CLEMSON® UNDERGRADUATE RESEARCH

Ninth Annual

Focus on Creative Inquiry

Poster Forum

April 3, 2014

9th Annual Focus on Creative Inquiry Poster Forum

April 3, 2014

The 2014 Focus on Creative Inquiry Poster Forum displays a selection of the projects accomplished by Clemson University students in their Creative Inquiry teams.

What is Creative Inquiry? It is small-group learning for all students, in all disciplines. It is the imaginative combination of engaged learning and undergraduate research – and it is unique to Clemson University.

In Creative inquiry, small teams of undergraduate students work with faculty mentors to take on problems that spring from their own curiosity, a professor's challenge, or the pressing needs of the world around them. Students take ownership of their projects. They ask questions, they take risks, and they get answers.

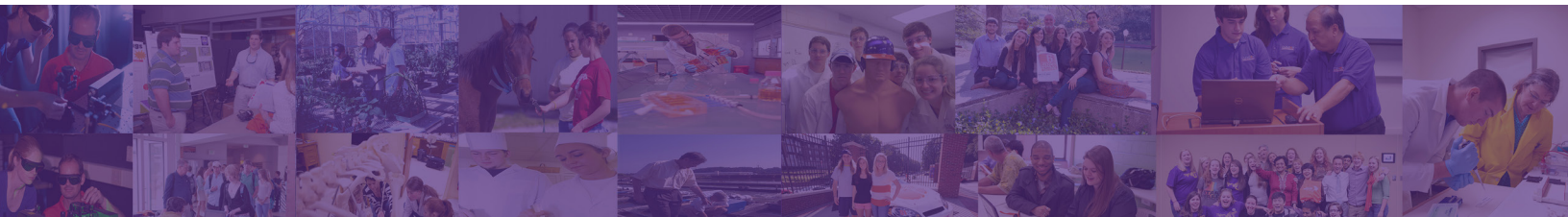
Since its start in 2005, Creative Inquiry has supported more than 800 teams enrolling approximately 22,000 undergraduate students.

Students may join Creative Inquiry teams as early as freshman year and continue through graduation and afterwards-- as graduate student mentors. They hone critical thinking and problem-solving skills as they learn to work in a team - sometimes as leaders, sometimes as followers. They develop communications skills as they present their work at professional conferences and to the external community, where they field questions from experts and decision-makers.

Creative Inquiry alumni praise their experiences for exposing them to real-world work experiences not available in the classroom, providing hands-on research experiences, preparing them for their future careers and providing opportunities to work closely with faculty.

Indeed, Creative inquiry is a campus-wide, cross-disciplinary culture that makes the Clemson experience relevant, engaging and extraordinary.

Learn more about Creative Inquiry in the annual *Decipher* magazine and on our website: clemson.edu/ci



Acknowledgements

Creative Inquiry program director:

Dr. Barbara J. Speziale, Associate Dean, Undergraduate Studies

Creative Inquiry committee:

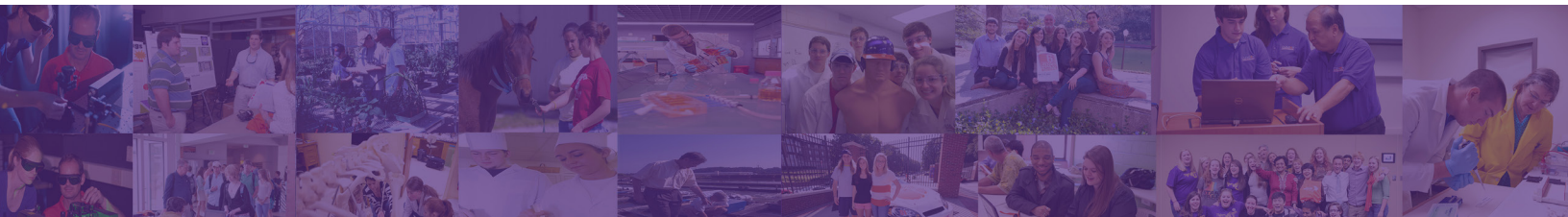
Barbara Speziale, Chair
Bob Brookover, Parks, Recreation, and Tourism Management
Min Cao, Biological Sciences
Marge Condrasky, Food, Nutrition and Packaging Science
Delphine Dean, Bioengineering
Molly Espey, Economics
Linda Gambrell, Education
Jon Harp, Undergraduate Studies
Michael Henson, Biological Sciences
Dana Irvin, Calhoun Honors College
Kendra Johnson, Performing Arts
David Knox, Institutional Assessment
Maribel Morey, History
Suzanne Price, University Housing and Dining
Gail Ring, Undergraduate Studies, ePortfolio
Kathy Woodard, Public Service Activities

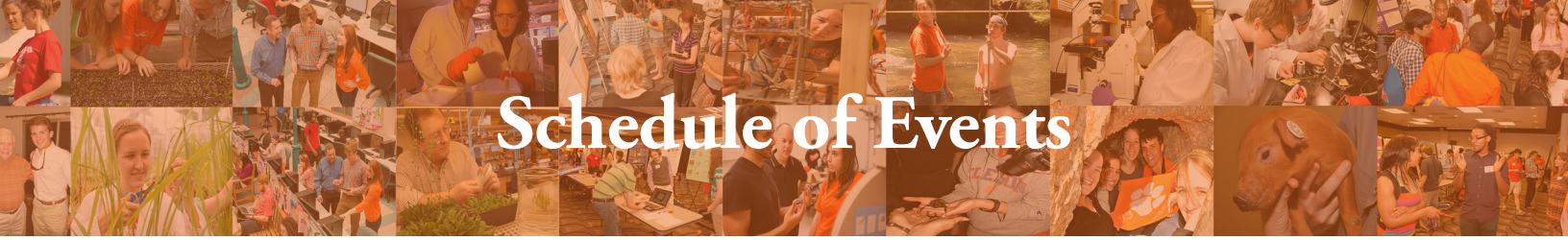
Focus on Creative Inquiry Planning Team:

Alice Brawley, Psychology and Institutional Assessment
Tullen Burns, Undergraduate Studies
Robbie Fitzwater, Marketing Services
Gaurav Marmat, Electrical Engineering and Creative Inquiry

Cover Design by Gaurav Marmat

The new logo depicts students' views that Creative Inquiry empowers them, bringing them together to discover their passions, push boundaries, and collaborate in the pursuit of a better and more inspired world.





Schedule of Events

8:00 am - 9:30 am	Students install posters	Hendrix Ballrooms, Meeting Rooms & Multipurpose Room
10:00 am - 12:00 pm	Morning Poster Session	Hendrix Ballrooms, Meeting Rooms & Multipurpose Room
1:00 pm - 3:00 pm	Afternoon Poster Session	Hendrix Ballrooms, Meeting Rooms & Multipurpose Room
3:00 pm - 4:00 pm	Plenary Session	McKissick Theater

Welcome - Dr. Barbara Speziale

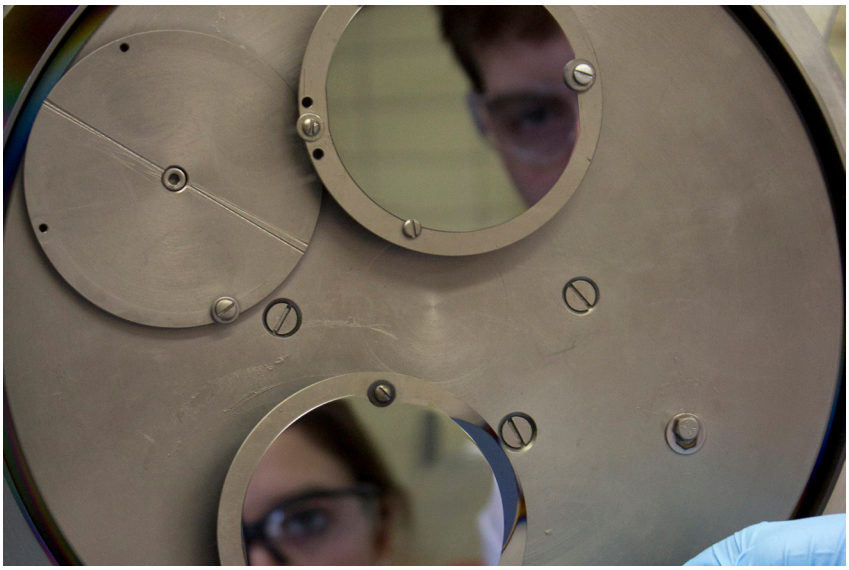
Introduction - Dr. Janice Murdoch

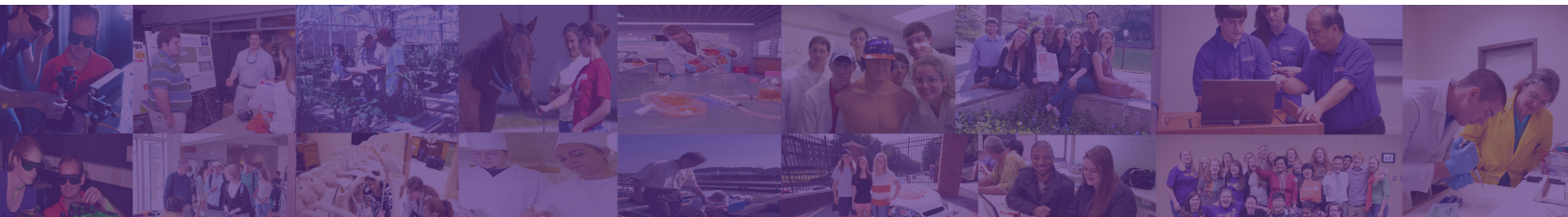
Featured Speaker – Dr. Marian (Molly) Kennedy, Materials Science and Engineering

Spider's Silk is Awesome and Other Adventures in Material Science: Nanostructuring of Protein Based Fibers

Awards Announcements - Dr. Barbara Speziale

4:00 pm - 5:00 pm	Students remove posters





Speakers

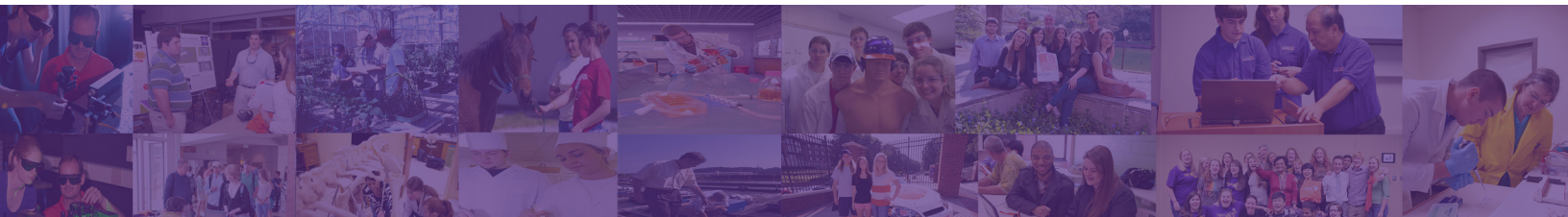
Barbara J. Speziale
Associate Dean, Undergraduate Studies

Dr. Barbara J. Speziale earned her Ph.D. in Zoology from Clemson University, a master's in Botany at the University of Minnesota and a bachelor's degree in Biology and in English Literature at the State University of New York at Binghamton. She has served Clemson University in public service, teaching, and administrative roles. She holds the rank of full professor in the Department of Biological Sciences, and directs Clemson's Creative Inquiry program in Undergraduate Studies. Dr. Speziale's research, funded by more than $13,000,000 in external grants, includes limnological studies of algae in freshwater lakes, water quality educational materials, and science education activities that encourage students, K-12 through college, to pursue science studies and careers. A National Science Foundation grant created the FIRST program to recruit and retain first-generation college students in science careers. The SC Life project, funded since 1998 by the Howard Hughes Medical Institute Precollege and Undergraduate Science Education Program, provides life sciences education for K-12 students, their teachers, and undergraduate students. She has received numerous awards for her work, including the Elliott Award for Outstanding Service to Off-Campus, Distance and Continuing Education, the South Carolina Governor's Award for Scientific Awareness, Clemson's Martin Luther King Jr. Award for Excellence in Service, the Society for Environmental Toxicology / Menzie-Cura Environmental Education Award, and two awards for the $4H_20$-Pontoon Classroom curriculum -- the Natural Resources Conservation Service Youth Environmental Award and the 4-H Centennial Program of Excellence.

Janice Murdoch
Vice Provost and Dean of Undergraduate Studies

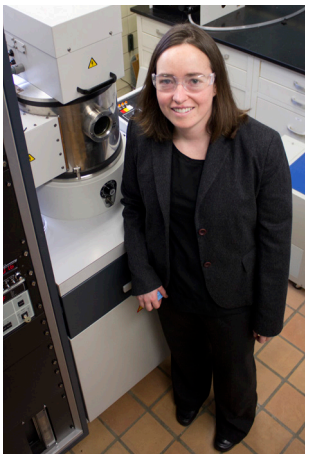
Jan Murdoch, who has taught at Clemson since 1986, received her bachelor's with honors in Psychology from Wake Forest University in 1980, followed by a master's in General Experimental Psychology in 1982. She was elected to Phi Beta Kappa in 1980. A native of Wilmington, NC, she completed her Ph.D, in clinical psychology at Vanderbilt University in 1985, with a clinical internship at Brown University. She is licensed to practice clinical psychology and holds the rank of full professor in the Department of Psychology. Murdoch's primary interest has been in undergraduate teaching. She also works with students on directed research projects and honors research. Courses she teaches include abnormal psychology, substance abuse treatment, and health psychology. Murdoch's research interests are in learning outcomes in General Education social science courses. Murdoch's other interests include public policy, including a sabbatical leave during the 1994-95 academic year to serve as an American Psychological Association Congressional Fellow working for Senator Jay Rockefeller's Senate Committee on Veterans' Affairs staff. She also plays bluegrass mandolin with "Any Old Time."

As Dean of Undergraduate Studies, Murdoch is responsible for maintaining and enhancing the quality of undergraduate academic programs and services, including curriculum, academic advising, the Calhoun Honors College, Cooperative Education, the Academic Success Center, Creative Inquiry, and ePortfolio.



Plenary Speaker

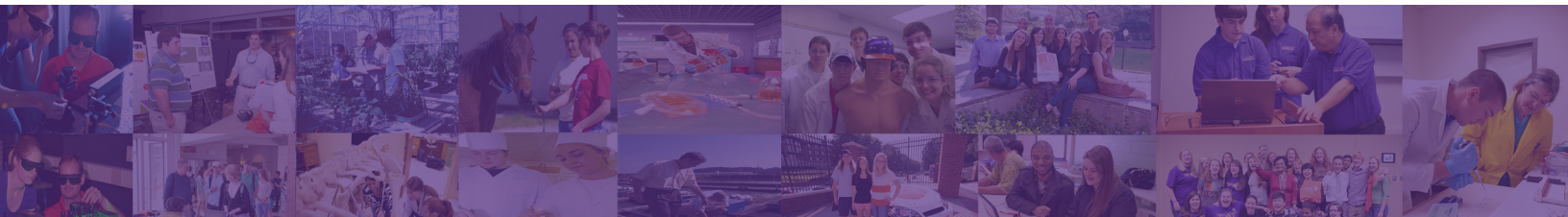
Dr. Marian (Molly) Kennedy
Associate Professor of Materials Science and Engineering



Dr. Molly Kennedy received her Ph.D. in Materials Science from Washington State University in 2007 and joined the Clemson University Department of Materials Science and Engineering as an assistant professor later the same year. Her research focuses on the mechanical response of thin films and composites, ranging from biological systems to traditional and flexible microelectronic systems. In particular her work characterizes how small feature sizes influence both deformation mechanisms and also failure of these structures. Dr. Kennedy is dedicated to improving undergraduate engineering education through teaching, mentoring and research. In 2013, she was awarded the Phil and Mary Bradley Award for Mentoring in Creative Inquiry for her work in mentoring undergraduates at Clemson University. Dr. Kennedy currently helps mentor three undergraduate Creative Inquiry research teams focusing on topics from wear of dental tissues to spider silk. She credits the CI students with helping her expand her research focus and new collaborations across colleges.

Plenary Lecture:
Spider's Silk is Awesome and Other Adventures in Material Science: Nanostructuring of Protein Based Fibers

Spiders create complex webs made of protein-based fibers. These spider silks can display a remarkable range of mechanical properties that are controlled by the protein structure. The primary structure, the amino acid sequence of the protein, is precisely specified by an organism's genetic code. Although most spiders produce silks with similar amino acid compositions, their properties can significantly vary and additional work is needed to understand how the protein structural arrangement along the fiber surface and core influence its properties. Our CI team is focused on categorizing the unique properties of spiders native to South Carolina and also helping to identify how surface and core structuring of the silk links to their properties. This talk will focus on how the CI group has developed methods for collecting local spider species and their silk. She will also outline their characterization of the dragline silk's mechanical properties and surface properties with specific high-resolution force spectroscopy. Our CI team works really well together across disciplines. This can sometimes be difficult so in this talk, I will also talk about the factors we identified successful to get our successful research teams.



The Phil and Mary Bradley Award for Mentoring in Creative Inquiry

The Phil and Mary Bradley Award for Mentoring in Creative Inquiry is presented each spring in recognition of outstanding work with undergraduate students. Nominations are accepted from student participants in Creative Inquiry Initiative team projects. The award is made possible by a generous gift from Phil and Mary Bradley, and consists of a plaque and a salary supplement.

Bradley Award Recipients

2013 Dr. Marian (Molly) Kennedy, Associate Professor, Materials Science and Engineering
2012 Dr. John DesJardins, Assistant Professor, Bioengineering
2011 Dr. Delphine Dean, Assistant Professor, Bioengineering
2010 Dr. June Pilcher, Alumni Distinguished Professor, Psychology
2009 Dr. Karen Kemper, Associate Professor, Public Health Sciences
2008 Dr. Susanna Ashton, Professor, English
2007 Dr. Mark Charney, Professor, Performing Arts

The Bradleys are a "One Clemson" family, supporting both athletics and academics, including providing the first major gift for the Creative Inquiry initiative. They did so because they like the idea of relevance and results. "The projects we've seen so far are about real problems," says Phil, "and they're designed to find solutions."

Phil's father, William F., had attended Clemson in the late 1930s, gone into service before he graduated, gotten married and started a family. In the late 1940s, he came back to Clemson with his young family to finish his degree. Years later, Phil Bradley enrolled in Clemson. After his sophomore year, he married his high school sweetheart, Mary, and before he graduated in 1965, they too had begun their own family with daughter, Renee.

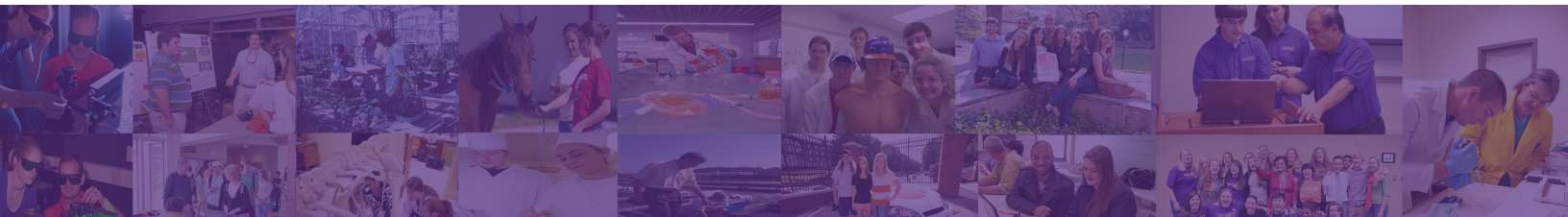
After military service, the Bradleys settled in Charleston where they had their second child, Philip, and where Phil established a successful career in the insurance industry. Their children grew up coming to Clemson ball games. One of Philip's first Death Valley memories is that of being picked up by the Tiger.

Both children attended Clemson. Renee later transferred to the College of Charleston, while Philip earned a political science degree at Clemson in 1992. He now has his own Allstate agency in Mount Pleasant. Seeing Philip graduate was coming full circle for Phil and Mary. In fact, Philip had his father's and grandfather's graduation years engraved inside his own Clemson ring.

The Bradley family has always believed in a life of involvement - whether it's working for their church, hosting Clemson Lowcountry events or giving financial assistance to worthy causes.

"Clemson has played a large role in my family's development," says Philip. "As our own history has evolved, so has the University's. Giving back is part of our shared tradition."

Excerpted from: Clemson World, Summer 2006Volume 59 Number 3: 'One Clemson' Family



Creative Inquiry gratefully acknowledges the support of Interim Provost Dr. Nadim M.Aziz

Dr. Nadim M. Aziz
Interim Provost Nadim M. Aziz

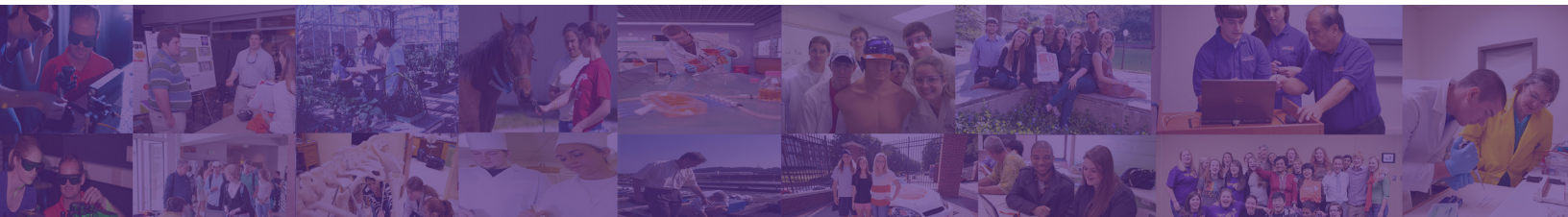
Dr. Aziz joined Clemson University in 1984 as a member of the faculty immediately after obtaining his Ph.D. in engineering science from the University of Mississippi. He was promoted to full professor in 1995, selected to chair the civil engineering department in 2003, and named associate provost for faculty development in May 2012. Clemson University President James F. Barker appointed Dr. Aziz as interim vice president for academic affairs and provost in May 2013.

During Dr. Aziz's nine-year tenure as the civil engineering department chair, the department achieved its highest national rankings. U.S. News & World Report ranked the department among the top-20 undergraduate programs and the top 30 graduate programs in civil engineering at national public research universities. The department also grew to become the 10th largest civil engineering program in the country in terms of BSCE degrees awarded. Under his leadership, the department witnessed increased diversity of its faculty and student body and a growth in its research scholarship, research expenditures, Ph.D. productivity, and students and faculty awards and recognitions.

In September 2011, with an endowment from civil engineering alumnus Gerald Glenn and his wife, Candi, the department was re-named the Glenn Department of Civil Engineering. In doing so, the department become one of the few named civil engineering departments in the nation.

When Dr. Aziz became the Associate Provost for Faculty Development, he joined the University leadership team and was instrumental in developing and implementing a market and performance based faculty salary adjustment initiative that brought Clemson University faculty salaries to a nationally competitive level. He was also involved in the tenure, promotion and reappointment review process, a plan to add approximately 100 new faculty positions to accommodate increased enrollments and to strategically support and grow Clemson's main research focus areas.

Dr. Aziz received his bachelors in civil engineering and his masters and doctorate in engineering science from the University of Mississippi.



Poster #1

Stimuli-responsive drug delivery systems using gold nanoparticles and phospholipid vesicles

Mentors: Christopher Kitchens, *Chemical & Biomolecular Engineering*

Students: Thomas Solon, Cody Davidson, John Stonaker, Taylor Ledford, Connor Leroy

In the near future, new pharmaceutical therapeutics will evolve to contain complicated protein molecules, gene therapies, SI-RNA etc., which must be transported in extremely specific environments such as a specific pH level or sodium concentration. The problem is that throughout the body there are many different environments that a drug could pass through. For example, gastric acid can have pH levels as low as 1 where blood is around 7.4. This is a problem because as the drugs pass through these harsh environments they may become rendered useless. Furthermore, these new therapeutics are not compatible with conventional drug delivery mechanisms and new strategies for drug delivery are required. To solve these problem DPPC/DPPG phospholipid vesicles are being used with Au nanoparticles to transport these drugs. The DPPC/DPPG vesicles encapsulate the drug of choice and protect it from the harsh environments of the body. The Au nanoparticles can be designed to either embedded in the lipid bilayer of the vesicles or decorate the vesicle exterior. When radiation is applied, the nanoparticles are excited and cause a disruption in the vesicle structure, leading to the release of the drug into the body. Our research is centered around how the stability of the lipid vesicles changes based on the size, surface chemistry, and distribution of the nanoparticles.

Poster #2

It's not easy being a reef: Impact of corallivory and competition on coral cover in the Florida Keys

Mentors: Michael Childress, *Biological Sciences*

Students: Sarah Hoffmann

As coral cover in the Florida Keys continues to decline, understanding the factors driving this trend has become a priority for researchers. Previous studies have shown that macroalgae directly competes with corals for nutrients and space, and that parrotfish herbivory can reduce macroalgae density. However, parrotfish also graze on corals so the net impact of parrotfish on corals is unclear. To estimate the net impact of parrotfish abundance on macroalgae and corals, we measured substrate composition and parrotfish density on 14 reefs in the middle Florida Keys. Parrotfish abundance was not significantly related to macroalgal cover nor was macroalgal cover significantly related to coral cover. Parrotfish density, however, was sometimes positively related to coral cover. This suggests that the net impact of parrotfish grazing may have a positive impact on corals in the Florida Keys.

Poster #3

Clemson engineers for developing countries - well drilling

Mentors: Jennifer Ogle, *Civil Engineering*

Students: Emily Thompson, Savannah Miller, Coty Holland

Currently there is a lack of readily available water in 20 rural villages of the Central plateau of Haiti. The task of this well drilling project is to provide a constant source of clean water to these 20 villages. This task is essential to improving the overall lifestyle and health of the Haitian villages. Cholera has been a severe problem in these areas for many years, largely due to the lack of clean water to drink. These 20 wells will be installed using a Porta-Drill-Mini rig at a maximum depth of 200 feet. The drilling process will consist of penetrating through various types of limestone and carbonates. The goal is to tap into the perched aquifers that lie within the depths of 200 feet. The water from these aquifers will be drawn out with hand pumps that are easy to use for women and children since they collect water for the daily uses.

Poster #4

Selection of wintering habitats by bats in the South Carolina Piedmont

Mentor: Susan C Loeb, *School of Agricultural, Forest, and Environmental Sciences*

Student: Jordyn Kahanamoku

Bats are nocturnal and elusive, and can travel large distances in search of food. For these reasons and more, little is known about their natural history and behavior, even though they are found all over the globe. Many studies have been done to discover their roosting sites and overall ecological niche, but these studies have been conducted in the summer when the bats are most active. Little is known about where they go and their activity in the winter except for large colonies that dwell in caves, mines, tunnels and other structures. This study focused on learning what habitat types bats use during January - March. Ultrasonic detectors were used to record bat echolocation calls and were placed in three different habitat types: mature hardwood forests, mature pine stands, and open fields. Preliminary results suggest more activity in pine stands than in hardwood forests. This might be due to a reduction in heat loss from the protection of the pine needle canopy. This means bats expend less energy while not in torpor, which gives them a better chance of making it through the winter.

Poster #5

Turnaround time reduction for military certificates of compliance - team 1

Mentor: Reshmi Koikkara, *Industrial Engineering*

Students: Kevin Carlson, Julie Foecking, Michael Lazaro, Zong Wang

The objective of this project is to reduce the turnaround time for military Certificates of Compliance (COC) at the Milliken Company in Marietta, S.C. The first step was to determine the needs of the clients and determine the major losses of the system by performing a physical and Why-Why analysis as well as utilizing fishbone diagrams. With this information it was possible to then construct a Pareto chart to show the clients where the large percentage of losses is coming from. The team found that the key losses in the system came from having to send material to an outside lab for testing and that lab technicians allowed large losses when machines were allowed to sit idle for extended periods of time. Using this data the team will generate a set of solutions to tackle the scheduling issues that will optimize the dry-lab testing procedures.

Poster #5

Turnaround time reduction for military certificates of compliance - team 2

Mentor: Reshmi Koikkara, *Industrial Engineering*

Students: Christopher Greco, Ainsley Shreve, Michael Reitz, Tanner Slice

The student members of this senior design project worked specifically with Milliken & Company's Enterprise plant in Marietta, SC. The Enterprise plant is a finishing plant, therefore it receives previously manufactured textiles from other Milliken plants, applies dies and finishing chemicals, tests the products, issues a Certificate of Compliance (COC) and ships the product to the customer. The scope of this project includes optimizing the workflow of Military products through the dry testing lab in order to reduce turnaround time of COC's by at least 25%. The team began by modeling the current system for better understanding. The team then analyzed the losses of the current system and performed the appropriate root cause analyses. The next step in the project is to generate concepts and test them against each other in order to identify the optimal concept. The final step is to implement said concept.

Poster #6

Getting into the "swing of it": A study of sports motivation and performance for PGM students

Mentors: Teresa Tucker, Adam Savedra, *Parks, Recreation & Tourism Management*

Students: Griffin Barth, William Burdette, Bryant Duncan, Katherine Edwards, Ansley Farmer, Brooks Gray, Ann Hammond, Ryan Marcengill, Kyle Murphy, Joe Turbeville

In sports, numerous research studies have found that motivation is one of the biggest factors affecting an athlete's performance. Limited research has examined the relationship between performance and motivation of those who play a sport at the serious leisure level and also pursue a career in that particular sport's industry. Professional Golf Management (PGM) programs are designed to prepare students as leaders in the golf industry. In order to successfully complete the PGM program, all students must demonstrate their ability to play golf at a high level. The purpose of this study is to examine the relationship between performance and levels of motivation as outlined by self-determination theory for PGM students. A variation of Sports Motivation Scale (SMS) will be administered to current PGM students throughout the country in an online format. Upon completion of data analysis, implications and recommendations will be presented.

Poster #7

Local DC electricity generated by photovoltaics (PV): Transforming the electricity infrastructure of the 21st Century

Mentor: Rajendra Singh, *Electrical & Computer Engineering*

Students: Holly Goodwin, Cody Neary, Michael Darlington

United States aging electricity infrastructure of generation, transmission and distribution facilities was built over the course of a century and is dominated by alternating current (AC). Most of the loads around us are direct current (DC) load. Commercial buildings have more than 80% DC loads. DC has many advantages over AC. Due to the advancements in power electronics today, DC infrastructure can be implemented with all the advantages of saving energy and improved reliability of the grid. By doing measurements of cell phones we will demonstrate the advantages of DC source over AC. We expect energy saving of about 25-30% by using DC in place of AC. At Edison's time there was no local source of DC electricity. Today solar panels are available and the installed PV system cost is as low as $1.50 per peak watt. Due to growth of electric vehicles and grid storage, battery cost is also decreasing every day. Tesla (an electric car manufacturer) is going to build a Giga watt battery manufacturing plant in US. The combination of PV and battery storage will transform the electricity infrastructure of the 21st century.

Poster #8

Student perceptions of the use of marijuana and abuse of prescription drugs at Clemson University

Mentor: M. Elaine Richardson, *Academic Success Center*

Students: Parker Rhoden, Jordan Hyrne, Charles Halliday, Corine Tyler

Prescription drugs and marijuana have been used and abused across college campuses for many years, but recent data show that usage has been increasing. This goal of this research project has been to understand the perceptions of prescription drugs and marijuana among users within a college setting, and compare the results with a similar study conducted at Duke and UNC Greensboro. A quarter of the Clemson University undergraduate student population was administered a survey, with 9% response rate. Respondents included a range of diverse ethnic origins, genders, class standings, and fields of study. The questions specifically focused on student opinions, perceptions, and behaviors concerning the illegal use of marijuana and abuse of prescription drugs. Nearly 40% of students surveyed indicated that use of marijuana and abuse of prescription drugs are major issues facing students at Clemson. Approximately 11% of respondents have been diagnosed with attention deficit/hyperactivity disorder (ADHD) and have prescriptions for ADHD medications. Data matched very closely with results of

studies at other institutions, indicating that Clemson students share the same perceptions and potential for prescription abuse as students at other institutions. Results will be used for further research and implementation of action to provide educational resources to Clemson students.

Poster #9

A study of the actors in volunteer tourism in Rwanda: Tourists, communities, and service providers

Mentors: Kenneth F Backman, *Parks, Recreation & Tourism Management*

Students: Morgan Adcock, Courtney Ambrose, William Barnett, Elizabeth Holmes, Amethyst Kipling, Jami Kraft, Caitlyn Martin, Sara Snyder, Hayden Uldrick, Casey Walters

The purpose of this study is to assess the problems and potential solutions for volunteer tourists, residents, and service providers in the volunteer tourism industry in Rwanda. By studying the three actors in volunteer tourism, we can determine how to make volunteer tourism a positive experience for everyone involved. Reviewing the effects of volunteer tourism in Rwanda can determine if it leads to increased manpower, improvement of facilities and quality of life, and eventually lower levels of poverty. The data will be collected through surveys and interviews of volunteer tourists, communities and services providers in Rwanda outside of Volcanoes National Park in May of 2014. We will try to survey 200-300 people at random so that we collect a good representation of the population's opinion. The questions will be directed toward finding tourists motivations for volunteer tourism, their likelihood of purchasing from service providers, and what the community expects from their experiences. Then, the data will be analyzed to understand the benefits for each actor and to create the best experience possible for volunteer tourists. The data will show how to improve the role of volunteer tourism in Rwanda and how it may help lower poverty.

Poster #10

Comparison of till and no-till agricultural practices on carbon dioxide flux from the soil on an organic farm

Mentors: Scott E Brame, *Environmental Engineering & Earth Sciences*

Students: Ashley Coffin

The utilization of no-till or conservational tillage practices is widely considered to lower carbon dioxide (CO2) emissions. In this study, the effect of till and no-till practices were assessed based on the CO2 flux from the soil on an organic farm located in upstate South Carolina. The measurements were taken over a month long period in late fall. The no-till plot had been recently converted and the till plot had been harvested in the months prior. In addition to studying the CO2 flux, temperature data was recorded for comparison. At temperatures below 45°F, the CO2 flux from the till plot was lower than from the no-till plot. While these findings were helpful, they raised questions. The study was repeated with different comparisons. The plots were compared to ambient outputs, and the results favored the no-till plot. Overall, no-till output of CO2 was lower than the till plot. These findings support the implementation of no-till practices as a method of reducing atmospheric CO2.

Poster #11

Development of an inexpensive tire softening agent from readily available materials to improve traction in race car tires

Mentors: Rachel Getman, *Chemical & Biomolecular Engineering*

Students: Baxter Ward, Sean Dix

Developing inexpensive tire softeners can prolong the life of tires and save people money that would be spent on new replacement tires. We have conducted two tests on the treated and untreated tires: the hardness test and the grip test. First, tire hardness was measured with a durometer on a tire that was treated with hot lap and a tire that was not. The tire that was

treated with hot lap was slightly softer than the untreated tire substantiating the tire softener's claim. Next, we will be cutting pieces out of the tire (also called omegas) and running them through an instron machine. This machine stretches the omegas at a certain frequency and reports back the hysteresis. The higher the hysteresis, the better the grip. Testing is ongoing, but initial results show that the tire softners did make the tires softer.

Poster #12

A prospective study of resuscitative outcomes at a downtown Greenville SC hospital using Connect Care versus CodeNet for cardiac arrest documentation

Mentor: John Whitcomb, *School Of Nursing*

Students: Ivey Sumner, Kirk Shelley, Cayla Hahn, Taylor Hunnicutt

Our study was looks at the difference between 2 systems used to document cardiac arrests in a hospital setting. One is a new machine that is called CodeNet. This documentation device was compared to the documentation system at Saint Francis Hospital in downtown Greenville, SC. When the details of a cardiac arrest are recorded (e.g., time it began, how many shocks were given, and what interval the shocks were given), this information can be used to look for patterns that predict survival. This can hopefully be used to create new protocols that will increase the patient's chance of survival. This is being accomplished through chart review (cardiac arrest sheet) of cardiopulmonary arrest for 12 months and data collected with the CodeNet from cardiac arrests that occur in theIntensive Care UnitandCritical Care Unit. More data is being collected, but the preliminary results seem to indicate that CodeNet isa much more efficient way to document the details of a cardiac arrest.

Poster #13

Smart & Savvy students

Mentor: June Pilcher, *Psychology*

Students: Leah Hildreth, Kimrey Holmes, Raegan Osborn

We, the Smart & Savvy Students (SSS), provide studying and general life tips to Clemson University students. We have a Twitter feed and a Facebook page to spread the information to the student body. Each tweet contains a 140 character tip written in a dialogue format. The tweets include links to the Facebook page, which has more information. The Facebook page provides links to scientific sources that support our claims. These links provide students with the opportunity to learn more about the topics. SSS posts tips to Twitter and Facebook 3 to 5 times a week. Using popular social media, SSS provides students quick tips about topics including study skills, exercise and diet, recreation, social life, emotional health, and healthy habits. This project is sponsored by the Creative Inquiry Program at Clemson University.

Poster #14

Designing medical technology for developing countries

Mentors: Delphine Dean, John D. Desjardins, Kayla Gainey, Adam Metzger, Jorge Rodriguez, *Bioengineering*

Students: Hilliary Adams, Rebekah Adams, Charles Devon, Robert Hall, Andrew Hargett, Austin Herbst, Patrick Ovington, Katelyn Rye, Sarah Stafford, Michael Tibbs, Jacqueline Veliz, Robert Youngblood

Resource-poor countries have markedly different healthcare systems. Many developed nations donate medical supplies to these countries, but this often does not meet the needs of the recipients. Our goal is to develop simple healthcare solutions that can be produced in-country so the developing area does not depend on outside sources for its supplies. Our group works on many projects, including sustainable woven grass neck braces and a variety of low-cost sensors. Our designs do not require frequent donations, minimize the use of consumables, and provide better detection and/or treatment of prevalent medical concerns.

Our baby monitor will detect skin temperature and control a heating element based on the needs of the infant. Our low-cost glucometer operates with the use of test strips that can be printed for a penny with a standard inkjet printer. This will allow the hospital or clinic to print the strips themselves rather than depend on donated strips. Our bacterial sensor will measure resistance to quickly detect the quantity of bacteria in a sample. We seek sustainable solutions for in-house manufacturing to advance more self-sufficient healthcare systems.

Poster #15

In vivo femoral strains in swimming turtles: Influence of locomotor medium on limb bone loading

Mentors: Richard Blob, Vanessa Young, *Biological Sciences*

Student: Joshua Sutton

The transition from aquatic to terrestrial habitats was an event in vertebrate evolution that preceded a sudden radiation of species. Subsequently some vertebrate lineages have returned to their ancestral aquatic habitats. It is known that vertebrate bone structure can vary depending on habitat. The evolutionary explanation for this is attributable to the fact that loads on the skeleton varies depending on the environment organisms inhabit. Terrestrial vertebrates would be expected to experience greater loads on their bones versus aquatic vertebrates due to body support demands, but there are no experimental data to test this hypothesis or quantify the difference. We tested how loads differed on the appendicular skeleton between use in terrestrial and aquatic habitats by recoding in vivo femoral strains during swimming and walking in turtles. We predicted that since swimming exerts less force on the limbs, peak load magnitudes would be lower during swimming versus walking, but that load peaks would be nearly equal during the thrust and recovery phases of the swimming limb cycle. Our data support our first prediction, with average peak strain magnitudes of swimming being half those of walking. Loading regimes were similar between both swimming and walking with compressive axial strains experienced dorsally on the femur. However, our second prediction was not supported, because peak strains were much higher during the thrust phase. Our results indicate that even when environmental forces are lessened, limb muscles play a large role in the production of bone loads.

Poster #16

An investigation into nurses' knowledge, comfort level, and behaviors regarding palliative and hospice care

Mentors: Nancy K. Meehan, *School Of Nursing*

Students: Michelle Johnson, Laura Batson

Background/Purpose: Hospital nurses are often the first line caregivers who receive questions regarding hospice and palliative care. Research has identified underutilization of these services due to multiple barriers in the referral process.This study aimed to identify nurse knowledge and comfort levels with hospice and palliative care and any barriers they perceive in referrals. Methods: A survey was distributed to acute care nurses on various specialty units at two large hospitals in SC. The questions covered demographics, knowledge and comfort level with hospice and palliative care, and perceived barriers to referral.Results: Seventy-nine nurses completed the survey. Overall, nurses reported being somewhat knowledgeable regarding hospice care and palliative care services.Conclusions:In general,nurses are only somewhat knowledgeable regarding when hospice and palliative care referrals are appropriate,and they are not comfortable with nor likely to initiate discussions concerning hospice or palliative care with physicians, patients, or families.This has led to lack of meaningful discussions of this type of care in the healthcare setting.

Poster #17

Clemson University implant retrieval program

Mentors: Melinda Harman, John D. Desjardins, *Bioengineering*

Students: Allison Santillo, Andrew Zandecki, Christine Stamer, Garrett Hall, Rachel Binnicker, Rebekah Dixon, Ryan Taylor, Sandra Siatkowski

The Clemson University Retrieval of Explants Program and Registry in Orthopaedics (CU-REPRO) is a student led Creative Inquiry program, and currently led by Dr. John DesJardins and Dr. Melinda Harman. This program provides an exciting opportunity for students to work with orthopedic surgical teams from around South Carolina to collect and process explanted medical devices. It allows students to explore clinical and experimental problems associated with surgical and patient variables, implant designs, biomaterials, and implant failure. This group meets weekly to discuss, investigate, and develop a viable implant retrieval program. As a group, we provide a working repository for retrieved implants and develop the tools and techniques for the systematic evaluation of implant designs, materials, surfaces, and function. This semester, we have taken on an additional goal of analyzing and determining the degree of corrosion present on non-bearing metal-on-metal surfaces using a method similar to the Goldberg Method for Corrosion and Fretting.

Poster #18

An interdisciplinary approach to product development

Mentors: Alexandra Weeks, Margaret Condrasky, *Food, Nutrition & Packaging Sciences*

Students: Devaun Austin-Walker, Rachel Kranjc, Olivia Schertz, Emily Moody

College courses in product development are often taught as a senior-level "capstone" class. The objective of this project was to engage sophomores in the design of an applications product development program. The focus was on using within cross discipline teams to develop healthy new food products for children. One group of students has completed two semesters of discussions, demonstrations, and hands-on labs within the product development process. A second group of students will present their products by semesters end. Preliminary results indicate that the completers feel significantly more confident collecting marketing information, conducting a market analysis, developing a gold standard recipe, applying changes to a formula to make it healthier, collecting commercial materials, and collaborating with students in a different major or field of study.

Poster #19

Greek community needs assessment: Reducing the negative impact of alcohol and drugs

Mentor: Jennifer Goree, *Student Health Center*

Students: Anna Bokman, Alexandra Fehling, Andrew Keller, Austin McIlwain, Annemarie Weekley, Brooke Ingram, Carter Lister, Emily Miller, James Godbold, Kaitlyn Stewart, Katherine Holba, Katherine Shuler, Lucy Schoemer, Parker Rhoden, Stephen O'Neill, Spencer York

Participants representing Clemson's Greek community have designed a research project that aims to define the problems associated with alcohol and drug misuse in the Greek community at Clemson University and to implement action steps based on sound evidence to mitigate the negative consequences associated with that misuse. The team is made up of Greek student leaders who are passionate about making a difference in their community and ultimately creating a plan to reduce alcohol and drug abuse among members. The team has conducted IRB and National PanHellenic approved focus groups and is in the process of coding the data. This poster reflects a preliminary analysis of that data.

Poster #20

Analyzing the response of *Legionella pneumophila* to gold salts

Mentor: Tamara McNealy, *Biological Sciences*

Student: William Linder

Legionella pneumophila is a species of bacterium found in freshwater aquatic environments globally and is a known human pathogen causing legionellosis. It is transmitted through inhalation of aerosolized particles that have been expelled from a reservoir, usually biofilms in aquatic environments or biofilm-associated amoeba/protozoa. How the bacteria persist in these biofilms and respond to the environment is an understudied area. This research involves identifying an effective method for control of growth and dispersal of *L. pneumophila* in man-made aquatic environments through the use of gold nanoparticles. Previous research has shown gold nanoparticles to cause biofilm dispersal events and alter host-pathogen interactions. The operon composed of genes lpg2105-2108 is hypothesized to encode products involved in bacterial interactions with gold in the environment. Mutants in two of the genes were created to assess function. Growth kinetics were analyzed for the wild type strain as well as two mutant strains, Δ2107 and Δ2108. Cultures were grown in AYE liquid media either with or without added gold salts. The results showed that the gold salts in the media had a slight inhibitory effect on the wild type strain, while inhibition was more pronounced on the Δ2108 mutant. The Δ2107 mutant showed very little growth in liquid culture with or without gold salts, although it grew well on semi-solid media. These results provide insight into how *L. pneumophila* responds to the presence of metals in the environment and could help in the development of an effective control method for disease-causing strains.

Poster #21

On the construction and sustainability of happiness: Where does my happiness come from?

Mentors: Robin Kowalski, *Psychology*, Brooke Baker, *English*

Students: Julia Turner, Megan Morgan, Matthew Webb, John Martin, Laura Frazee, Justin Stephens, Brittany Zaremba, Brittany Newsome, Anna Bokman, Elizabeth Whittaker

Problem. Happiness is attributed to three sources: genetics and personality (50%), the situation (10%), and voluntary behaviors (40%) (Lyubomirsky, 2008). Few studies exist on the subject of happiness factors, their duration, and how these factors may relate to Lyubomirsky's (2008) three sources of happiness, the purpose of this study. Method. Three hundred and forty-seven undergraduates listed what they felt contributed to their overall happiness. Then they indicated the three items they considered the most significant contributors. Finally, participants reported the duration (e.g., minutes, hours, days, weeks, or years) of happiness caused by each of these items. Results and Discussion. The number of happiness items participants expressed ranged from 0 to 77 (M = 28.58; SD = 13.74). The item listed most often was "family" (20.27%), followed by "friends" (15.18%). Most people gave priority to items that made them happy for "years." As priority of the items decreased, so did duration, suggesting that people place greater value on factors that lead to prolonged levels of happiness,. These findings have implications for happiness construction and sustainability, as increasing individuals' happiness levels may involve seeking out more socially-beneficial--as well as longer-lasting--resources.

Poster #22

The influence of rearing environment on life history and morphological traits of sailfin molly fish (*P. latipinna*)

Mentor: Margaret Ptacek, *Biological Sciences*

Student: Grant Davidson

Life history traits such as time to and size at maturity are influenced by both genetic and environmental factors. One such environmental factor may be the social environment in which a juvenile is reared. This study examined the life history traits

of sailfin mollies (*Poecilia latipinna*) that were reared in varying social environments: in isolation, in groups with an adult male present, and in groups without an adult male present. Since females prefer larger males, we anticipated that males reared in the presence of an adult male should delay maturation and therefore mature at larger sizes in order to better compete for mates. We found that males reared with an adult male took three times longer to mature and were almost 30 percent larger than males reared without adult males or in isolation. Our results suggest that social environment has significant effects on the final size at maturity, and therefore fitness, of male sailfin mollies.

Poster #23

Personality traits and motivations of medical voluntourists

Mentors: Jennifer Thomsen, *Forestry & Natural Resources*, Matthew Hughes, Teresa Tucker, *Parks, Recreation & Tourism Management*

Students: Drayton Garrett, Elizabeth Oxner, Curry Cook, Neyle Noyes, Ryan Foster, Austin Newman, Karis Watson, Eliza Ellis, Devon Dorn

Tourism is a critical component to many developing countries' economies. As tourism grows worldwide many individuals seek new opportunity in search of authentic experiences. In some cases these individuals want this new experience to include a component of helping others in the communities that they visit. This has caused a growth in multiple types of volunteer driven tourism called voluntourism. Previously, a group of Creative Inquire students addressed the personality traits and motivation of surf voluntourists. This study extends that research to medical voluntourists. As the name implies, these individuals contribute medical care in communities that are in need of said services while also experiencing what the community has to offer as a tourist. This study utilizes both quantitative and qualitative data to identify personality traits and motivations of medical voluntourists. The information is designed to help organizations better recruit future volunteers.

Poster #24

Investigating if Dr Pepper TEN is a "10" for men

Mentors: Rose Martinez-Dawson, *Mathematical Sciences*, Paul Dawson, *Food, Nutrition & Packaging Sciences*

Students: Mollye Macnaughton, Brooke Butterworth, Alexandra Corvese, Kathryn Davis, Eric Ewald, Hannah Green, Alyssa Grigg, Edward Jones, Lindsey Keating, Mark Maurer

The objective was to investigate taste preference for Dr Pepper TEN and Diet Dr Pepper and consumers' willingness to purchase Dr Pepper TEN after viewing the product's commercial. A taste preference test was conducted using 168 students at Clemson University during fall 2013. An online survey developed using Qualtrics consisted of items for demographics, taste preference and consumer behavior after viewing a Dr Pepper TEN commercial. One and two sample proportion Z tests were performed and chi-squared tests were used for testing associations. The majority (overall, males and females) preferred the taste of Dr Pepper TEN (p-value<0.001). There was no evidence of a difference in the proportion of males and females who preferred the taste of Dr Pepper TEN (p-value=0.2546). There was no evidence of an association between gender and likelihood of purchasing Dr Pepper TEN after seeing the commercial (p-value>0.25). The results give doubt to the "just for women" claim of the advertisements.

Poster #25

Life cycle analysis of regional brewing

Mentors: Charles Thornton, *Campus Utilities*, Terry Walker, *Environmental Engineering & Earth Sciences*

Student: Gwendolyn Morris

Brewing beer requires malted grains typically obtained from northern sources, such as Canada, and transportation of these ingredients can contribute significantly to life cycle impacts of the brewing process. There is a lot of interest within the craft beer industry to make the industry more sustainable by brewing with locally sourced ingredients. This study used the EarthsureBrewer life cycle analysis software to assess life cycle impacts of a beer brewed with ingredients all obtained from sources in the Carolinas, and compared these results to the same beer produced using conventionally sourced ingredients. Analysis of alcohol content, specific gravity, color, and pH were used to compare product quality. Results showed that the locally sourced beer showed much lower life cycle impacts, but that some quality was sacrificed by using these ingredients. This study indicates that local malt houses must improve the quality of their products if the craft beer industry is going to become more sustainable while maintaining high quality in their beers.

Poster #26

Digital history: Working with large data sets

Mentor: Orville Burton, *History*

Students: Daniel Mack, Brent Werts, Michael Madani, Collin Eichhorn

In this Digital History Project, we have used new digital methodologies to look at old questions such as Southern identity and interpretations of the Civil War. We used the Social Media Listening Center to collect Tweets, Facebook postings, and other social media messages for a year, and we have analyzed by region what is being said about the South and Southerners through social media today. In order to develop our methodology, we had to set up criteria and survey academic experts as well as people who lived in the region to develop our algorithms. In addition, we helped develop two different approaches to data mining to look at changing meanings of the South and the Civil War over time in the largest collection of digitized documents, the HathiTrust. The HathiTrust contained more than a million documents related to our research questions. We constructed training documents that had artificial intelligence (AI) find other documents that were similar in one method. In another, we searched out place names mentioned with the Civil War and mapped where they were and whether the "sentiment" was positive or negative. Our poster displays our on-going research as we look further into analysis.

Poster #27

Modulation of *Bacteroides* polysaccharide metabolism by small organic molecules as a potential therapeutic for Type I Diabetes.

Mentors: Kristi Whitehead, *Biological Sciences*, Daniel Whitehead, *Chemistry*

Students: Katrina Ross, Elaine Bradford, Nathan Kahue, Jessika Colvin, Gwendolyn Morris, Erin Koch

Bacteroides species are commensal members of the gastrointestinal tract that play an important role in human health by contributing to complex polysaccharide degradation in the colon. Although these organisms are considered to be normal members in a healthy human colon, several recent research articles have demonstrated that the normal proportion of *Bacteroides* species increases significantly in genetically susceptible children before the onset of Type 1 Diabetes (T1D). Our research is focused on the development of novel therapeutic molecules to prevent the onset or exacerbation of T1D by inhibiting the abnormal increase in *Bacteroides*. Preliminary results demonstrate that acarbose, a medication currently used for treatment of Type 2 Diabetes, can inhibit the growth of *Bacteroides thetaiotaomicron*. This inhibition occurs at concentrations of 100 uM acarbose, and our data suggests that this inhibition is due to a disruption in the polysaccharide degradation pathway

in *B. thetaiotaomicron*. Current work is focused on derivitization of acarbose and investigation and development of alternative compounds in order to increase the inhibitory activity.

Poster #28

Measuring soil moisture in rain gardens using geophysical methods

Mentor: Stephen Moysey, *Environmental Engineering & Earth Sciences*

Student: Daniel Good

To increase infiltration in urban areas, permeable plant-filled areas are being constructed to collect runoff from impermeable surfaces and return it to the area's groundwater supply. These runoff collection zones are known as rain gardens. Rain garden test cells were constructed to simulate the inflow and outflow as well as infiltration and subsurface movement of the water collected in rain gardens. Experiments were conducted under artificially ponded conditions to simulate the sudden surge of runoff collected in a storm event. Data was also collected over longer intervals and compared to the precipitation received at the location of the test cell. The movement of water was primarily measured by the changes in soil moisture measured by dielectric probes buried in the soil at different depths. The other method used in this study is surface based ground penetrating radar (GPR). The goal of GPR surveys are to create a two dimensional image of the water moving through the soil.

Poster #29

Macro-AFM model

Mentors: Vladimir Reukov, Aleksey Shaporev, *Bioengineering*

Students: Maxwell Hoelzen, Deepti Athavale, Maria Portilla Rodriguez

An Atomic Force Microscope (AFM) is an important tool in modern nanoscience, capable of producing surface maps at resolutions below 1 nanometer, which is impossible for other methods. Despite AFM's often use, it is often difficult for students to understand their work because all measurement processes take place at micro- and nano-scale. The goal of this project is to create a macro scale model, which will serve as an educational tool to introduce the principles behind AFM to undergraduate and high school students. Currently, a fully automatic microprocessor-controlled surface scanning block has been built and successfully tested with a scan area of ca. one square foot. Continued work includes designing and building of a topography measurement block that will work on the same principle as a real AFM does at nano-level. We expect that macro AFM building an image using AFM techniques will empower instructors to show the concepts, and to spark interest of potential students in Bioengineering.

Poster #30

Microbial degradation of micro-crystalline cellulose within the intestinal tract of the Florida manatee

Mentors: Haggai Bediako, John Henson, *Biological Sciences*

Student: Christopher Fecci

The Florida manatee (*Trichechus manatus latirostris*) is an herbivorous hindgut fermenter that utilizes an enlarged cecum to digest plant material. The diverse bacterial community in the Florida manatee includes lineages involved in fiber degradation that are found in other herbivorous mammals. Because of the presence of these bacteria, the Florida manatee is capable of consuming a diet full of complex carbohydrates such as cellulose and hemicellulose. As food travels through the various sections of the gastrointestinal tract, various bacterial communities degrade components within the food. To understand the degradation of cellulose and hemicellulose along the gastrointestinal tract (GIT) of the Florida manatee, communities from 8 sections of the GIT of a fresh killed manatee were enriched on Solka-Floc and Avicel. Based on sequencing information, we hypothesized that the cecum and mid-colon will have higher endoglucanse and exoglucanase activity than any other sections along the GIT.

Furthermore, we hypothesized that there will be a significant decrease in the crystallinity index of substrates in enrichments with the highest exoglucanase activity.

Poster #31

Mobile apps software development with Creative Inquiry

Mentor: Roy P. Pargas, *School of Computing*

Student: Gregory Edison

This project presents and focuses on a sample of apps resulting from a novel and successful mobile device software development course taught at Clemson University. Today's smartphones are filled with ample features. This presents a challenge for a student wanting to learn about developing mobile apps. At Clemson University, a senior/first year graduate-level course uses a novel approach to deliver the course content. This poster briefly describes the course. The software development course uses a novel teaching technique called "open collaboration." The course is divided in two sections; the first section is common to all students, wherein students are required to complete a set of four assignments that help them get acquainted to the platform. When students finish the common set of assignments, they work on a project. Using this novel approach we were able to develop variety of apps like The Strawberry and Peach Project, Firefly Counter, Clemson Tour for Android, mHealth app, Virginia Woolf app, Touch-Calc app.

Poster #32

The ecology of a new invasion by *Bellamya japonica* in the Savannah basin

Mentor: John Hains, *Biological Sciences*

Students: Brittany Broome, Todd Woollen, Joshua Howard, Jessica Logan, Lauren Frees, Rebecca Helstern, Sarah Fishburne

The first known infestation of *Bellamya japonica* in the Savannah River Basin was discovered in 2006. Investigations of this population led to questions regarding their distribution and behavior. We have completed experiments on behavior and concluded that there exists a significant negative phototactic but no detectable geotactic response. In addition, a study of their dispersal using mark-recapture methods concluded that, while this technique was useful to follow the life history of individual snails, they did not meet the method assumptions and therefore this method could not produce a reliable population estimate. Studies of fecundity have shown a seasonal trend with an unsurprising correlation to water temperatures and time-of-year. Fecundity rates are still being assessed. Age is difficult to determine and the life history studies using marked snails will assist with this as well. Metabolism is unknown for this species but methods are currently being developed. Anecdotal observations suggested a possible circadian rhythm with regard to fecundity. A systematic study of this phenomenon is also in progress. If successful our studies may help with management of this infestation in the future.

Poster #33

Redefining happiness: Is the happiness pie literature missing some slices?

Mentors: Robin Kowalski, *Psychology*, Brooke Baker, *English*

Students: Megan Morgan, Matthew Webb, Justin Stephens, Julia Turner, Laura Frazee, Elizabeth Whittaker, John Martin, Brittany Zaremba, Brittany Newsome, Anna Bokman

This study examined the relationships among happiness-related factors, as well as the relation between the antecedents of happiness (e.g., an individual's personality, situations, and voluntary behavior) and self-reported individual differences. Three hundred forty-seven undergraduates completed measures of happiness, positive affect, subjective well-being, contentment, self-compassion, depression, neuroticism, mindfulness, and openness to experience. Participants also indicated the percentage of their happiness due to personality, the situation, and voluntary behaviors. The results corroborate evidence for happiness being

most indicative of a multidimensional construct, as contentment, subjective well-being, and happiness were highly related. Additionally, in spite of research showing that almost half of our happiness is determined by voluntary actions, participants, on average, divided the happiness pie into thirds, attributing their happiness to personality (30.36%), the situation (36.88%), and voluntary actions (32.7%).

Poster #34

Carbon dioxide efflux in forest soil and topsoil influenced by soil moisture and temperature variations

Mentor: Scott E Brame, *Environmental Engineering & Earth Sciences*

Student: Katherine Hickok

The efflux of carbon dioxide from soil contributes heavily to global climate change. Due to the lack of data illustrating the carbon dioxide (CO_2) efflux in the Clemson, SC area, this experiment was designed to quantify and analyze the local CO_2 efflux. Soil samples were collected from the Clemson Experimental Forest and purchased from a home improvement store to provide a contrast between two different soil types. Soil characteristics, such as temperature and moisture, either enhance or limit this efflux. Therefore, this experiment involved manually altering the soil moistures and temperatures for both soils and measuring their CO_2 levels. Soils in the higher temperature and medium moisture range had a higher efflux, while cooler soils with higher and lower moistures had an overall lower efflux values. The topsoil had a higher total organic matter percentage than the forest soil which allowed the medium moisture topsoil to have the highest CO_2 efflux.

Poster #35

Just keep grazing: Parrotfish grazing and dietary selectivity in the Florida Keys

Mentors: Michael Childress, Kylie Smith, *Biological Sciences*

Students: Brandt Quirk-Royal, Sarah Hoffmann

Parrotfish have indirect positive effects on corals by grazing on macroalgae that competes for substrate space with corals. Parrotfish can also have a negative impact on corals by feeding on live coral. Feeding preferences are correlated to jaw morphology in parrotfishes. This study examined the feeding selectivity for two genera of parrotfish (*Scarus* and *Sparisoma*) in the Florida Keys to determine the impacts they have on coral reefs. On 14 reefs, fish censuses, behavioral surveys and substrate composition analysis were preformed to calculate selectivity indices for the various substrate types. The indices showed that parrotfish do exhibit selective feeding. *Scarus* had a significantly higher preference for turf and Sparisoma had a significantly higher preference for macroalgae. These results support life history theory that *Scarus* are excavators and *Sparisoma* are grazers as predicted by their jaw morphology. This project was partially supported by the Creative Inquiry program.

Poster #36

CU save the tiger

Mentors: Elizabeth Baldwin, *Parks, Recreation & Tourism Management*

Students: Bailey Brafford, Codi Cammer, John Sojourner, Katherine Darby

The purpose of this research is to determine how aware the Clemson community is about wild tigers. As a community with a school mascot, the tiger, that is also an endangered species, we are interested in assessing knowledge of wild tigers as well as raise awareness about the importance of tiger conservation. The methods used to collect the data about awareness on the Clemson University campus were online surveys and social media sites. Preliminary data suggest a severe lack of knowledge throughout the Clemson community about wild tigers and tiger conservation. The results will be ultimately used to raise awareness about tigers and conservation efforts to help them in the wild through social media, fact sheets, and surveys.

Poster #37

Enhancing the food waste composting program at Clemson University

Mentor: Patricia Zungoli, *School of Agricultural, Forest, and Environmental Sciences*

Student: Samantha Perea

Clemson University's composting program currently uses an in-vessel composter to breakdown food waste to useable mulch that serves to supplement materials needed at the Botanical Gardens. Our Creative Inquiry is investigating ways in which the program can become more visible and expand to include other methods of food waste composting that will provide a demonstration of composting techniques useful for education and to yield valuable economic analyses as a basis for making future programmatic decisions. We have three projects in progress. The first project will result in a vermicomposting demonstration system that will be used to assess the feasibility and profitability of a future large-scale effort. The second project will gather data on the food hydrator that is on loan from Integrated Waste Solutions specifically to assess its cost/benefit and to evaluate the end result of using biodegradable products in the Clemson House dining facility. The final project will result in two the production of two videos to advertise the program and to provide a view of what happens to food as it decomposes.

Poster #38

Can cells solve mazes? Understanding cells responses to wound healing

Mentor: Delphine Dean, *Bioengineering*

Students: Elliott Mappus, Nora Hlavac, Tyler Harvey, Brian Peterson, Sharon Olang, Renae Keeley, Mary O'Kelly, Huu Vo, Aniqa Chowdhury, Evan Robinson, Keeland Williams

Wound healing is a complex process that occurs after the body's tissue has been damaged or impaled by a foreign object. Cells must travel from all over the body to the site of injury. The goal of this project is to understand what affects the migration of fibroblast cells in order to develop more effective wound treatments. Our research has aimed to develop a way to map the decision-making processes of fibroblasts that drive their migration to a wound site. We have addressed this by asking the question: can cells solve mazes? Our team has developed several methodologies by which we have been able to study the responsiveness of fibroblasts to certain cues. Specifically the migration of the cells has been tracked relative to physical barriers created by the walls of the maze and chemical concentration gradients. Preliminary results have demonstrated the feasibility of this apparatus for a mode of studying cell proliferation and migration.

Poster #39

Undergraduate views of critical thinking

Mentor: Benjamin R Stephens, *Psychology*

Student: Matthew Webb

Clemson University's Quality Enhanement Plan (QEP) is designed to assist undergraduates in the development of their critical thinking skills. Paul et al. (1997) found that professors indicate that they value critical thinking as important, explicit, and achieved in their students, but faculty also are vague and confusing in their open-ended descriptions of the conceptual and practical components of critical thinking instruction in the classroom. The purpose of the current study was to assess student views of the "a typical professor's views" and student's "own personal views" using modified versions of the survey items that Paul et al. (1997) employed. Students (n = 139) completed two eleven-item surveys; one framed a typical professor's view and the other framed the student's personal views of critical thinking. Students do not rate "a typical professor" as valuing critical thinking as important, explicit, and achieved in their students. This disconnect between professors' views of critical thinking and students' views of their professor's beliefs may result from classroom confusion and miscommunication.

Poster #40

ACTS: Apps connecting today's students

Mentor: Roy P. Pargas, *School of Computing*

Students: Austin Brennan, Anna Kutch, William McKay, Daniel Branum

In the information age, there is a need for technology that fosters connections between students, faculty, and administrators alike. Now is a pertinent time to introduce applications for students and faculty that make connections with one another easier. We have spent time both researching the needs of students and finding ways that mobile applications can meet those needs. Our first application is a calendar app that will combine calendars across a university campus into one easy- to- use, convenient calendar. Clients can pull selected events from preferred calendars into one, all- inclusive calendar with features including campus maps, pins to mark event locations, attendance lists, and pictures of the event location. We will describe the development of and demonstrate the iPhone (iOS) version of our app. We aim to show the process of creating applications that help foster a successful college experience. We will present data from students and faculty members about what they feel are important and the documentation of the process of application development.

Poster #41

Soil inventory of Capps Forestland, Westminster, SC

Mentor: Elena Mikhailova, *School of Agricultural, Forest, and Environmental Sciences*

Student: Johnny Capps

The objectives of this study were to conduct a soil inventory of Capps Forestland in Westminster, SC, using Web Soil Survey, to collect soil samples, to analyze collected soil samples in the Clemson University Agricultural Service Laboratory, and to interpret the results for management recommendations. Two soil map units found on the property: Hayesville and Cecil fine sandy loams (15-25% slope), and Hayesville and Cecil fine sandy loams (25-45% slope) all belong to the soil order of Ultisols. The dominant soil type present was Hayesville and Cecil fine sandy loams (15-25% slope), (Fine, kaolonitic, mesic Typic Kanhapludults). All soils are not prime farmland. All soils are having tree site index of 85 feet for Eastern white pine (Pinus strobus L.). Soil samples were collected from each soil type and then analyzed to determine the soil chemical and physical properties. Soil nutrient analysis recommendations are discussed in terms of establishing Bermuda grass (Cynodon dactylon (L.) Pers.), and fruit orchard while minimizing environmental impact.

Poster #41

Soil survey of land in Beaufort, South Carolina

Mentor: Elena Mikhailova, *School of Agricultural, Forest, and Environmental Sciences*

Student: Jessica Holbrook

The objectives of this study were to conduct a soil inventory of land in Beaufort, South Carolina using Web Soil Survey, to collect soil samples, to analyze collected soil samples in the Clemson University Agricultural Service Laboratory, and to interpret the results for management recommendations. The soil series found on the property are: Polowana and Wando, belonging to the soil orders of inceptisols and entisols, respectively. The dominant soil type present is Wando fine sand (Thermic, coated, Typic Quartzipsaments). Wando and Polowana soil is classified as prime farmland, if irrigated and drained. Soil samples were collected from each soil type and then analyzed to determine the soil chemical and physical properties. Soil nutrient analysis recommendations are discussed according to the land owner's future objective of establishing an organic garden, while minimizing environmental impact.

Poster #42

Unraveling the basal angiosperm cinnamyl alcohol dehydrogenase (CAD) genes that are involved in lignin biosynthesis

Mentor: Haiying Liang, *Genetics and Biochemistry*

Students: Matthew Barclay, Garrick Stott

Biomass is biological material derived from living organisms that can be used for fuel and energy sources. Given current energy concerns, high yielding biomass production systems are in greater demand than ever. Wood is a natural, high energy and environmentally sound source that has a long history of use as feedstock for energy, chemical extractives, and fiber. A better understanding of wood formation in trees is fundamental to efforts to enhance the production of woody biomass. The overall goal of the project is to identify and investigate the cinnamyl alcohol dehydrogenase (CAD) genes that are involved in lignin biosynthesis in the yellow poplar (*Liriodendron tulipfera)*, a tree with great economic and ecological significance. Lignin is a major constituent of wood. A Creative Inquiry team of three undergraduate students (C. Xu, M. Barclay, and G. Stott) attempt to identify yellow poplar homologs involved in plant cell wall biosynthesis by using an Arabidopsis mutant that has lost the functions of its primary CAD genes. Approaches employed included complementation analysis, examination of promoter activities under various environmental stresses, and enzymatic kinetic assay with potential substrates. Information obtained through this project will enable comparative analyses of function and expression of CAD genes between yellow-poplar and poplar. Such a broad taxonomic comparison will eventually help us identify and/or confirm the key genes that are most important in regulating and enhancing biomass feedstock productivity.

Poster #43

Foam vs. Gel: Are these soaps foams equal

Mentor: Paul Dawson, *Food, Nutrition & Packaging Sciences*

Students: Claire Gillespie, Carolyn Musselwhite, Lauren Johnson, Peter Marvin, Samantha Brown

In the past few years, liquid hand washing soap has started being dispensed as a foam rather than a gel. Some people have questioned whether these two forms of soap are equally effective in cleaning hands. The objective of this project is to compare liquid foam and liquid gel soap for removing bacteria from hands inoculated with Escherichia coli. The data collection is ongoing, but when a fluorescent gel was applied to hands before washing, there did not appear to be a qualitative difference in the gel that remained when observed under UV light when foam or gel was used to wash hands. Further experiments will be conducted to determine if gel or foam differ in their efficacy in removing bacteria from hands.

Poster #44

International health and Hispanic culture

Mentor: Graciela Tissera, *Languages*

Students: Caleb Addis, Aliyah Anjarwalla, Deepti Athavale, Thomas Cotton, Breci Davis, Michelle Fuentes, Hannah Haire, Ashley Jamison, Katherine Orellana

This research project focuses on the interrelations between health and culture in the Hispanic countries and their impact on individuals and communities. The research explores medical diseases and conditions, people's traditions, beliefs, and perceptions related to concerns related to health issues, home remedies, behavior change, family and community, doctor-patient relationship, and social aspects of public health (ethnicity, gender, poverty). Students will have the opportunity to travel to the Dominican Republic with the researchers and participate in service learning activities to help Hispanic communities and collect data for this research project. CI students will lead the following research topics in the Dominican Republic: 1) self-medication, low-income population accessibility to medicines, and the governmental pharmacy system (Boticas Populares)

(Caleb Addis); 2) domestic violence as a public health concern (Aliyah Anjarwalla); 3) how chronic diseases are promoted, prevented and controlled (Deepti Athavale); 4) hepatitis A as a public health concern (Thomas Cotton); 5) challenges/barriers of people with disabilities to access physical therapy services (Breci Davis) ; 6) cultural and socio-economic determinants of childhood obesity (Michelle Fuentes); 7) medical equipment maintenance at public health care settings: advantages and disadvantages of donated equipment (Hannah Haire); 8) challenges and opportunities for the implementation of the HIV Vertical Transmission Prevention Program (Ashley Jamison); and 9) a behavioral theory analysis of drug abuse (Katherine Orellana).

Poster #45

Does salt affect milk spoilage?

Mentors: Paul Dawson, *Food, Nutrition & Packaging Sciences*

Students: Jonathan Mitchell, Katelyn Bond, Austin Taylor, Hannah Quinley, Breanna Yocum, Nicolas Osborne, Philip Fain, Elyse Ciotta

Milk spoilage is caused by bacteria. Even if milk is properly stored, psychrotrophic bacteria have the ability to withstand cold temperatures and are able to cause spoilage in refrigerated foods. Several news reports and websites have claimed that adding a pinch of salt to milk cartons will extend the shelf life of the milk. This experiment was done to see if adding salt to the milk would increase the time it takes to spoil. In an attempt to get accurate and consistent results, three different experiments were performed. To perform each experiment, the group worked with whole milk and fat free milk samples that were divided into smaller samples containing different concentrations of salt. In experiment one, the group prepared both whole milk and fat free milk samples with salt concentrations of 0%, 0.1%, 0.5%, and 1%. The same principles were used for the second experiment except for a few experimental changes. In experiment two, four samples with salt concentrations of 0%, 0.5%, 1%, and 2% were prepared for each of the two milks (whole and fat free). The number of bacteria present in a milk sample does not consistently increase or decrease as a result of adding salt. Thus, the conclusion was that adding salt to milk at the levels we tested did not increase the shelf life of the product.

Poster #46

America Reads: A tale of two studies

Mentors: Anastasia Homer, Marjorie Ramey, Linda B Gambrell, *Teacher Education*

Students: Emily Dodgins, Seirra Hamilton, Kristen Herring, Jordyn Hughes, Destin Jennings, Austin Taylor

America Reads is an after-school tutoring program housed at Clemson Elementary School. Staffed by students from across majors, the program serves struggling readers in kindergarten through third grade. Though the program has a record of success in terms of increasing reading motivation and reading achievement, each year directors of the program strive to make the program better. The creative inquiry team has had a significant impact in this regard, as research findings generated by past C.I. projects have informed refinement of the program. The team this year was charged with reviewing the literature to determine "what works" in tutoring programs similar in structure to America Reads. Informed by this knowledge and information specific to our own program, two camps within the team emerged, each with a viable intervention. Rather than settle on one, it was decided that both studies would be piloted. With modest guidance from their mentors, the two camps developed research questions and designed the two studies currently being conducted.

Poster #47

Using virtual spatial audio to aide visually impaired atheletes

Mentors: Kyla McMullen, Christina Gardner, *School of Computing*

Student: Ryan Becwar, Dominic Sieron

Many people with visual impairments actively play soccer, however the task of making the game accessible is met with significant challenges. These challenges include: the need to constantly talk to signify location and detecting the positions of silent objects on the field. Our work aims to discover methods to help persons with visual impairments play soccer more efficiently and safely. The proposed system uses headphone-rendered spatial audio, an on-person computer, and sensors to create 3D sound that represents the objects on the field in real-time. This depiction of the field will help players to more accurately detect the locations of objects and people on the field. The present work describes the design of such a system and discusses perceptual challenges. Broadly, our work aims to discover ways to enable people with visual impairments to detect the position of moving objects, which will allow them to feel empowered in their personal lives and give them the confidence to navigate more independently.

Poster #48

Cryptic pathways of aromatic compounds

Mentor: Mark Blenner, *Chemical & Biomolecular Engineering*

Students: Sarah Knowles, Jeremy Fowler, John Campbell, James Foster, Joseph Redzikowski

Our group is studying *Yarrowia lipolytica*, a yeast that has evolved to metabolize well on hydrophobic substrates and produce significant amounts of fatty acids. Many microorganisms have been studied and proven to be able to grow on aromatic substrates, but unfortunately many of these organisms cannot produce fatty acids and therefore cannot be used to engineer hydrocarbons, fuels, and lubricating oils. Our group is interested in metabolizing lignin materials because the materials are relatively inexpensive and composed mainly of hydrocarbons. Currently the lignin biomass of the paper product industry is waste and not able to be used. Our group is metabolizing *Y. lipolytica* in YeastPeptone Dextrose media and various lignin derivatives such as vanillin, guaiacol, and catechol. Currently, *Y. lipolytica* is able to metabolize the glucose in YPD media and tolerate some of the lignin derivatives. This allows the group to see which derivatives do not stunt the growth of *Y. lipolytica* in a media that contains glucose. Next, the group will grow *Y. lipolytica* in lignin based media that do not contain glucose. This means that *Y. lipolytica* will be forced to metabolize the lignin derivative in order to continue growing. We expect the derivatives that did not significantly stunt *Y. lipolytica* growth to be metabolized by *Y. lipolytica* more readily when the media lacks glucose. Our group is aiming to find trends in the lignin derivatives that inhibit and enable the growth of *Y. lipolytica*.

Poster #49

Systolic blood pressure and effects on threat appraisal and risk behavior

Mentor: James A McCubbin, *Psychology*

Students: Aaron Nathan, Diana Lansinger, Gregg Hayden, Kelly McDermott, Alexis Newman, Jessie Quakenbush

Appropriate coping methods must be utilized to deal with stressors. While hypertension may reduce an individual's appropriate emotional recognition, we believe that this may have a blanket affect on other areas of appraisal including risk behavior. In the current study resting systolic blood pressure was recorded using a calibrated GE Dinamap Pro 100v2. A modified Youth Risk Behavior Survey in 88 young adults assessed risk behavior score. Men had marginally higher risk scores (.461 +/- .0255) than women (.400 +/- .01836; p=.059). Risk behavior was positively correlated with systolic blood pressure (r(88)=.358, p<.001). Risk taking behaviors approached significance in males (r(88)=-.203, p<.058). The results indicate young adults who may be at risk

for hypertension later in life partake in more risk taking behavior suggesting that cardiovascular dysfunction can reduce threat appraisal not allowing the individual to realize the extent of danger certain actions or situations can cause.

Poster #50

Royal jelly-mediated prolongevity in *Caenorhabditis elegans* is modulated by the interplays of DAF-16, SIR-2.1, HCF-1 and 14-3-3 proteins

Mentors: Yuqing Dong, Xiaoxia Wang, *Biological Sciences*
Students: Lauren Cook, Lindsay Grasso

Recent studies suggested that royal jelly and its substances may have anti-aging properties and can be utilized as nutraceuticals. However, the molecular mechanisms underlying its beneficial effects are far from clearly elucidated. Our genetic analyses suggested that the effect of royal jelly (RJ) and enzyme-treated royal jelly (eRJ) on lifespan and healthspan in *Caenorhabditis elegans* is modulated by the functional interplays of DAF-16, SIR-2.1, HCF-1 and 14-3-3 proteins. Previous studies have reported that DAF-16/FOXO, SIR-2.1/SIRT1, 14-3-3, and HCF-1 are important prolongevity determinants and have extensive interplays in worms and mammals. Considering the conservation of these prolongevity determinants in diverse species, this study not only provides new insights into the molecular mechanisms of royal jelly's function on healthspan promotion in *C. elegans*, but also has imperative implications in higher order organisms to delay aging and age-related disorders.

Poster #51

Warehouse process improvement team 1

Mentor: Sreenath Chalil Madathil, *Industrial Engineering*
Students: Jessica Langley, James Allison, Tyler Dunn, Samantha Smith, Wilson Daniels

In partnership with Glen Raven's Anderson facility, this capstone design project focused on reducing the time and improving the flow of materials through the storing, picking, palletizing, staging, and shipping stages of the warehouse to help cope with a forecasted increase in demand. Through observation, interviews, and surveys the customers' needs and product specifications were determined. The system losses were determined, then through root cause analysis, the main areas of concentration were found to be reducing palletizing time and congestion within the warehouse. This was followed by an in depth concept generation phase, where the focus was on decreasing time and congestion. ARENA simulation was used to model the current system and what effects any changes in the layout, procedure, or amount of resources would have on process times. From this, the best concepts were determined and suggestions for changes in the layout and procedures were made to the client.

Poster #51

Production scheduling and optimization of Glen Raven shipping warehouse

Mentor: Sreenath Chalil Madathil, *Industrial Engineering*
Students: Katelyn Murphy, Ryan Richards, Jenny Trotter, Jose Vargas, Michael Ziobrowski

In partnership with Glen Raven in Anderson, this design project focuses on optimizing the processes of the shipping warehouse for custom fabrics in preparation for expected growth. The shipping warehouse is responsible for picking the rolls of fabric ordered, preparing them for shipment by creating pallets, and finally shipping the pallets to the customer. The initial investigation revealed the palletizing process to be the primary source of system losses in the warehouse. Customer needs were established and used to create product specifications for the proposed solution. The team performed time studies and took measurements to gather data on the warehouse and its processes. A Pareto analysis was used to identify the major system losses and multiple methods of root cause analysis were performed. The team will continue the project by using the information from these steps to generate concepts for an optimized warehouse and ultimately develop a single solution.

Poster #52

A cross-discipline approach to healthcare needs

Mentor: Delphine Dean, *Bioengineering*

Students: Anna Ford, Denish Parekh, Eliza Shaw, Mary Hobbs, Natalie Harper, Sean Zadeh

With rapid advancements in technology and growing demand for better healthcare, hospitals are struggling to find a balance between providing the best possible care and maintaining a responsible budget. This issue is especially evident in small hospitals lacking resources and infrastructure to keep up with modern technology. The Engineering for Modern Healthcare Creative Inquiry is a collaboration between Industrial Engineering and Bioengineering students. Our goal is to help small hospitals to develop efficient, cost-effective solutions to their needs. Currently, we are working with hospitals in South Carolina and Virginia to explore these solutions. We are interviewing clinicians, nurses, and other staff members to better understand current practices and identify improvement opportunities. Our initial focus will be on inventory management and sterile processing. Utilizing both departments' expertise, we will develop a comprehensive solution to this complicated need.

Poster #53

***L. pneumophila* response to heavy metal conditions**

Mentor: Tamara McNealy, *Biological Sciences*

Student: Eric Wright

Legionella pneumophila is a gram negative bacterium that is the causative agent Legionnaire's disease, a severe form of pneumonia. *L. pneumophila* has a genomic island containing the *lpg2105-2108* operon, which is known to be upregulated in the presence of gold salts. To determine whether this response is specific to gold, a mutant of the *lpg2107* gene was created by insertion of a kanamycin cassette. The wild type bacterium and its 2107::kan mutant were then grown in planktonic culture with increased concentrations of iron or manganese. Both wild-type and the 2107::kan mutant strains show suppressed growth in cultures containing high levels of iron or manganese in comparison to those strains grown in standard media. This indicates that the gold response mechanism regulated by the *lpg2105-2108* operon is likely not involved in iron and manganese homeostasis. Future studies will include investigation of whether this operon is involved other types of stress response. One such stress response is the phenotypic transition of *Legionella* to a viable but nonculturable state when exposed to nutrient-deficient conditions.

Poster #54

Undergraduate views of the structure and value of the Clemson general education ePortfolio

Mentor: Benjamin R Stephens, *Psychology*

Students: Eliza Leland, Tracie Baskett, Caroline Cooper, Dakota Egglefield, Kathryn Kirk, Lauren Lucas, Christine O'Hara

We gathered structural information about the Clemson general education eportfolio as well as students' views of the ePortfolio's educational, professional, and assessment values. Fifty-one students who had completed the ePortfolio were interviewed, and they reported minimum structural content (artifacts and rationales) in their ePortfolios. Participants rated the usefulness of the ePortfolio as very low. However, they rated the ePortfolios as "accurately" describing their capabilities significantly higher. Participants with a major program ePortfolio rated the values higher than those without. We are currently interviewing undergraduates who have not completed the ePortfolio to determine if their plans and expectations are more positive than students who have actually completed the ePortfolio.

Poster #55

Detachable force sensor for an ultrasound probe to improve rotator cuff injury diagnosis

Mentors: Delphine Dean, David Kwartowitz, *Bioengineering*

Students: Mary Showers, Charles Kerr, Hannah Cash, Cheryl Corbett, Emily Kowal, Haley Scruggs, Megan Hanschke

Rotator cuff disease, common in elderly persons and athletes, is resultant of repetitive use of shoulder muscles or sudden impact to the area. The spectrum of injury ranges from tendonitis to a complete tear of the rotator cuff tendon which results in a myriad of treatments. Even though ultrasound is one of the most frequently used imaging techniques to diagnose this disease, it lacks contextual information and consistency needed for an accurate treatment plan. We are creating an ultrasound probe attachment using pressure sensing pads to measure force applied during imaging. Using our pads, we measured the change in resistance across the pad which can be used with pre-existing ultrasound imaging data to calculate the Young's Modulus of the tissue. We hope this will provide more consistency in characterizing the rotator cuff. For the clinician, having this additional information may help to determine the extent of the injury and be beneficial in determining the appropriate treatment.

Poster #56

The effects Memorial Stadium has on the migratory patterns of Brazilian free-tailed bats

Mentor: Susan C Loeb, *School of Agricultural, Forest, and Environmental Sciences*

Student: Marie Fogle

Brazilian free-tailed bats (*Tadarida brasiliensis*) are found mainly in the western states in North America and into South America but are also found in the southeastern U.S. In recent decades, the bats have continually moved north and inhabit buildings and infrastructure, including Frank Howard Memorial Stadium in Clemson, SC. Because the stadium is a well-populated area in the fall, concern was expressed about the bats inhabiting the stadium. There were reports that a majority of the bats were found on the north side. I tested if temperature had affected on the roosting habits of *T. brasiliensis* in the stadium in the winter. I placed 3 iButton temperature sensors in the stadium's upper deck on the north side and 3 iButton temperature sensors on the south side to examine temperature differences throughout the stadium. I also examined bat activity from January to April using Anabat acoustic detectors to understand the winter patterns of *T. brasiliensis*. Daily activity seemed to increase with temperature, and more so on the south side than the north side. It appears that *T. brasiliensis* move to the south side of the stadium in the winter rather than remaining on the north side.

Poster #57

Redesign of Schneider electric rack layout into a centralized warehouse layout

Mentor: Reshmi Koikkara, *Industrial Engineering*

Students: Lauren Pack, Timothy Bobola, Brandon Bagwell, Richard Porter, Christopher Sladek

The primary objective of this project is to move all parts kept on Kanban for Schneider Electric's Motor Control Center product line to a centralized warehouse within the plant. Currently these materials are spread throughout the facility. At this stage of the project it has become apparent that this lack of centralization creates several non-value added system losses. The process of identifying system losses, performing Pareto analysis, and conducting root-cause analysis has shown three main contributions to system losses. These three losses are walking between storage department stations, traffic interference during navigation throughout the warehouse, and the Waterspider attendant maneuvering to his replenishment stations. These system losses will be the main focus as the project progresses. The next step in the project is to generate concepts and test them against each other in order to identify the optimal concept.

Poster #57

Redesign of Schneider electric rack layout into a centralized warehouse layout

Mentor: Reshmi Koikkara, *Industrial Engineering*

Students: Lauren Dezervos, Sarah Rivera, Zachary Schnee, Steven Walter, Orddrell Whitworth

This capstone design project sponsored by Schneider Electric was to create a centralized warehouse layout based on provided part usages, forklift practices, ergonomics, and warehouse procedures. Previously, storage areas were separated based on assembly lines, resulting in long times to pick parts for orders. The objective was to optimize current part placement in a centralized storage area and develop a tool to determine where to place new parts after the layout was set. Through task analyses, employee interviews, and time studies, customer needs and product specifications were determined. A root cause analysis was done to determine the main causes to be addressed in the concept generation phase. Tools including VBA, FLAP, and ergonomic standards were considered in concept generation. Moving forward, each concept will go through several iterations of testing and refining before the most beneficial solution will be chosen and implemented at the plant.

Poster #58

Accelerometer measurements to characterize drag profiles in the mesosphere

Mentor: Gerald Lehmacher, *Physics And Astronomy*

Student: Brandon Burkholder

This project will verify the capabilities of an accelerometer for launch aboard suborbitalvehicles. If our prototype reliably produces data with ample resolution, it can be used to study the mesosphere and the reentry of suborbital vehicles. With partial support from NASA's Low Cost Access to Space Program, we hope to provide drag data on free-falling vehicles in the mesosphere. Our set up consists of a 3-axis accelerometer in a 10 cm CubeSat and a 12 bit data logger at 1024 Hz sampling rate. With zero-g environment data, we apply spectral analysis to find the amplitude of each frequency in our signal. In our testing phase this will be used to characterize noise present in the device while in a rocket test this will tell us how drag on the vehicle affects the rocket's flight. Once we are satisfied with the behavior of the instrument and understand the voltage outputs adequately, we plan to prepare a report to XCOR Aerospace to fly our instrument on the Lynx suborbital space plane.

Poster #59

Integrating row covers and hydronic heating for high tunnel season extension vegetable production

Mentors: Shawn Jadrnicek, *Colleton*, Geoffrey Zehnder, *School of Agricultural, Forest, and Environmental Sciences*

Students: Blake Rodgers, Morgan Perpall, Rachel Thomas, Connor Bolick

Traditionally used to cover plants during cold events, row covers trap heat stored in the soil extending the growing season. Another season extension technique employs hydronic heating systems to heat water then transfer the heat to plants using pipes. Combining hydronic heating systems with row covers is a novel idea and improves the performance of both. A 50% improvement over row covers alone and a 70% improvement over hydronic heating systems alone was observed when the techniques are integrated. This research gives growers new options in extending the growing season and protecting plants from extreme cold events and subsequent monetary losses.

Poster #60

Adaptation of soil judging to Northeast China

Mentors: Elena Mikhailova, Christopher Post, *School of Agricultural, Forest, and Environmental Sciences*

Students: Justin Ashley, Johnny Capps, Wilson Clayton, Katelin Colby, Coleman Davis, Jarrett Davitte, Micah Godwin, Mark McCown, Jesse McGee, Cody Parks, Alexis Patel, Brandon Sott, Benjamin Tillman, William Tolson, Corbin Yon, Thomas Yon

Soil Judging teaches students important skills for field identification of soil types, their properties, and interpretations for use. The adaptation of Soil Judging in China can be beneficial to students as well as government agencies and private sector. The objective of this study was to adapt Soil Judging to northeast region of China by a graduate student from China in collaboration with Clemson University Creative Inquiry students, who were trained using an undergraduate course in Soil Judging and a regional Soil Judging competition. Unlike the U.S., China has 14 soil orders with six soil orders somewhat similar to the ones found in the Southeast region of the U.S. A Southeastern Region Soil Judging Handbook was used for newly developed teaching materials for Northeast of China (including tables of soil physical and chemical properties, topographic maps, and scorecards). These new teaching materials can significantly improve soil education in China and mitigate problems associated with land use management.

Poster #61

Determination of chemical weathering rates using mass balance equations and determination of weathering products using X-ray diffraction

Mentor: Scott E Brame, *Environmental Engineering & Earth Sciences*

Students: Kimberly Gloersen, Sergey Goretoy

The weathering rate was analyzed using a geochemical mass balance approach. This approach analyzed mobile cations in an adjacent stream and calculated the stoichiometry of the weathered minerals using a microprobe. The cation flux and mineral stoichiometry were used in Velbel's modified mass-balance equation. The results yielded a weathering rate that can be interpreted as a denudation rate (rate of bedrock weathering). The weathering products study determined the shift in the mineralogy of soils from the parent rock through different soil horizons. Soil samples were analyzed using X-ray diffraction. The results indicated that the soils from three locations contained kaolinite and felsic materials from metamorphic and igneous rocks. The upper soil horizons were heavily weathered, and many diagnostic elements of felsic and mafic minerals were leached. X-ray diffraction analysis of the lower soil horizons provided better indications of residual parent material. The weathering rate was analyzed using a geochemical mass balance approach. This approach analyzed mobile cations in an adjacent stream and calculated the stoichiometry of the weathered minerals using a microprobe. The cation flux and mineral stoichiometry were used in Velbel's modified mass-balance equation. The results yielded a weathering rate that can be interpreted as a denudation rate (rate of bedrock weathering). The weathering products study determined the shift in the mineralogy of soils from the parent rock through different soil horizons. Soil samples were analyzed using X-ray diffraction. The results indicated that the soils from three locations contained kaolinite and felsic materials from metamorphic and igneous rocks. The upper soil horizons were heavily weathered, and many diagnostic elements of felsic and mafic minerals were leached. X-ray diffraction analysis of the lower soil horizons provided better indications of residual parent material.

Poster #62

Stream restoration and vegetative succession in an alien environment: A Hunnicutt Creek case study

Mentor: Jeremy Pike, *School of Agricultural, Forest, and Environmental Sciences*

Students: Alicia McAlhaney, Bradley Sheorn, Carolyn Lanza, Daniel Dixon, Evan Guy, Gary Pence, Tucker Simmons, Brett Kelly, Donald Mcdaniel, Lorn Clark

Historically, many streams in the Piedmont Ecoregion of South Carolina were pushed up against hillsides, straightened and bermed to maximize farmland and minimize flooding. Due to the lack of floodplain connectivity and upstream influences, resulting impacts on many of these ecosystems have altered plant communities into an invasive dominated community. Stream restoration attempts to rebuild the natural curvature, reconnect the stream to a functional floodplain, and reestablish a natural vegetative community. Hunnicutt Creek, located on Clemson University's campus, is one such system and was restored in late 2013. Using the Carolina Vegetation Survey (CVS) sampling protocol, plots have been established within the restoration reach and the remaining impaired stream area to compare the existing communities with the restored communities. The results presented in this poster are the baseline comparisonsbetween these two extreme ecosystems.

Poster #63

Testing the effect of topography on infiltration in rain gardens

Mentors: Stephen Moysey, Adam Mangel, *Environmental Engineering & Earth Sciences*

Students: Andrea Creighton, Daniel Good

As communities across the country continue to expand, there is a marked increase in the area of impervious surfaces, which increases runoff in urban watersheds. Rain gardens are landscaped depressions designed to detain and infiltrate stormwater runoff back into the groundwater system. Several rain gardens were constructed in sequence to determine if there is a significant difference in infiltration volume with different topographic features Different infiltration experiments including, input/output and ponding experiments were conducted. Water content was monitored using dielectric soil moisture probes and this data was compared to hydrologic infiltration models that were created using the HYDRUS-1D software package. Time-lapse infiltration was imaged using ground-penetrating radar by taking radar lines across the same area at various times throughout the experiment. The radar data was then compared to the hydrologic models and the soil moisture probe data.

Poster #64

Roads in Cange, Haiti

Mentor: Jennifer Ogle, *Civil Engineering*

Student: Victoria Golaszewski

Clemson Engineers for Developing Countries (CEDC) works towards improving quality of life in Cange, Haiti. The roads team of CEDC is developing a plan for a system of trails for the people of Cange, Haiti, to easily travel to and from the village and increase their commerce, share goods between villages, and increase the accessibility to healthcare. In order to accomplish this, the current trails through the Central Plateau in Haiti will be identified and compared with trail paths created by a slime mold test. Slime mold is an organism that will begin in a central location and grow with the path of least resistance towards a food source. The slime mold will be placed on a three-dimensional model of the Central Plateau in Haiti and food sources placed at villages surrounding Cange. The slime mold test will show the most efficient path between the villages. By knowing these efficient paths, the current paths can be reconditioned to improve transportation.

Poster #65

The effects of mineral microparticles on dental cell differentiation

Mentors: Delphine Dean, *Bioengineering*, Marian Kennedy, *Materials Science & Engineering*
Students: Amanda Farley, Kevin Shores, Zachary Messick

With the progression of regenerative medicine, bio-fillers are becoming a very viable option in the treatment of dental caries and the repair ofcranio-facial injuries.Manyprevious studies have focused onthe use ofbone marrow stem cells (BMSCs) with micro-Hydroxyapatite (HA) particles. However, there have been mixed reports on these particles having positive or negative effects on cells. This work delves into the effects of micro-HA on BMSCs, 7F2 osteoblasts, and dental pulp stem cells (DPSCs) as well as the effects of micro-Fluorapatite (FA) on these cells.ALP and BCA assays were run for 14 days on to determine ALP specific activity and protein content. Antibody stains andconfocalimaging were done for collagenI and osteocalcin. Control cells produced more protein, osteocalcin, and collagen I, and had higher levels ofALP specific activitywith the exception ofa few spikes in each for cells cultured with microparticles.

Poster #66

Aspire Creative Inquiry

Mentors: Chloe Greene, Jennifer Goree, Katelin Domanski, *Student Health Center*, Martha Thompson, *Public Health Sciences*
Students: Gregory Donaldson, Annie McGuire, Caroline Lee, Emily Grey, Alexis Hinton, Michael Lowder, Rachel Sealby, Stephen Smith, Brett Andresini

Developing Peer Delivered Initiatives to Foster the Promotion of a Healthy Campus Creative Inquiry consists of previous Aspire Facilitators and Healthy Campus Interns. Aspire is a Clemson University new student requirement focusing on the topics of alcohol abuse prevention, sexual assault prevention, and mental health. Student participants study the Clemson University culture of health and wellness, specifically as it relates to alcohol abuse prevention, sexual assault prevention, and mental health. Using the Socio Ecological Model, students will help promote a healthy and safe campus community through various campus outreach events. While the Aspire Program is continuing to evolve, Creative Inquiry students are researching the best practices of meeting students' needs and providing the appropriate education and resources for Clemson University undergraduate students.

Poster #67

ChemE car

Mentor: Christopher Kitchens, *Chemical & Biomolecular Engineering*
Students: Kimberley Owen, Benjamin Childs, Philip Pstrak, Jacob Dworkin, Joy Coats, Jayraj Joshi, Joseph Redzikowski, Erin Hughes

With gas prices rising every day, scientists and engineers are looking to alternative fuel sources to power our vehicles. One project specifically designed to help collegiate engineers work toward an energy solution is the American Institute of Chemical Engineers ChemE Car competition. This competition requires that students build a model car that is powered by an alternative fuel source to gasoline. For the Clemson ChemE Car team, we are building a car that is powered by a silver oxide - zinc battery. Additionally, our stopping mechanism is an iodine clock, in which a delayed light sensor stops the car once the iodine reaction darkens. We will be testing our car at the Southern regional conference in Puerto Rico over Spring Break, and we will present our competition results.

Poster #68

Cooking with a Chef and Supermarket Matters with nutrition majors

Mentor: Margaret Condrasky, *Food, Nutrition & Packaging Sciences*

Students: Paul Leonard, Laura Falconi, Ashley Quarles

In this Creative Inquiry, students have learned about food and nutrition in a hands-on culinary approach. Using the Cooking with a Chef and Share our Strengths Shopping Matters programs, students have discovered healthy menu planning options as well as ways to shop both cost- and health-effectively. Students were evaluated with cooking skill, nutrition knowledge, and self-efficacy surveys in order to determine their readiness to apply culinary nutrition to their future careers.

Poster #69

The Cooler Koozie, optimizing thermal insulation for beverage consumption

Mentor: Christopher Kitchens, *Chemical & Biomolecular Engineering*

Students: Meghan Flanagan, Cody Orear, Kyle Johnson

Our work aims to develop a new koozie with insulating properties that improve upon the current available commercial options. The hot climate of South Carolina, especially during football season, can heat a consumer's beverage to an unenjoyable temperature in a very short period of time. To recreate these hot conditions in a lab setting, our team designed a hot air circulation box with a temperature controller. Our baseline for improvement was established by testing plain cola cans without koozies, cans with basic foam koozies, and cans with more expensive, name brand koozies. Based on these results, we set out to design a new koozie that would outperform those on the current market. Our design focuses on separating the can from the environment by maximizing captured air space between the two. Air is exploited in our design due to its low thermal conductivity, or ability to reduce heat transfer. The material of construction for our koozie is thin wall, flexible PVC tubing wound around in a spiral manner, and then glued together. We are also investigating different diameter tubing to determine the effect differing amounts air space. These results show that our new design has improved insulating properties compared to commercially available koozies while also being aesthetically pleasing.

Poster #70

ACTS: Apps connecting today's students

Mentor: Roy P. Pargas, *School of Computing*

Students: Sean Garcia, Kirsten Erich, Dylan Byrd, Matthew Ellis

In the information age, there is a need for technology that fosters connections between students, faculty, and administrators alike. Now is a pertinent time to introduce applications for students and faculty that make connections with one another easier. We have spent time both researching the needs of students, and finding ways that mobile applications can meet those needs. Our first application is a calendar app that will combine calendars across a university campus into one easytouse, convenient calendar. Clients can pull selected events from preferred calendars into one, all inclusive calendar with features including campus maps, pins to mark event locations, attendance lists, and pictures of the event location. At FOCI, we will describe the development of, and demonstrate the Android version of our app. We aim to show the process of creating applications that help foster a successful college experience. We will present data from students and faculty members about what they feel are important and the documentation of the process of application development.

Poster #71

Establishing adaptive sports programs for youth with moderate to severe disabilities

Mentor: Joseph Ryan, *Teacher Education*

Students: Mary Chapman, Erin Jashinsky

Children with disabilities are at increased risk of health risk factors including obesity, often due to low levels of physical activity and limited participation in sports. This presentation provides recommendations for establishing successful adaptive sports leagues for children and youth with disabilities in schools and other community-based recreational facilities.

Poster #72

Investigating Nabisco's claim that Double Stuf Oreos contain double the stuff

Mentors: Rose Martinez-Dawson, *Mathematical Sciences*, Paul Dawson, *Food, Nutrition & Packaging Sciences*

Students: Brooke Butterworth, Alexandra Corvese, Hannah Green, Alyssa Grigg, Laura Falconi, Edward Jones

The objective of this study was to test Nabisco's claim that Double Stuf Oreos contain double the "stuf" when compared to original Oreos. Six packages of each type of cookie were purchased from 3 local grocery stores. For each package, 10 cookies were randomly selected using a random number generator. Sixty of each cookie type was used in this study. Total cookie weight, weight of each cookie side and cream weight were measured in grams for each cookie. Results from a *t*-test indicate no evidence that consumers are getting less than double the "stuf" and a 95% confidence interval constructed for the ratio of means also supports this.

Poster #73

Humanitarian aid for ethnic reconciliation

Mentor: Vladimir Matic, *Political Science*

Student: Katherine Holba

Mission: Promote rebuilding of a multi-ethnic society in Srebrenica, Bosnia-Herzegovina Methods: The group organizes events to engage Clemson students to collect aid for the students in Srebrenica. This is a small city, which was the site of the genocide in 1995 and ethnically cleansed, and it is recovering very slowly. There is an effort to build ethnic tolerance and it starts with youth. The forms of aid have been determined based on their needs and our capability. Close relationship has been established with The House of Confidence, a local NGO in Srebrenica. Their work is focused on children and young people many of whom are thinking about leaving because of lack of jobs, and also ethnically motivated political struggles. This past May twelve suitcases filled with clothing, school supplies, and other necessities were transported to the town and handed out to different groups of children ages 5-teens. Conclusion: Our group hopes to shed light and expose the Clemson community to the Balkan region. We want to build support in Clemson for the people of Srebrenica.

Poster #74

Freshmen/senior design and mentoring experiences in bioengineering

Mentors: John D Desjardins, Jorge Rodriguez, *Bioengineering*

Students: Mitzi Gamez, Carter Ellis, Julisa Ibarra, Denise Suarez, Austin McCadden, James Eister, Jacqueline Rohde, John Buzhardt

The focus of this Creative Inquiry is to develop a collaborative design effort between senior and freshmen engineering students to solve the need for novel biomedical products in today's technology driven society. This motivates these students to be

innovative and develop products that will benefit humanity. Through the students' creativity, products and prototypes are constructed. The students effectively learn the process of developing new innovations. Currently, we are assisting different senior design teams with their capstone design projects. There are many different needs including helping patients who have essential tremors to minimize the shaking in their upper extremities, developing a knee stabilizer for arthroscopic hip operations, designing a ventilated prosthetic with foam padding to maintain the integrity of residual limbs, and creating a wound-suturing device that reduces the time of pediatric surgeries. Our goal is to develop a marketable solution for these problems.

Poster #75

CU and the CDC

Mentors: Tamara McNealy, Christina Wells, *Biological Sciences*

Students: Charles Howard, Kasey Remillard, Kyle Toth, Rayphael Hardy, Joseph Painter, David Limbaugh

Legionella is a gram-negative genus of bacteria that is the cause of Legionnaires disease. Currently, 50 species and 70 serogroups of *Legionella* have been identified. The Center for Disease Control (CDC) in Atlanta maintains a bank of identified and unidentified *Legionella* samples. The availability of sequencing technologies has increased since many samples were collected allowing for identification of many previously unidentifiable isolates. We received 68 unidentified samples from the CDC. A sequence based typing scheme was used for characterization. Genomic DNA was extracted from samples and polymerase chain reactionwas performed on the 16S and *mip* genes. These samples were then sequenced at Clemson University Genomics Institute. Currently, we have identified several samples which were previously undescribed. Once a sample is identified as novel, characterization through sequencing other genes along with morphological and biochemical assays will be conducted. As a collaborative project, regular meetings occur with scientists from the CDC. Characterization of novel strains expands this lab's ability to conduct outbreak analysis and risk assessment along with expanding our knowledge of the pathogen.

Poster #76

Introducing the basics of palliative care to college level students

Mentor: Nancy K Meehan, *School Of Nursing*

Students: Lauren Rhodes, Casey Gooden

This poster outlines research conducted to find out more about the knowledge of college students regarding palliative care provided to patients nearing the end of life. The focus is on background information regarding palliative care, which is analyzed and implemented into modules in order to teach Clemson University Nursing students to communicate with those loved ones who are at risk of losing their life. An in-depth literature review is provided to showcase present research regarding the topic of palliative care and how this research pertains to the goal of educating students about communication with the dying. Both positives and negatives of recent research are noted, along with the need for further research to be done. The data presented shows that there is a significance in the impact that the teaching module has on students based on comfort level regarding palliative care from before the module. The conclusion of the research is that students should be open with their loved ones and should provide psychosocial and emotional support in their time of need. The aim is to emphasize the importance of understanding the needs of those at the end of their lives, so that students can communicate effectively and provide adequate palliative care.

Poster #77

Brake assembly bench part set up and part presentation

Mentor: Scott Mason, *Industrial Engineering*

Students: Brett Barry, William Rogers, Jacquelin Smolinski, Kristin Vanest

In partnership with Meritor, this project focused on improving the part presentation and downtime losses of the current brake assembly process. The way in which the parts are currently presented to an operator causes an ergonomic strain on the worker, which is not ideal for production, resulting in worker downtime losses and an inefficient build rate. The Rapid Upper Limb Assessment (RULA) was conducted to ensure the ergonomic strain on the worker remains at an acceptable level. As a result of performing two fishbone diagrams on the downtime and ergonomic strain, the team quantified the system losses by the amount of time lost and quantified harmful motions by conducting a RULA assessment. Based on the findings of the Pareto chart and utilizing various Industrial Engineering tools, the team was able to provide solutions to reduce the amount of downtime while also ensuring the motions of workers remain ergonomically safe.

Poster #77

Meritor brake assembly bench part setup process improvement

Mentor: Melissa Dorlette Paul, *Industrial Engineering*

Students: Nicholas Drenosky, Halee Dupree, Christopher Guinn, Frank Petroski, Marco Sidhom

In partnership with Meritor's Manning, South Carolina facility, this capstone project focuses on the changeover process of a drum brake assembly for industrial trucks. The changeover process is the downtime an operator spends preparing the workstation for the next set of brake orders. This team's objective is to use process improvement techniques to reduce downtime in between brake orders. Once the customer needs were determined, the team developed concepts to increase the efficiency of the changeover process time. The concepts consisted of real world applications and the utilization of a discrete event simulation software called Arena. In addition to the Arena model, the team has begun testing individual concepts. With the results from these tested concepts, the team will be able to effectively develop solutions to reduce downtime of operators during the changeover process.

Poster #78

Effects of hydrologic and atmospheric processes on soil displacement

Mentor: Lawrence C Murdoch, *Environmental Engineering & Earth Sciences*

Students: Savannah Miller, Caroline Searcy, Christopher Jackson

Moisture content variations in the subsurface cause load changes on the underlying material. These load changes can be quantified by measuring the displacement of the soil using an extensometer. The technique involves measuring the displacement of two anchors, which are approximately 1.5 meters apart. Compressive displacement correlates to rainfall with approximately 0.2 microns of displacement per millimeter of rainfall. Temperature and barometric pressure affect the measurements, but it appears to be possible to correct for these effects. The Penman-Monteith equation was used with meteorologic data to estimate the evapotranspiration and these data were correlated to periods of expansive displacement in the underlying soil. Displacements appear to be a promising method for characterizing rainfall, evapotranspiration, and other processes.

Poster #79

Economic, ethical and practical aspects of trapping

Mentor: Webb M Smathers Jr, *School of Agricultural, Forest, and Environmental Sciences*

Students: Hannah Davie, Hannah Newton

Through research on traditional and modern techniques, laws and regulations, as well as technical application,students have gained an understanding of wildlife control and the effectiveness of applied management techniques.Due to the extensive amount of damage nuisance species cause, trapping is sometimes the most logical solution to manage detrimental wildlife. Trapping helps maintain a balance between wildlife and people by reducing or preventing expensive damage to agricultural crops, buildings, and homes.Regulated hunting and trapping reduces the threats to human and pet health,by decreasing wildlife populations and exposure to diseases and parasites. Controlling these animals through trapping also ensures viable and healthy populations.With property access granted by private landowners, students were able to experiment with various trapping methods, and had a great amount of success. A selection of species captured included Wild Hogs,Beaver, Raccoon, Opossum, Skunk, and Squirrels.This project was partially supported by the Creative Inquiry program.

Poster #80

Family role strain and its impact on women with breast cancer

Mentor: Stephanie Davis, *School Of Nursing*

Students: Aubrey Crawford, Emily Griffin, Katlyn Howell, Weslyn Jones

The purpose of this study is to examine the degree that breast cancer diagnosis and treatments impacts family dynamics, and to devise and implement a program to support families. The research question being evaluated is how the diagnosis and treatment of breast cancer impacts the patient and her relationship with family members psychosocially and emotionally. Previous studies have found that breast cancer diagnosis and treatment negatively impacts both the patient and her family. As nursing students, this research team is interested in discovering the impact of a breast cancer diagnosis on a family and learning how nurses can provide support based on these findings.

Poster #81

Generation and characterization of radiation in biomedical applications

Mentors: Delphine Dean, Matthew Rusin, *Bioengineering*, Endre Takacs, *Physics And Astronomy*

Students: Bryana Baginski, Kristyn Brandenburg, Sam Caruso, Arthur Hellyer, Taylor Kimmel, Adam Klingenberger, Donald Medlin, Jonathon Miller, Janet Williams, Robert Wilson, Joseph Wilson

This Creative Inquiry, Generation and Characterization of Radiation in Biomedical Applications, fuses two scientific disciplines, physics and bioengineering, seeking a common goal. Students under Dr. Takacs and Dr. Dean, including a doctoral candidate, are designing experiments to irradiate various biomaterials, including proteins and cancer cells, with monochromatic x-rays between 1000 eV to 15000 eV, and then study the results of those interactions. This specific creative inquiry's (PHYS 2990-005 and BIOE 4510-025) goal for this semester is to further understand x-ray interactions with matter, specifically biomaterials. The bioengineering students are devising specific ways to cultivate certain proteins and cell cultures, and the physicists are designing parameters for the experiments, including the production and spectroscopy of x-rays. Several of the experiments will also be utilizing Clemson's EBIT (electron beam ion trap, one of two in the country) as one of the sources for such radiation. With so little data collected using instrumentation of this precision, we feel that even our short-term goals will have far reaching implications.

Poster #82

Clemson veterans project

Mentors: Daniel Mack, *Psychology*, Lance Young, *College of Business and Behavioral Science Academic Advising Center*
Students: Austin Mall, Derek Devera, Heidi Gerstmyer, William Richter, John Richter, William Hines, Zachary Bruns

The Clemson Veterans Project exist to honor the stories of combat veterans from conflicts throughout our country's history and do so in a professional manner expected from a university with such a rich military heritage. The project collected over 70 interviews in HD video. All videos have been made public on Youtube. The project was started to assist the Library of Congress with its own Veterans History Project. Before interviewing each student must take an exam on the digital file preparation process, interview courtesy, and then conduct a practice interview where they behave exactly as if it was a real interview. The videos are put onto DVDs along with accompanying documentation and then shipped in bulk. Going above the requirements for the LoC, each shipment contains a flash drive with every video and document in a digital format. Special interviews are selected for post-production including a custom made introduction.

Poster #83

International global competence of university graduates

Mentor: Felix H Barron, *Food, Nutrition & Packaging Sciences*
Students: Steven Fernandes, Tkoiya Gibson, Grace Arney, Lauren Ladelfa, Philip Pstrak, Sloan Bankson, Churchill Carter

The globalization of science and engineering has resulted from various advances, including those in communication technologies, political events and economic policies, as well as the expansion of multi-national corporations. Because of this, university graduates need to acquire new skills related to global competence. Our Creative Inquiry team is using an ethnic food product design approach working with a group of students from a university in Mexico City to apply as many dimensions of global competence as possible to achieve the product design goal. The tested dimensions include appreciation of other cultures, communicating across international cultures and the use of a second language (Spanish) at conversational and technical levels. Students will complete a global competence survey at the conclusion of the project to assess their global competence.

Poster #84

The development and application of autonomous, low-cost, 3D printers

Mentor: Todd Schweisinger, *Mechanical Engineering*
Students: Christopher Russell, Curtis Beck, Shelby Coroneos

Low-cost 3D printers have empowered individuals to create customized printed parts, but they have yet to be as user friendly as a vending machine. The purpose of this research project is to develop an autonomous, low-cost, 3D printing "Vending Machine" that would increase access to this technology. This research with 15 students is divided into two teams. One team is responsible for the design concepts required of an additive manufacturing vending machine, and the other team is responsible for printing and prototyping the parts using a low-cost 3D printer. The teams have produced printed objects from original designs using kits they built, implemented basic communications, developed design concepts for the vending machine, and training strategies to increase access. This multi-disciplinary research provides educational opportunities for students to pursue their interests in the emerging field of additive manufacturing, and it addresses critical challenges in wide-spread implementation of this technology across campus.

Poster #85

Light-responsive facade prototype

Mentor: David Lee, *School Of Architecture*

Students: Brett Smentek, Arif Javed

Research into improving building energy performance has the potential to create new and innovative architectural products. Through developing "green" architectural technologies aimed at increasing energy efficiency, architects and engineers must overcome the financial, architectural, and engineering challenges of their implementation. A prototype façade design was designed to respond to sunlight intensity as part of a study on similar façade schemes. Light sensors and Arduino microcontrollers are used to direct the actuation of 52 servos that independently control the actuation of folding panels. The purpose of this façade scheme is to increase building energy performance through the use of automated robotics programmed to permit sunlight into a building to achieve a desired interior temperature. This prototype built upon research into animated façades and created a working proof-of-concept prototype from these designs.

Poster #86

Literary and cinematic perspectives on gender studies

Mentor: Graciela Tissera, *Languages*

Students: Mahvash Husain, Emily Winburn, Katie Lovett, Hannah Haire, Courtney Dunnigan

This project focuses on gender studies including women, men, and sexual diversity studies. Students explore gender and sexuality in the fields of literature and cinema related to cultural, social, and economic issues in Latin America and Spain. The analysis includes a diverse selection of topics: gender and science, gender and sexuality, gender and minority ethnicities, feminism and diversity, transgender identities, transgender healthcare, lesbian and gay figures and trends, and intersex and culture.

Poster #87

Student interactions with the packaging industry

Mentors: Robert Moore, *Food, Nutrition & Packaging Sciences*

Students: Devaun Austin-Walker, Demi Wooi

Students interact with the packaging industry to make professional connections well in advance of graduation. In addition to benefits for the students (co-ops, scholarships, careers, etc.), Clemson's Packaging Science program, one of only five in the U.S., also benefits by making the packaging industry aware of our Bachelor of Science program, and by facilitating industry collaboration with, and support for, the program. The packaging industry likewise benefits by learning about our future packaging professionals, our faculty, and our many research and testing capabilities. The primary artifact is a relational data base, which allows for two-way cross reference by categorizing both companies and students, using a wide range of search criteria. Student interactions with industry occur in a variety of ways, including industry trade shows, conferences and seminars, visits to companies, and visits to the Clemson campus by companies.

Poster #88

NIR camera for early detection of diabetic ulcers

Mentors: Vladimir Reukov, Aleksey Shaporev, *Bioengineering*

Students: Maria Portilla Rodriguez, Maxwell Hoelzen, Deepti Athavale

The purpose of this Creative Inquiry is to test whether near-infrared (NIR) imaging devices can detect areas of skin at risk for ulceration in diabetic patients. Venous blood accumulation, or high levels of deoxygenated blood within a tissue, can indicate poor blood circulation and increased risk of ulceration. Here we propose to detect venous blood in tissues using differences in optical spectra of oxygenated vs. deoxygenated blood in NIR region. We previously designed and built a prototype scanner with three integrated NIR light sources that is being tested at MUSC. Our current work is focused on testing of improved NIR illumination systems and improved NIR imaging device, and our second prototype that uses a more sensitive Raspberry Pi-controlled camera and advanced NIR light sources will provide significantly improved image quality. Upon success, the ultimate goal of this project is to manufacture a cheap, portable NIR camera for skin self-monitoring by diabetic patients.

Poster #89

Americans vs. Europeans: Who Has Better Sleep Quality?

Mentors: June Pilcher, Drew Morris, *Psychology*

Students: Jesse Walker, Elizabeth Rummel, Justin Williams

The purpose of this study is to examine Pittsburgh Sleep Quality Index (PSQI) component scores in students from Clemson University and the University of Vienna. 324 students in a Clemson undergraduate psychology course and 292 students in psychology courses at the University of Vienna were asked to complete surveys regarding their sleep quality. Vienna students had overall longer sleep duration ($p < .0001$), better sleep efficiency ($p < .005$), less sleep disturbances ($p <. 0001$), a lower usage of sleep medication ($p < .0001$), but also reported longer sleep latency ($p < .0001$). The current data suggest that Clemson students experience worse sleep quality than students at the University of Vienna. Perhaps living on or near a traditional American college campus provides students with too many options that interfere with placing greater value on proper sleep hygiene.

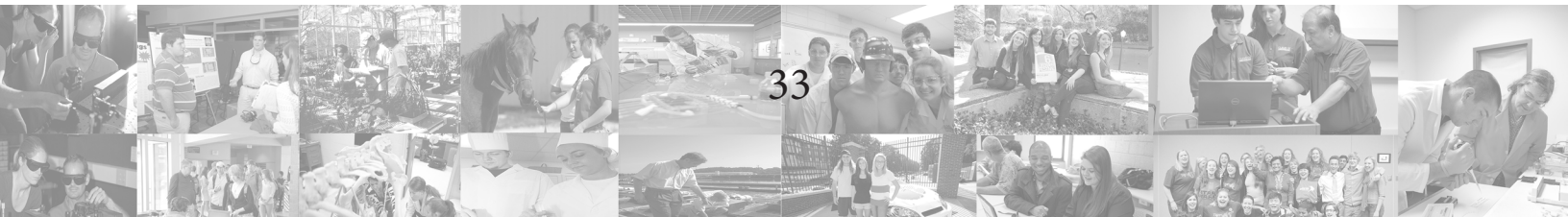
Poster #90

A molecular approach to the autoregulation of nodulation: Genes and hormones

Mentor: Julia Frugoli, *Genetics and Biochemistry*

Students: Lucy Rummler, Kaylee Kotwis, Benjamin Flanagan

Legumes form a symbiotic relationship with nitrogen fixing bacteria in the soil which feed the plants. The bacteria are housed in nodules formed on the roots. Autoregulation of Nodulation (AON) is an important pathway controlling nodule number based on the needs of the plant. Our lab exploits the model legume system *Medicago truncatula* to understand AON. We have identified multiple inputs affecting AON, and alteration of these factors cause plants to make too many nodules. The inputs include genes such as the *SUNN* receptor kinase, an enzyme called *RDN1*, and the plant hormone auxin. We report investigations with transgenic plants carrying proteins modified to fluoresce in order to visualize AON factors in living plants and investigations of the effect of mutations in these same genes in plants that don't make nodules to determine their universal function. Combined with work by other members of the lab, we report a model for how the AON regulatory pathway works, which should help address the fundamental problem of how plants grow in response to environmental factors. This work is supported by NSF IOS#1146014, the Calhoun Honors College and the Creative Inquiry Program.



Poster #91

Greenville Hospital System central sterile process improvement - orange team

Mentors: Kapil Madathil, Scott Mason, *Industrial Engineering*

Students: Tabitha Davenport, Jennifer Kahler, John Alt, Jaime Sanchez-Julia

Partnered with Greenville Memorial Hospital, this capstone design project focused on its Central Sterile unit. This department, located on the mezzanine level of the hospital, handles the packaging, picking, and sterilization of operating room materials and tools. Their use of automated guided vehicles (AGV) provides many benefits, but also causes massive hallway congestion. Moreover, while the soft materials are located on the same level as Central Sterile, the instrumentation is on the operating room floor (second floor). The objectives were to alleviate the heavy traffic of AGVs and to reallocate as much instrumentation as possible on the mezzanine level. Customer needs and specifications were determined, and the team gathered the necessary data to develop alternative solutions to these issues through the use of time studies and root cause analyses. After conducting simulations and usability tests during the off-hours of the department, the team refined and finalized a successful solution.

Poster #91

GMH central sterile process improvement - purple team

Mentor: Kapil Madathil, *Industrial Engineering*

Students: Chase Blatchford, Michela Hunt, Cesar Navarro, John Stallard

In partnership with Greenville Memorial Hospital (GMH), this design project focused on improving the Central Sterile Process, which strictly supplies the Operating Room floor. GMH has a "central" sterilization process located on the mezzanine level, which is where all soft/consumable products are stored, as well as where all instruments are sterilized. The sterilized instruments are sent up stairs by an Automated Guided Vehicle, where they're stored in three separate cores which are specific to the type of surgeries being performed. The team determined the customer needs by administering surveys, conducting interviews, as well as observing the current process. Once the customer needs were found, the team converted the needs into product specifications. The team identified system losses based on key business goals and conducted a root cause analysis to determine the causes of the system losses. Our team found a problem with the efficiency due to poor infrastructure.

Poster #92

Implicit and explicit stigma towards mental health treatment

Mentors: Kandice Goguen, Kristen Jennings, Thomas W. Britt Jr, *Psychology*

Students: Allison Peasley, Stephanie Jeffirs, Brittany Zaremba, Abigail Lee, Kaitlin Rivera, Jilian Palmer

In order to better understand stigma associated with mental health treatment, 118 Clemson University students completed Implicit Association Tasks (IAT) and self-report surveys. The IAT presented terms associated with either medical or psychological treatments or patients, paired with additional positive or negative terms (e.g., good vs. bad). Survey items assessed attitudes towards mental health and medical treatment, as well as mental health and medical patients. Responses from the IAT and survey were compared regarding mental health versus medical treatments and mental health versus medical patients. The IAT results revealed a significant negative implicit bias toward mental health treatment and mental health patients. Explicit survey measures also showed more negative responses toward mental health treatment and patients. Our findings provide both implicit and explicit evidence of stigma associated with mental health treatment and patients. Through better understanding these biases, researchers can work to reduce the stigma associated with mental health treatment.

Poster #93

Linking mountains with their past

Mentors: Elizabeth Baldwin, *Parks, Recreation & Tourism Management*

Students: Alexander Goode, Daniel Gossett, Rodriquez Hall, Elizabeth Johnson, Charone Peake, Natalie Proctor, Tyler Slaton, Anthony Smith

Clemson University launched an internationally recognized networking tool for parks of all types called the Open Parks Network (OPN). This Professional Network project team has partnered with the National Parks Service to digitize and make available data in the form of bound materials, maps, and photographs from the history of areas that are now managed by the National Park Service. One such area is the Great Smoky Mountains National Park where over 19,000 photographs alone have been digitized. This Creative Inquiry project will focus on the landscape and panoramic images from the 1930's in the OPN repository, and the research team is taking archival quality images of the same landscapes, and views from fire towers in an effort to provide comparison data that will be made available through the Open Parks Network. It is the goal of this project to make comparison data available, as well as to provide inspiration for others to use this immense historic data set, previously difficult to access, to explore questions on a temporal and spatial scale that emerge in order to develop deeper understanding of change and meanings of landscapes in the Southern Appalachians.

Poster #94

SmartBottle: An iPhone app for water consumption monitoring

Mentors: Aleksey Shaporev, Vladimir Reukov, *Bioengineering*

Students: Carolyn Arthur, Sean Gorman, Dinkelpreet Kaur, Adam Killmeyer, Janna Hughes, Dominika Wisniewska, Rachel McComas

It is widely acknowledged that people should drink around eight glasses of water per day. While apps that allow you to record your water intake already exist, this project will expand upon that technology by designing and building a water bottle that will record the volume of water that has been consumed and then communicating that data to an accompanying iPhone application via Bluetooth. A device for tracking of water intake using magnetic flowmeter was designed and prototyped, and iPhone application showing water intake over time and allowing the user to flexibly manage desired water consumption goals and reminders is being developed. When developed, this device could be used by athletes, patients, and people seeking to lose weight, or anyone who wants to monitor and improve their water daily water intake.

Poster #95

The power of syllabi: Faculty roles in ePortfolio

Mentor: Jeffrey R. Appling, *Office of Undergraduate Studies*

Students: Andrew Dippre, Megan Hembree, Kaitlynn Kooi, Kyle Pazzo

A study of faculty views about General Education requirements, paired with a review of faculty syllabi, revealed concerns about communication of General Education goals to students. Syllabi reviewed were those meeting the natural sciences General Education requirement. Students demonstrate natural science competency with work from various science courses, deposited in an electronic portfolio. Electronic portfolios are evaluated systematically as part of the university General Education assessment plan. We explore possible reasons for gaps in faculty communication about the natural science competency requirement, including issues such as institution type and faculty desire for autonomy. Factors which contribute to creation of successful syllabi are also reviewed, and we discuss how these factors could be employed to better communicate General Education requirements to students.

Poster #96

Evolutionary conservation of male size at maturity genes in poeciliid fishes

Mentor: Margaret Ptacek, *Biological Sciences*

Student: Shawn Shaji

Swordtails (*Xiphophorus*) and mollies (*Poecilia*) demonstrate predictable mating strategies based on body size; large males court females, and small males sneak copulations. Mutant alleles of a gene encoding the melanocortin 4-receptor protein (*mc4r*) have been implicated in regulating time to maturity and male size at maturity in swordtails, affecting male mating strategy. We hypothesize these mutant alleles are ancient and found across the entire family Poeciliidae explaining the repeated evolution of male size variability and alternative mating strategies in these fishes. We characterized allelic variation at *mc4r* in 18 species of poeciliids (*Gambusia, Limia, Poecilia and Xiphophorus*). DNA sequencing and fragment analysis revealed the presence of mutant mc4r alleles with identical deletions to mutant alleles in *Xiphophorus*. Phylogenetic analysis and a haplotype network based on statistical parsimony were used to pinpoint the origin and age of mutant *mc4r* alleles (> 40 MYA). This suggests that the origin of gene duplication at *mc4r* pinpoints a major factor in the diversification of male size and mating behavioral strategies in poeciliid species.

Poster #97

Ask me about 27

Mentors: Robin Kowalski, *Psychology*, Brooke Baker, *English*

Students: Abbey Robinson, Emily Blackshire, Allison Toth, Margaret Wynkoop, Briana Smith, Lisa Emerson, Caitlyn Lankowski, Elizabeth Whittaker, Lauren Brown, Jardin Dogan, Kelsey Sherck

Worldwide, there are 27 million victims of trafficking. With that in mind, this project intended to help students (a) gain an understanding of social issues throughout the world, (b) become activists on behalf of victims of social injustice, and (c) educate others about social injustice and what can be done to reform it. A 26-item survey assessed student knowledge about trafficking. Clemson students correctly answered just over half of the survey questions ($M = 16.84$; $SD = 2.37$). The team then designed activities to raise awareness about trafficking. Activities included a venue for students to create Valentine's for trafficking victims, a campus showing of the film "Not My Life", and an invited speaker, an expert on trafficking. At all events, bookmarks containing survey results were distributed.

Poster #98

Roper Mountain bioengineering innovation lab

Mentors: Delphine Dean, David Kwartowitz, John D Desjardins, *Bioengineering*

Students: Erica Baskin, Erica Beal, Jordan Esposito, Nicole Cucchi, Rebecca Leland, Victoria DeCroes

Roper Mountain Science Center (RMSC) is a center in Greenville, SC, devoted to science enrichment through interactive and informative displays. The center has been a place of learning for elementary and middle schools throughout the Upstate. However, the exhibits are in desperate need of updating. Through funding by the South Carolina government, a grant has been secured for renovations. Seven hundred square feet of the museum will be devoted to biomedical engineering and nanotechnology. This Creative Inquiry focuses on developing technologically advanced displays targeted to seventh grade students that engage and excite them in the field of biomedical engineering. One display we are working on involves relating high impact collisions in sports. It will show the students the importance wearing protective helmets in sports, and allow them to design their own helmets for testing. A second project that has just been completed is our surgery simulator. This exhibit will allow students to work in groups to complete a pseudo-operation situation with real medical tools and a camera guides robotic arm.

Poster #99

A process improvement approach to optimizing central transport at Greenville Health System

Mentor: Sreenath Chalil Madathil, *Industrial Engineering*

Students: Calvin Brown, Harrison Demint, Jacey Gombert, Melissa Molony

In conjunction with the Greenville Health System, this project aimed to optimize Central Transport (CT). Personnel of CT are responsible for all patient transfers between departments within the hospital campus. After observations and analysis of the current system, customer needs and product specifications were created to assist in the development of effective solution concepts. The team created one model concept that allows the client to explore how altering the number of transporters (personnel) affects the overall cycle time of a transport job. Additionally, four tools were developed that, collectively, provide recommendations for: scheduling labor, assigning transporters to hospital zones, and an enhancing training for transporters that educates them on the most efficient work methods. This project's goal is to reduce the transport job cycle time and variability while maintaining current safety and quality standards within the Greenville Health System.

Poster #99

GHS central transport optimization (GMMC) orange team

Mentor: Sreenath Chalil Madathil, *Industrial Engineering*

Students: Jasmine Mack, Rachel Nadel, Ross Wafer, Jacob Ward

The objective of this study was to improve the patient transport process throughout Greenville Memorial Hospital. The Central Transport Department is in charge of moving patients to and from the many different areas of the hospital, and on a given day, will transport up to 550 patients. Overcrowding is a growing problem because there is not enough room to accommodate patients, which increases wait times. Our team's objective is to increase turnover, opening up rooms for new patients, and to reduce patient time in system by minimizing transportation time and maximizing resource utilization. To achieve this goal, the team has analyzed the current system along with a year of historical data to create an Arena simulation model, which will then be used to test and evaluate potential improvement efforts.

Poster #100

Alternative baits for minimization of non-target species usage in an Eastern gray squirrel (*Sciurus carolinensis*) contraceptive project

Mentor: Kristina Dunn, *Wildlife & Fisheries Biology*

Student: Mark McAlister

The eastern gray squirrel (*Sciurus carolinensis*) (EGS) is a common nuisance species throughout its range. A new means of limitingEGSpopulation is being tested onClemson University's campus by administering the drugDiazaCon™ orally with coatedsunflower kernels.The objective of this study is to determine the best bait for administeringDiazaCon™ while minimizing non-target usage.The usage of three baits:corn, peanuts, andsunflowerseedswill betested by placing trail cameras facing feeders in squirrel-frequented trees.Each of the baits will havetwo feeders for a total of six. This same process will berepeated in areas classified as rural, urban with little foot traffic, and urban with heavy foot traffic. The pictures will then be analyzed to understand speciesusage and frequency.All bait typeswill be coated withDiazaCon™ to determine the capacity of eachoneto hold thecontraceptivedrug. This capacity of each bait type and its preference or lack of preference by non-targets may offer an alternative contraceptive delivery method to the one currently being used withEGSthereby reducing non-target consumption.

Poster #101

The nitty gritty of South Carolina soil orders

Mentors: David White, *CCIT Research Support*, Dara Park, *School of Agricultural, Forest, and Environmental Sciences*
Students: Morgan Reed, John Deason

Detailed information on soil orders of South Carolina is available but not in a digestible format for various state stakeholders. The goal of this first-semester Creative Inquiry is to develop stakeholder appropriate tools regarding general soil characteristics of South Carolina. A poster and interactive Web map depicting and explaining the soil orders of South Carolina are the first tools produced. Both the poster and Web map are targeted for K-12 teachers as teaching aids and will accompany a lesson plan for meeting school standards. The Web map will also be available for the public to use in exploring the soil orders of South Carolina. By the end of the first semester, students will determine complete lesson plans and present a lesson to two 7th grade science classes, and will identify at what classification level will soil attributes be used to integrate in to the interactive Web map.

Poster #102

Phase behavior and application studies of cellulose nano-crystals synthesized by acetic acid

Mentors: Christopher Kitchens, *Chemical & Biomolecular Engineering*
Students: Sean Demass, Matthew McMillan

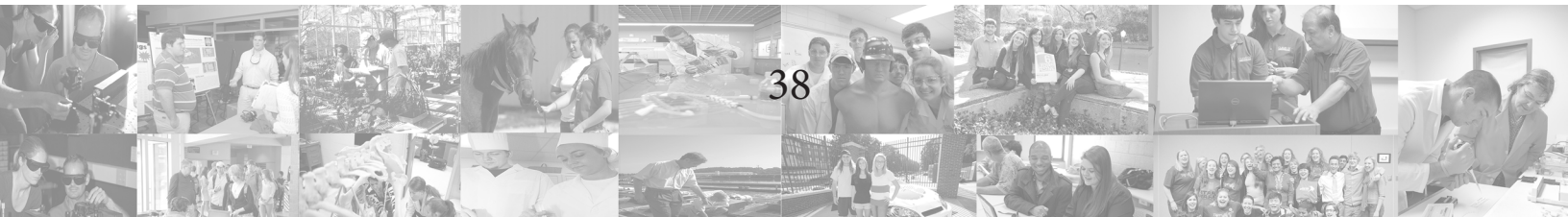
Cellulose is the most abundant source of biomass in the world. Nano-cellulose possesses the extraordinary mechanical properties of high Young's modulus and great tensile strength found in natural cellulose fiber. However, during drying, abundant hydrogen bonding can agglomerate the nano-cellulose, hindering its mechanical properties. Thus it is important to ensure that the nano-cellulose is utterly deagglomerated in order to improve its applicability. We used various sonication and centrifugation techniques to successfully deagglomerate the cellulose. To better understand the phase behavior of the cellulose nanocrystals, various concentrations of CNC-AA were left to sit in glass vials, while the phase behavior was optically observed over time. After several weeks, there was no discernable phase separation, yet liquid crystalline behavior was noticed in certain concentrations utilizing polarized light microscopy. In order to then use the stable CNC-AA suspensions as films (for eventual application in MEMS devices) a spin-coating procedure onto silicon wafers was optimized. Using AFM and interferometry, the structure and thickness of the CNC-AA films were observed.

Poster #103

Applications of number theory to public-key cryptography

Mentor: James Brown, *Mathematical Sciences*
Students: Patrick Dynes, Brittany Rosener, Debra Parmentola

Throughout history, methods for sending messages secretly have been desired by governments, societies, and individuals. For instance, Julius Caesar sent commands to his army by simply replacing each letter of the alphabet with the letter that occurs three places down the alphabet. The mathematical discipline of *cryptography* emerged to develop more secure methods than Caesar's for sending messages secretly. Modern methods of cryptography often use difficult mathematical problems to ensure encrypted messages can never be decoded without certain private information. The security of the first practical public-key cryptosystem, the *RSA algorithm*, relies on the assumption that it is hard to factor large numbers quickly. In this Creative Inquiry, the students studied the basic mathematical theory of cryptography, learned how to program in the SAGE mathematics platform, and implemented the RSA algorithm in SAGE. It was found that the RSA algorithm offers adequate security for most practical applications used today.



Poster #104

The effects of weekend camp participation regarding vocational skills in individuals with intellectual impairments

Mentors: Leslie E Conrad, *PRTM Outdoor Laboratory*, Francis A McGuire, *Office of Summer Programs*

Students: Ethan Jordan, Katie Cox, Tyler Chambers, Lauren Dimaio, Carly Durant, Hannah Henderson, Sarah Sosa,

Margarette Carter, Moniet Creebsburg, Brittany Ropp, Haley Driggers

The effects of weekend camp participation regarding vocational skills in individuals with intellectual impairments is a Creative Inquiry in partnership with Camp Sunshine, a program sponsored by Clemson University's Outdoor Lab. With research conducted by students in the department of Parks, Recreation, and Tourism Management, the effects of recreational therapy techniques on participants in a weekend camp experience will be determined via the facilitation and evaluation of positive recreation and leisure activities. Research conclusions will be made after each weekend camp is completed.

Poster #105

A study of gene expression in *Legionella pneumophila* biofilms through the use of confocal microscopy

Mentor: Tamara McNealy, *Biological Sciences*

Student: David Limbaugh

Legionella pneumophila is the causative agent of Legionnaires' Disease. *L. pneumophila* is ubiquitous in freshwater environments as well as in man-made water systems such as air conditioners and cooling towers. *Legionella* biofilms in these systems have been identified as the source of a number of outbreaks. Gene expression in planktonic phase *L. pneumophila* has been well characterized but little analysis has been conducted within biofilms. We hypothesize that gene expression in *Legionella biofilms* will exhibit unique expression patterns as compared to planktonic cells. To test this hypothesis *Legionella* were transformed with reporter gene vectors and biofilms grown on glass slides and imaged using confocal microscopy. Characterization of biofilm stages was conducted from attachment through dispersal. Gene expression of the global regulatory protein, CsrA, and the flagellar gene, FlaA, was quantified over 120hr of biofilm growth. Biofilms were imaged at five key time points in the biofilm development: 12 hr (initial attachment), 24hr (irreversible attachment), 48hr (early maturation), 72hr (late maturation), 96hr (mature biofilm) and 120hr (mature biofilm with dispersal). Whole biofilm fluorescence was measured with syto59 staining and compared to the percentage of cells that demonstrated GFP fluorescence from the reporter gene. DIC images clearly demonstrate that Legionella biofilms follow the typical biofilm developmental stages. Analysis of the CsrA expression showed upregulation in early biofilms but little to no CsrA expression in mature biofilms. FlaA was expressed in early biofilms and during late biofilms where dispersal was occurring. Planktonic cultures are often used to characterize cycles of gene expression which are often not identical to the patterns seen in biofilms. *Legionella* biofilms are not well characterized molecularly and here we present the first evidence showing gene expression patterns of essential genes over time within biofilms. Use of confocal microscopy for such assays provides a high resolution, specific image that allows for quantification and detailed analysis of gene expression. This research begins the opportunity to better understand biofilm gene expression that can lead to improved prevention and control of infectious biofilms.

Poster #106

Exercise is medicine in rural health centers and federally qualified health centers

Mentor: Joel Williams, *Public Health Sciences*

Students: Caitlyn Bobo, Reagan Buie, Mary Culbertson, Liska Dobberstein, Korynn Duke, Mabry Gray, Bailey Hamlett, Olivia Huckabee, Emily Hyder, Caroline Jones, Leslie Spearman, Whitney Stilwell, Joel Szabo, Carter Martens, Samantha McGowans, Rachel Patton, Kendra Prosser, Lindsey Hughes

The American College of Sports Medicine in collaboration with the American Medical Association developed the the Exercise is Medicine™ initiative to promote physical activity as a "vital sign" among health care providers. The purpose of the study is to inform initiative advocacy efforts among Rural Health Centers and Federally Qualified Health Centers. An interview guide was developed through literature review and expert feedback. Provider responses will be recorded via field notes which are coded to extract common themes. The qualitative data collected from these interviews will be used to examine healthcare provider knowledge and awareness of the initiative, current behaviors related to patient physical activityassessment, counseling, prescription, referral and follow-up, and the likelihood of these providers using existing Exercise is Medicine™ materials and resources in the future. Our findings and recommendations will be communicated back to the American College of Sports Medicine through the Exercise is Medicine™ Community Health Committee.

Poster #107

Scheduling system for Nutra manufacturing

Mentor: Melissa Dorlette Paul, *Industrial Engineering*

Students: Mariam Namouz, Devin Tiernan, Reed Kelley, Reid Newman

This capstone project focused on Nutra's manufacturing scheduling system. Originally there were numerous scheduling tools in place for the softgel, hardshell and tablet manufacturing processes. After identifying users, conducting surveys, and generating metrics, we came to understand that the new system needed to be automated, easy to use, standardized, and capable of meeting due dates. The team then developed an initial scheduling solution. Following this, multiple usability tests were conducted to help refine and improve the solution. The final solution reduced the amount of time and manual input it took to create a manufacturing schedule and has the potential to be scaled across all departments.

Poster #107

Production scheduling project: Nutra manufacturing

Mentor: Scott Mason, *Industrial Engineering*

Students: Samantha Paris, Sara Biega, Samuel Smoot, Kyle Taylor

In partnership with Nutra's Greenville manufacturing plant, this capstone design project focused on developing an improved scheduling process. The current scheduling system at Nutra encompasses a heavily manual process. This involves completing duplicate processes in multiple locations throughout the facility resulting in a delay of product state information. The proposed benefits of the product include improving usability of the system, simplifying the scheduling process, and implementing a dynamic system. One of the biggest issues with the current system is the transparency between scheduling tools. A Root Cause Analysis was conducted and core causes were identified as follows: untracked utilization, insufficient time and resources to implement needed systems, and no standardization. As a result, the final product will be designed to address these needs by developing a tool that tracks work in process (WIP), reduces the overall time to produce a schedule, and has flexibility to make schedule changes as needed.

Poster #108

Sustainable energy from food waste

Mentors: Terry Walker, *Environmental Engineering & Earth Sciences*, Charles Thornton, *Campus Utilities*

Students: Jennie Dewitt, Paige Lux

How can we divert waste from landfills AND create valuable feed, biofuel and organic fertilizer? Easy, by combining a team of Biosystems Engineers, Environmental Engineers, Chemical Engineers and Agronomists to create a sustainable system to divert cafeteria food wastes into value added coproducts. Using a combination of Black Soldier Fly digestion and traditional composting, our team has created an energy crop, a high protein meal for fish and poultry, and sustainable oils for biodiesel production. Join us as we demonstrate our novel co-extraction process and discuss the process of turn waste into energy crops. This unique process not only diverts waste from landfills, but reduces disposal costs, reduces greenhouse gas emissions, reduces energy consumption in waste processing, all while generating revenue from this waste and creating jobs!

Poster #109

Livestock improvement in Cange Haiti

Mentor: Brianna Noblin, *Campus Life*

Students: Dalton Caine, Emily Elliott

Clemson Engineers for Developing Countries, as a whole, desires to improve living and economic conditions in Haiti through the development of sustainable solutions. More specifically, the Livestock Improvement project endeavors to improve the quality and production of livestock. Currently, Haitian farmers are not properly confining their livestock. Rather, they are using stakes to secure the animals to the ground, resulting in low yield rates and production problems due to decreased grazing and exercise. The goal of the team is to improve livestock to yield market value. Several solution options are being analyzed including various types of fencing such as chain link, woven wire, high tensile wire, and electric. While these options have proven to be effective in the United States, the most effective option to implement in Haiti must be determined. Once the most optimal method is established, this trial run will be conducted in Haiti on a two-acre plot that has been secured. Pending success, the solution will be implemented in additional areas in Haiti.

Poster #110

Modeling population structure and adaptation in a Hawaiian stream goby: *Sicyopterus stimpsoni*

Mentors: Michael Childress, Kristine Moody, *Biological Sciences*

Students: Emily O'Connor, Mary Burgess

Due to the environmental problem of climate change, it has been forecasted that the Hawaiian islands can expect increased drought and increased rainfall variability. This could cause a change in stream flow and threaten the amphidromous waterfall climbing gobies, *Sicyopterus stimpsoni*. To study the impact of these projected changes, we used spatially-explicit, individual-based population models with four levels drought and three levels of rainfall variability for three islands with different topographies (Hawai'i, O'ahu and Kaua'i) and looked at the effect on the goby population dynamics after 10 years. Our results showed that total abundance was impacted by drought, variability, and island shape, especially under extreme conditions. The rate of morphological change and percent of juveniles was also negatively affected by the extreme conditions. Overall, the populations were stable under moderate drought conditions, but suffered when conditions reached extreme levels.

Poster #111

Examining college student perceptions of students with mental health problems

Mentor: Thomas W. Britt Jr, *Psychology*

Students: Abigail Lee, Allison Peasley, Brittany Zaremba, Jilian Palmer, Kaitlin Rivera, Stephanie Jeffirs

During college, students often face stressors significant enough to trigger mental health problems. To better understand college students' perceptions of mental health problems, we conducted a study in which 105 Clemson Students (68.3% female) read a scenario about a student either experiencing significant life stressors (e.g. death of a relative, taking a large number of difficult classes) or not experiencing these stressors and who subsequently experienced mental health symptoms consistent with anxiety. Students then responded to questions assessing their affective reactions to the student, how close they would get to the student, and the perceived causes of the mental health problem. We examined differences in ratings of perceived cause in the low stress and high stress conditions. In the low stress scenario, participants rated bad character, a chemical imbalance in the brain, and a genetic or inherited problem most highly as causes of the symptoms. In the high stress scenario, stressful life circumstances were the most highly rated cause. Those students who had more negative reactions to the student demonstrated a lesser desire for social closeness, especially when the student was under high levels of stress. These results imply that students consider the environmental context of individuals when making judgments about the causes of mental health symptoms.

Poster #112

Which animal optimizes the best? A study of bio-inspired heuristic algorithms

Mentor: Brian Dean, *School of Computing*

Students: Benjamin Bowen, Sean Kelly, Euan Kemp, Winslow Mohr, Everett Pompeii, Nitin Sachdeva, Christian Weeks

While foraging for food and conducting other daily activities, organisms like ants, bees, and even single-celled amoebas naturally solve hard optimization problems - problems that in many ways are still quite challenging for modern computers. This project studies "bio-inspired" heuristic algorithms, designed to mimic the problem-solving behavior of organisms in nature like ants, bees, wolves, fireflies, dolphins, bacteria, swarms of fish, and many more, in order to produce good solutions to a wide range of hard optimization problems (those of interest to humans). We have designed an interactive web-based experimental platform where users can alter algorithm parameters and visualize the results of different organisms as they compete in a tournament to see which one ultimately provides the most effective method of optimization. Our hope is to make these algorithms more understandable and engaging, and to show students how computational problem-solving can be a fun, creative process.

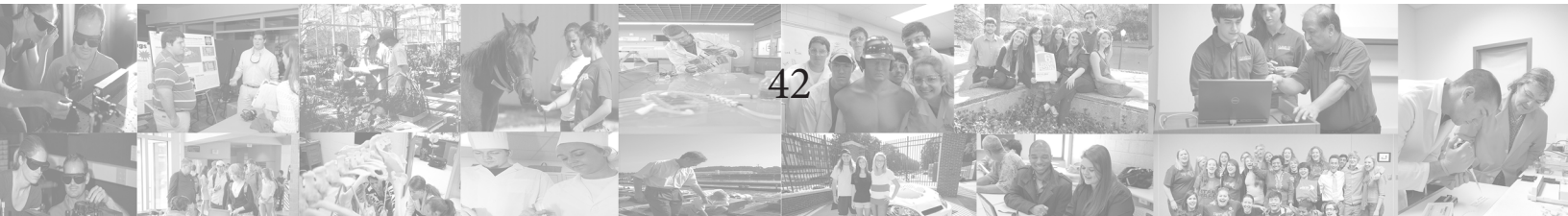
Poster #113

Medical training simulation for central venous catheterization

Mentors: Jiro Nagatomi, Delphine Dean, *Bioengineering*

Students: Rebecca Thomas, Alex Barrett, Samuel Foister, Julianne Jett, Kirsten Hicks

Our Creative Inquiry, in collaboration with clinicians, local hospitals, and MBA students, has involved the development, testing, and commercialization of a central venous catheterization training simulator. Medical training simulators are important tools for educating physicians without needing to practice on patients. Central venous catheterization (CVC) is the insertion of a catheter into a sizable vein in order to deliver a large influx of drugs to the heart. The risky nature of the procedure comes from the proximity of the vein to the heart, lungs, and major arteries. Many complications can arise, often the cause of expensive and ineffective training methods. We have created an affordable simulator with features that address the limitations of current simulators, including a fully rotatable head, proper anatomical landmarks, and ultrasoundability. Our patent-pending design is currently being prepared for manufacturing and marketing in hopes of increasing the safety of CVC procedures.



Poster #114

Effects of thoughts and sensory experiences on heart rate variability

Mentor: Cheryl Dye, *Public Health Sciences*

Students: Brittany Lamont, Hailey Karg, Kathryn Fountain, Shakena Jones, Yahaida Aleman, Russell Pace

A Creative Inquiry team studied the impact of interventions including thoughts and external stimuli such as nature images, aromas, and music on heart rate variability (HRV) of older adults. HRV is the change in heart rate in a given period of time and is an important indicator of mental and physical health. HRV was measured by a monitor which indicates the percentages of time spent in coherence, a characteristic of optimal HRV. Twenty-three members of the Osher Lifelong Learning Institute and Seneca Senior Center participated in the study in fall 2013 which continued work from summer 2013 when 17 participated. Participants in a Memory Health program at Greenville Health System were added in Spring 2014. Through a sorting process, all participants chose a preferred nature image, aroma, and musical selection and the effects of these preferred stimuli on HRV was then measured. Stimuli impact on HRV varied by individual, but most experienced improved HRV compared to their HRV during thoughts of frustration.

Poster #115

Do spiny lobsters prefer to associate with familiar individuals?

Mentor: Michael Childress, *Biological Sciences*

Students: Katherine Cunningham, Julianna Ellis

Juvenile spiny lobsters (*Panulirus argus*) are known to be gregarious. We studied the preference of spiny lobsters in their association with other individuals. Twenty lobsters were captured for this experiment, paired, and divided into either "dominant" or "subordinate" status. The pairs of lobsters were then placed into the cattle tank with another pair and allowed to interact throughout the night. Spiny lobsters spent significantly more time in their "home" den than the "away" den, and were much more likely to be in their "home" den with a familiar individual than with an unfamiliar individual. However, they showed no preference for specific individuals outside of the den. Juvenile spiny lobsters seem to establish fidelity to shelters, but not to other individuals. This project was funded in part by Creative Inquiry.

Poster #116

Finding your voice

Mentor: Denise Anderson, *Parks, Recreation & Tourism Management*

Students: CI Teams 816 & 672

Preadolescent females are more overweight today than ever before (CDC, 2013). Overweight in preadolescent girls might be due in part because female participation rates in active recreation are often lower than that of males. The constraints that influence female participation in outdoor recreation can include stereotypes, social norms, peers, body image, and self-esteem. The purpose of Clemson University's Finding Your Voice weekend camp is to determine if the all-lfemale weekend camp can have an impact on self-esteem, self-efficacy, body image, and relationships. It is a three-day camp targeted for 50 middle school girls in Oconee, Greenville, and Pickens County. The research setting will be at Clemson's Outdoor Lab. The camp will offer a variety of activities including rock-climbing, kayaking, backpacking, and educational sessions ranging from body image to nutrition. Data will be collected through pre- and post-test surveys, interviews, and focus groups.

Poster #117

Waste management in Cange, Haiti

Mentor: Jennifer Ogle, *Civil Engineering*

Students: Yongkun Liao, Karuiam Booker, Zachary Priester

Our goal is to create a self-sustained waste management system in order to improve the sanitation and environmental health in Cange, Haiti. Cange currently has no waste management system; garbage is either piled in ravines or burned. We have divided Cange's waste into three waste streams for treatment: organics, plastics, and other. The organics will be primarily treated with municipal scale composting windrows and the finished compost will be sold to surrounding farms. The plan for the plastic materials is to work with merchants to minimize the need and use of disposable plastic, repurpose used plastic waste into other marketable items (e.g., woven bags, construction blocks, etc.), and to recycle them at a newly formed micro-recycling facility. Other materials are expected to be mainly construction debris, which is already widely repurposed by the community, so it will be collected in a central refuse pile. In conclusion, we believe this system will effectively process the waste in a beneficial manner to the community.

Poster #118

Cardiovascular emotional dampening and blood pressure: Is there a relationship between diastolic blood pressure and risk-taking behavior?

Mentor: James A McCubbin, *Psychology*

Students: Melissa Hibdon, Anastasia Morrison, Justin Stephens, Marina Scanlon, Caitlin Lindberg

Persons with higher blood pressure have emotional dampening, a reduced response to emotionally meaningful stimuli. Dampening of perceived threat could influence risk-related decision-making. The present study examined the relationship between cardiovascular emotional dampening and risk behavior. We measured resting diastolic blood pressure (DBP), emotion recognition, and risk-taking behavior in 44 healthy, self-identified males and 44 females with an average age of 22.5 years. Participants judged the type of emotion depicted in faces and sentences as an index of emotion recognition. We measured risk with a modified Youth Risk Behavior Survey. Results showed a significant correlation between risk-taking behaviors and resting DBP [$r(88) = .408$, $p < .001$.]. Sex was also correlated with resting DBP, [$r(88) = -.230$, $p = .031$]; however, a multiple regression showed no main effects or interactions with sex in prediction of risk. These results indicate that young adults with higher DBP report more risk-taking behavior and show less accuracy in recognition of emotion in faces, suggesting that cardiovascular emotional dampening may reduce threat appraisal and increase high-risk behavior. The effect of blood pressure on risk behavior could contribute to increased disease risk later in life.

Poster #119

Impact of mobile devices on clinical laboratory data

Mentor: Vincent Gallicchio, *Biological Sciences*

Students: Christopher Chaudhary, Jamie Albertson, Caroline Andrews, Anissa Anglin, Landon Bulloch, Taylor Dennison, Jordan Elder, Craig Holliday, Charlene Lyon, Elisabeth Smith, Ryan Smith

Recent advancements in mobile wireless devices (smart phones and tablets) have given these products the potential to drastically alter the practice of healthcare. The project described determined how these devices would assist in improving diagnosis, treatment, and therapeutic outcomes in the delivery of healthcare. Also, it seeks to determine if the healthcare community feels these devices will make healthcare more cost effective and affordable. To cover multiple aspects of healthcare, several groups have been targeted: clinical laboratory; emergency, dental, rehabilitation, and surgical medicine; hospital administration; diagnostic imaging technology; public health; and veterinary medicine. This presentation will focus on our

current results pertaining to the clinical laboratory. A questionnaire was distributed to clinical laboratory personnel both domestic and international. Questionnaire data was analyzed. The respondents concluded the use of mobile wireless devices have and will improve the dissemination of laboratory data in the coming years. The devices will assist in direct clinical assessment of reported test results even directly to the patient. Additionally, responders noted such devices should allow greater and improved access to medical literature that is web-based such as test procedures, treatment protocols, and guidelines. Also, responders reported these devices should improve laboratory work productivity and efficiency. In the future, the project will to continue monitor the impact of mobile devices in these areas of health care in order to help define the effect of mobile wireless devices to improve future healthcare delivery and practice.

Poster #120

Analysis of carbon flux from soils derived from different rock types

Mentor: Scott E Brame, *Environmental Engineering & Earth Sciences*

Students: Jasmine Newman, Richard Demille

Carbon emissions into the atmosphere have become a growing issue due to carbon dioxide (CO_2) being a potent greenhouse gas. This study compared CO_2 soil fluxes in two areas underlain by markedly different rock types: biotite gneiss and amphibolite. The soil flux of carbon dioxide was measured using a modified soil chamber. CO_2 concentrations in the chamber were determined by an infrared detector with a built-in gas sample pump connected to a data logger. Comparison studies were conducted at each area to include sites with different topography and land cover. Variables measured at each site included temperature, soil moisture, and soil permeability. At both sites, the data showed a direct correlation between the time of day, temperature, and soil moisture on CO_2 flux. Soil permeability played an important role. CO_2 fluxes were greatest during the day when temperatures were higher and lower at night. These measurements are important as very few baseline studies have been conducted in temperate, deciduous ecosystems.

Poster #121

Structural optimization using FEA tools

Mentor: David Lee, *School Of Architecture*

Students: Brett Smentek, Arif Javed

A structural surface prototype with varying structural properties that has been adapted to its specific loading requirements has been designed using finite element analysis tools in Grasshopper for Rhino. The goal of this project is to design a method for reducing the amount of material required to achieve an acceptable structural strength. This is done to reduce construction costs and provide the capability to form surfaces that existing construction materials are incapable of. This research involved the analysis of carbon fiber's material performance using finite element methods to guide decision making regarding the prototype's construction. This digital prototype shows the potential applications and formability properties using the optimization method explored. A proof of concept pedestrian bridge constructed of fiber-reinforced polymer in a non-traditional form is presented.

Poster #122

Developing an online environmental landscape certification program

Mentors: Dara Park, Sarah White, *School of Agricultural, Forest, and Environmental Sciences*

Students: Paulina Pena, Ashleigh Hough, Mary Wylie

Landscape maintenance is a large, rapidly growing, and unregulated small business sector South Carolina (SC). Beyond a pesticides applicators license, no experience or training is currently required in SC. A Lever-Initiative grant was awarded to

develop an online Environmental Landscape Certification Program to help landscape professionals meet client expectations and protect SC natural resources. A survey was conducted to identify stakeholder buy-in including content, cost, and preference on learning style. In order to increase adoption by contractors and technicians, specific strategic areas throughout SC were selected to spearhead the program. Stakeholder meetings were held in March to identify barriers to success, fine-tune logistics and develop critical program content. Modules in development give detailed information on pertinent landscaping practices. This certification should help to increase the economic viability of the SC landscape industry while helping to protect natural resources.

Poster #123

Conservation drones for natural resource mapping

Mentor: Christopher Post, *School of Agricultural, Forest, and Environmental Sciences*

Students: James Noel, Karim Alimohammed, Kiana Gilchrist, Nicholas Goodwin, Cleveland Holmes, Shannon Johnson, Carson Langston, Trelvonta Peeples, Ryan Pruitt, Caitlyn Schulze

New advancements in open source autopilots allow for development of low-cost unmanned aerial vehicles (UAVs) that have the potential to revolutionize aerial mapping. This study was conducted to create platforms and workflows to help expand applied use of UAVs in the agricultural and natural resource areas. In collaboration with the conservation drones group from Switzerland, our Creative Inquiry team built an autonomous aircraft that is currently being tested. A custom 3D printed camera nose was developed. This aircraft is very light-weight (650 grams) which makes it intrinsically safer then heavier platforms. It is expected that this aircraft will be able to fly approximately 20 minutes on one battery charge and be able to image 50-100 hectares at one time. This study was supported by the Clemson University Creative Inquiry Program.

Poster #124

Evaluation of hydrology of Hunnicutt Creek Wetland

Mentor: Lawrence C Murdoch, *Environmental Engineering & Earth Sciences*

Students: Emily Thompson, Brian Bastian, Thomas Vaughan

We are evaluating the hydrologic processes associated with the Hunnicutt Creek wetland on the southern end of the Clemson Bottoms. The water budget consists of water entering the wetland through noticeable seeps along the base of a steep hill as well as groundwater discharge to small channels in the wetland. Outflow components appear to be from surface water flow to Hunnicutt Creek and evapotranspiration. The inflow from seeps during February was 0.25 ft3/s, and average surface water outflows increased slightly from 0.40 ft3/s in November to 0.45 ft3/s in January. The average surface water level decreased by 4 centimeters from October to November, and another 3.8 centimeters from November to January. Potential evapotranspiration (PET) was calculated using the Penman-Monteith equation, and in the winter when no vegetation was living the Shuttleworth evaporation equation (EV) was used. These results indicate the PET increased from 10 millimeters per day in September to 14 millimeters per day in October and then dropped to 8 millimeters per day when the wetland vegetation died in November.

Poster #125

The effect of gold salts on the growth and structure of *Legionella pneumophila* Lp02 and Legionella pneumophila 2107 biofilms

Mentor: Tamara McNealy, *Biological Sciences*

Student: Olivia Keane

Legionella pneumophila is a Gram-negative bacteria that causes Legionnaire's Disease when the bacterium is inhaled. It is found ubiquitously throughout aquatic environments in both natural and man-made habitats. *L. pneumophila* forms biofilms on

surfaces of man-made aquatic systems such as cooling towers and spas. Cells within biofilms are embedded in a self-produced polymer matrix called the extracellular polymeric substance (EPS) that consists of proteins, polysaccharides, glycoproteins, glycolipids, and even DNA. Understanding biofilm interaction with the environment is extremely important for the successful treatment of microbial biofilms. Bacteria often form biofilms for support and protection from stressors such as antimicrobial agents and toxic heavy metals. Heavy metals, such as gold, are common in aquatic environments as a result of geochemical cycling and industrial pollution. This project investigated the relationship and interaction between dissolved gold (HAuCl4) and *L. pneumophila* biofilms formed by the wild-type strain *L. pneumophila* Lp02 and a mutant strain *L. pneumophila* Δ2107. *L. pneumophila* Δ2107 possess a lpg2105-08 operon. Though the function of this operon is not fully known, it's proposed function deals with bacterial response to metal ions. *L. pneumophil*a Lp02 and *L. pneumophila* Δ2107 biofilms are established according to previously designed protocols and then exposed to AuCl in moderately-hard water (MHW). The biofilms are then imaged using a Nikon TiE confocal microscope. Finally, COMSTAT analysis is performed on the biofilm images to quantify changes in biomass and roughness. Preliminary results have indicated an increase in thickness and total biomass of both *L. pneumophila* Lp02 and *L. pneumophila* Δ2107 biofilms when treated with gold. These results are significant because they reveal that there is an important interaction occurring between the bacteria and the gold salts.

Poster #126

Can food personality traits be used to describe visitors at a culinary festival?

Mentor: Sunju Kim, *Parks, Recreation & Tourism Management*

Students: Anne Evatt, Ashley Summers, Courtney Kight, Elizabeth Barnes, Katelyn Flaspoehler, Katherine Dunn, Kyla Kessler, Kaitlin Fry, Lauren Camlin, Shelby Brent, Sarah Whitehurst, Sean Baker, Stephen Mihaly, William Black

Culinary festivals have become very attractive events for many communities. Communities have produced such events not only for economic development but to develop community pride or providing new experiences for community members as well as tourists. As more communities expand their mix of tourism products and services to include culinary festivals the competition for visitors is increasing. It is important for event producers to understand what motivations individuals to attend a culinary festival. Traditionally, event producers have focused their research around the motivations and demographics of visitors. Although this information is key for marketing, very little research has focused on product development. The purpose of this research is to determine if food personality traits differ between visitor groups. Data will be collected Fall 2014.

Poster #127

Imaginative approaches for important ligands

Mentor: Modi Wetzler, *Chemistry*

Students: Matthew Wasilewski, Grayson Panetti, William Sharpe

Metal complexes are extremely important in a range of fields; for example, two thirds of all enzymes contain metals, and almost all industrial catalysis depends on metals. The reactivity of the metals is usually controlled by the ligands that surround them, but synthesizing those ligands can be very challenging. Often harsh, toxic, and dangerous reaction conditions are used, and ligand synthesis strategies often limit the possibilities of controlling the metal reactivity. We are interested in developing new approaches to ligand synthesis for applications ranging from catalysis to nuclear fuel cycle to fundamental studies of metal complexes. We have identified new activating groups and protecting groups (e.g., Boc, Nos as detailed below) that greatly enable the synthesis of lariat and azamacrocycle ligands. We are also developing novel peptoid-based ligands inspired by siderophores, the molecules bacteria use to selectively bind metals.

Poster #128

Exploring tissue engineering

Mentors: Jorge Rodriguez, Delphine Dean, *Bioengineering*

Students: Jeffrey Holmes, Carolyn Arthur, Joseph Wortkoetter, Caitlyn Jones, Amanda Stastny, Laura Gorrell, Kirsten Johnson

In this Creative Inquiry, we have two main projects. Our first project aims to improve the cell culture process by eliminating the need for trypsin, an enzyme that dissociates cells from the surfaces they grow on, but also compromises cell membrane integrity and can kill cells over time. This will be done by growing cells on solar panels. Induced current via light exposure will repel the proteins from the surface so that the cells can be collected. The second project aims to determine the most viable and reproducible method of culturing cells in 3D geometry. Initial studies were done on fibroblast cells and further studies will focus on mimicking tumors. Various culturing environments, cell lines, and culturing surfaces (such as non-adhering surfaces) will be done to alter the geometries, size, and composition of the 3D geometries. The first project would be useful for pharmaceutical companies who culture large volumes of cells and for researchers who wish to study specific cell membrane proteins while the second project has applications in cancer research.

Poster #129

Sleep habits around the world

Mentors: June Pilcher, Drew Morris, *Psychology*

Students: Hayley Feigl, Emily Howard, Elizabeth Henderson, Elizabeth Ferguson

The purpose of this study is to examine a relationship between sleep habits in college students at Clemson University and at The University of Vienna. Using the Pittsburgh Sleep Quality Index (PSQI), we define sleep habits as a) time they go to bed, b) time they wake up, and c) amount they slept at night. 324 Clemson participants and 292 Vienna participants from undergraduate psychology courses were asked to complete surveys regarding their sleep quality (PSQI). An independent sample t-test showed a significant difference in both the average times Clemson and Vienna students went to bed and woke up ($p < .001$) as well as in the average total hours they slept at night ($p < .001$). Our data findings suggest that Clemson students went to bed later, woke up earlier, and slept less on average than Vienna students.

Poster #130

Compounds from fermented noni exudates (fNE) selectively kill human cancer cells

Mentors: Yanzhang Wei, Ashlee Tietje, Xi Yang, *Biological Sciences*

Students: Robert Borucki, Alexandra Blumer, Haley Huggins

Our recent studies involving fermented noni exudates (fNE) made from noni (*Morinda citrifolia*) have shown promising anti-cancer activities. Using an *in vitro* cell culture system, this study examines dozens of compounds isolated from fNE in order to identify specific compounds preferentially toxic to tumor cells. The compounds at concentrations of 20, 5, or 2 μg/ml were added to NL-20 non-tumor lung cells or A549 lung carcinoma cells and incubated for 48 hours. The cytotoxicity of the compounds on the cells was measured using the MTS cell proliferation assay. Several compounds were found selectively effective in killing more A549 tumor cells than NL-20 cells. An antioxidant assay was then performed to investigate if a correlation exists between antioxidant activity and selective cancer cell killing in our samples. We found that samples BGS, C2, BGL, and C1 had the highest amount of antioxidant activity. Of these samples, only C2 showed significant selective A549 cell killing ($p<.05$ at 2μg/ml). Further testing is necessary to determine the mechanism of action and its possible role in immune activation.

Poster #131

Project proposal on funding for parks

Mentors: Dustin Wilson, Jeffrey Hallo, *Parks, Recreation & Tourism Management*

Students: Evan Anderson, Isaiah Battle, Joshua Brewton, William Everroad, Beatrice Gumulya, Justin Jenkins, Joshua Minton, Robert Satterfield, Robin Wardlaw

This study will look at state and county level parks and see what and if there are alternative funding solutions for these parks. We will interview officials and administrators of two parks, while using surveys to gather information about visitors of the parks. The interviews that we will use for the park officials and administrators will be semi-structured. When it comes to analyzing the data we receive from the interviews, we will use three techniques: member checking, qualitative coding, and developing themes. The second method we plan on using is surveys of park visitors. We want to conduct exit surveys with visitors of two different parks, one local and one state. Approximately 200 surveys will be collected from those visiting Table Rock State Park and Nettles Park in Clemson. This will give us a good summary of what people would like and not like. From these results we would be able to make inferences about the population of park visitors, and would we be able to advise parks which funding alternatives would be successful and unsuccessful.

Poster #132

漢ガエル **(Kangaeru)**

Mentor: Toshiko Kishimoto, *Languages*

Students: Ashley Webber, Brendan Watterson, Logan Combs

Kanji is the Japanese writing system that was adapted from China. The symbols represent ideas or objects rather than sounds. These characters prove to be difficult for American students because we have adopted the same kanji teaching methods as the Japanese, despite the age and culture of the students. This project seeks to provide American students with a mobile application that will facilitate their learning kanji. This year, students of lower level Japanese courses were given the opportunity to play test the application on a tablet and then were surveyed about the application. Students think that the flashcards would be more useful if they could add words outside of the chapters. Students found that the compound game was the most effective learning tool because it allows them to see and use the kanji in context. Based on results, the application will be modified to include more contextual games. The team also plans to make the interface more interactive to encourage use.

Poster #133

Vegetative succession in a restored urban wetland: If we build it will they come?

Mentors: Donald Hagan, Calvin B Sawyer, Jeremy Pike, *School of Agricultural, Forest, and Environmental Sciences*

Students: Lorn Clark, Daniel Dixon, Evan Guy, Brett Kelly, Carolyn Lanza, Alicia McAlhaney, Donald Mcdaniel, Gary Pence, Bradley Sheorn, Tucker Simmons

Urban wetlands can provide many important ecosystem services to society. However, they are often severely degraded by runoff, pollution, and invasion by aggressive non-native plant species. This Creative Inquiry project is establishing a long-term monitoring program to document vegetation composition in a restored wetland in the Hunnicutt Creek watershed for the purposes of inventory, assessment of environmental conditions, and adaptive management. Using a standard ecological observation unit, a 10 x 10 meter sampling plot originally developed by The Carolina Vegetation Survey (CVS), we are evaluating the performance of re-introduced and naturally regenerated native woody species, and documenting the recruitment of non-natives from adjacent unrestored areas. A total of eight CVS plots have been established and will be resampled twice annually for the next several years.

Poster #134

Boeing South Carolina shake process improvement

Mentors: Kapil Madathil, Scott Mason, Melissa Zelaya, *Industrial Engineering*

Students: Brenden Colby, Jami Compton, Amanda Hobbs, Timothy Lorow

Boeing South Carolina produces the 787 Dreamliner, a twin-aisle aircraft. Before delivery of the 787 midbody assemblies, technicians perform a final quality and foreign object debrisinspection called a "shake." Boeing management expects this shake to take 2 days per aircraft; however, shakes currently take up to 6 days. Reported here is a study of the system for completing the shake using industrial engineering tools. Analysis of the current system, through measuring the impact of system losses, reveals time wastes loss relating to defects/rework, transport, over-processing, waiting, and employee underutilization. Solutions include new standards and systems to support processes of management and technicians for consistency and efficiency. It is crucial that solutions adapt to the dynamic environment with applicability to different customers' requirements and ever-changing incoming condition of aircraft (COA). By improving processes and systems to support work, the time and costs of the shake will be reduced.

Poster #135

Robotics in bioengineering

Mentors: Delphine Dean, David Kwartowitz, *Bioengineering*

Students: Donald Benza, Andrew Cobb, Hannah Haire, Scott Cole, Matthew Tingen

The robotics in bioengineering group has conducted research on the effects of hands-on demonstrations on students' interest in engineering disciplines. Data has been collected over a two year period utilizing pre- and post-demonstration surveys in order to gauge the change in interest because of demonstrations. Projects that were used in order to test the hypothesis include an eye-controlled PowerPoint, slot cars that are driven by flexing the user's biceps, as well as the mind bot project which uses brain waves in order to drive a Lego car. The demonstrations seem to have an effect on the students' interest in the field that the demonstrations are presented.

Poster #136

Intelligent center pivot

Mentor: Young J Han, *School of Agricultural, Forest, and Environmental Sciences*

Students: Harold Conrad, Nicholas Rogers, Ryan Richardson, Joseph Watkins, Caleb Patrick, Coleman Scroggs, Brandon Avant, Madison West

Irrigation systems are designed to apply a relatively uniform amount of water to fields that often time needs to be varied due to factors such as soil types, multiple crops, and topography. With the potential of a field to vary, a significant amount of water, energy, nutrients and minerals can be wasted, which can ultimately reduce crop yields. As a solution, we are now developing an intelligent irrigation system that automatically adjusts application rates to match the requirements of individual management zones within a particular field. A tabletop version of a center pivot is being constructed to promote adoption and to demonstrate this innovative technology. This model has working pumps to replicate individual irrigation zones to vary the application rate by automatically turning sections off or on, and by changing the rotational speed of the center pivot. The tabletop center pivot will be used during field days, trade shows, and meeting with producers to demonstrate the uses, benefits, and effectiveness of this irrigation technology.

Poster #137

Python game design for children: Games and programming resources

Mentors: Christina Gardner, *School of Computing*

Students: Jessica Rex, Jorge Calzadilla, Robert Flair, Cheyenne Harmon, Kevin Haynie, Steven Mets, Neil Parchuri, Kaci Summerton, Shi Zheng, Latonya Housie, Justin Jackson, Richard Kelly

This project is focused on helping middle and high school students learn how to program and think computationally. We are creating a set of resources that will be used by the students to understand programming, Python, and PyGames concepts. These resources will be used for teaching the two one-week summer camps through Clemson University's Pre-Collegiate programs in June and July 2014. This camp has been offered at Georgia Tech and Clemson University for two summers using a drag and drop visual programming language to help students create games. The instructors have found that the camp attendees do not find the visual programming language to be challenging enough. Thus, we are designing curricula to teach introductory computing concepts with the Python and PyGames programming languages in a fun and creative way and to give students the opportunity to learn to design and program their own games. We are also designing and creating our own games as a way to learn the language and have examples for the kids in the camp to build upon. This project was initiated this semester and we will pilot resources this summer during the two weeks of camp. We will showcase the initial games and resources created for this project.

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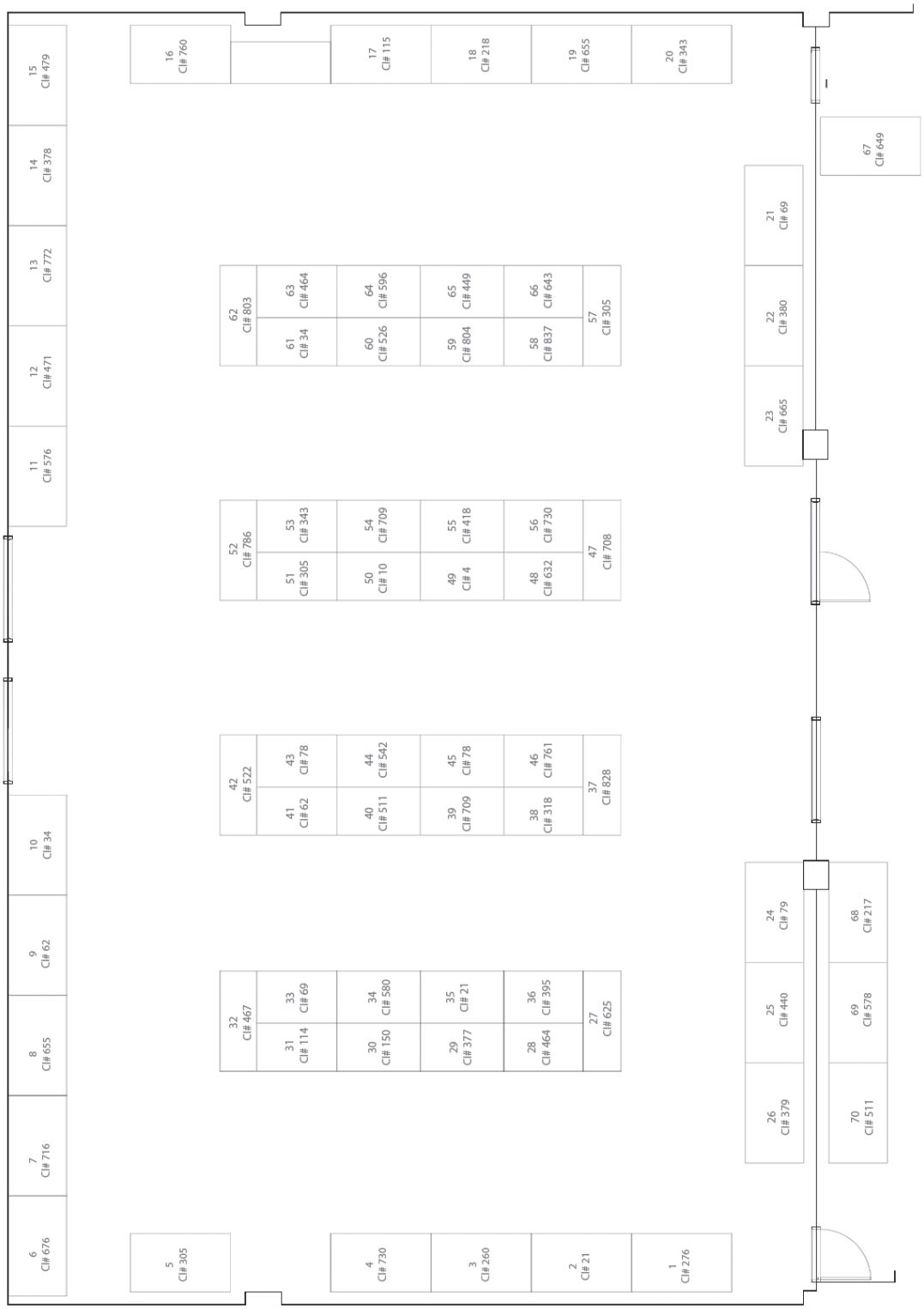
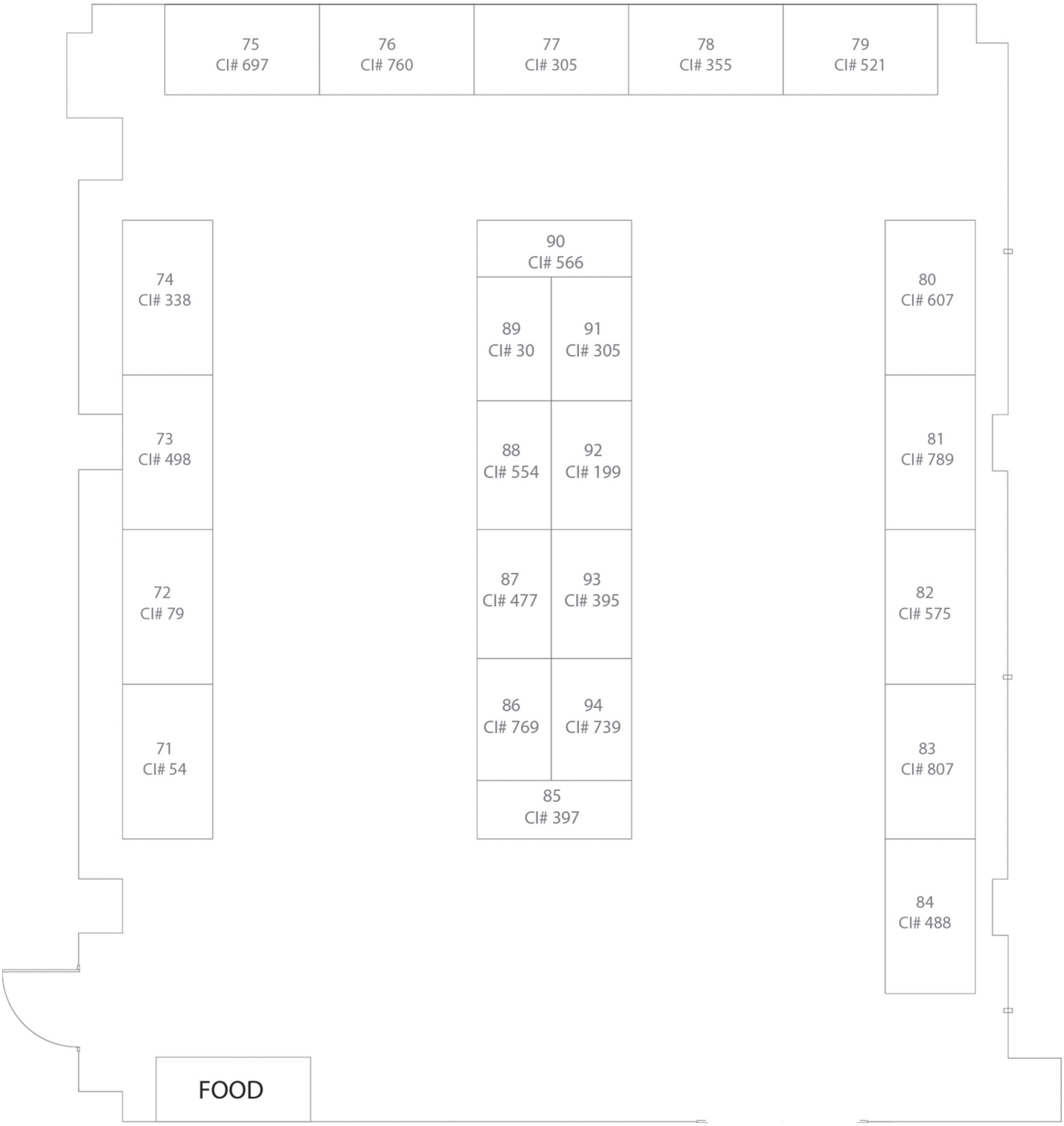
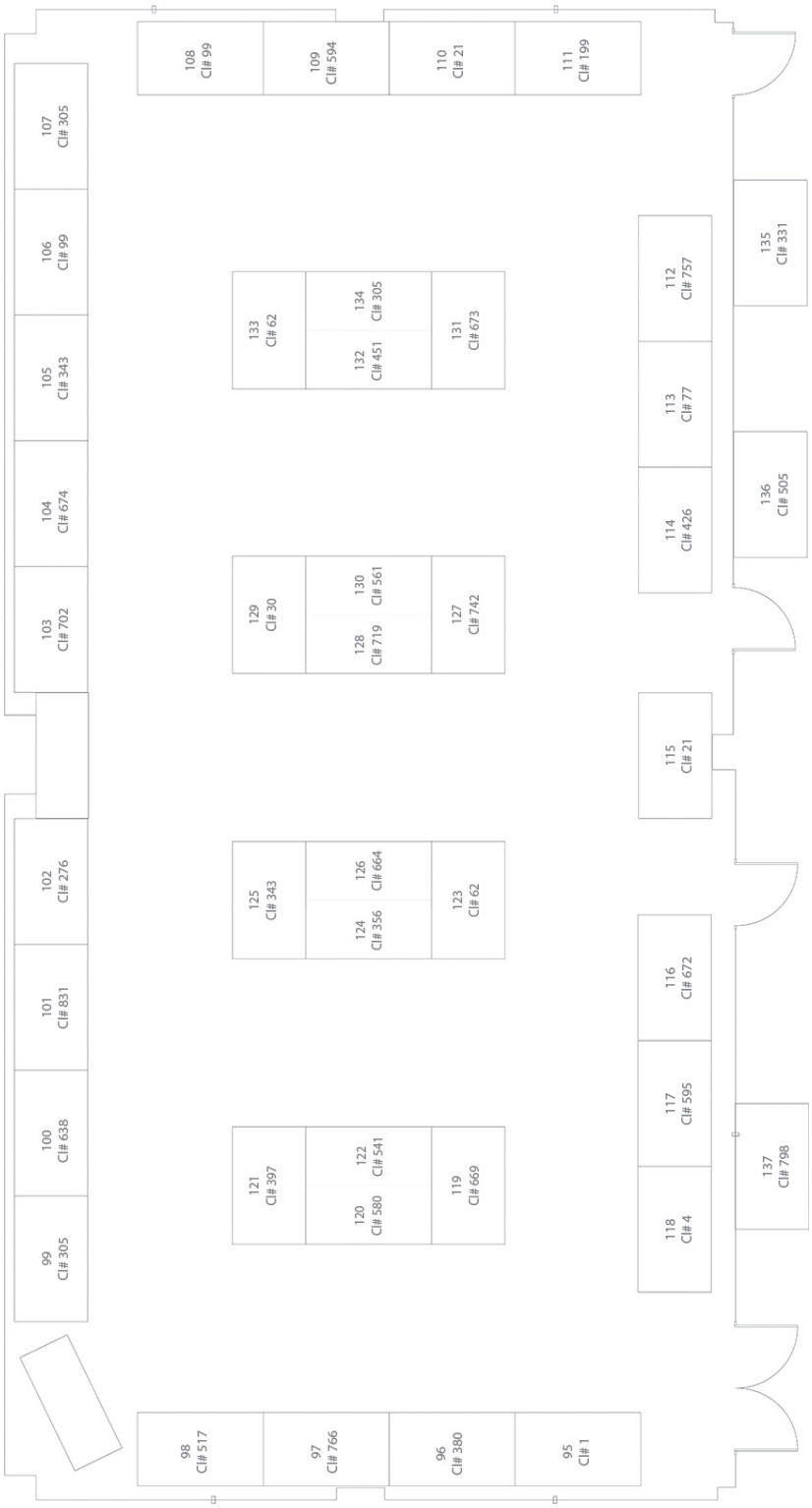
Map - Ballroom



Map - David Peebles Room



Map - Meeting Room



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