsibly managing and effectively educating the visitors to the Galapagos.

I teach evolution at CCU, so touring where Darwin first started putting the pieces of his grand idea together, was amazing. Instead of being viewed as some sort of scoundrel, as he often is in the U.S., there were statues honoring him and streets named after him. In my class, we talk about the animals in the Galapagos, so it was like celebrity sightings at the Oscars for me: A blue-footed booby! A marine iguana! A Galapagos sea lion! A Galapagos tortoise! And the animals are generally not afraid of people. They just sit and look at you as you look back. In San Cristobal, you have to watch where you’re walking lest you trip over a sea lion or get sneezed on by one. I snorkeled with a penguin. It was really quite amazing. It would be an honor for me and for CCU to play some small role in preserving this very special place.
I arrived at Sheremetyevo airport in January 2013, during the full force of what would later be recognized as the winter of the most snow in Moscow in 100 years. My inexperience with extreme cold weather shouldn’t be an issue, I had told myself. I would not be deterred; I was on a mission to bring gerontology education to the Russian Federation. My original plan had been to arrive in Moscow during August 2012, get living arrangements settled, and then ease into the cold and snow that would soon arrive. But things happened to cause delays—in this case, visa problems—and now it was January. As I loaded my rolling bags into the trunk of the waiting university car, the bone-chilling wind whipping through the concrete terminal reminded me of my earlier fear that without the running start of August I might never warm up.

On hand to deliver me to the apartment that would serve as home for the next four and a half months was Ruslan, my best Russian friend. Noting my apparent surprise at the cold, even as I had thought ahead and donned my big coat and hat, Ruslan said, “Bill, did you bring special underwear?” In my frozen state, I was glad to see the familiar face of Ruslan—Dr. Ruslan Zinatulavich Khairullin, Professor and Chair of Social Pedagogy at Russian State Social University (RSSU), where I would spend the spring semester teaching on a Fulbright Scholarship. Ruslan has spent his life, as have most Russians, using the well-developed metro and train systems connecting locations in urban and rural Russia. He has never had a driver’s license or owned any type of personal vehicle; his typical, daily, round-trip commute to work lasts three hours. He has become accustomed to the cold, as have all Russians, and enjoys the winter as his favorite season. Climbing into the car, I thought of a picture of Ruslan and myself in my office, back in sunny South Carolina. The photo, taken during a previous trip to Russia—in the month of June—shows me with a big smile, all zipped up in a leather coat.

My feelings prior to that moment, when living in Russia was no longer an abstraction, were those of excitement, with a little bit of caution thrown in for good measure. I wasn’t breaking entirely new ground, as I had established contacts at Russia State Social University, and I knew I could count on the support of the Fulbright office in Moscow. But I also knew that visiting a place and living in a place were different; I just wasn’t sure what the differences might be. Fortunately, I had Ruslan to help me gain momentum for my new running start and, most importantly, guide me through the complex world of higher education in Russia.

RSSU, established in 1992 in response to the push for educational reform following the dissolution of the Soviet Union, is today the largest university in the Russian Federation, with over 130,000 students and 45 campuses—five in Moscow—stretching across 11 time zones to the Pacific Ocean. The relationship of Coastal Carolina University with RSSU began in 2004 as a cooperative arrangement initiated by Darla Domke-Damonte and Dennis Wiseman of CCU. I didn’t come on board until the next year, but have since been fortunate to travel to Russia with colleagues to promote the relationship and further University interests.
All-in-all, when considering the opportunities and output of scholarly products resulting from the arrangement, I believe our interactions have been productive. Some of the highlights are: CCU students have twice visited RSSU in Moscow, once for a study abroad opportunity and once when CCU honors students made research presentations; faculty have provided presentations on aspects of the cooperation at numerous national and international conferences; RSSU officials and an RSSU graduate student have visited CCU; and three book projects have been completed, largely the result of editing efforts by Wiseman, producing close to two dozen scholarly writing opportunities for Coastal faculty. There is now a fourth book in progress, on gerontology issues, and a fifth book planned, on issues of childhood, to round out the series on family issues. In addition, the ongoing relationship of the universities led to the agreement of RSSU to serve as host for my Fulbright experience, during which I was able to speak about Coastal Carolina University at RSSU, the American Center in Moscow and in dozens of cities across Russia through RSSU Internet broadcasts. Currently, RSSU has expressed a willingness to host additional CCU faculty and students for study abroad and work opportunities, and most recently, a new invitation has been issued for CCU faculty to produce journal articles to help RSSU meet a government-initiated goal of expansion of the Russian scientific literature to include more Western contributions.

Working at RSSU for a semester was wonderful but unlike anything I might have expected. While medical gerontology education in Russia has been provided through geriatrics since 1957, social gerontology education wasn’t established until the early 1990s with the development of social work as an academic discipline. Today, gerontology education in Russia exists primarily as a single course required for all social work students. This meant, for me, an affiliation at RSSU with the Department of Social Work and Social Pedagogy. The host agreement of RSSU with the Fulbright organization specifically stated that I would teach in English to English-speaking students. However, my arrival and presence on campus closely followed a new policy of the Russian Minister of Higher Education and offered the university a range of options not originally foreseen. After some quick deliberations, it was decided that I would teach a class in Social Gerontology to English and non-English speaking students and then, as appropriate, work with other classes to help RSSU fulfill the new requirement that students receive some instruction in a language other than Russian. Since classes at RSSU met, on average, only once every two weeks in 1.5-3 hour sessions, it was apparent I would have a lot of extra time. Within just a few days as the semester got going and word of my availability got out, I began to receive requests to guest lecture in additional classes at RSSU and eventually at another university, where an RSSU faculty acquaintance was also employed. Many of the new opportunities were out of my area of expertise, but since the new requirement allowed double- and triple-dipping, that didn’t seem to matter. With the understanding that I would talk about gerontology topics, I was soon addressing classes.
I found the students of RSSU to be delightful. They were bright, excitable, energetic and optimistic, and all had an impressive knowledge of Russian history and literature.

-William Hills

Students in Russia receive a government stipend to offset the costs of a modern university education. Further, in response to President Putin’s request that couples have lots of babies to offset the current and projected decline in the Russian population, RSSU has initiated policies that provide a married student with an extra stipend and a student who gets...
pregnant with another stipend on top of that. All students receive transportation and library passes, and free passes and discounts are provided for students for amenities throughout Moscow, such as theater and gallery tickets. Similar to students in the U.S., many Russian students work and attend school, with a difference that students there must fit work around their school schedules, which are provided for them each semester by the university. Most students with whom I interacted did not speak English, and of those who did, most had learned English from Russians and never heard or interacted with a native English speaker. This necessitated the use of translators who were, invariably, not professional translators, but rather students who spoke at least some English and were willing to help out. The students of RSSU overall were very polite and interactive, and it became a common occurrence for students and their friends to approach me in the hallways to simply hear me speak English.

An exciting event for me occurred late in the semester—in May 2013—when officials of CCU traveled to Moscow to update the cooperative agreement established for CCU and RSSU. Over the couple of days of meetings surrounding the signing ceremony, I felt proud to represent CCU for my RSSU colleagues and, because I had been accepted and worked successfully in Moscow, represent RSSU for my Coastal Carolina University colleagues.

The renewal of the contract, with guidelines specifying work to be accomplished, is important for the continuity of the relationship of the universities and because it supports an established cultural bridge over the currently troubled waters separating Russia and the United States. Psychology has taught us that the best way to get people to look beyond differences is to create circumstances whereby they might see similarities. Establishing and maintaining international connections does this for CCU. Working and living side-by-side with colleagues of other countries promotes dialogue about things other than the often divisive, daily news feed; dialogue creates friendships; friendships, in turn, support community building. This win-win for all parties supports the missions of Coastal Carolina University and Russian State Social University and is the reason the Fulbright Association exists—to promote international cooperation.

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BASE TO 451,

COME IN 451...

By Scott Parker, Ph.D.
Assistant Professor, Biology
The breeze has stopped, and the sun feels like a weight on my back. The surface of the water in the tidal creek is smooth and featureless. There is no sound except for the buzz of biting flies and the accompanying SLAP followed by mumbled profanities. It’s been two hours since we last heard a signal from one of the 15 diamondback terrapins (Malaclemys terrapin) that my graduate student and I had fitted with portable radio transponders earlier in the year in order to track their movements in the North Inlet of Winyah Bay.

Unexpectedly, we hear a faint “beep” through our headphones; at last one of our radio-tagged diamondback terrapins is on the move. We can tell from the frequency of the signal that it is terrapin 451, a large mature female. Now comes the hard part. Following the signal, we maneuver the boat as close to her location as possible. She appears to be located somewhere in a large open mud flat covered by saltmarsh cordgrass (Spartina alterniflora). My graduate student, Beckett Hills (coastal marine and wetland studies program), is out of the boat first, carrying the tracking receiver and antenna. Beckett moves surprisingly easily through the sticky “pluff” mud of the Spartina flat as he closes in on her location. Meanwhile, my progress is considerably slower as I struggle to move one leg at a time through the viscous and tepid pluff mud. Sweat stings my eyes as I make seemingly minimal progress toward my objective. With my heart pounding and my head throbbing, I come to the sobering realization that I’m not working with the same body that I had more than a decade ago when I was a graduate student. By the time I catch up, Beckett has narrowed the female terrapin’s location to a one square meter area.

With a bit more work manipulating the transmitter’s signal sensitivity, we have her location narrowed to an area the size of a beach ball. Visual inspection of the mud’s surface does not give the slightest indication that a large terrapin lies somewhere just below the surface. After a brief period of searching in the slimy black mud, we pull out a beautiful diamondback terrapin, only slightly smaller in diameter than a dinner plate. In an instant, all of the heat and exhaustion is forgotten as we marvel at the striking beauty of this animal. Beckett palpates the female to determine whether she is gravid (pregnant) and enters coordinates of her location into our GPS unit. Undergraduate researchers Zach Parker and Joshua Lynn (both marine science students) take the female’s weight and inspect the condition of the radio tag. After a few more moments of admiring female 451, we release her in the same patch of mud where she was found.

No matter how difficult the conditions, tracking terrapins in the marsh is addictive. Using radio telemetry, we are able observe the secret lives of diamondback terrapins and learn about the physiological ecology of these unique reptiles.

Diamondback terrapins are unique among turtles in that they are one of only two turtle species in the world found exclusively in coastal salt marsh environments. Interestingly, vertebrate animals living in saline aquatic environments such as salt marshes share some of the same physiological adaptations as animals living in deserts, namely features that help retard body water loss while at the same time preventing uptake of salts from the environment. Terrapins are highly adapted for living in estuarine environments because they are able to maintain internal body water balance over a wide range of
environmental salinities, ranging from fresh water to sea water, and can quickly take advantage of intermittent rainfall by drinking from surface films of rainwater accumulations on the muddy surface of the ground. Diamondback terrapins can drink from a film of water as thin as one millimeter.

Diamondback terrapins have one of the widest latitudinal distributions of any North American reptile species, ranging from Massachusetts south to Florida and around the Gulf Coast to Texas. Despite their relatively wide distribution, terrapin are declining throughout much of their range. Threats to diamondback terrapin come from a variety of causes including habitat loss, crab pot mortality, boat strikes, pollution, poaching for meat and egg mortality. Mortality of eggs due to depredation is perhaps the greatest natural threat to terrapin populations with depredation rates in excess of 90 percent in many populations. In long-lived species, such as diamondback terrapins, reduction in juvenile recruitment may take several years before declines are observed in local populations.

CURRENT RESEARCH PROJECTS:

My research on the biology of diamondback terrapins centers on three focal areas: 1. habitat use and spatial ecology; 2. nesting ecology and nest site selection; and 3. predation pressures on terrapin eggs. Through the hard work and dedication of graduate students Beckett Hills and Sam Buzuleciu (both NSF GK-12 Fellows), as well as several CCU undergraduate students, we have learned a great deal about the ecology and reproductive biology of South Carolina diamondback terrapins and made some important discoveries directly relevant to the conservation of this species.

Beckett’s two years of radio telemetry data revealed some surprising differences in behavior and habitat use between terrapin sexes. Both males and females show high site fidelity, meaning that their home range tends to be associated with particular defined areas of habitat. The smaller male terrapins (225 g) have small home ranges often overlapping those of other males and typically make relatively short distance movements (i.e., < 0.5 km) during their activity...
season. In contrast, larger females (680 g) have relatively large home ranges overlapping those of multiple males but with relatively little overlap with other females. Additionally, females typically have a home tidal creek or “address” where they spend the majority of their time but then periodically make long distance movements (up to 4 km) from their “home address” to neighboring creeks. One surprising observation is that females often make repeated trips from their home creek to one or two specific distant tidal creeks. Invariably, females return to their “home address” after several days of absence, most often returning to a small localized area each time. The reason for these unusual movement behaviors by females is not known but could be related to foraging, mating or nesting activity.

In addition to the radio telemetry work, we have identified locations of the major diamondback terrapin nesting sites in the North Inlet and documented microhabitat characteristics of over 300 terrapin nests located across these sites. Beckett used these data to help build a geographic information system (GIS) model that can be used by researchers and land managers to predict areas of critical nesting habitat for terrapins in South Carolina and potentially for other areas along the eastern coast of the U.S.

Of the 300 plus terrapin nests that we identified, approximately 98 percent were raided by predators. My graduate student Sam Buzuleciu and his GK-12 undergraduate assistant Megan Spencer documented types of egg predators in North Inlet and also conducted experiments to determine sensory cues used by predators to locate terrapin eggs. Sam used camera “traps” and track boards to identify five potential predators of diamondback terrapin eggs. Photographs and track data indicated that of these, raccoons are the likely egg predator in the majority of cases. Sam then used a series of elegantly designed experiments to identify the sensory cue used by raccoons to locate terrapin nests. We initially predicted that raccoons use the scent left by female terrapin during nest construction as the primary olfactory cue. To our surprise, however, raccoons showed no preference for terrapin-scented simulated nests compared to neutral-scent and no-scent controls. In a series of follow-up experiments, Sam demonstrated that raccoons use the scent of freshly excavated soil to identify the specific location of terrapin nests. It is likely that volatile chemical compounds produced by soil microflora are released during the process of nest construction. In the future, we hope to identify the chemical signal or signals released from soil that raccoons use to locate terrapin eggs.

It’s been a very exciting three years of diamondback terrapin research. Undergraduate students Zach Parker and Josh Lynn won first place at the Big South Undergraduate Research Symposium for a poster detailing results of their independent study project on microhabitat characteristics of diamondback terrapin nesting sites in North Inlet. Zack and Josh also presented a second poster on another aspect of their terrapin research at the 2013 Joint Meeting of Ichthyologists and Herpetologists in Albuquerque, N.M. Beckett and Sam will defend their master’s thesis in fall 2014. Beckett presented a paper on his nest model at the 2013 Joint Meeting of Ichthyologists and Herpetologists and was additionally named the 2014 Coastal Marine and Systems Science Graduate Student of the Year. Sam is putting finishing touches on a manuscript describing the results of his egg predation study for submission to the Journal of Herpetology. As for me, I’m looking for another motivated graduate student to accept the torch and carry on diamondback terrapin research into 2015.

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Groundwater. Not exactly a buzzword to most. How about melting glaciers in the Antarctic? A tad more engaging? And naturally occurring hydrocarbon seeps, discharging tons of oil and methane into our world's oceans every minute of every day? Well, my story, intended to excite, is centered around this simple word: groundwater.

When asked what I do, I answer first that I am a student in the graduate program here at Coastal Carolina University. Inevitably, this is followed by:

"Interesting, and what do you study?"

"Groundwater," my answer.

"How uneventful" is invariably the message of the response.
Not surprising. But, my ‘uneventful’ groundwater studies have taken me to wonderful places including the Antarctic continent and the bottom of the ocean to investigate the exact subjects that undoubtedly sparked interest moments ago: melting glaciers and natural oil seeps. These two topics, while very different, have something important in common in that both are environments where fluid (water and oil) moves through the land to ultimately discharge into the ocean (as some form of discharging groundwater).

Nearly seven months prior to my writing this article, the icebreaker R/V Laurence M. Gould docked at Palmer Station, Antarctica. It transported several researchers, some students—including me, several professors and even volunteers from Chile to our new home in Antarctica. Despite varied backgrounds and experience levels, everyone aboard was excited to leave the unsteady platform that had transported us from the last hunk of land we had seen (Punta Arenas, Chile) prior to our arrival at Palmer Station. During our five-day transit, we hit approximately 20-foot seas, an unfortunate potential hazard when traveling through the southern ocean. Finally, solid ground! It was time to get settled and prepare for the three-month stay on the icy continent.

As this was the second year we spent the austral summer in the Antarctic, the veteran members of the group (me and a graduate student from our partnering university, East Carolina University, ECU) who had survived last year’s Antarctic excursion (see past Progression issues) motioned to the others signaling the direction of our temporary “home.” A few days later, our group was ready for action, prepared to answer questions related to the movement of freshwater from the continent to the adjacent ocean. For this, we planned to sample the coastal ocean (no more than two miles away from Palmer) in search of naturally occurring radiotracers (namely 222Rn, 223Ra, 224Ra and 226Ra) that fingerprint freshwater transport pathways. My studies here at Coastal Carolina University involve groundwater, which incorporates the fields of hydrogeology (rock/water interactions) and geochemistry (using chemistry to explore geology). These naturally occurring radiotracers are the chemical signature we seek in the ocean to identify water that has recently moved through the land before being discharged into the coastal ocean. Using these chemical signatures, we can decipher how the ice migrates into the ocean after it melts. Meltwater will pick up different amounts of vital materials that support much of the aquatic life around the continent’s coast.
“Groundwater studies have taken me to wonderful places including the Antarctic continent and the bottom of the ocean.”

-Leigha Peterson

Depending on whether it flows over land or through the ground. See, we like penguins as much as we do groundwater! Despite our excitement to get to work, it would be nearly two weeks before we could begin. Brash ice had accumulated on the ocean surface after calving events (where large chunks of glacial ice fall into the sea), making it impossible to navigate an approximately 20-foot rubber boat through the water. Our talented team, including Rick Peterson (a professor here at CCU), Kim Null (a postdoctoral scholar at ECU), Jared Crenshaw (a graduate student at ECU) and me, invented some creative ways to make use of the unnavigable waters. We melted ice! Interested in the chemical signature of the melting ice source of the groundwater we were tracking, we hiked to the top of the neighboring Marr Glacier and collected hundreds of pounds of glacial ice to melt and measure for our radiotracers. This was no easy task. The terrain of the western Antarctic peninsula where the research base is located is rocky and difficult to traverse, even without a few hundred additional pounds of weight to bear. Many months later, I can proudly say that the juice was worth the squeeze! We performed an essential piece of our research puzzle during our isolation on land and were able to continue more easily through the remaining months working from the water as we had originally intended. Preliminary results from this project show that a substantial portion of the melting ice is indeed moving underground in addition to flowing over the ice/land. But, before we could really dive into the
results of the Antarctic work, we were tasked to blend water with oil in the Gulf of Mexico—a completely different environment.

In April, six days after returning from the ice, I was headed to Gulfport, Miss., to board the R/V Atlantis accompanied by Rich Viso (CCU graduate program coordinator) and Rick Peterson (my aforementioned CCU ice companion). Again, our collective interest in groundwater was guiding the CCU group to a relatively unexplored part of the world. This time? The bottom of the ocean! Here, we joined researchers from many institutions, all working to investigate the effects of the Deepwater Horizon oil spill with the aid of the near 50-year-old deep-ocean research submersible, Alvin. This was the first science cruise using Alvin since it underwent a two-year overhaul, making it more comfortable and capable of operating at the bottom of the ocean. Using the submersible, two scientists and a pilot could motor down (often through a mile of ocean water) and observe the bottom post-oil spill. The same submersible sent to explore the Titanic was aboard the very same ship I was to operate from during this month-long cruise. Amazing! The vehicle would allow many biologists and biogeochemists (those using chemistry to explore the link between geology and biology) to sample organisms present among the wreckage while also exploring some additional areas where natural oil seeps were occurring. The latter sites allowed us to compare biological health between areas where oil is normally present and the region where impacts of the 2010 oil spill were originally observed. It was our role to use the same naturally occurring radiotracers as we did in the Antarctic to identify oil seeps, study the migration of oil as it moves through the ocean and gauge the rate at which these seeps are discharging hydrocarbons.

I have since returned to my student office at the University after a four month “sabbatical” investigating the very two things that shouldn’t mix: water and oil. The abrupt shift in research focus and environment, moving from the Antarctic to the Gulf of Mexico, parallels my life here as a Coastal Carolina University graduate student. I am currently preparing to transition into the newly offered doctoral program in the School of Coastal and Marine Systems Science. From there, under my advisor Rick Peterson, I will continue to work on these two tangential projects. My research experiences thus far illustrate the potential to conduct even two glaringly opposite projects, launched at a rapid, overlapping pace, with composure and diligence when armed with the proper tools—those provided here at CCU. The educational and research opportunities I have been fortunate to take part in have indeed offered a broad view of a particular environment while maintaining an invaluable perspective of the “BIG picture,” making it possible for me to share a bit about ongoing research here at Coastal Carolina University. I look forward to the coming years guided by the direction of the SCMSS graduate program. Thank you to all involved.

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Scientists estimate that humans have directly explored only 5 to 10 percent of the world’s oceans. Even “well-known” areas routinely offer up new observations and data on the complex interactions between physical, chemical, geological and biological phenomena at play in the ocean. Yet the seemingly simple question—how many fish are in the sea?—remains difficult to answer and is an area of great interest to marine biologists, fisheries, scientists, fishers, divers, politicians and economists. Because we have an insatiable appetite for food and products derived from the oceans, and because commercial fishing and recreational fishing are important sectors of the global economy, attempts to estimate populations of fish have a long history of scientific research. We also now know that the oceans are not static and that fish populations are influenced by a wide range of natural and human processes.

Many of us have probably never really considered what the ocean floor looks like once we leave the shore. Just off the beaches in the Carolinas, the ocean bottom near the shore is fairly similar to what you see on the beach: large areas of flat sand and other sediments sloping gently toward the edge of the continental shelf. Those of us who scuba dive probably have a greater appreciation for what else is out there, but even still, most divers see this plain of sand interrupted only by an occasional shipwreck. Interspersed with these large sandy areas and wrecks are natural outcrops of rock, mostly limestone, that are oases of life. These natural outcrops are known variously as hard-bottoms, live rock, ledges or reefs, and they are much more complex than the surrounding areas. They act as magnets for colonizing organisms like algae, sponges, corals and other sessile invertebrates, and as larders and hideouts for larger, more mobile life, like fish.
Any good fisher knows that to catch fish, you should go where the fish are. These hard-bottom areas are magnets for the fish that attract the fishers, but in total area, hard-bottom habitats represent only a small fraction of the continental shelf in our region. The dominant fish on these relatively shallow hard-bottoms are collectively known as the snapper-grouper complex, a group of 60 or more co-occurring, exploited fishes grouped together for fishery management purposes. As the name implies, the complex includes snapper and grouper, as well as porgy, grunt and a mixed assemblage of other fish of interest to fishers and managers. Fisheries management is a discipline that attempts to protect and manage fishery resources toward a goal of sustainable harvesting. The primary limitation in this field is the need for quality data about fish populations, including their biology and ecology.

With relatively simple equipment including scuba gear, two private offshore fishing boats and two camcorders in underwater housings, and assisted by a group of diver volunteers including Coastal Carolina University students Benjamin Binder, Mark Nevin and Brandon Toms, we set out to document the presence and number of grouper, along with the associated fish assemblage at hard-bottom sites that were attractive to fishers and divers off of Cape Fear, N.C. Our work was focused on the area known locally as Frying Pan Shoals, about 30 miles offshore of Southport.

Our group completed 57 survey dives over a seven-month period, a field season that included effects from a hurricane and two tropical storms, and collected over 30 hours of underwater video. Once raw video was extracted from the cameras, a group of dedicated marine science research undergraduates and I reviewed each

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HOW THE PROJECT BEGAN:

Scientific collaborations often develop from overlapping and complementary interests among academic researchers. In the case of this project, the interests that brought the core research team (Craig Andrews, Jim Atack and me) together had little to do with science directly. In fact, this project developed from a chance encounter at my very first University-wide faculty meeting. I was a brand new assistant professor in the department of marine science, attending my first faculty meeting. I was a bit nervous and not sure of the meeting's location. I arrived early at Wheelwright Auditorium and must have looked a bit lost. As I was milling around, Chris Shaffer, then the assistant director of Wheelwright, approached me and asked if I needed help. We got to talking, and it turned out that we both were avid scuba divers. Chris suggested that the next time he went diving in North Carolina he'd let me know, and I could come along. Through Chris, I met Craig Andrews, a diver and spear fisher who works out of Southport, N.C. Craig is active in local fisheries management as a "concerned citizen" and serves as a member of various fisheries management panels that solicit opinions from stakeholders. I went diving and fishing with Craig several times and was blown away by the diversity of fish, the apparently healthy populations of large predators, and the beauty of the hard-bottom reefs off of Cape Fear. Along the way, Craig mentioned that North Carolina Sea Grant was sponsoring a grant program to team fishery stakeholders - like him - with academics - like me - to initiate research projects. Craig suggested we propose a study to explore the diversity and populations of fish present on North Carolina hard-bottoms using video cameras. Most of the previous work regarding these fish populations had relied on fishing surveys of commercial and recreational fishers, shipboard observer programs and scuba divers to identify and count fish. Over the course of the following months, we joined Jim Atack, a diver/fisher with deep interests in protecting and managing North Carolina fisheries, to develop a proposal to explore these reefs using video cameras, with a focus on grouper, a group of fish of major ecological and economic impact. We were eventually funded by North Carolina Sea Grant to complete about 60 dives on Cape Fear hard-bottom habitat, conduct diver visual surveys (counts) of grouper, and collect video data on grouper populations and the associated fish assemblage that utilize these habitats.

video clip at least four times and recorded the occurrence of every grouper (over 2,300 fish sightings), identified each as to species and estimated size, and made notes about the visibility, topography and other fish species in view. Undergraduates were broken into two teams: a "grouper count" team of Benjamin Binder and Lauren Bohrer, and a "fish assemblage" team of Amanda Wood and Zachery Hart. I met with each team weekly for many months to perfect species identifications, review size estimations and record the fish diversity that became the data for more thorough analyses.

To satisfy the primary objective of the study—to estimate grouper population sizes on hard-bottoms and relay that information back to fishery managers—we worked with statistician Keshav Jagannathan of the CCU Department of Mathematics and Statistics to normalize video sampling and come up with defendable estimates of how many grouper were actually there. Using our new estimates of grouper populations, we were able to compare our results to those from earlier studies. Our results showed that populations of gag grouper, the largest and most sought after target of commercial and recreational fishers, had declined relative to diver estimates from the 1970s and 1990s. Conversely, there were large increases in numbers of scamp, a smaller species of grouper. We also showed that a more tropical species, the yellowmouth grouper, had dramatically increased in abundance along the coast relative to earlier studies. In addition, we compared our diver visual surveys conducted concurrently with our video counts and found that divers typically recorded the presence of more gag grouper than did the video surveys, while the numbers of scamp sighted were similar between the two techniques. Along the way, we documented the presence of at least 91 species of fish that were present on these hard-bottom sites, a significant fraction of the total known species of the offshore South Atlantic Bight fish assemblage.
We recorded interesting behaviors of many fish including a large male hogfish courting a female, sand tiger sharks hovering over hunting sites, grunts "kissing" as a form of dominance and the proliferation of Indo-Pacific lionfish, a venomous invader first reported off the Carolinas in 2000. To see these and other scenes from this project, visit youtu.be/qngZBYHlzNQ. We went on to produce a peer-reviewed paper from this project that was published in the Bulletin of Marine Science (Burge et al. 2012), and a short film of the results of the study was screened at the Beneath the Waves Film Festival as well.

Several important changes have occurred in recent years in the management of grouper fisheries. For example, the government body responsible for management of the snapper-grouper complex has instituted a seasonal closure (January-April) on harvest of all shallow-water grouper including gag, scamp and yellowmouth, and researchers with the National Marine Fisheries Service have undertaken a large scale project to collect fishery data on the snapper-grouper complex using underwater videography. The rapid decrease in the cost and size of video cameras, like the GoPro® series of "extreme sports" cameras, coupled with improvements in the quality of images, have recently made using off-the-shelf recorders and underwater housings financially feasible on a large scale for research purposes.

Contact Erin Burge at 843.349.6491 or eburge@coastal.edu.


Youtube link: “Swimming through a natural aquarium. Video observations of fishes on the limestone ledges of North Carolina.” 9:00. youtu.be/qngZBYHlzNQ.

WHERE ARE THEY NOW?

Six CCU undergraduates participated in various aspects of this project.

BENJAMIN BINDER ’10
Student co-author, volunteer diver and “grouper count” team member. Ben is a biology graduate student at Florida International University. He works in the fisheries acoustics lab utilizing sonar technologies to locate and monitor reef fish spawning aggregations in south Florida. After graduation from CCU, he spent several years as a biologist with Florida Fish and Wildlife, stationed in the Florida Keys.

LAUREN BOHRER ’09
Student co-author and “grouper count” team member. Lauren earned a master’s degree in marine science in the summer of 2013 at the University of North Carolina Wilmington. She studied primary production in freshwater to oligohaline tidal creeks.

AMANDA (WOOD) GRUBER ’10
Student co-author and “fish assemblage” team member. Amanda is a graduate student at Green Mountain College (Vermont) in environmental science with a specialization in conservation biology. She works with the South Carolina State Park Service at Hunting Island State Park as a naturalist responsible for habitat protection, recreational/educational programs and animal care.

ZACHERY HART ’11
Student co-author and “fish assemblage” team member. After graduation, Zach worked as a dive master for SCUBA Express in Murrells Inlet. He now works as an MWD (measurement while drilling) engineer for Scientific Drilling International, one of the leading companies in the world for oil field wellbore placement and services.

MARK NEVIN
Volunteer diver. Mark works full time as a scuba instructor and technical diving instructor with Scuba Express in Murrells Inlet.

BRANDON TOMS ’10
Volunteer diver. Brandon is the owner and founder of FST Dive Services, a commercial diving company based out of Myrtle Beach that specializes in ship husbandry and salvage.
Imagine the following situation: you and seven of your friends decide to play a round of golf. One problem is that your friends are golfers of varying skill levels. Some are good and some are not so good. The good golfers are either consistent or not so consistent, and the story is the same for the not so good golfers. To further complicate the issue, suppose everyone wants to bet a little money to keep things interesting. How could things be made “fair” for you and your friends? That is, how could you ensure that no one player has an advantage and that everyone in the group has the same chance of winning?

Golf is a fairly logical sport, though some would argue that the people who play golf are not logical in their love for (or in some cases addiction to) a fiendishly frustrating sport. For example, it stands to reason that it is easier to get the ball in the hole with more strokes than fewer strokes. It also makes sense that a better golfer will typically score better than a not-as-good golfer. Therefore, to level the playing field, the better player must give the worse player some strokes. The million-dollar question is, “How many strokes?”

The U.S. Golf Association (USGA) provides a handicapping service that “enables golfers of all skill levels to compete on an equitable basis.” In other words, they provide a Handicap System™ that allows us to calculate the number of strokes every player would receive when playing 18 holes of stroke play golf. This system calculates the handicap based on a player’s “potential.” It is based on two key assumptions: 1). Each player will try to make the best score at every hole in every round, regardless of where the round is played; and 2). Each player posts every round for “peer review.”

The term “peer review” is defined on the USGA’s website as “the ability of golfers to gain an understanding of a player’s potential ability and to form a reasonable basis for supporting or disputing a score that has been posted.” In other words, peer review allows anyone to look up any player’s scores and verify that player’s potential ability.

To fully understand the USGA Handicap System, you (and your friends) must understand the following terms. Every golf course has a course rating (CR) and a slope rating (SR) provided for each set of tees. The course rating values depend on the set of tees and is a number typically between the high 60s and low to mid 70s. Tees with higher course ratings are more difficult than tees with lower course ratings. Slope ratings, however, range from 55 to 155, with 55 representing an easy course and 155 representing the most difficult possible golf course. For example, the Hackler Course at Coastal Carolina University has a course rating of 70.8 and a slope rating of 128 for the white tees. There are only two golf courses in the United States that have had a slope rating of 155, the Ocean Course at Kiawah Island in South Carolina and Ko’olau Golf Club in Oahu, Hawaii. A golf course that is of “average” difficulty has a slope rating of 113. You and your friends can now select a set of tees based on the difficulty; just get ready for some arguing about the tees.

Now we are ready to understand how a golfer’s handicap is determined. First, for each round of golf, a handicap differential (HD) is calculated using the formula:

$$HD = (\text{Adjusted Gross Score} - \text{USGA Course Rating}) \times \left(\frac{113}{\text{Slope Rating}}\right)$$
What is an adjusted gross score? A gross score is your score at the end of a round of golf. So what does the adjusted mean? According to the USGA, every player’s score is subject to something they call “equitable stroke control (ESC).” When a player’s actual or most likely score on any hole exceeds a threshold value, we use a score based on the table below for that hole.

<table>
<thead>
<tr>
<th>COURSE HANDICAP</th>
<th>ESC SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 or less</td>
<td>Double bogey</td>
</tr>
<tr>
<td>10 – 19</td>
<td>7</td>
</tr>
<tr>
<td>20 – 29</td>
<td>8</td>
</tr>
<tr>
<td>30 – 39</td>
<td>9</td>
</tr>
<tr>
<td>40 or more</td>
<td>10</td>
</tr>
</tbody>
</table>

Notice that we multiply the difference between the adjusted gross score and USGA course rating by the ratio (113/SR). This is done to scale the handicap differential based on the difficulty of the course, i.e. a higher score on a harder golf course should not translate into a higher handicap differential.

Once a player has posted 20 rounds, we can calculate his or her handicap index (HI) by looking at the lowest 10 handicap differentials of 20, averaging them and then multiplying that average by 0.96.

For example, if a player has an average handicap differential of 17.8 using the lowest 10 of 20 rounds, then his or her handicap index is 17.088, which is then truncated to 17.0.

Once a player’s handicap index is established, a course handicap (CH) can be calculated using the formula given below. The resulting CH is then rounded to the nearest whole number.

\[
\text{Course Handicap} = \text{HI} \times \left(\frac{\text{SR}}{13}\right)
\]

The handicap index is then multiplied by the ratio (SR/113) in order to account for the difficulty of the set of tees being played. You can use your friends’ USGA handicaps and tables provided in all golf course clubhouses to calculate everyone’s handicap. Now, you can go to the first tee and play the round of golf knowing that everyone has a fair chance of winning.

The same two assumptions that enable us to calculate the USGA handicap are some of the key reasons why establishing an accurate handicap is challenging. First, people don’t always play their best on each hole. Individuals will sometimes (possibly intentionally) miss strokes to inflate their handicap. This inflated handicap can then be used for their benefit in tournaments. Parenthetically, in golf terms, these individuals are referred to as “sandbaggers.” Second, individuals don’t always post every score. Many people play rounds that they consider “unusual” for themselves and will not post them for consideration. Other individuals sometimes forget to post scores or will collect their scorecards for weeks on end prior to posting them. In either case, when accurate rounds don’t get posted, that skews the USGA handicap.

Then, there is the issue of handicapping the consistent golfer versus the inconsistent golfer. Consider two golfers who both maintain 5 handicaps. Suppose one is consistent and the other is inconsistent, i.e. one scores with handicap differentials between 5 and 9 and the other with handicap differentials between 5 and 16. Player 1 therefore consistently shoots in the high 70s and Player 2 scores between 76 and 90. Since the USGA Handicap System only measures potential, both Player 1 and Player 2 would be allegedly equally likely to win if they played each other. Consistency, though, is a highly coveted quality for a golfer to have. Being more consistent gives Player 1 an edge over Player 2. That makes it more difficult for Player 2 to be handicapped.

While a USGA handicap bridges the gap between the good golfer and the bad golfer, it does nothing to help with the issue of consistency. Variability issues, on the other hand, are not that easy to reconcile. There is not a simple way to make a consistent and inconsistent golfer of equal ability (handicap wise) able to play stroke play contests by handicapping one in favor of the other. Each round’s result is dependent on the form exhibited by each golfer.

Back at the first tee, you should assign everyone strokes based off the lowest handicapper, have fun, and remember to keep your head down and follow through.

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Except, life is not so simple.
THIS FISH,

THAT FISH,

EAT FISH?

WHICH FISH?

NO FISH?
Fish and shellfish are considered to be an important part of a healthy diet because they are high in protein, low in saturated fats and contain omega-3 fatty acids. Omega-3 fatty acids have a variety of positive health effects including helping to reduce cardiovascular disease, diabetes, rheumatoid arthritis, depression and cancers, as well as promoting neurological, optical and reproductive/fetal development. However, fish can contain high levels of contaminants, such as methyl mercury, that may cause adverse health effects.

Consumption of fish containing high levels of methyl mercury may lead to increased incidence of stroke and neuro-developmental disorders, increased risk of developing cardiovascular disease, and lowered infant cognition and brain development when mothers consumed fish high in methyl mercury content during pregnancy.

Inorganic mercury enters the atmosphere through the burning of fossil fuels such as coal and municipal waste incineration. Once in the atmosphere, the inorganic mercury enters soils, lakes, rivers and the ocean via rain, snow and dust. The inorganic mercury is converted to methyl mercury by bacteria that live in soils, aquatic sediments and on the roots of aquatic plants. Methyl mercury biomagnifies in aquatic food chains and is eventually consumed by humans who eat fish. The process of biomagnification can be thought of as the big fish eating the little fish, eventually resulting in the highest levels of methyl mercury found in the biggest fish. Humans who frequently consume fish with high levels of methyl mercury can accumulate the substance in their blood, hair and urine. In addition, methyl mercury can build up in the placental tissue of pregnant women and be transferred to developing fetuses.

Typically, the concentration of methyl mercury in water is 1 part per trillion (1 ppt) or less. A part per trillion can be expressed as one gram of methyl mercury in one trillion grams of water. The concentration of methyl mercury in large fish, such as shark or swordfish, is typically one part per million (1 ppm). A part per million can be expressed as one gram of methyl mercury in a million grams of fish tissue. So on average, the concentration of methyl mercury in large fish is usually a million times higher than the concentration of methyl mercury in water.

Imagine a football stadium filled with a trillion ping-pong balls. One ball is red, and all the rest are white. That represents one part per trillion. Now imagine the same stadium filled with a trillion ping-pong balls, but one million are red. That represents one part per million. The change in the number of red ping-pong balls represents the increase in the concentration of methyl mercury in fish relative to water by a factor of one million.

When choosing what type of fish to consume, it is important to examine the relative balance between the amounts of methyl mercury vs. omega-3 fatty acids (Table 1). Eating fish that contain high levels of methyl mercury can work in direct opposition to the dietary benefits obtained by consuming omega-3s from fish. Consumers should choose fish high in omega-3 fatty acids and low in methyl mercury. Fish and shellfish that fall into this category are salmon, trout and shrimp. They contain, on average, 0.01-0.1 ppm methyl mercury and 0.3-1.0 grams of omega-3s per 3 ounces. Other types of fish that are low in methyl mercury and contain slightly lower levels of omega-3s are canned light tuna, tilapia and cod. These fish, on average, contain 0.01-0.1 ppm methyl mercury.
mercury and 0.1-0.3 grams of omega-3s per three ounces. Fish that contain high amounts of omega-3s and methyl mercury and that should be avoided are wild ahi tuna steak, canned albacore tuna, sea bass, swordfish and shark. These fish, on average, contain 0.3-1.0 ppm methyl mercury and 0.4-1.3 grams of omega-3s per three ounces of fish.

In 2000, the National Academy of Sciences published a maximum daily consumption rate of 0.1 micrograms of methyl mercury per kilogram of body weight. Assuming that a serving is six ounces, the values in Table 2 represent the number of servings of fish per week that you can eat based on methyl mercury concentrations in the fish of 0.01, 0.1, 0.3, 0.5 and 1.0 ppm. For most people in non-coastal areas, the main exposure to methyl mercury is from eating canned tuna fish. A can of tuna is six ounces, and the methyl mercury content in canned light tuna averages 0.1 ppm. A 50-pound person could eat one can of light tuna per week, and a 200-pound person could eat four cans of light tuna per week, with both remaining within the maximum acceptable daily intake of methyl mercury. The average methyl mercury content of canned albacore tuna is 0.35 ppm. A 50-pound person could eat less than one-half can of albacore tuna per week, and a 200-pound person could eat one can of albacore tuna, with both remaining within the maximum daily intake value. The number of servings per week for individuals weighing 50-100 pounds (small child) is less than one for fish that contain 0.3-1.0 ppm methyl mercury. Individuals who weigh 150-200 pounds (teens or adults) could eat about one-half of a serving per week of fish containing 0.5-1.0 ppm methyl mercury.

<table>
<thead>
<tr>
<th>Type of Fish or Shellfish</th>
<th>Omega-3 (grams per 3 ounces)</th>
<th>Methyl Mercury (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canned Albacore Tuna</td>
<td>0.73</td>
<td>0.35</td>
</tr>
<tr>
<td>Canned Light Tuna</td>
<td>0.26</td>
<td>0.1</td>
</tr>
<tr>
<td>Canned Salmon</td>
<td>1</td>
<td>0.07</td>
</tr>
<tr>
<td>Cod</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Farm-Raised Salmon</td>
<td>1.5</td>
<td>0.03</td>
</tr>
<tr>
<td>Sea Bass</td>
<td>0.4</td>
<td>0.38</td>
</tr>
<tr>
<td>Shark</td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>Shrimp</td>
<td>0.3</td>
<td>0.01</td>
</tr>
<tr>
<td>Swordfish</td>
<td>0.49</td>
<td>1</td>
</tr>
<tr>
<td>Tilapia</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td>Trout**</td>
<td>0.8</td>
<td>0.07</td>
</tr>
<tr>
<td>Wild Ahi Tuna</td>
<td>0.7</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*The values for omega-3s and methyl mercury were taken from Smith and Guentzel, 2010.

**Freshwater fish.
Table 2. Servings of Fish per Week (assuming a six-ounce serving size)

<table>
<thead>
<tr>
<th>Methyl Mercury Content in Fish</th>
<th>50-Pound Person</th>
<th>100-Pound Person</th>
<th>150-Pound Person</th>
<th>200-Pound Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 ppm</td>
<td>9</td>
<td>18</td>
<td>28</td>
<td>37</td>
</tr>
<tr>
<td>0.1 ppm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0.3 ppm</td>
<td>0.3</td>
<td>0.6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.5 ppm</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>1.0 ppm</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Much more research needs to be conducted concerning the bioaccumulation of methyl mercury in marine fish. CCU graduate student Daniel Ferons and undergraduate student Veronica Lance are working on a project in a salt marsh near Waties Island, S.C. They are working with two smaller fish (mummichogs and Atlantic silversides) that are consumed by the much larger marine fish that we eat. These fish occupy the same trophic level in the aquatic food chain but eat different types of food. The mummichogs eat plant detritus along with algae, amphipods, copepods and smaller fish. The Atlantic silversides eat copepods, amphipods, insects, algae, shrimp and molluscan larvae, with plant detritus being a very small component of their diet. Since they eat different things, these fish may contain very different amounts of mercury. By comparing the diets of and mercury levels in these two smaller fish, it may be possible to determine the potential of each species to contribute to the bioaccumulation of mercury in the larger fish that we eat. The project that Daniel and Veronica are working on has been funded by a CCU Professional Enhancement Grant awarded to Jane Guentzel.  

Jane Guentzel can be reached at 843.349.2374 or jguentze@coastal.edu.
In February 2011, CCU implemented Experienced@Coastal, a university-wide initiative that was designed to transform the educational culture of the university by strengthening students' abilities to link theory with practice via experiential learning (EL) across the curriculum. In contrast to more traditional learning practices of listening to lectures and taking notes, experiential learning incorporates active, participatory observations and learning in the classroom.
THREE KEY COMPONENTS THAT COMPRISE THE SOCIAL JUSTICE RESEARCH INITIATIVE’S WORK:

1. Education (i.e., to educate future social justice leaders).
2. Research (i.e., to conduct and/or support innovative research that addresses social inequalities and social change).
3. Action (i.e., to engage students in direct service and social action for change).

Students enrolled in EL courses engage in hands-on activities such as field trips, working in their field, volunteering and using kinesthetic learning to relate their classroom knowledge and skills. This approach provides students with the opportunity to blend traditional academic work with instructor-designed, out-of-class learning, whereby one informs the other (Porterfield 2013).

In response to the university’s call for increased experiential learning opportunities and to support my own development as a social justice scholar, I collaborated with sociology professors Jason Eastman and Matthew Wilkinson to create and implement the Social Justice Research Initiative (SJRI) in fall 2012. The mission of the SJRI is to work for equal access to opportunities and rewards for all people through critical understanding and scientific investigations of the root causes of social injustice in order to develop and implement innovative solutions for change. Three key components comprise the SJRI’s work: education (i.e., to educate future social justice leaders), research (i.e., to conduct and/or support innovative research that addresses social inequalities and social change), and action (i.e., to engage students in direct service and social action for change).

To support the mission and goals of SJRI, in spring 2013 we began developing and implementing EL courses in sociology whereby students were required to complete at least 40 hours of service with nonprofit organizations or government agencies in the local community. Students served campus organizations such as SHORE and the Dalton Mentoring Program, community organizations such as Habitat for Humanity, Horry County Teens and Infant Shelter, and Street Reach, and government agencies such as the Conway Police Department and J. Reubin Long Detention Center. Student activities included grant writing, assisting with research needs, project management, organizing special events, and completing daily administrative and programmatic tasks. Students were required to document, reflect and analyze their volunteer experiences in light of key theories, concepts, and debates discussed in their classes. During the first year of implementation, the SJRI sponsored six EL courses that served approximately 150 students and nearly 50 community organizations.

A preliminary assessment was completed after the first year by the SJRI’s evaluation team, sociology lecturer, Lisa Winters, and SJRI student intern, Jamie Glass. Findings from surveys and focus groups conducted with several of the classes revealed that most students felt that taking an EL course in sociology was a positive experience, and that the experiential learning component was beneficial to their academic coursework (Winters and Glass 2014).

When asked about the benefits of their experiential learning journey, the benefit expressed most often by students was being able to combine classroom learning with real-world experience. One student from the Community Development and Social Change
class said, “I was able to see how class work and community work were intertwined.” Another student said of the benefits, “Hands on learning experience...having something to compare classwork to right away as you’re learning it.” Survey findings revealed that 70 percent of students agreed that their volunteer experiences were relevant to the course material covered in the classroom.

Students also cited making a difference in the community as a benefit of experiential learning. A student said, “I think that feeling like I was making a difference in the community while I was taking this class was hugely beneficial. I honestly felt like I was both developing the community around me while also creating social change.” Another student concurred: “The biggest benefit is actually working hands on and really being a part of something bigger than yourself. Learning about the real world and real problems and being able to help out in some way.”

The third most commonly cited benefit of the EL courses was gaining experience that would help students in their future educations and careers. According to one student, “This course taught me a lot about myself and what I need to be looking for in a career.” Another student testified to the professional development gained from the class: “Pushing us to build résumés, put ourselves out there and professionally go out and get involved in volunteer work.” The EL courses actually led to paid employment for two students who volunteered with the Rape Crisis Center and Waccamaw Youth Center. One of these said, “I learned a lot through my volunteer experience, which eventually turned into a job.” Overall, more than half of students surveyed agreed that they learned more in their EL courses than traditional courses (Winters and Glass 2014).

As we reflect on our experiences over the past year and a half, I and others who work with the SJRI believe that we are on the right track in creating an effective model for implementing experiential learning into the curriculum. The courses and activities sponsored through the SJRI are in concert with the goals of QEP’s Experienced@Coastal to 1. engage students in experiential learning activities that complement and build on the knowledge and skills relevant to their academic program and/or career goals, and 2. foster critical reflection among students on the relationship between experiential learning, their academic experience and the world in which they live.

We look forward to continued growth and development in the upcoming year and the opportunity to turn more students onto social justice and experiential learning at CCU.

For information about the SJRI, visit our website at http://www.coastal.edu/socialjustice/.

Please contact Deborah Perkins at 843.349.2693 or dperkins@coastal.edu.
Coastal Carolina University hosts a CHEMISTRY EDUCATION WORKSHOP

Through the sponsorship of Georgia State University's Chemistry Collaborations, Workshops and Community of Scholars (cCWCS) program funded by the National Science Foundation, professor of chemistry John Goodwin held a science writing mini-workshop at CCU June 6-8, 2014.

The workshop, titled Writing POGIL-in-Context Activities for General Chemistry, focused on the type of context-rich activities Goodwin and collaborators developed several years ago with NSF funding through a CCLI grant (Course, Curriculum and Laboratory Improvement). These activities have been published by Pacific Crest in a book called Solving Real Problems with Chemistry, now in the second edition. Goodwin's collaborator, Troy Wolfskill, Ph.D., who is director of undergraduate chemistry workshops at Stony Brook University, co-led the workshop. POGIL is a nationally-disseminated pedagogy in science education and stands for Process Oriented Guided Inquiry Learning.

The activities generated over the weekend by the group of 18 chemistry faculty visiting from all across the United States included topics such as identifying elements in a star from its line spectrum, calculating just how cold a cold-pack would get on a hot day, examining the energy flow in eating fast foods and an investigation into what constitutes a lethal dose of a common dietary supplement. The activities are being shared across the group for testing and revisions and possible future publication. ☟

Contact John Goodwin at jgoodwin@coastal.edu or 843.349.2295.
iBiochemistry:
LABS UTILIZING MODERN TECHNOLOGY—
EXPERIENCING THE FUTURE.

by Paul Richardson, Ph.D., Associate
Professor, Department of Chemistry

LEARNING
to compete in today's world.
Technologies are always advancing and, as such, so are the ways that we communicate with one another. The idea behind the iBiochemistry project was to integrate classical biochemistry teaching labs with modern technology to provide a unique experience that could help students be competitive in the increasingly digital world.

The project was threefold; firstly, the complete change of paper-based lab manuals to fully integrated, digital lab manuals; secondly, develop a fully accessible site to store and share data over the Internet; and finally, a digital interface for each lab group to communicate, collaborate and access information.

The first part of the project was to digitize the current lab manual. The old paper copy of the lab manual was converted to a digital format. This also allows the students to access the lab manual for free, with no need to buy the manual or print it off. Once the biochemistry manual was digitized, links were added to the manual to provide background information. This way the students could read up on additional materials to better understand the lab. Finally, a link to training videos was also added so students could learn techniques and instrument procedures before they entered the classroom, the idea being that next to no lab time is needed in instruction as the digital lab manual has all that training and background material built into it, on the web.

The second part was the creation of a web-based (Cloud) site to store information. The site also had to be secure so no one could tamper with their data, but allow all users access when they need to work on their lab reports. Using a free cloud-based system (Dropbox), a secure folder was created for each lab group to store and access data. As it was also cloud based, the students could work as a team from different locations on group projects—an easier way for students to collaborate and communicate.

The final part was to provide students with a digital interface to help them with their lab work, foster a better way to communicate scientific information, and save the students money in printing and book costs. Through the technology funds, the biochemistry program was given a grant to purchase 11 iPads and 10 chemical resistant iPad holders. A generous gift by a donor funded the purchase of cases to protect the iPads from chemical spills and other damages. Each iPad has wireless access to the Internet, allowing students to research questions and assignments while they have breaks in their laboratory.

In most industrial/professional lab settings, each person is provided a computer that is linked to instrument(s) and an electronic lab notebook. This way, all laboratory data is stored electronically, so any individual within the company can monitor the progress of the experiment. This makes collaboration easier, as access to the data is instantaneous for those who need it. This will allow many people to review the data and help in the experimental process by communicating feedback and comments in a timely manner. This project was designed to mimic that environment. It is to provide a technologically-rich environment allowing them to learn the skills and tools to compete in today's world.

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every year the College of Science Swain Scholars conduct a community health outreach and research project to benefit the greater Horry County area. This year, the project conducted by the junior-level Swain Scholars was titled “Biking in Kind Environments” and consisted of many facets. The overall mission of this project was to encourage bicycling for health, wellness, and transportation, and to advocate for a bicycle-friendly CCU community and greater Horry County area. The reason the project was important to the community was the comparatively high bicycle fatality rates. Fatality rates for cyclists reflect a growing problem, especially within South Carolina and Horry County, specifically. South Carolina’s fatality rate per million has continued to remain higher than the rate of the United States (Palmetto Cycling Coalition, 2013); furthermore, in 2010, South Carolina recorded 15 cyclist fatalities, while in 2013 there were five cyclist fatalities in Horry County alone (League of American Bicyclists, 2010). Beyond the alarming fatality rate statistics, it was also recognized that as this coastal area continues to grow, alternative means of transportation will become more of a necessity than for recreational exercise.

In order to determine attitudes and knowledge about bicycle safety, a multifaceted project was created, including research, advocacy and educational components. The research aspect of the project included an online survey that was utilized to determine attitudes and knowledge of cyclists versus non-cyclists regarding safety, education, traffic law enforcement and quality of life in the community. Once the final statistics are analyzed, the results will be shared with local government entities.

During the fall and spring semester, the Swain Scholars were able to focus on planning the advocacy and educational portion of the project. This first component consisted of an event, which was the Bike Rally Day on Prince Lawn at Coastal Carolina University. This day included vendors, food, giveaways, education from Campus Safety, and two bikes to raffle off, courtesy of the Eco-Rep Program at CCU. To ensure that the day was planned out with expertise and precision, a committee was formed consisting of the Swain Scholars, Campus Recreation, Eco-Reps, Campus Safety and Student Government. With these campus organizations coming together, Bike Rally Day was a success. We obtained 98 responses to brief surveys to determine if students would use a bike share program, a project led by Layne Davis of Campus Recreation. Plans are for this information to be utilized along with the research survey and to continue this day annually.

The second portion of the advocacy and educational portion of the project was to create a public safety announcement for the 4,000 foreign exchange students who live and work in Myrtle Beach each summer. One of the major inspirations for the entire project was the tragic death of one of the students in 2013 as a result of a bicycle accident. The public safety announcement was designed in Russian and Spanish, along with a brochure for the Myrtle Beach Police to use during the foreign exchange students’ orientation. The purpose was to advocate bike safety and educate the students so future accidents could be prevented.

An overall goal for the project is to provide sound feedback from residents which will provide future seed grants to fund new infrastructure, specifically for bicycle safety. One of the Swain Scholars was able to present preliminary research to Horry County planners, while another Swain Scholar presented bike share survey results to City of Myrtle Beach committee members. When the final results are completed, additional presentations and meetings will be planned. We hope the research will continue to impact our county and state in further infrastructure planning. We are still very passionate about continuing the project into the senior level of the Swain Scholar program.
The Swain Scholar Program is a unique scholarship program which fulfills the wishes of a 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 Promotion, Biochemistry, Biology, Exercise Sport Science and Chemistry programs.

The Swain Scholar Program, which began in 2009, has been a sought-after scholarship for science students and to date has had 21 participants.

2009 – 2010
Sherri Tomlinson – Chemistry
Christina Eells – Biology
Kaile Laurenzo – Health Promotion
Tyler Gebauer – ESS

2010 – 2011
Alex Hamb – Health Promotion
Allyson League – ESS
Miguel Mendoza – Biology
Thomas Niemela – ESS

2011 – 2012
Janel Reeves – ESS
Christine Po – Health Promotion
Iesha Wade – ESS
Katie Roach – Health Promotion

2012 – 2013
Ina Troutman – Bio-Chem
Kayla Liland – Bio-Chem
Kaity Essel – Health Promotion
Jessica Otten – ESS

2013 – 2014
Dori Sanders – ESS
Chelsea Thomas – Biology

2014 – 2015
DeVaraiy Levon White – ESS
Christina Auth – Health Promotion
Briana Nicole Laws – Biology

Dori Sanders and Chelsea Thomas, Exercise Sport Science and Biology majors, respectively, are returning Senior-level Swain Scholars. For the 2014-2015 year, three Junior-level students from the College of Science were selected through a competitive process to serve as Swain Scholars for four semesters. Those selected are:

DeVaraiy Levon White
Exercise Sport Science major from Sumter, S.C., whose career objective is to obtain a doctorate in physical therapy and to open a physical therapy clinic or fitness organization.

Christina Auth
Health Promotion major from Monroe, N.Y., whose career objective is to be a Global Health Adviser for the Center for Disease Control (CDC).

Briana Nicole Laws
Biology major from Myrtle Beach, S.C., whose career objective is to become a dentist.

Interested Swain Scholar applicants should contact Sharon Thompson, professor of health promotion, College of Science at 843.349.2635 or email: thompson@coastal.edu.
Coastal Carolina University has continued to increase enrollment and expand educational offerings, the College of Science (COS) has mirrored those improvements. In a previous issue of Progression Magazine, statistics showed that enrollment at the University increased 27.9 percent from 2006-2011, yielding an annual growth rate of 5 percent. During that same time period, the College of Science grew 55 percent, yielding a 9 percent annual growth rate. Even more telling, 40.7 percent of all University students in 2014 were science majors.

As of 2010 through preliminary 2014 enrollment illustrates that CCU has grown 14.3 percent and the COS 29.9 percent, with the COS representing 44.0 percent of total enrollment. If the range is extended to 2006 through preliminary 2014, CCU has grown 40.8 percent and the COS 84.5 percent.

The continued growth of the University reflects the invaluable worth to one's career and economic benefit of obtaining a college degree. The continued growth of the COS reveals that career opportunities in the many disciplines of science are also burgeoning and that the need for individuals with a science education will continue to grow. The demand for these individuals greatly exceeds their availability.

As stated in the previous issue of PROGRESSION, the economy, commerce, technology, environment and demographics all influence education and careers. For example, health care from various vantage points—from laboratory and research for treatments and cures to technology for the same; to exercise for younger and older generations; to cleaner environments for life; to automation and robotics—ALL impact the aforementioned influences on education and careers. Recent articles by the Bureau of Labor Statistics, Raytheon, Burning Glass Technologies and the Brookings Institute state the “value of and future need for” degreed individuals, especially those who studied a science-related discipline.
**Figure 1: Enrollment Growth Relationship of CCU and the College of Science**

- **CCU's enrollment growth percentage 2010-2014:** 3.5%
- **COS enrollment growth percentage 2010-2014:** 8%
- **CCU enrollment percentage of COS students in 2014:** 44%

- **2010 CCU enrollment:** 8,203 students
- **2014 CCU enrollment:** 9,976 students

**Figure 2: Percentage of COS Enrollment at CCU**

- **2010 COS enrollment:** 3,175 students
- **2014 COS enrollment:** 4,127 students

**Figure 3: COS Departmental Student Growth**

- **2010 COS enrollment:** 3,175 students
- **2014 COS enrollment:** 4,127 students
COMPUTER SCIENCE

Cory Nance
Lecturer
Nance completed his master’s degree in Computer Science at Georgia Southern University and his undergraduate degree at Coastal Carolina University. He has experience working with relational databases, software development and as a systems administrator. His research interests include system administration, design patterns and data mining.

EXERCISE AND SPORT SCIENCE

Ashley Balyeat
Lecturer
Balyeat recently completed her master’s in exercise and sports medicine at Western Michigan University, where she instructed a variety of courses in health, wellness and physical activity. She has worked as a personal trainer and as a health fitness specialist in corporate wellness. Certified from the American College of Sports Medicine, her interests include physiological changes in adaptive populations and the role of internships in the development of exercise science professionals.

CHEMISTRY AND PHYSICS

Drew Budner, Ph.D.
Assistant Professor, Chemistry
Budner received his bachelor’s degree from Adams State University in 2000 and his Ph.D. from South Dakota State University in 2006. His dissertation research was on the analysis of polar ice cores. He developed a new analysis system to increase sample throughput as well as performed initial investigations of the electrochemical analysis of H2O2 in these cores. He spent seven years teaching general chemistry and analytical chemistry at Whitworth University before joining CCU. His current research interests include improving the performance of a Prussian blue modified electrochemical sensor for the detection of hydrogen peroxide and the development of the aroma and flavor profiles of beer brewed from gluten free grains.

Matt Lykins, Ph.D.
Visiting Assistant Professor, Physics
Lykins earned his bachelor’s degree in physics from Eastern Kentucky University and his M.S. and Ph.D. in physics from the University of Kentucky where his dissertation work involved magnetic fields in star forming regions of the galaxy. He has taught courses at Eastern Kentucky University and University of Kentucky and was most recently a Postdoctoral Research Fellow at the University of Kentucky. He will be teaching introductory physics and astronomy courses. His research interests lie in working with Cloudy which is an open-source program that involves spectral synthesis simulation code.

André Wehner, Ph.D.
Lecturer in Physics
Wehner received his bachelor’s degree in physics from Humboldt-Universität in Berlin, Germany. He received his M.S. in physics from Idaho State University and his Ph.D. in mathematical physics from Utah State University where he specialized in quantum field theory and general relativity. He was previously at Westminster College in Pennsylvania before joining Coastal Carolina University. He has taught numerous courses in physics and mathematics and will be teaching introductory level physics and astronomy courses. His research interests are in the area of general relativity and differential topology.

MATHMATICS

Debendra Banjade, Ph.D.
Assistant Professor
Banjade recently completed his Ph.D. work in mathematics at the University of Alabama, Tuscaloosa. He received a master’s degree in mathematics from the University of Alabama – Tuscaloosa, and a master’s degree along with his undergraduate degree from Tribhuvan University in Kathmandu, Nepal. He has research interests in complex and functional analysis, operator theory and harmonic analysis.

PSYCHOLOGY

Nicole C. Rushing, Ph.D.
Assistant Professor
Rushing is finishing her Ph.D. in clinical psychology from Florida State University, where she also earned her master’s degree. Her bachelor’s degree was in psychology from UNC Chapel Hill. She completed a pre-doctoral internship at the Gulf Coast Veterans Health Care System in Biloxi, Miss. Her research interests include neurocognitive functioning and health behaviors in older adults, Alzheimer’s disease and depression.

Emalee J. W. Quickel
Assistant Professor
Quickel is finishing her Ph.D. in clinical health psychology from UNC Charlotte. She earned her master’s degree in clinical psychology and bachelor’s degree in psychology from UNC Wilmington. She is licensed to practice in North Carolina as a Licensed Psychological Associate. She completed an internship at the Wisconsin Department of Corrections and practicums at Carolinas Medical Center and Wake Forest University Baptist Medical Center. Her research interests include expectancy and civil competency in legal judgments and sentencing as well as trait mindfulness.

SOCIOLOGY

Lisa Winters, Ph.D.
Lecturer
Winters received her doctorate in sociology from Louisiana State University where she focused her research on the ways that income inequality affects mortality. She has been a Teaching Associate with our department for two years, and during that time has been working with the Social Justice Research Initiative as well as teaching a variety of courses. As a highly regarded teacher, our students benefit from her real-world application of research findings into her courses as well as her engaging personality.
MARINE SCIENCE

Eric Rosch
Lecturer
Rosch is a marine biologist who received his Ph.D. in zoology from Texas A&M University and his M.S. degree in marine biology and coastal zone management from Nova Southeastern University. His main research interests pertain to marine invertebrate behavior and ecology, especially crustaceans. His past research projects have involved social interactions within and among fiddler crab species (genus Uca) as well as experiments exploring factors that influence larval development of several crab species. He has also studied benthic ecology of nearshore systems and conducted environmental impact studies using macroinvertebrates.

Zhixiong Shen, Ph.D.
Assistant Professor
Shen received his B.Sc. degree from the Department of Urban and Environmental Sciences in Peking University, China in 2002 and Ph.D. degree from the Department of Geography in the University of Liverpool, Britain in 2007. He worked as a McWilliams Postdoctoral Research Associate during 2007-2012 and a Research Assistant Professor during 2012-2014 at Tulane University, and joined CCU in August 2014. He has research interests in Quaternary geochronology, Earth surface processes, neotectonics, environmental change, sea-level change and fluvial and coastal geology.

Till Hannebuth, Ph.D.
Associate Professor
Hannebuth completed his Ph.D. on the Dynamics of Global Cycles within the Earth System at GEOMAR, Christian-Albrechts-University Kiel, Germany. He is an expert in marine sedimentation with global experience, most recently with the Coastal Systems Group at Woods Hole Oceanographic Institution. His research interests include application of an exceptionally wide range of oceanographic, geophysical, and geological techniques to source to sink sediment studies. His findings are instrumental in unraveling environmental, climate and ocean circulation dynamics.

BILOGY

Steve Midway, Ph.D.
Visiting Assistant Professor, Fish Ecologist
Midway completed a Ph.D. in marine biology at the University of North Carolina Wilmington, a Master's in Fisheries and Wildlife Sciences at North Carolina State University, and a Bachelor's of Science in Wildlife and Fisheries Biology at the University of Vermont. He has most recently served as a post doctoral research associate at the Pennsylvania State University in the U.S. Geological Survey's Pennsylvania Cooperative Fish and Wildlife Research Unit. His research interests include both basic fish biology and ecology, as well as improving fisheries science and management. He often seeks to inform fisheries management needs with quantitative descriptions of fish biology and ecology.

Julia Molnar, Ph.D.
Visiting Assistant Professor, Vertebrate Biologist
Molnar completed her doctoral degree in veterinary anatomy at the Royal Veterinary College in London, UK, her master's in medical and biological illustration at Johns Hopkins University in Baltimore, and her bachelor's in general fine arts at the Maryland Institute, College of Art in Baltimore. Most recently, she worked as a research technician in the Structure and Motion Lab of the Royal Veterinary College while pursuing her Ph.D. Her research focuses on evolutionary changes in musculoskeletal anatomy and their effects on locomotion, particularly across water-land transitions.

HEALTH SCIENCES

Wanda Dooley
Associate Professor and Program Director, Nursing
Dooley initially earned a diploma in nursing in upstate New York, then completed her bachelor and master degrees in nursing at George Mason University in Fairfax, Virginia. She earned the Doctor of Nursing Practice from Old Dominion University. After practicing in a variety of bedside settings, she worked in the large Neonatal Intensive Care unit before earning her MSN and certification as a Family Nurse Practitioner. She began her teaching career in an associate degree nursing program in northern Virginia, where she served as assistant dean for about 10 years before coming to CCU. During that time she also acted as a preceptor for a number of nurse practitioner students. She started at CCU as an adjunct when the new BSN program began in spring 2011, and became full-time faculty in fall 2011. Her research interests include examining outcome differences between online learners and traditional learners, and prevention and early intervention for early childhood caries. She assumed her duties as the program director for the RN-to-BSN completion program on Aug. 16.

SCHOOL OF COASTAL AND MARINE SCIENCE SYSTEMS

Roi Gurka, Ph.D.
Associate Professor
Gurka completed his B.Sc. and M.Sc. in agricultural engineering at the Technion in Israel. He also completed his Ph.D. at the Technion in mechanical engineering. He specializes in fluid mechanics with expertise in turbulent flows. His research interests include development and application of non-intrusive flow imaging tools such as 3-D Particle Imaging Velocimetry to a broad range of environmental and biological fluid dynamic studies.
<table>
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<tr>
<th>Department</th>
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INFORMATION SYSTEMS
Kaitlyn E. Brown
Cameron D. Collins
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Daria A. Horinbein
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Lena Schaeffner
Ashleigh A. Watson