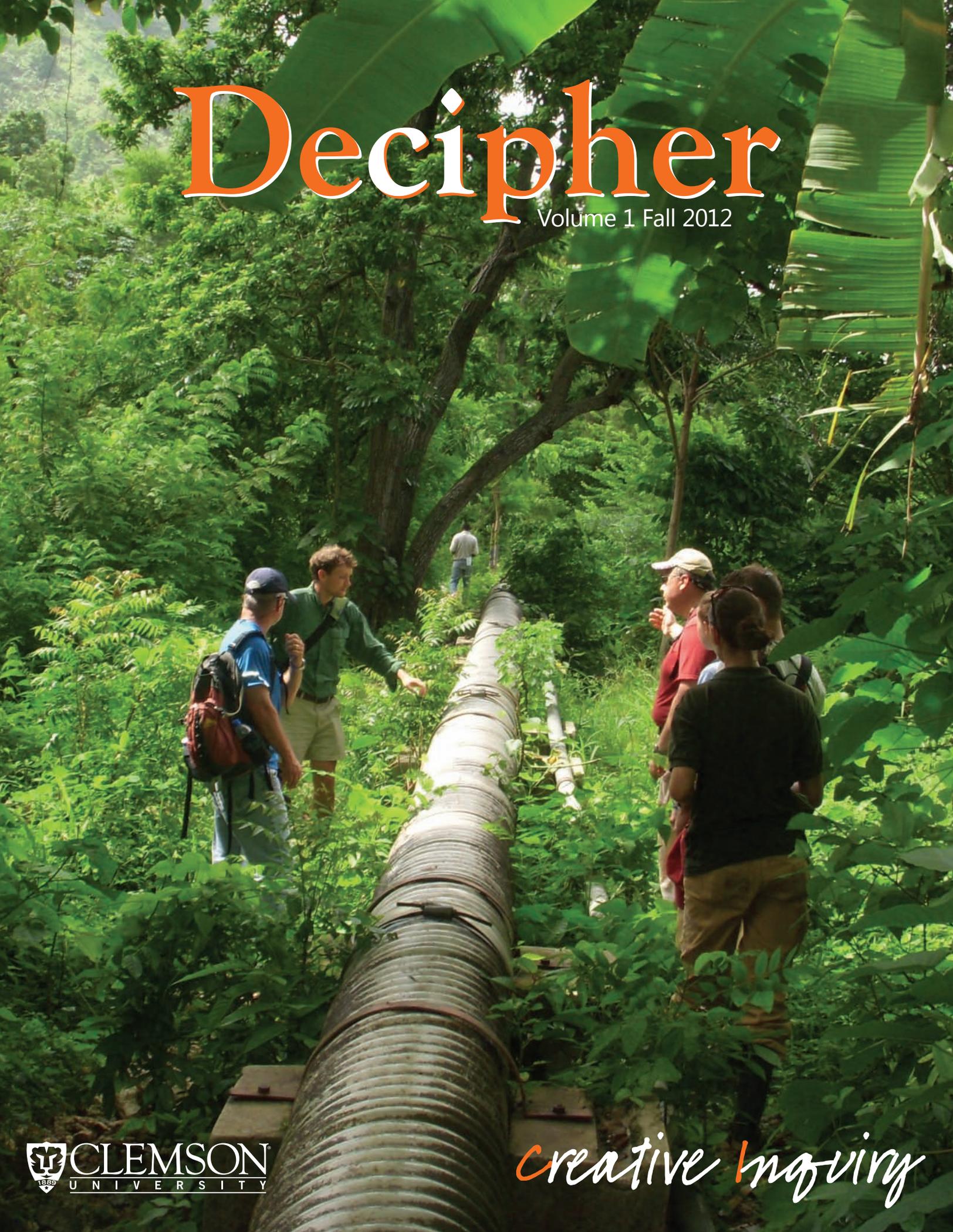


# Decipher

Volume 1 Fall 2012



# Contributors:

Creative Inquiry Program Director:  
Barbara J. Speziale, Undergraduate Studies

President:  
James F. Barker

Provost:  
Doris R. Helms

Dean of Undergraduate Studies:  
Janice W. Murdoch

Executive Editor:  
Rachel Wasyluk

Staff Adviser:  
Anne Jenkins, Public Affairs

Staff Writers:  
Suzannah "Zan" Isgett  
Briana Kloc  
Thomas Larrew  
Danielle Tom  
Rachel Wasyluk

Designers:  
Alexis Peterson  
Juan Villamizar

## Decipher

Volume 1, Number 1, Fall 2012

Decipher is published by Clemson University's  
Office of Undergraduate Studies.

The editorial address is  
Creative Inquiry, E-201 Martin Hall, Clemson  
University, Clemson, SC 29634-5105.  
©2012 Clemson University

**Find us online:** [Clemson.edu/ci](http://Clemson.edu/ci)

To subscribe, please contact the Creative  
Inquiry program director: [bjspz@clemson.edu](mailto:bjspz@clemson.edu)

**COVER PHOTO: CONSTRUCTING WATER  
SYSTEM FOR CANGE, HAITI.  
FULL STORY ON PAGE 34.**

# in this issue...

---

<b>About Decipher</b> .....	<b>1</b>
<b>Don't be Crabby:</b> .....	<b>4</b>
Creative Inquiry Students are Making a Splash	
<b>From Frying Pan to Gas Tank:</b> .....	<b>6</b>
The Creation of Biodiesel	
<b>Digitizing the Chicken:</b> .....	<b>8</b>
Filling in the Chicken Genome	
<b>It's a Joint Effort</b> .....	<b>9</b>
<b>Designing Medical Technology for the Developing World</b> .....	<b>10</b>
<b>Sizzlin' on the Southern Circuit</b> .....	<b>12</b>
<b>Playing by the Rules</b> .....	<b>13</b>
<b>Cultura in the Carolinas</b> .....	<b>14</b>
<b>To an Asteroid, and Beyond!</b> .....	<b>15</b>
<b>The Pulse of Perception:</b> .....	<b>16</b>
The Relationship Between Blood Pressure and Emotional Recognition	
<b>I Belong to South Carolina</b> .....	<b>17</b>
<b>Clemson Students on the Run</b> .....	<b>18</b>
<b>Matters of the Heart: They Don't Miss a Beat</b> .....	<b>20</b>
<b>Tailgating for Clemson in Orange – and Green</b> .....	<b>21</b>
<b>A Fruitful Discovery:</b> .....	<b>22</b>
Why We Age	
<b>Kicking Normal to the Curb and Bringing Home a Gold.</b> .....	<b>24</b>
<b>Experiencing Our World through Your iPhone</b> .....	<b>25</b>
<b>The Solution is All in Your Head</b> .....	<b>26</b>
<b>Stepping into a Greener Future</b> .....	<b>27</b>
<b>Read All About It:</b> .....	<b>28</b>
Translating from Their Lab to Your Home	

# Decipher

<b>Finding Flavor and Fighting Sickness in Food</b> .....	30
<b>Shooting for the Moon</b> .....	31
<b>Food Myths Exposed:</b> .....	32
Why the Five-Second Rule Should Be the No-Second Rule	
<b>The Cange Change:</b> .....	34
Developing a New Water System in Haiti	
<b>The Science Behind Simulations:</b> .....	36
Injecting New Possibilities into the Medical Field	
<b>Don't Judge a Book by its Cover:</b> .....	38
Camp Read-a-Rama	
<b>Creative Inquiry Project Results in Kennedy Center Award for Playwriting</b> .....	39
<b>Raise Your Glass:</b> .....	40
The Connection Between Brewing and Driving	
<b>The Early Bird Might Not Get the Worm</b> .....	42
<b>The Next Performance Enhancing Drug: Sleep</b> .....	44
<b>Raising Political Awareness</b> .....	45
<b>Teaching to Learn:</b> .....	46
Improving Science & Math Education for Kids	
<b>Hatching Urban Furniture for the Streets of Asheville</b> .....	47
<b>Cyberbullying and Beyond:</b> .....	48
Psychology in the Digital Age	
<b>They're Watching You:</b> .....	50
Conversation Analysis in Social Media	
<b>More than Just a Walk Through the Park</b> .....	52
<b>You've Got a Friend in Me</b> .....	53
<b>Can You Please Hold My Hand?</b> .....	54
<b>The Balloon Release:</b> .....	56
Pre-Game Tradition or Wild-Game Malnutrition	
<b>Creative Inquiry Supporters</b> .....	59

# about Decipher...

**MORE THAN 400 CREATIVE INQUIRY TEAMS** are actively working on Clemson University's campus with 3,000 students involved during the last school year alone. From designing new medical devices to monitoring cyber bullying, students are taking part in life-changing projects every year. These stories of innovation and discovery deserve to be shared. That's where the Decipher team is involved.

This past year, seven students set out to research, record, and convey stories of a selection of Creative Inquiry projects. They created the Creative Inquiry magazine, Decipher. These students originally began as members of the Popular Science Journalism Creative Inquiry project, where they wrote about research taking place around the world. Coming from a primarily scientific background, these journalists were able to interpret the intricate workings of these projects, while explaining them in a way that others could easily understand.

Honing in their scope for Decipher, they focused entirely on student research taking place at Clemson University. The Decipher team was able to capture the spirit and enthusiasm evident in each and every project – whether it includes the fundamentals of robotics or the importance of physical activity in children.

This magazine's primary goal is to communicate the importance of these impressive Creative Inquiry projects taking place on the Clemson campus, in South Carolina and throughout the world.



## The Naming of Decipher

### Decipher (*verb*)

To succeed in understanding, interpreting, or identifying

In Creative Inquiry teams, students **develop and hone their reasoning skills** to better illuminate situations taking place in their surrounding environment. There is an entire **world to discover and explore**—and Clemson students are doing just that!



**WHAT DO GREEN STINKBUGS** and water purification systems have in common? On the surface, there would seem to be nothing tying these disparate topics together, but here at Clemson University, they are uniquely interrelated. The distinctive undergraduate research program known as Creative Inquiry spans countless research topics, engaging students and faculty alike.

Formed in the fall of 2005, Creative Inquiry has quickly become a popular academic pursuit among students. Many projects have waiting lists for participation! Topics are boundless. Students often find themselves presenting their work at national conferences, fielding questions from professionals. This invaluable experience produces exceptional graduates. Our Creative Inquiry participants develop critical thinking skills, learn to solve problems as a team and hone their communication and presentation skills.

Creative Inquiry has garnered recognition from industry and media. To extend the reach of our projects and publicize the impressive work of our students, we put this magazine together. Creative Inquiry is a student-driven culture of discovery and innovation. Inside you'll find accounts of research projects proposed and conducted by students, in diverse areas of study. We invite you to learn more, and even suggest a topic you would like to see investigated by Creative Inquiry.

Dr. Doris Helms  
Provost

Tell me and I'll forget. Show me, and I may not remember.  
Involve me, and I'll understand.

*Native American Proverb*

Since the fall of 2005, Clemson University has blazed a trail into engaged learning. The Creative Inquiry program not only offers our students opportunities to explore problems in unique ways, it empowers our students to identify those problems and lead the charge toward deciphering them.

*The College Solution: A Guide for Everyone Looking for the Right School at the Right Price*, by Lynn O'Shaughnessy, recognizes this innovative approach to learning. "Unfortunately, the experiences that Clemson students enjoy are not nearly common enough among undergraduates elsewhere." Topics run an impressive gamut, from developing rockets to measure atmospheric conditions, to determining the perils of double-dipping chips and salsa. Increasingly often, students originate projects then seek faculty mentors. Student research has resulted in patent applications, publications, presentations, awards, and travels to locations as remote as Tanzania.

Students find inspiration and pride in their work. "Being a part of Creative Inquiry has taught me lessons of greater value and practicality than I ever could have gleaned from a textbook. It has provided me with real-world opportunities to collaborate with a team, balance responsibilities, communicate effectively with different personalities and learn more about how to lead and follow," said Aliece Wilson.

Creative Inquiry is making a lasting impression on our students and faculty. Real research, real results, real commitment and understanding—Creative Inquiry is changing the way we learn at Clemson University.

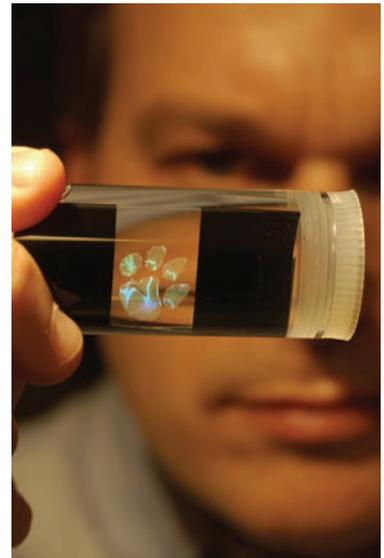
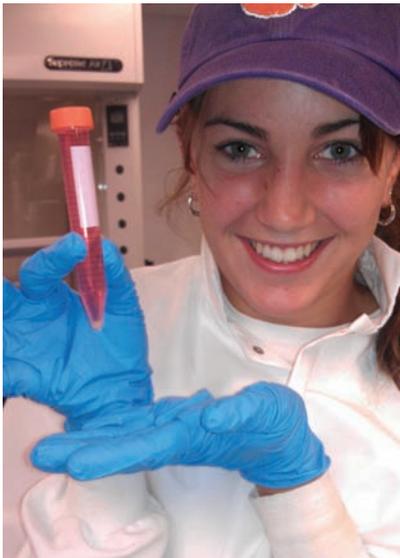
Barbara J. Speziale  
Associate Dean of Undergraduate Studies



Caroline Johnson is a marketing major involved in a Creative Inquiry project that is designing a pediatric arm stabilizer. She works with a team of mechanical engineering and nursing students to help develop the business end of the process. Johnson passionately describes her experiences working with students from other areas of expertise:

“I truly feel that being able to work on this project was one of the most meaningful experiences I have had as an undergraduate student. Working with students from different disciplines has allowed me to better understand what businesses go through on a day-to-day basis, and has prepared me for careers that will involve collaborating with people from various professions. In addition, the real world experience I gained from working on this project set me apart from the countless other graduating students, and was a contributing factor to my securing a job upon graduation. Overall, I feel incredibly lucky to have met and worked with this amazing group of people and feel that my undergraduate education greatly benefited from my being a member of this team.”

ous professions. In addition, the real world experience I gained from working on this project set me apart from the countless other graduating students, and was a contributing factor to my securing a job upon graduation. Overall, I feel incredibly lucky to have met and worked with this amazing group of people and feel that my undergraduate education greatly benefited from my being a member of this team.”





## Don't be Crabby: Creative Inquiry Students are Making a Splash

By Briana Kloc

**IMAGINE GOING TO A LOCAL SEAFOOD RESTAURANT** and not being able to order your favorite dish ever again. Research being conducted by Clemson students is showing that blue crabs may disappear from the menu due to human impacts on the environment. This active group led by Dr. Michael Childress, a professor in biological sciences, introduces students to the many challenges of conserving our ocean resources. This includes studying the effects of climate change, consequences of fishing, and problems caused by human development. Students first read and discuss articles based on these topics, then conduct lab and field experiments, and eventually progress to develop and carry out their own research. The long-term goal of this team is to use the data that they collect to predict future effects of environmental change.

This Creative Inquiry team was created in 2008, and they have been actively working ever since. One of the greatest accomplishments was the creation of the Living Laboratory program at the Keys Marine Lab (KML) in Florida, a near-shore research project observing marine

communities. The team played a direct role in developing the protocols for this science outreach program, designed for school groups ranging from high school to college students. Visitors collect data by snorkeling in five locations at the KML in order to build a large data set for examining the health of marine communities in the Florida Keys. In addition, this team has been responsible for three scientific publications and an online blog.

The team studies two main topics: the effects of water salinity and drought on blue crabs in the ACE Basin National Estuarine Research Reserve in Bennett's Point, SC, and the effects of habitat loss on juvenile Caribbean spiny lobster behavior at the KML.

Not only do they travel to both of these locations, but they also attend the Benthic Ecology meeting every year where their group posters won two outstanding student

presentation awards in 2010. Recent meetings have been in Wilmington, NC, and Mobile, AL.

When there are large changes in water quality, important components of lobsters' habitat, like sea grass and sponges, die out. Lobsters use these habitats for protection while they are young, and the Creative Inquiry team studies the behavioral changes in these lobsters as the environmental conditions change. There is a





blue crabs. Dr. Childress believes that without both regulated fishing and water quality control, it would be very difficult to have sustainable populations of blue crabs in the future.

Kelsey McClellan, a second year student on the Creative Inquiry team, has been able to work with both the blue crabs and lobsters in Clemson. She enjoys getting involved with all aspects of lab work, from animal care to data analysis. Her experiences on this team have influenced her decision to pursue marine research as a career because she realized that research can be interactive and multi-faceted.

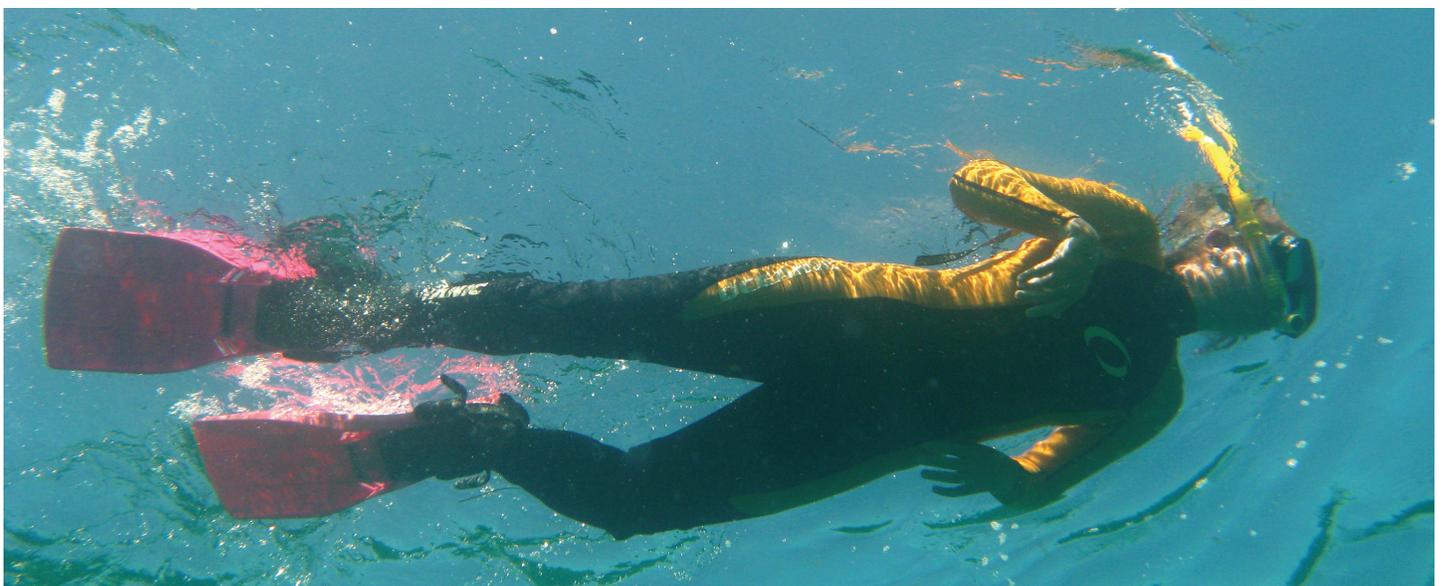
“Lobsters and blue crabs are among some of the most important marine animals that we harvest, and ... populations are declining.”

trade-off between being aggressive and owning a piece of habitat individually and being cooperative and sharing it with other lobsters. Perhaps juvenile lobsters are smarter than we think—they may be able to work together to adjust to their habitat no matter what conditions we throw at them.

The group also studies many aspects of life in juvenile blue crabs in their lab at Clemson. They're able to look at things such as settlement, survival, and growth patterns in the lab, but they also collect data on predation and disease out in the field. They use computer models to predict future population dynamics based on the data they have collected.

Lobsters and blue crabs are among some of the most important marine animals that we harvest, and while lobster populations are stable, blue crab populations are declining. Not only is over fishing draining the blue crab population, but water quality also plays a major role in their reproduction. Changes in estuary salinity due to human irrigation have detrimental impacts on juvenile

This Creative Inquiry shows that you don't need to live at the beach to make huge impacts in marine conservation. Not only do the team members conduct a lot of research in their own lab and in the field, but their development of the KML Living Laboratory allows students from everywhere to gain hands-on experience while contributing to an ongoing study. It's necessary to reduce man's effects on the environment as much as possible in order to sustain our planet, and studies like this Creative Inquiry bring hope that conservation can be successful. ■





## From Frying Pan to Gas Tank: The Creation of Biodiesel

By Danielle Tom

**WHAT IF YOU LEARNED WE ONLY HAD 30 YEARS LEFT OF OIL RESERVES** and less than 80 years worth of Uranium? Obviously you would want to find an alternative, especially using resources you already have. Dr. Terry Walker, Dr. Robert Clark, David Thornton, and their Creative Inquiry team are seeking such a product to offset these diminishing fuel sources. The team is developing a system to reuse vegetable oil to create biodiesel and investigating other methods to produce energy and cut down on waste. With unpredictable gas prices, most would welcome alternative fuels with open arms.

The oil from the grease trap at your local McDonald's may not seem valuable, but the team is transforming it into ready-to-go fuel. Their Mobile Biodiesel Production Lab (MBPL) converts and purifies vegetable oil into biodiesel and glycerin. Dr. Walker, from the Department of Environmental Engineering and Earth Sciences,



uses a lab that runs on 100% biodiesel and is completely off the grid. Clemson's campus produces 5,000 gallons of waste vegetable oil annually, and since the team's process produces a gallon of biodiesel for every gallon of vegetable oil, that's 5,000 gallons of gas made every year from waste! This biodiesel is currently being used in campus vehicles like trucks, tractors, garbage vehicles, and perhaps even buses in the near future. The MBPL creates 20% of the fuel campus vehicles use, and the team's goal is to reach 10,000 gallons, or 50% of Clemson's diesel needs, by the end of 2012.

Since the summer of 2011, the Creative Inquiry team has approached local businesses and restaurants, including favorites like Briosio and Croc's, as sources for used vegetable oil. This green energy and biodiesel project has several associated Creative Inquiry projects seeking to increase sustainability and reduce waste. The "Biosystems Engineering: Creating Value Added Co-products from Biofuel Waste Products" looks for uses of glycerin, a by-product of biodiesel purification.

This semester the team is focusing on cleaning products like soap or detergent. About 20 gallons of glycerin is generated every week from Clemson's biodiesel production. Last year the research team experimented with different mixtures for bars of soap. Initial attempts included adding pumice or seed hulls as an abrasive.

The latest iteration uses a mixture of the glycerin and white clay, resembling a hardened piece of cornbread. David Thornton says their goal is to make it less crumbly and add an appealing fragrance – for the moment, the soap smells like cooking oil. To deal with the large quantities of glycerol generated, though, the team is trying to figure out how to make a liquid detergent that can be used in Clemson's dining halls for everyday mopping. This creates a useful product made from their own cooking oil, and could save on cleaning material costs.

This Creative Inquiry team still has more ideas cooking up in their frying pan. Dr. Walker and students are also looking into algae to produce fuel. The growing algae feed off the CO<sub>2</sub> generated by the engine that purifies the oil, making the biodiesel purification process even more environmentally friendly. The team will then

process the algae into oil, which will go on to become even more biodiesel. Algae are also a high quality source of protein that can be used for animal feed.

Another idea that the team would like to explore is feeding biodiesel waste products to black soldier fly larvae. "They harvest themselves," Thornton explains, as the larvae will eventually become pupae that can be rendered back into biodiesel production or as protein pellets for livestock feed. A square foot of fly larvae will consume three pounds of food waste. When it's time to pupate, the larvae are trained to move through channels and fall into a bucket. The pupae can be processed to produce both oil and a protein meal that can be used in composting and as feed.

This Creative Inquiry team is the driving force behind Reduce, Reuse, Recycle. They bring biodiesel to Clemson University's utility vehicles with little to no harm to the environment. Thomas Green Clemson would be proud. ■

Learn more about their work at:  
[clemsonbiofuels.wordpress.com](http://clemsonbiofuels.wordpress.com)  
[facebook.com/ClemsonSustainableBiofuels](https://facebook.com/ClemsonSustainableBiofuels)



# Digitizing the Chicken: Filling in the Chicken Genome

By Danielle Tom

**MANY CLEMSON STUDENTS ARE TRAINING TO BECOME FUTURE SCIENTISTS**, but some are actively assisting the scientific community already. There are dozens upon dozens of papers where chicken genes have been described, but it's an immense task to find all of the relevant information in one place.

A Creative Inquiry team led by Dr. Susan Chapman from the biological sciences department reviews literature and extracts information to add to the Gallus Expression in Situ Hybridization Analysis database (GEISHA), an international resource for chicken genes visualized in embryos. Chicken embryos are very similar to mammalian embryos, but they are more easily obtained. Therefore, visualizing gene expression in chicken embryos helps scientists better understand gene expression in our own species.

Genetics and molecular biology have grown exponentially in the last decade. Technology makes sequencing an entire genome fast and relatively inexpensive. In fact, experts estimate that anyone will be able to transcribe their own genome for \$1,000 soon. However, being able to sequence genes quickly presents a problem: how can all this data be sorted and made accessible to scientists and the general public? Bioinformatics databases fill this need. For example, the University of California-San Diego maintains a Human Genome browser where a scientist can specify a particular area on a chromosome and find relevant information at that specific location, like diseases linked to that area or how many different species share that same sequence.

The GEISHA database is specifically for genes expressed in the first six days of chick development. A GEISHA entry is annotated with information about the gene from the National Center for Biotechnology Information's databases and specific images. These images show where the gene is physically expressed through dyes with tags for specific anatomy parts. Some genes are expressed only at certain stages in development, and sometimes at very specific locations, so it's useful to have this information available in one place.

Students at the University of Arizona, Brigham Young University in Utah, and Clemson University, under the direction of Dr. Chapman and Dr. Diana Darnell at Arizona, become curators for the GEISHA website. Curators select a gene that hasn't been processed for the database yet and are given the name of the paper where it is referenced. They must then read through the paper to find the accession number of the gene and take screenshots of appropriate figures to upload to the website. The accession number is used in other web databases to find more information to link,

such as the exact DNA sequence of the gene. About 25 Clemson University students have participated, and although the other schools have a larger number of students involved, the Clemson branch has submitted a substantially higher number of entries. This could be because at Clemson, the GEISHA project is the focus of a Creative Inquiry whereas at BYU it is part of a biology lab or course as an optional project.

According to Dr. Chapman, technology has really made science accessible to undergraduates, giving them the ability to make real world contributions. In the Spring 2012 semester, a facebook group was added for students and the professors to troubleshoot issues and Dr. Chapman thinks that video tutorials could be added. Eventually, the GEISHA curation system could be opened to high school students, increasing community involvement in real science through crowdsourcing.

This Creative Inquiry worked for three semesters from Spring 2011 through Spring 2012. Dr. Chapman enjoys projects like these because they allow students to participate in real science as an undergraduate. "I don't think people come into biology for a degree. I think they come in because it's fun," Dr. Chapman says. ■

GEISHA is accessible to the general public at <http://geisha.arizona.edu>

"...experts estimate that anyone will be able to transcribe their own genome for \$1,000 soon."

# It's A Joint Effort

By Anne Jenkins

**MEDICAL IMPLANT DEVICES (MIDS) HAVE BEEN USED WIDELY FOR MORE THAN 40 YEARS**, and it is estimated that 8 to 10 percent of Americans (20-25 million people) currently have such a device. Although implant devices produce great benefits, sometimes MIDs must be removed or replaced. They are in a continual state of development to increase their performance and extend their useful lifespan. Long-term data on the behavior of implanted devices and host response are essential inputs to the development process, yet there are few systematic programs for the retrieval and analysis of implants in the USA.

Retrieval and analysis of implants benefits patients, as this method leads to implant design. Implants have a minimum lifespan of three months, penetrate living tissue, have a physiologic interaction and are retrievable. A number of barriers exist to establishing

an implant retrieval program. Major impediments are the costs associated with such a program and fear of litigation affecting manufacturers, hospitals, physicians, and investigators. The long-term goal of Professor John DesJardins' Creative Inquiry project is to discuss, investigate, develop, establish, promote and grow a viable retrieval program.

Rather than throwing these used devices away, members of this team have started a state-wide program, known as Clemson University Retrieval of Explants Program in Orthopedics (CU-REPO) to learn more about why implants fail, how they work, and how we can make them last longer. The aim of such a program is to provide a working repository for retrieved implants, and to develop the tools and techniques for the systematic evaluation of implant designs, materials, surfaces and function.

Every year nearly 1 million patients receive total joint replacements to relieve arthritis pain and restore joint function in the hip or knee. Within 15 years it is predicted that this clinical procedure will increase as much as 675%, as our population ages. These implants are not perfect, and sometimes they are removed, or explanted, because of infection, loosening, damage or wear. This team of undergraduate bioengineers collaborate with hospitals and surgeons from around the state and nation. They collect, clean, catalog and study explanted total joint replacements to make them better for all of us. ■



# Designing Medical Technology for the Developing World

By Briana Kloc

**GETTING YOUR TEMPERATURE AND PULSE TAKEN IN THE DOCTOR'S OFFICE** seem like routine tasks. Many patients even complete these tests at home. In a country with so much medical technology, it is hard to imagine life without our luxuries. However, developing countries lack some of the basic medical instruments that keep us healthy.

Bioengineering students are working on a project to create affordable medical instruments for developing countries, specifically focusing on Tanzania. While healthcare is improving in these countries, they still lack much of the medical technology found in the United States, and generally use outdated models donated from other countries. This Creative Inquiry team, led by Clemson engineering professors Dr. Delphine Dean and Dr. John DesJardins, aims to create inexpensive, easy-to-use medical technology for the countries that need it the most.

This team is crafting a number of medical products, ranging from a neonatal heating device for hospitals to an affordable glucose monitor for poor villages. Senior team member Suzanna Langworthy says, "We take concepts from our everyday line of medical care and design a device or tool that can accomplish the same goal, but that is cheaper, easier to use, can be easily implemented, and can be made locally to enhance self-sufficiency." The education for healthcare workers in developing countries is often limited, so it is vital that they have devices that they understand how to use, but at the same time are comparable to higher-end equipment.

The students have the freedom to design and work on any project that interests them, and as a team they are developing a number of problem-solving technologies. For example, Tanzania has an infant mortality rate ten times that of the United States, partly caused by failing incubators. This team designed a low-cost temperature monitor that detects the temperature of infants and a heating device to regulate their body temperature.

While this project allows students to learn the fine points of producing medical technology, it also emphasizes bettering healthcare around the world. Some team members have had the chance to travel to Tanzania and tour the hospitals. This helped them determine which devices are most essential to create. As Britton McCaskill remarks, "In the long-term, we hope to provide developing countries the capacity to be self-sufficient in the health-



Another project constructs blood glucose monitors, which are an important preventative technology. These machines provide diabetes patients with a way to control their disease to prevent further health complications. Other projects include a blood volume indicator and a bacterial sensor for detecting gastrointestinal diseases, such as typhoid and cholera.

care industry and reduce their dependence on external donations."

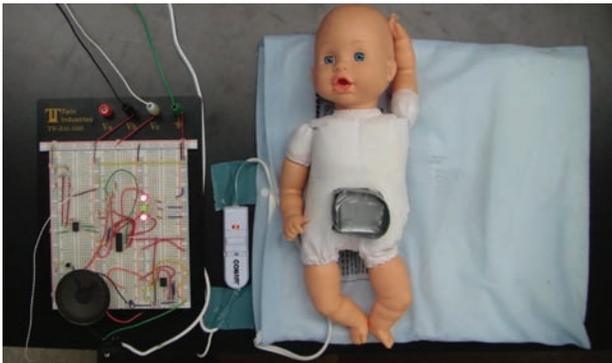
Many students on this team express how rewarding it is to apply their engineering skills in a real world setting to address serious health problems. Kevin Keith's favorite aspect of this project is how "this Creative Inquiry puts us in a position to impact patients who are often in the most

need.” Maglin Halsey also comments, “I quickly learned once I began this Creative Inquiry that there are a lot of things involved with the state of healthcare in the developing world. Obviously, there is no quick-fix to the problems in these areas, but we are hoping to start taking small steps towards improvement. We believe that we have a great foundation to make a difference.”

This Creative Inquiry provides Clemson students with knowledge and experience to become skilled professionals in bioengineering through a personally and professionally gratifying program. ■



“...we hope to provide developing countries the capacity to be self-sufficient in the healthcare industry and reduce their dependence on external donations.”



## Meet the Decipher Team!



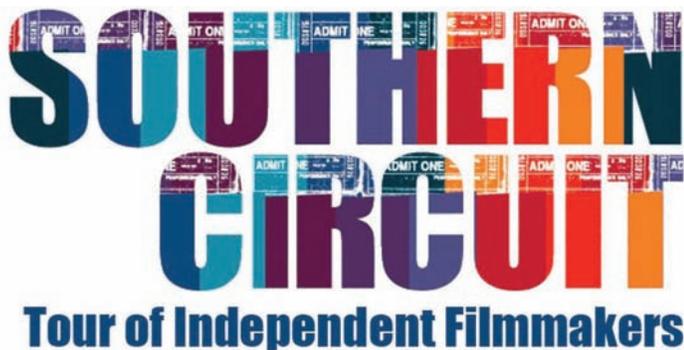
Briana Kloc graduated Clemson University in May 2012 with a degree in Biological Sciences, earning both general and departmental honors. She has a passion for conservation biology and spent a summer tagging nesting loggerhead sea turtles in North Carolina, and her newest project is tagging small mammals in the Clemson Experimental Forest. Her undergraduate research project at Clemson used zoo studbook data to look at birth-sex ratios in captive endangered primates. She will be continuing her education at the College of Charleston to pursue a M.S. in Environmental Studies. In her free time she loves practicing yoga, going hiking, and cooking.

# Sizzlin' on the Southern Circuit

By Zan Isgett

**MOST MOVIE THEATERS IN TOWNS SURROUNDING CLEMSON, SC** show only the major Hollywood flicks, full of hot lead actresses, 3D explosions, and big-name directors: all this “entertainment” for nearly fifteen bucks. However, one Creative Inquiry, in collaboration with South Arts, has assisted in bringing independent films and documentaries to the campus, and it only costs a walk to McKissick Theatre.

The Southern Circuit is a regional film tour, the only one of its kind in the Southeast. Although it was founded almost 40 years ago, it found its new institutional home about five years ago – right here in Tiger Town. Amy Monaghan, a faculty member in the English Department, has been spearheading the project with a group of dedicated undergraduate students ever since. By integrating Southern Circuit with the Creative Inquiry program, students are afforded unique opportunities to organize events and document the history of the project.



Filmmakers from around the country (and the world) compete for a spot to tour on the Circuit, ranging from Alabama to Tennessee. Because Clemson University is one of the prestigious venues in South Carolina, Monaghan and students invite directors of the films to Clemson, where they engage in lively discussions on the process of cinematography, planning a documentary, or directing a film. After the students host the directors, the directors then attend a showing of their movie on campus, where everyone is invited to view the film. As the Creative Inquiry students lead a discussion, attendees have the opportunity to pose questions to the directors about the movie. In this way, people of the Clemson community are exposed to more diverse forms of cinematography, and are also encouraged to learn more about the directors' process.

Many of the films are documentaries, such as *NY Export: Opus Jazz*, produced by Ellen Bar, a former professional ballet dancer. Shown at Clemson in February 2012, it captures a modern take on 1950s choreographer Jerome Robbins's “ballet in sneakers.” Other films that have passed through include director Anne Makepeace's *We Still Live Here*, a documentary about the revival of the Wampanoag American Indian language.

The students in this Creative Inquiry do more than host filmmakers – they capture oral histories. Learning interview skills from Sam Adams, a professional film writer who has worked for *The Onion* and *L.A. Times*, they interview the directors and filmmakers who pass through the circuit. Currently, the students are deciding how to best preserve the history they are recording, which most likely will be through designing an interactive website.

Students have also traveled to other film festivals, such as the Strange Beauty Festival held in Durham, North Carolina. There, they were able to talk one-on-one with the organizers, as well as programmers from the Full Frame Documentary Festival, the largest film festival in North America. Monaghan believes that the Southern Circuit provides a unique opportunity for students, as well as members of the community. In other big-city film festivals, the chances of undergraduate students meeting with filmmakers would be as slim as their 35 mm film reel. Clemson students “access film professionals in a way that they never would have, had it not been for the Southern Circuit... Pushing us out into the world that way, it's kind of amazing,” Monaghan stated.

Clemson's collaboration with the Southern Circuit continues to provide unique, thought-provoking films to people who regularly do not have exposure to these forms of entertainment. This service, organized by Monaghan and other students, is free to the community, so all can access these films and the directors. It has helped broaden Clemson education and will continue to draw filmmakers from far away.

Next time you're looking to catch a movie at your nearest cinemas, think about checking out these independent films in McKissick Theatre instead! ■

Learn more about the Southern Circuit Film Series: [southerncircuit.blogspot.com/](http://southerncircuit.blogspot.com/)

# Playing by the Rules

By Jeannie Davis and Mary Parker

**WHEN PRESIDENT JIM BARKER WAS ASKED TO HELP SIMPLIFY AND IMPROVE THE DIVISION I RULEBOOK FOR THE NATIONAL COLLEGIATE ATHLETIC ASSOCIATION (NCAA)**, he asked, “How can we make this a teachable moment?”

Barker turned to colleague Dan Wueste, professor of philosophy and director of Clemson’s Rutland Institute for Ethics. They developed a one-semester Creative

by economics and studies television contracts and the visual rhetoric that plays into athlete portrayal on the big screen. Others are athletes themselves.

All share a common bond: the love of sports and sports-related topics. “I think the most valuable thing I learned from the class that I will carry with me into my career after Clemson is that there is nothing wrong with asking for help from others around you,” according to Matt Jordan,

Why are NCAA violations such a hot button topic at the moment? Wueste, Barker and their students suggested that the economy has put more focus on how money is being spent within universities. Also, college sports affect a huge national audience, from avid fans to parents of pee wee ball players, who shell out enormous amounts of money for number-branded jerseys and cross their fingers that this year’s MVPs will set the right kind of examples.

“I think the most valuable thing I learned from the class that I will carry with me into my career after Clemson is that there is nothing wrong with asking for help from others around you”

Inquiry class in the Department of Philosophy and Religion to engage a small group of students from across the campus in the rules evaluation. Eight students worked over the course of the spring semester to delve into the rulebook, looking not just for answers, but also for the right questions.

The students did not pull any punches. They asked if the top priority of intercollegiate athletics is consistent with the main values of the NCAA. Is it fair to punish an entire team or university when the violators are often long gone without ever being punished? How do we align the noncommercial ethics of college sports with commercial practices such as merchandising?

Half the students in the group are philosophy majors, the rest seeking degrees in educational leadership, business administration, financial management and management. One student hopes to work for ESPN, while two foresee law school in their futures. Another student is intrigued

a senior from Piedmont, majoring in philosophy. “Some of my best ideas came from conversations with other people in the class, and I like to think I helped some others in progressing their ideas.”

According to student Doug Margison, a junior majoring in philosophy from West Hartford, Conn., “This was an unforgettable experience, and hopefully one day I will be able to look back and say I had one of those conversations that changed the game.”



At the conclusion of the CI class, the students presented their research to Barker and other members of his working group — University of Nebraska-Lincoln Chancellor Harvey Perlman and North Carolina Central University Chancellor Charles Nelms. Those three university leaders have their work cut out for them as they prepare to make recommendations to the NCAA sometime next year.

But in the meantime, the path forward may be a bit clearer thanks to the hard work and creative inquiry of eight very special Clemson students. ■

Reprinted from Clemson World magazine, Summer-Fall 2012.

# Cultura in the Carolinas

By Zan Isgett

**SOUTH CAROLINA'S CULTURE** is viewed, sometimes quite literally, in black and white. That is, white culture is one facet and black history and tradition, another. While this might have largely been the case for decades, a burgeoning Hispanic population is changing the face of the Carolinas. With nearly 150,000 Spanish-speakers in the Palmetto State, these individuals claim ancestry from many Latin American countries. Consequently, the significance of Hispanic culture in our state can no longer be overlooked. To expose students and the community to the Hispanic world, Dr. Graciela Tissera from the languages department has spearheaded a Creative Inquiry project that examines Hispanic culture and raises global awareness through research and outreach.

This multi-faceted project has been around since 2007, and one of its goals is to increase global awareness at Clemson. Using media as a tool, students can study the political and social issues that are pertinent to the Hispanic world. In some cases, Spanish-language novels are analyzed for themes that arise; other times, students compare films concerning real world events, such as poverty versus wealth in the films *Secuestro Express* and *Plata quemada*. Several students on her team presented research this year at a conference for the Southwest Texas Popular Culture and American Culture Association in Albuquerque, New Mexico. Their research involves a comparative analysis of Latin American films dealing with diverse issues such as gender identity and survival during civil wars.

Another goal of the Creative Inquiry team is to actually contribute to the education of children in a local Hispanic community. Tissera's undergraduates volunteer at Café Cultura, a weekly program in Simpsonville, South Carolina, that facilitates tutoring and enrichment activities for Spanish-speaking children. Because many of the parents are not fluent in English, the team hopes to help the children's communication, reading, and math skills through learning activities and fun interactions.



One team member, Nicole Cooper, states that “these parents get frustrated because they cannot help their kids with English-language homework; we contribute in this way.” Café Cultura also serves as a cultural hub, where families come to celebrate their Latin American heritage with food and music.

In the future, Dr. Tissera hopes to broaden her students’ experience with Hispanic culture by creating a Spring Break study-abroad excursion to Latin American countries such as the Dominican Republic or Costa Rica. There, students can explore in-depth a topic of interest to them, such as infectious disease or teen pregnancy.

Dr. Tissera believes that undergraduate research in areas of global significance is imperative to modern college education. When students become mindful of Hispanic issues that go beyond the United States, they are able to spread their knowledge to others and promote global awareness. Tissera hopes that her Creative Inquiry team will contribute to Clemson’s goal of becoming a Top 20 university. ■

“Gaining research experience through a Creative Inquiry team was essential when I applied to PhD programs in Psychology. Potential advisors want to know not only if you are a good student, but whether or not you are capable of running studies, analyzing data, and conceptualizing ideas. After presenting several posters through FOCI and regional conferences, I became a rather accomplished undergraduate researcher. This fall, I plan to discuss my research experiences in an application for the competitive NSF Graduate Fellowship Program.”

Zan Isgett

# To an Asteroid, and Beyond!

By Nancy Spitler

**YOUR TASK, SHOULD YOU CHOOSE TO ACCEPT IT**, is to design a mission to an asteroid. Sound like an old episode of Mission Impossible? Not quite. This time, it's NASA, Clemson University and other members of the NASA Human Health and Performance Center that are challenging students in the sixth through eighth grades to dream of going where no one has gone before.

"Asking kids to create a presentation for NASA is a very cool challenge. That creative process can enhance their interest in science and technology, setting the stage for their next steps toward STEM topics in higher education."

The contest is open to teams of one to four students who will submit a slide show presentation to NASA that outlines their plans for sending a human crew on a trip to an asteroid.

The goal of the contest, according to Clemson psychology professor Benjamin R. Stephens, is to engage more students in the fields of science, technology, engineering and math (STEM) and to stimulate students by providing an opportunity for them to explore and discover.

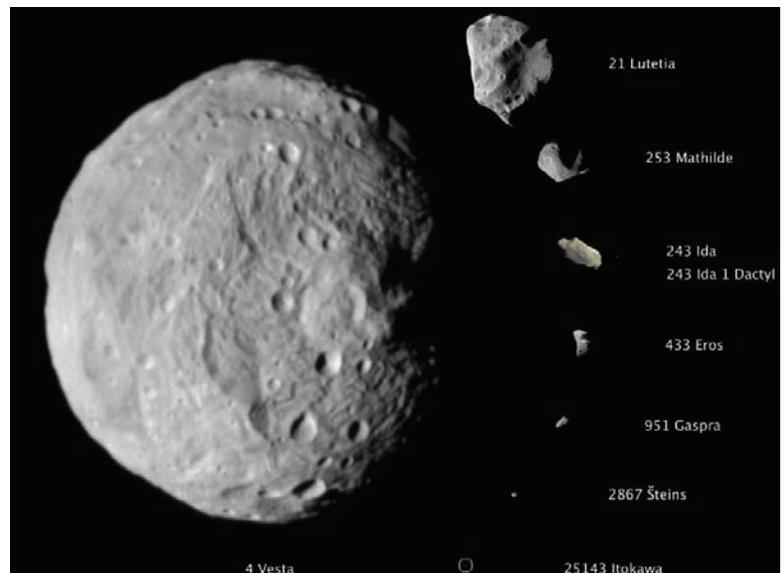
"Asking kids to create a presentation for NASA is a very cool challenge," Stephens said. "That creative process can enhance their interest in science and technology, setting the stage for their next steps toward STEM topics in higher education."

Although winners of this Asteroid Contest will not receive prizes or monetary awards, select winners of the challenge who have displayed exemplary workmanship and creativity, will have the opportunity to have their presentations highlighted on the NASA website.

Amanda Carter, a student on the team noted, "Working on this Creative Inquiry team has been such a great opportunity for me. It's not like any sort of typical group project - your opinions and input really matter. I've been able to gain a lot of research, technical, and leadership experience I might not have developed outside of this team. You don't get to work on these sorts of things in your typically college classes, and that's what I really love about this Creative Inquiry."

Creative Inquiry students at Clemson working with Stephens are involved in designing the challenge and creating the website.

They are promoting the competition regionally, judging the submissions and evaluating the impact/effectiveness of the challenge. ■



Comparative sizes of eight asteroids courtesy of NASA.

View contest results and announcements at:  
<http://www.clemson.edu/psych/ugrad/nasa-challenge>

# The Pulse of Perception: The Relationship Between Blood Pressure and Emotional Recognition

By Zan Isgett



**LUB-DUB, LUB-DUB, LUB-DUB.** The heart of a participant beats as Dr. Jim McCubbin's students listen through a stethoscope for the faint whoosh that indicates systolic blood pressure, with an eye on the blood pressure gauge and a cuff on the subject's arm. The undergraduates on this Creative Inquiry team are manually assessing blood pressure to study the effects of cardiovascular activity on emotional perception.

Dr. McCubbin, a professor in Clemson's Department of Psychology, has been studying for years how the cardiovascular system relates to a person's response to stressful or emotional stimuli. He and his colleagues have found that blood pressure is not only involved in physical health, but may also be related to a phenomenon known as "emotional dampening." The higher your resting blood pressure, the more difficulty you may have identifying others' emotions – from the angry squint of a coworker to the joyful smile of a loved one. His most recent publication in *Psychosomatic Medicine* has gone viral with the news media, and was even used as a joke in Saturday Night Live's "Weekend Update."

Recently, Dr. McCubbin's team of eight undergraduates has extended emotional dampening research to the realm of risk perception. The rationale is this: if you cannot detect the degree of others' emotions, you also might not detect your own degree of risk in a given situation. For example, you might be more likely

to take chances, blowing your entire paycheck betting at the racetrack or spending the weekend binge drinking. So far, the students have found that blood pressure is indeed significantly related to perceived benefits of taking risks. In another study, the team is investigating whether or not emotional dampening extends to self-expression in individuals with elevated blood pressure. Participants are asked to write about an emotional topic, and their personal stories will be analyzed with linguistic software to detect any emotional differences in expression.

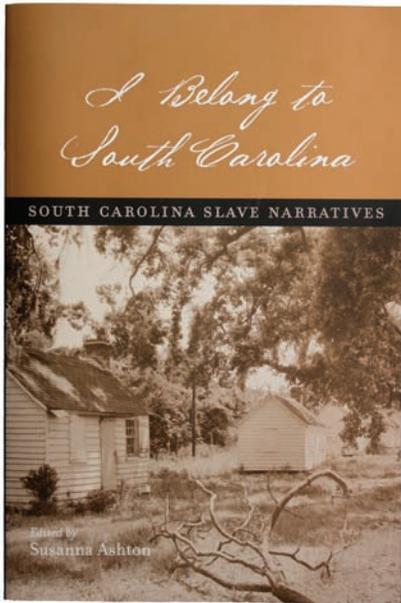
The Creative Inquiry team is now starting to take a clinical approach to this phenomenon, extending their work to children with Autism Spectrum Disorder. Even though autistic children do not necessarily have high blood pressure, they generally have a problem recognizing emotions in faces, a major impediment to their social development. The team is in the process of developing a game to help improve emotional recognition. Eventually, the team hopes to test it with autistic students at a school in South Carolina for children with social and developmental disabilities.

The team members are truly excited about the ground-breaking research. Previous students have presented research all across the country, from Portland, Oregon, to San Antonio, Texas. One recent study was presented at the Society for Behavioral Medicine's 2012 annual conference in New Orleans, Louisiana. Students from the team travelled there in April to present the research, alongside graduate students and medical professionals. According to Jack Graham, a junior psychology major on the team, "the future is only brighter as we continue exploring emotional dampening and piloting new projects concerning [therapies] for those with deficits in emotional recognition."

Analyzing data and developing projects may be a challenge, but the students have avidly taken it on – without any rise in their blood pressure! ■

# I Belong to South Carolina

By Anne Jenkins



the Palmetto State's Upcountry, Midlands and Lowcountry, from plantation culture to urban servitude.

First published between the late eighteenth century and the dawn of the twentieth, these richly detailed firsthand accounts present a representative cross section of slave experiences, from religious awakenings and artisan apprenticeships to sexual exploitations and harrowing escapes.

In their distinctive individual voices, narrators celebrate and mourn the lives of fellow slaves, contemplate the meaning of freedom, and share insights into the social patterns and cultural controls exercised during a turbulent period in American history.

Each narrative is preceded by an introduction to place its content and publication history in historical context. The volume also features an afterword surveying other significant slave narratives and related historical documents on South Carolina. *I Belong to South Carolina* reinserts a chorus of powerful voices of the dispossessed into South Carolina's public history, reminding us of the cruelties of the past and the need for vigilant guardianship of liberty in the present and future. ■

## PROFESSOR SUSANNA ASHTON'S 2007-2008 CREATIVE INQUIRY

**PROJECT TEAM** sought to collect and publish slave narratives of South Carolina. Now their hard work is being rewarded. *I Belong to South Carolina: South Carolina Slave Narratives* is being published by the University of South Carolina Press.

Ashton edited the book and provides the introduction. Her team of researchers included undergraduate students Robyn E. Adams, Maximilien Blanton, Laura V. Bridges, E. Langston Culler, Deanna L. Panetta and Kelly E. Riddle and graduate student Cooper Leigh Hill.

*I Belong to South Carolina* restores to print seven slave narratives documenting the lived realities of slavery as it existed across



# Clemson Students on the Run

By Rachel Wasylyk

**ACCORDING TO THE CENTERS FOR DISEASE CONTROL AND PREVENTION**, childhood obesity has more than tripled in the past 30 years. In 2008, over one third of children and adolescents were overweight or obese. Physical activity plays a role in numerous aspects of life, including physical fitness, stress level, mental clarity, and overall health. It is important to instill good patterns of physical activity in young children, so these habits can be continued as they age.

“Physical activity plays a role in numerous aspects of life, including physical fitness, stress level, mental clarity, and overall health.”

A Creative Inquiry team in the public health sciences department is working on promoting physical fitness in elementary and middle school girls, as well as evaluating the effectiveness of exercise in these youth. Their main goal is to both implement and assess a physical fitness program for children in the community.

The team of students, led by Dr. Karen Kemper, is working in partnership with the Greenville Hospital System and their branch of the Girls on the Run program. This is an international, non-profit organization that encourages physical activity, positive self-esteem and body image, and overall healthy lifestyles in girls and young women. This group is established as a prevention program and

promotes physical activity through the training and completion of a 5K run/walk event by females in the community.

Team member Lizzy Johnsen notes, “It’s programs like these that are helping toward the mission to fight the obesity epidemic and to develop healthier lifestyles. Girls are enlightened on how to read cues from society and adapt in a way that is healthiest for them.”

The Creative Inquiry team is divided into two different groups, each focusing on separate tasks. In the first group, Clemson students act as coaches for children at two nearby locations, Nettles Park and Edwards Middle School. These coaches facilitate a 10-week long after-school program that includes 2 lessons per week. During this time, they implement the curriculum, aid with collecting pre- and post-event questionnaires, and serve as inspirational role models to the young children.

Johnsen explained, “I followed a lesson plan to teach the girls different lessons on adopting healthy lifestyle habits, stress management skills, how to cooperate with others, and how to give back to the community. The coach’s responsibility is to facilitate the discussion and act as a motivator for the girls in their workouts.” After completing the program, the girls and their coaches complete a 5K walk/run event in the community, sponsored by the Greenville Hospital System.

The other group of students on the Creative Inquiry team focuses their efforts on evaluating the Girls on the Run program, as well as assessing the physical fitness of the youth.



These students collect data through pre- and post-event questionnaires completed by approximately 100 girls who participate in Girls on the Run.

The questions centered on body image and physical activity trends. The team then analyzes the data to compile a final report, which is presented to the Greenville Hospital System's Girls on the Run Director.

However, the Creative Inquiry team is planning even more for the future. In addition to the implementation and evalua-

Through this, the team will create an assessment of cardiorespiratory fitness. The participants, children ages 5-17, will complete a specific workout on a treadmill, which the team will then analyze.

Finally, the team is encouraging physical fitness in people of all ages by planning and organizing a family walk/run in Nettles Park. This event will promote physical activity in members throughout the community. Johnsen noted that "Being a part of a program like this makes me aware that I can make a difference in my community no matter where my career

Overall, this Creative Inquiry team hopes to demonstrate to girls how vital it is to remain physically active, as well as instill a lifelong passion for fitness in each individual. Johnsen explains her love for the project when she notes, "What keeps me passionate about this project is seeing the girls' faces when they cross the finish line at their 5k. They have accomplished something huge in their lives and they are so proud of themselves." The team wishes to impact the physical lives of people in the community. And most importantly, they want to show young girls that exercise can be fun! ■



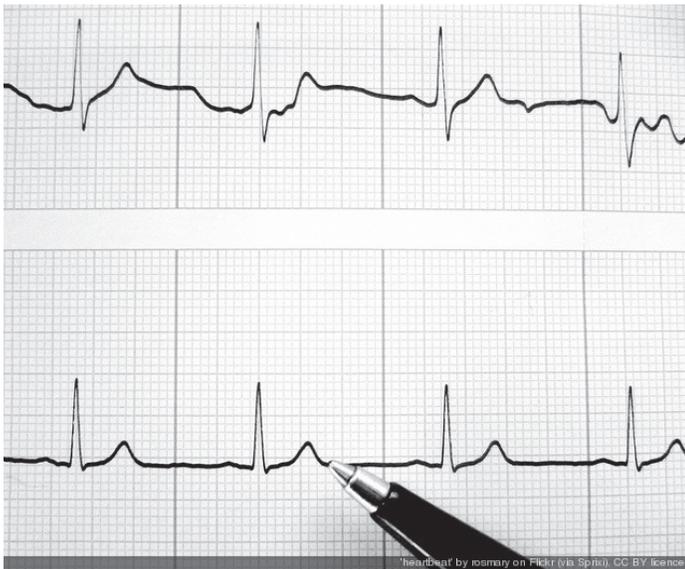
tion of the Girls on the Run program, they are conducting a pilot study that assesses the physical fitness of youth. This research will be completed in the Department of Public Health Sciences Instruction and Research Lab.

takes me. I just have to make an effort to invest a little bit of time to make a big difference in my community."

# Matters of the Heart: They Don't Miss a Beat

By Rachel Wasylyk

**YOUR PULSE IS RACING** and you can feel your heartbeat resonating through your chest. The emergency room doctors hurriedly push you down the cold hallway, trying to hide the panic on their faces. When a patient is lying in the hospital with a serious heart condition, the last thing they need to worry about is the extent of the doctor's training. Therefore, it is vital for doctors to practice their techniques before interacting with live patients. A team of bioengineering Creative Inquiry students, led by Dr. David Kwartowitz, is working to create an electrocardiogram (EKG) simulation device based on biological signals in the human body. They plan to use the device for training and evaluation purposes.



An EKG is the typical method used to collect data about electrical activity in the heart. Patients are often closely monitored during surgeries to ensure a healthy beat is maintained. However, it is necessary to have a working system that collects the data from the EKG and sends it to a computer for further analysis. This information can be used to diagnose a number of health issues, including heart attacks and heart arrhythmias – which are caused by problems in the electrical impulses that create heartbeats. These issues cause a fast, slow or irregular pulse in the patient.

Amanda Nguyen, a junior on the team, explained, “Working on the EKG Simulation and Modeling Creative Inquiry project has provided me the invaluable opportunity to gain hands-on experience with designing electrical circuits. During the process I learned a lot about the practicalities of electrical circuit design that I would not have been able to gain otherwise.”

The Creative Inquiry team focused on two main goals. First, they designed a system to process the EKG signals. Then, they created a human-like dummy for the simulation. The materials used in the dummy were produced to resemble the texture of human tissue, which creates a realistic environment when operating the EKG system.

This EKG simulation will be used for both teaching and training purposes. The simplistic yet realistic nature of the system allows it to be utilized in a number of settings, from elementary schools to medical training evaluations. As children are taught about the human body and EKG signals, they can visualize the process using the interactive dummy. The kids will be able to physically manipulate the simulation in a hands-on approach to understand exactly how an EKG works. They will also be able to listen to hearts that have abnormalities, like arrhythmias, to engage them in the material and help them better grasp the concept.

Professional medical trainees can utilize the simulation due to the realistic and reliable nature of the system. Doctors will be able to learn, experiment, and evaluate their work on the model. The team created an EKG unit that efficiently filters out electrical potential changes in the heart and amplifies them, which allows doctors to better understand what is taking place in the patient from a safe distance. Nguyen noted, “It has been incredibly rewarding to be able to apply the knowledge I have gained in lecture to produce a working EKG.”

Through creating an advanced electrocardiogram system, this Creative Inquiry team will impact both the educational and medical fields. This versatile project benefits a wide array of people in a variety of situations. The team is breaking down the science of simulations – one heartbeat at a time! ■

“It has been incredibly rewarding to be able to apply the knowledge I have gained in lecture to produce a working EKG.”

# Tailgating for Clemson in Orange – and Green

By Angela Nixon

**A GROUP OF CLEMSON UNIVERSITY STUDENTS** has come up with a way football fans can make tailgating more environmentally friendly.

A team led by students in civil engineering and architecture designed a sustainable tailgating trailer that can be pulled by a bicycle for a Creative Inquiry project. Their goal is to reduce the carbon footprint of tailgating by providing a way to do it without using a car.

Fans attending the 2011 Homecoming football game with Boston College visited the “green trailgating” trailer in the Lee Hall courtyard. The trailer folds out to create a place where people can tailgate.

It includes a table and chairs, a grill, a cooler and other handy tools. The group also has created a larger unit that can accommodate up to six families.

“We wanted to look at ways that we could transform Clemson’s culture to a culture of sustainability... Football and tailgating are so big at Clemson, so we decided to look at ways to incorporate sustainability into that.”

“We wanted to look at ways that we could transform Clemson’s culture to a culture of sustainability,” said Jackie Blizzard, a Ph.D. student in civil engineering. “Football and tailgating are so big at Clemson, so we decided to look at ways to incorporate sustainability into that.”

Clemson is looking at other ways to make its Homecoming celebration Earth-friendly. Each year, student organizations build Homecoming displays on Bowman Field. Starting in 2011, the President’s Commission on Sustainability and Clemson Recycling team up to help make the annual tradition a greener event.

There will be more recycling bins and trailers on Bowman Field to make it easier for students to dispose of recyclable waste.

As the Habitat for Humanity Homecoming House is built on Bowman Field, power tools and lighting for the project will be powered by a five-kilowatt biodiesel generator provided by Clemson’s Biosystems Engineering Sustainable Biofuels Initiative group. ■



# A Fruitful Discovery: Why We Age

By Thomas Larrew

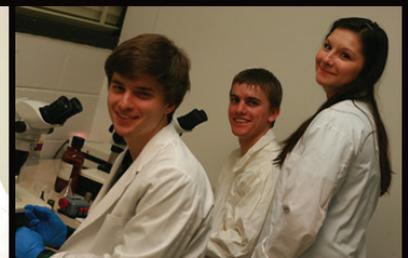
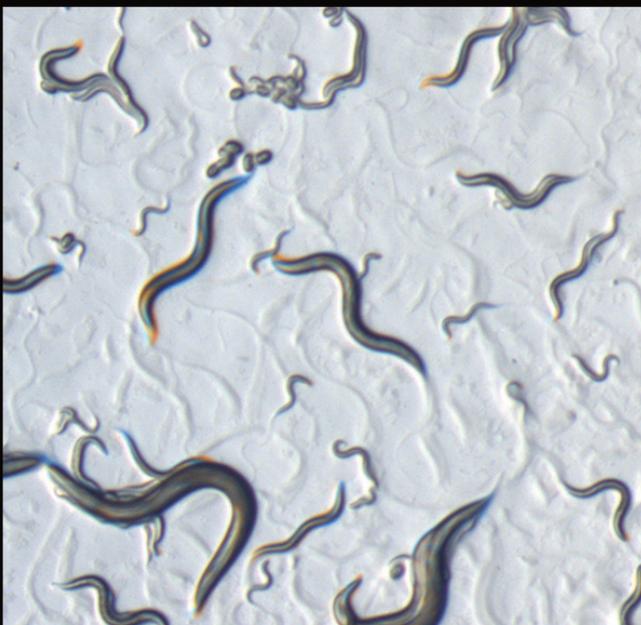
**IN RECENT YEARS, FRUITS LIKE THE ACAI BERRY AND POMEGRANATE** (coined ‘superfruits’) have been wildly heralded for their numerous health benefits. But what role do such fruits actually play in increasing the human lifespan? Groundbreaking research is being conducted by biological sciences professor Dr. Yuqing Dong, microbiology and molecular medicine professor Dr. Min Cao, and their Creative Inquiry team. They are helping determine whether various natural extracts affect the body’s aging and how they do so. In the process, the group has come upon some startling evidence that points to a link between stress resistance and lifespan.

The team first began its studies on a fruit regarded by many as one of the healthiest, the cranberry. This berry is known to protect the body from oxidative stress; that is, the generation of compounds created through our metabolism that are hazardous to our DNA and protein molecules. Could cranberry extract also have anti-aging implications? The team investigates how this and other high potential natural extracts could have life extending effects. Along with the cranberry, the Creative Inquiry team is looking at noni, a Hawaiian fruit that contains even more antioxidants than cranberries, and royal bee jelly, a substance fabled for its anti-aging effects.

Although the research team’s goal is human application, for now Dr. Dong and his students are studying *Caenorhabditis elegans* or the nematode worm. The short lifespan of the nematode, only two to three weeks, makes it the ideal organism for aging studies. The worm’s genome may only be 40 percent similar to the human genome, but 60-70 percent of its genes are expressed the same as in humans, making it an applicable model for most situations. For example, even Alzheimer’s disease has been studied in the nematode worm.

Nematodes obtain the nutrients of the extracts in a way any other worm would: they simply eat them! One of the three natural extracts is incorporated into the nutrient-rich substance that the nematodes live. The worms then consume this extract-ingrained media for six days, from hatchling to young adult. The researchers record their overall lifespan and compare differences.

Break out the turkey and cranberry sauce because the results are promising. The cranberry extract increased the average worm lifespan by about 40 percent and royal jelly increased lifespan by roughly 25 percent. The noni fruit extract study remains incomplete, although it seems to have similar effects.





Perhaps the most astonishing part of the results is that the increase in longevity was correlated with an augmented ability to resist a stressor. The cranberry extract not only increased lifespan, but it increased heat shock resistance as well. The worm normally lives at 25°C, but if exposed to temperatures 35°C or more, its heat shock resistance mechanism kicks in. This protection comes from proteins that help the body adjust to the consequences of high temperatures. Normally, nematodes can only live a half-hour in such warm conditions, but after being treated with cranberry extract, the nematodes could stand the heat for nearly twice that time. Initial results suggest that the natural extracts are also involved in the protection from various stressors, such as UV radiation and extreme cold, indicating that the secret to a long life may be due to a strong defense against stressors.

In 2012, the project has expanded its horizons. Dr. Dong puts it, “Humans do not follow the same habits throughout their whole lives. Young people don’t care what they eat, but when they get older, they start consuming healthy foods. We want to see if we can replicate that in our experiment.” The team is analyzing the effect the extracts have when given to the nematodes at different points of their lives. “Does it increase their lifespan more when the extract is given to them the last week of their lives or the first week?” This new part of the study aims to identify at what point in life such extracts have the strongest effect.

Along the way, the team is discovering new things about these special extracts. Cranberry extract not only has anti-aging implications, but the Creative Inquiry team has shown that it also has anti-microbial properties. It appears to slow the growth of some pathogens, such as salmonella.

It is not clear if all ‘superfruit’ or antioxidant-rich foods augment longevity, but Dr. Yuqing Dong and his Creative Inquiry team have provided substantial evidence demonstrating that at least some increase lifespan by supporting stress resistance. Who needs one of those expensive wrinkle-fighting creams when you can drink a glass of ice-cold cranberry juice? ■

“Break out the turkey and cranberry sauce because the results are promising.”

# Kicking Normal to the Curb and Bringing Home a Gold

By John Gouch

**FOUR CLEMSON UNIVERSITY STUDENTS TOOK FIRST PLACE** in a national marketing competition. The Creative Inquiry team topped students from the University of Pennsylvania and the University of Texas/Arlington to win the Chevrolet Sonic Marketing Challenge in Detroit. The teams from the three schools were the finalists out of 52 schools that participated in the competition, which was sponsored by Chevrolet and edVenture Partners.

The team members are Jessica Byrd, a senior graphics communications major from Fort Mill; Evan Duggar, a senior in marketing from Simpsonville; Paul Hargrave, a senior in marketing from Charleston; and Blair Bolen, a junior marketing major from Fredericksburg, Va.

They are led by James Gaubert, a senior lecturer whose Marketing 398 class worked in groups to come up with entries for the challenge and voted for the winning team's project.

Their entry, titled "Chevrolet Sonic: Kick Normal to the Curb," was built around a program to build awareness of the vehicle among Clemson University students. It included plans for a kickoff event on Bowman field; targeted marketing plans, including social media and guerilla marketing strategies; and research into students' perceptions of the vehicle.

"I applaud the four students whose entry won the competition," Gaubert said. "They represented Clemson well in Detroit. I

believe hard work and professionalism throughout the semester resulted in the victory.

"It is a testament to the synergistic results that can emerge from Clemson's Creative Inquiry groups that tap into students' skill sets from different majors and strengths," he said.

**"It is a testament to the synergistic results that can emerge from Clemson's Creative Inquiry groups"**

"I still have to pinch myself that we actually won," Duggar said. "If I had the chance, I would do it again. That's saying a lot because we spent a lot of late nights together working on this case, but it was worth every second."

Byrd said, "We had an amazing group that put in over 110 percent to this campaign and I think we did an amazing job. I would definitely recommend to any student interested in this field to get involved—nothing is better than real-world experience."

"The thought of securing a win for Clemson University and the marketing team was our drive as we made

every effort to put together a polished presentation," Hargrave said. "The presentation was the product of countless hours of brainstorming, design, and rehearsal, driven by the marketing and graphics coursework taken during our time at the university."

Bolen's participation "was especially exciting for me since my great grandfather opened a Chevrolet dealership which is still owned and operated by our family today, over 91 years later."

"Our team did a great job working together to come up with a interesting and innovative plan specifically designed to reach Millennials," he said. "I am very pleased that the executives at Chevrolet thought so highly of this project which we poured so much time and effort into." ■

The Clemson team's winning entry is posted on the EdVenture website at [edventurepartners.com/awards.asp](http://edventurepartners.com/awards.asp)



# Experiencing Our World through Your iPhone

By Anne Jenkins

**PROSPECTIVE STUDENTS AND THEIR PARENTS** can now tour Clemson University's campus with an iPhone as their guide.

The application developed by students as a Creative Inquiry project offers an interactive way to learn more about buildings and landmarks on Clemson's campus, watch video clips and get directions through GPS navigation.

The application is available at the Class of 1944 Visitors Center on Apple iTouch devices that visitors can check out. The tour can be downloaded for free on Apple's iTunes.

The application was developed by undergraduate students Gina Guerrero and Adam Cross and graduate student Kyungsoo Im. Information, video and images were developed with the help of the student tour guides.

"This was a great way to give our students hands-on experience in developing an application for hand-held devices, a rapidly growing industry," said computer science professor Roy Pargas,

who advised the Creative Inquiry team. "It also helped fill a need at the University by providing Clemson with another way to reach out to prospective students and showcase what the University has to offer." ■



## Creative Inquiry by the Numbers

CREATIVE INQUIRY GENERATED SOME IMPRESSIVE NUMBERS IN 2011-2012:

**PARTICIPATING STUDENTS: 3,000**

**TEAMS: 433**

**PROJECTS: 266**

**POSTERS EXHIBITED AT THE 2012 FOCUS ON CREATIVE INQUIRY POSTER FORUM: 186**

**PROJECTS ADDRESSING INTERNATIONAL TOPICS: 23**

SINCE ITS INCEPTION, CREATIVE INQUIRY PROVIDED UNIQUE OPPORTUNITIES FOR UNDERGRADUATE STUDENTS TO SHOWCASE THEIR RESEARCH:

**PRESENTATIONS AT PROFESSIONAL MEETINGS: 188**

**PUBLICATIONS IN PROFESSIONAL JOURNALS: 95**

**PATENTS PENDING: 3**

# The Solution is All in Your Head

By Thomas Larrew

**THE STORY OF ROBOTICS HASN'T ALWAYS BEEN A HAPPY ONE**, with countless tales of robots causing an end to humankind. However, Dr. Delphine Dean and Dr. David Kwartowitz have put a new spin on the classic tale. Their Creative Inquiry project in the bioengineering department focuses on helping people by using neural signals to control machines.

It all started as a student-led project, dubbed MindBot, that was an attempt to show the public just how far neural technology had progressed and what could be done using cost-effective equipment. But for these bioengineering students the project also provided an outlet for their creative juices to flow. Dr. Dean mentioned, "What makes this project really fun to work on as an advisor is that the whole process was extremely student driven; all the ideas originated from the students, which is why I think the project was so original and 'out of the box.'" The team drew up a concept design that used cranial electromyograms (EMGs) to direct a two-wheel robot to move forward, backward or to rotate.



The Mindbot was a great success! The team received a grant and is now working on the second phase of the project: to develop a device that's wirelessly controlled – through a neural headset – to navigate a maze while overcoming physical obstacles.

The project's potential is vast and far reaching. Joe Connolly, a senior student on the team, explained, "Through this experience, I was allowed to show my project to kids ranging from elementary school to college. CI served as a conduit to allow me to share my passion my the younger generation." This type of technology

could someday be used in anything from helping mobilize quadriplegics to mind-controlled video games to effortless driving.

Team members not only get the satisfaction of knowing that their product may someday be used to help society, but they experience

“Through this experience, I was allowed to show my project to kids ranging from elementary school to college. CI served as a conduit to allow me to share my passion with the younger generation.”

hands-on engineering in the fields of electrical and mechanical design, computer programming and system architecture. They also get a taste of how signal/image processing and psychological feedback work. Connolly commented, "With the help of my fantastic mentors, I had the freedom to work with a diverse team and explore an idea. I applied the concepts I learned through my college experience in a way that interested me the most."

New team members aren't expected to know the difference between a PIC and an ARM or how to handle segmentation faults, but if they're a devoted student ready to learn more in a team-centric environment, they are perfect for the team. Connolly summed it all up perfectly when he said, "The most rewarding thing I took away from the Creative Inquiry was showing other people the 'cool' side of engineering – the side they may not realize exists." ■



# Stepping into a Greener Future



By Sidney Nimmons

**AN ARCHITECTURE CREATIVE INQUIRY PROJECT** that focused on designs for the Clemson University Student Organic Farm was honored in an international design competition, Structures for Inclusion 2011, for a project called STEPS to Connectivity and Accessibility. The competition was sponsored by Social Economic Environmental Design (SEED).

STEPS is a design-and-build project of the Student Organic Farm. However, a collaboration between the Creative Inquiry program, the Community Research and Design Center, Studio SOUTH and the Student Organic Farm provided funding to pursue the award.

The project focused on asset-based design and highlighted the importance of a sustainable community infrastructure, local food and economic impact.

STEPS also promotes community connectivity and accessibility. The project included steps that enable pedestrians to more easily reach the farm.

“Certainly this is an award for all at Clemson and was only possible due to the commitment the university has exhibited toward the Creative Inquiry program, sustainability and collaboration,” said associate professor of architecture Daniel Harding, director of the Community Research and Design Center. “I realize this is a small and humble award; however, the ideals behind this work are very big.”

Twelve awards were given to recipients around the globe. The Student Organic Farm project will be published with other winners and was featured at the Structures for Inclusion Conference held in Chicago. ■





I really enjoyed being a member of the Popular Science Journalism Creative Inquiry team. Everyone was so creative and supportive of one

another. It was the class I looked forward to each week because it was challenging while still being fun.

-Lana Ward

Working on the *Tigra Scientifica* team this past semester has not only given me the opportunity to receive detailed feedback on my writing and improved my skills but was also a welcome environment to do so.

Dr. Temesvari is wonderful and is a supportive mentor for a great group of kids. My only regret is that I didn't learn about this CI earlier in my college career.

-Remember Watts



I am so thankful I participated in this CI team because it helped me learn how to interpret scientific information into common terms for the general public. This is a critical skill to have because scientific research affects all areas of our lives, whether we are aware of it or not.

-Alison Richman

# Read All About It: Translating from Their Lab to Your Home

By Rachel Wasyluk

**WHAT DO DIET SUPPLEMENTS, CUTTLEFISH, AND NEWSPAPERS HAVE IN COMMON?** A scientific journalism Creative Inquiry team is drawing these seemingly unrelated topics together. In doing so, they are making an impact on the community's knowledge of recent research that is being conducted around the world.

The team was founded by Dr. Holly Tuten, a PhD candidate who wanted to ensure the continuation of the science column in Clemson University's newspaper, *The Tiger*. Dr. Lesly Temesvari, a professor in the biological sciences department, became the mentor for the course in the fall of 2011, with the help of Matt Johnson, a faculty member in the biological sciences department, and Curtis Newbold, a PhD candidate in rhetoric, communication and information design.

The Creative Inquiry began in the spring of 2011 and has been actively branching out ever since. The students research newly released science journal publications and translate the information into terms that are suitable for the general public. The majority of the team members have a science background, so they are able to communicate higher-level scientific thoughts into ideas that are more relatable and easier for people to understand. One article is run in a column in *The Tiger* each week. At the end of every semester, the students compile all the articles and publish a glossy magazine, *Tigra Scientifica*. This publication is distributed both around campus and in the surrounding area.

The team was recently awarded a grant through the Pearce Center for Professional Communication that will give students the opportunity to convert one of their stories into a radio blurb to be broadcast on Clemson public radio. Funds from the grant will be used to cover the

Working on the *Tigra* gives you an opportunity to write about what you love and gives other students the chance to read about interesting developments in the world of science.  
-Megan Woodard



studio time and post-production editing. Additionally, Dr. Tuten and Dr. Temesvari co-authored a paper about the journalism team that was accepted for publication in the *Journal of College Science Teaching*. The article is entitled "Popular Science Journalism: facilitating learning through peer review and communication of science news," and it highlights the course as an example for other institutions.

Communication is vital in the scientific community. It is from sharing ideas, experiences, and knowledge that the field of science is able to flourish. While researchers may remain informed about current discoveries, many other people don't know exactly what is being uncovered in the baffling world of science. Additionally, typical scientific papers can be difficult for the general public to decipher – between the complicated jargon and technical terminology that is used. Therefore, people don't typically pick up scientific papers for light reading by the pool. However, for scientists, learning to effectively communicate higher-level materials to a general audience is important for the success of many future scientific endeavors.

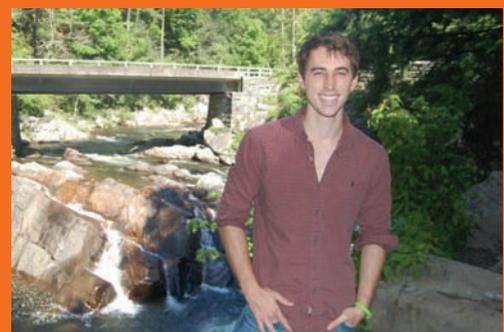
Closing the gap between society and the scientific community is imperative in this day and age. With immense amounts of new research being conducted and discoveries being made every day, it is important for the public to remain well informed – especially in a democracy where these revelations can significantly impact people's daily lives. Next time you're in the Clemson area, be sure to pick up a copy of *Tigra Scientifica* – an informative magazine that can easily be read poolside! ■

Working on the *Tigra Scientifica* team gave me the opportunity to combine my passions for science and journalism in a unique way. This experience has been exceedingly independent, as the students essentially run



the course. I have taken a lot of valuable knowledge out of this opportunity; I learned indispensable lessons in fast decision making, reaching deadlines, and collaborative teamwork.  
-Rachel Wasylyk

Working on the *Tigra Scientifica* challenged me as a student of biology and as a writer. I learned so much about the writing process and benefited from the scientific knowledge gained.  
-Blake Bendixen





## Finding Flavor and Fighting Sickness in Food

By Thomas Larrew

**COFFEE AND CANCER AREN'T OFTEN MENTIONED IN THE SAME SENTENCE**, but in Dr. Feng Chen's laboratory, both are topics of much debate. On Dr. Chen's Creative Inquiry team, students from the Department of Food, Nutrition, and Packaging Science get lab experience in a variety of food-related subjects, from analyzing the flavor of coffee to evaluating the clinical potential of certain fruit extracts. Students probe questions like, "When and why does coffee go bad?" and "Why are blueberries considered so healthy?"

Nutraceuticals, the development of a food towards medical purposes such as disease prevention, is just one of the many fields investigated by this Creative Inquiry group. The team originally started researching a set of compounds found in cottonseed oil called polyphenols. Through extraction and analysis, these polyphenols were discovered to contain a plethora of medical applications. These compounds are anti- almost anything you can imagine: antioxidant, anticancer, antiparasitic, and the list goes on. Although many of their properties are still being analyzed, these polyphenolic chemicals show good potential for future drugs.

With success using cotton, the Southern cash crop, the group started to wonder if other harvested goods held similar health-promoting properties. The team turned to blueberries and Southern-grown muscadine grapes. They were shown to have similar, but distinct polyphenols from cottonseed oil.

In these natural delectables, the students are investigating a particular subset of polyphenols called anthocyanins. Anthocyanins are part of what gives plants their red, blue, and purple colors.

These chemicals are proving to be just as promising as the polyphenols found in cottonseed oil – research shows that they can fight conditions like diabetes.

Because Dr. Chen's lab contains all the complex equipment needed to extract chemicals, his Creative Inquiry team has been able to step into new territories – the flavors of various foods. Currently, the team is investigating two of America's favorite goodies: chocolate and coffee. Instead of using the standard method of taste testing and subjective judgment, the students are approaching these guilty pleasures in a different manner: a purely analytical one. They are using flavor chemistry, or the chemical analysis of foods for natural and artificial flavor development and enhancement, to change how we think about these refreshments. Students looked at how the chemical composition of coffee changes from 30 to 60 minutes after brewing to determine what causes coffee to go bad, giving it that universally disdained burnt taste.

Dr. Chen boasts that his lab has some of the best opportunities at Clemson University to practice proper lab technique. "Results are good, but we really encourage students to learn critical thinking but also to gain an independent capability for research and to discover how to write scientific papers." Students are able to work with state-of-the-art instruments, such as a high-performance liquid chromatography machine and a UV-visible spectrophotometer, something that a normal undergraduate would never have the opportunity to interact with. No matter what subject the members are researching, they always take away valuable research experience. ■

# Shooting for the Moon

By Anne Jenkins

**FROM THE CLASSROOM TO THE LABORATORY TO PROFESSIONAL CONFERENCES**, students are exploring solutions to the complex problems of today and tomorrow, and everybody plays a role. Creative Inquiry project teams are comprised of undergraduates, graduate student mentors and faculty.

“It’s not a typical undergraduate experience,” says Dr. Christopher Kitchens, assistant professor in the Department of

lunar wheel on the next generation of moon rovers in Hawaii as part of a NASA Lunar Analogs testing and evaluation event. Some of the elements of that Michelin tire/wheel combination come directly from research conducted by Clemson students.

“It’s exciting to know that Clemson student research on treads and wheels could be an integral part of a possible manned mission to the moon,” says Clemson

“It’s not a typical undergraduate experience... There’s no answer in the back of the book”

Chemical and Biomolecular Engineering. Along with fellow chemical engineer Scott Husson, he co-manages a Creative Inquiry project team investigating chemical separation methods using advanced membranes. “There’s no answer in the back of the book,” adds Kitchens. His group of seven undergraduate students (freshmen through seniors) and three graduate student mentors is studying the design of novel membranes for efficient and effective capture of carbon dioxide from power plant flue gas. This ground breaking work has received funding from the American Chemical Society – Green Chemistry Institute.

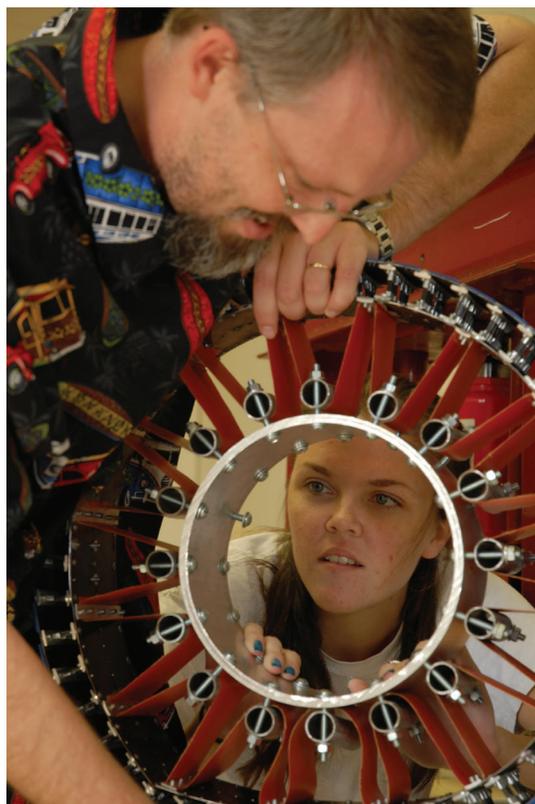
Student-powered innovation is a growing tradition at Clemson. For example, if NASA’s ATHLETE (All-Terrain Hex-Legged Extra-Terrestrial Explorer) robotic vehicle ever moves across the surface of the moon, it may be thanks to Clemson undergraduate student research. Michelin, a Clemson University partner, is testing its new non-pneumatic

mechanical engineer and researcher Dr. Joshua Summers. “It’s incredible what students can do if they’re given the opportunity.”

Clemson researchers and Milliken and Co. were challenged by Michelin to measure wear and traction of textile tread leading to the ability to improve tread materials that may someday be used on NASA moon rovers. The Michelin Lunar Wheel is based on the technology of the award-winning Michelin Tweel®, which also includes design features developed by Clemson undergraduate students in fall 2006. Four faculty, two postdoctoral students, eight graduate students, 12 undergraduate students and five high school students are working or have worked on the projects. Currently, a Creative Inquiry team of 10 freshmen and sophomores is focusing on the next phase of research. Half of the team is designing and building test equipment, while others develop computational models to design tire-sand traction systems that could eventually lead to improved tread material.

Students are lining up to participate in Creative Inquiry projects. According to Husson, that’s due to the hands-on nature of the research. Undergraduates are doing team-based research, while developing their lab skills in state-of-the-art facilities. At the same time, graduate students are strengthening their mentoring skills as they guide these dynamic teams. ■

Reprinted from Ideas Magazine, Spring 2009



# Food Myths Exposed: Why the Five-Second Rule Should Be the No-Second Rule

By Thomas Larrew

**IT HAPPENS ALL THE TIME** – the last chip in the bag drops onto the floor, so you quickly snatch it up, and eat it while quoting the five-second rule to your friends. But how legitimate is the five-second rule? Dr. Paul Dawson, a professor in the Department of Food, Nutrition, and Packaging Science, and his Creative Inquiry team are exploring this popular eating habit myth and other old wives' tales, such as double-dipping and drinking from the milk carton, to see whether we're putting our bodies at risk or if we're just saving time and food.

problem-solve. I learned invaluable experimental techniques that I know will help me when it's time for the job hunt."

Dr. Dawson and associates began their series of experiments by determining how long germs can survive on the ground. They found that the bacteria *Salmonella typhimurium* could survive for up to four weeks on dry surfaces and still be transferred onto food. The team then tested bologna and bread on wood, tile, and carpet to determine how fast and how many bacteria got onto the dropped food. The study verified that bacteria transfer to the food

“Creative Inquiry is the best way for students to gain not only practical research experience, but also self-confidence in the ability to problem-solve.”

Dr. Dawson noted, “Working with the students on the Creative Inquiry team is refreshing and exciting for me since we combine student creativity with hands-on experiments to challenge common myths and claims about food and bacteria.” The team consists of undergraduate students who investigate claims about food and public health.

Ashley Stone, a student on the project, explained, “Creative Inquiry is the best way for students to gain not only practical research experience, but also self-confidence in the ability to

instantly – so much for the five-second rule. Bacteria spread the best on the tile flooring, with just about 70 percent of the floor bacteria population transferring onto bologna and nearly half onto bread. Biological sciences major Paul Landeene mentioned, “I was impressed with what I learned, but even more impressed by the faculty’s effort to involve and inform all the team members.”

When the team looked into drinking milk directly out of the carton, the results were astonishing. Typically, milk spoils in the range of 100-1000 CFU/ml (colony forming units, that is, the number of bacteria that could form colonies). Already ten days into the experiment, there were roughly 400 CFU/ml in the carton that had been directly drunk out of, well into the spoiling range. This was more than eight times the number of bacteria found in the milk carton that had been consumed using cups. Although drinking straight out of the carton may not always make you sick, it will surely make your milk go bad sooner.

More recently, the team tackled a frequent topic of debate at parties – whether or not double-dipping is okay. They found that sauces that had been dipped in once had less than 10 CFU/ml; however, sauces that had been double-dipped in were far more contaminated. Thinner sauces seemed to pick up the most bacteria from double-dipping, such as salsa, which had nearly 1000 CFU/ml from double-dipping.





Still, other favorites such as cheese and chocolate were not free from the double-dipping bacteria party, with roughly 160 CFU/ml and almost 200 CFU/ml, respectively.

The most recent Creative Inquiry team examined the yearly tradition of blowing out candles on the birthday cake. On the small cakes that still had their candles lit, there was on average 200 bacteria capable of forming colonies while the cakes that had their candles blown out had roughly 3000 bacteria. Now who wants some cake?

The next time you're thinking of picking up that dropped chip, just don't do it. These projects have shown that some food myths

simply aren't true. The studies by this Creative Inquiry team have already helped to improve public health and awareness, but what will they look at next? Whether it be if worms really do drill holes through apples or how bad sharing a drink is, this Creative Inquiry team is sure to find where the bacterium lies. ■

“...bacteria *Salmonella typhimurium* could survive for up to four weeks on dry surfaces and still be transferred onto food.”

## Meet the Decipher Team!



Thomas Larrew graduated from Clemson in May 2012 with a degree in Biochemistry. He was a member of the Calhoun Honors College and graduated with both general and departmental honors. He was the president of Alpha Epsilon Delta Pre-Professional Health Honor Society and a participant in Clemson Project Remedy as well as other organizations. He conducted research in the fields of transgenetics, neuroscience, and tissue engineering. He is attending medical school at the Medical University of South Carolina. In his down time, he enjoys being outdoors, hiking, music, and racquetball.

# The Change Change: Developing a New Water System in Haiti

By Thomas Larrew

**FIVE THOUSAND CHILDREN A DAY** or 3.5 million people a year – that’s the number of lives that could be saved if the whole world had clean water. Here in America this basic necessity is often taken for granted, but in places like Haiti, easy access to water isn’t guaranteed. Haiti, a nation recently afflicted by natural disasters and disease outbreaks, ranks among the lowest for clean water availability. Only 46 percent of this island nation’s population has access to potable water. Determined to make a difference, Creative Inquiry students and Clemson Engineers for Developing Countries (CEDC) banded together to address this serious situation.

The project team is designing and building water-delivery systems in rural areas of Haiti, starting with the town of Cange. Faculty adviser and professor of Civil Engineering Lance Bell says, “The women are hauling water up an 800 foot incline with buckets on their heads. And that’s pretty much what they do all day long just to sustain themselves.” Clemson sent six delegations of students to survey for the design and to interact with the locals.

The town of Cange had an outdated water system that was built for a maximum of 2,000 residents, but with a population of 8,000 and no water treatment center, its water system was swimming with harmful pathogens. Not only did the team consider

how to create a facility with enough power to pump water to and throughout the city, they devised a way to filter and purify the water. A combination of UV disinfection and cartridge filtration has made the water fresher than ever. Physicians in Cange say that the clean water has cut their patient load in half.

The people of Haiti have had a real impact on the lives of the students. With a little bit of teamwork and a lot of engineering knowledge, the team completed a project that touches the lives of many Haitians. The people they helped were deeply thankful, but the students also gained something else: a true, lasting appreciation of other cultures.



Members of this student-led team worked with private engineering firms and raised almost \$10,000 to fund the project. For this hard work and ingenuity, the CEDC received the prestigious Commission on Higher Education Service Learning Award, an annual honor given to a public four-year college for “a meaningful service learning opportunity” that incorporates academic learning with service to the community.



During the summer of 2012, six team members were able to travel to Haiti with their faculty adviser and an industry adviser to dedicate the new water system they designed and created. “This week is going to be a myriad of ceremonies, dedicating things from cisterns to the pump house and all the different technologies that are supplying water to Cange,” said Jennifer Ogle, the team’s adviser from the civil engineering department.

The final project in Cange included nine fountains and showers, four cisterns with a total capacity of 200,000 gallons and pumping system that can deliver 144,000 gallons of water a day. This water is able to travel up an elevation of 1,100 feet through nearly two miles of pipelines.



Clemson Engineers for Developing Countries have taken this impressive project to the next level: starting to design and build housing and other infrastructures throughout Haiti. And they don’t plan on stopping there. As long as there are worldwide needs and the will to help, the efforts of the CEDC will span the globe. ■



# The Science Behind Simulations: Injecting New Possibilities into the Medical Field

By Rachel Wasylyk

**A YOUNG NURSE, NO OLDER THAN 25**, extends her trembling hand – ready to inject you with a needle. You squirm away, not comforted by the fact that the first person she is performing this procedure on is you. Although this may sound like an unlikely scenario from a nightmare, many medical students complete their initial trials, like injections, on living humans. While medical simulators exist on the market, many are outrageously expensive and do not accurately mirror the anatomical and physiological characteristics of humans. A team of bioengineering undergraduates is currently working to redesign medical simulators, and ultimately improve the care given to future patients.

The Creative Inquiry team, under the guidance of Dr. Delphine Dean, is attempting to radically change the world of medical simulators. The group's undertakings include reverse engineering of existing models to determine current problems, as well as creating new devices and improving older ones through the addition of new technology. The team is looking to build simulators that

Of these, more than 15% result in complications that cost as much as a combined \$2.17 billion per year.

This Creative Inquiry team has designed a CVC simulator that includes a rotatable head, a platform, and a puncture pad that resembles flesh and includes all of the correct bones and vasculature. This new technology will help physicians improve their techniques in a low risk environment.

The doctors aren't the only ones that are learning something new. Basic teamwork was essential amongst the undergraduates on this project in order to accomplish their goals. Many top students are able to handle entire group assignments on their own, without delegating tasks to other members. However, with a project this size, students needed to learn each other's strengths and rely on their teammates to follow through with every task. Eventually, this led to a delicate balance of trust and hard work, important skills that every college student should learn before graduating.



“Suddenly the project was ... a living entity that needed to be protected, promoted, and modified to grow successfully.”

are more accurate at mimicking the responses of the human body, while remaining inexpensive and user friendly.

Many procedures performed on humans are risky and can cause various complications. By using these simulators, caregivers will be able to practice medical techniques in a low stress environment. This removes many dangers that trial patients face today.

The team is currently focusing on the central venous catheterization (CVC) simulator. During a CVC, drugs are inserted into a person's heart using a catheter tube that enters one of the large veins in the neck. According to an article from the New England Journal of Medicine, physicians perform more than 5 million CVC procedures in America every year.

A junior undergraduate student on the team, Nadine Luedicke, explained that, “Being a part of a CI is a hands-on educational experience completely different than any class room experience. Learning is fast paced, individual, and not restricted.”

In addition to creating medical simulators, the team was able to experience entrepreneurship first-hand as they developed their own business and applied for a patent on their project. Molly Townsend, a senior student on the team, stated, “This has given me a leg-up on the rest of my competitors when I graduate, understanding not only the engineering aspects of a problem, but also the business, legal, and financial aspects.” This Creative Inquiry provided a way for students to step outside of their typical boundaries and delve into other areas of study.

Luedicke noted, “I have been pleasantly surprised that along the way I have learned so much about networking, business plans, finding donors, and the intellectual property process.”

The team has been presenting their work at career and entrepreneurship conferences over the past few years. In December 2010 they were awarded \$200 at the SCLaunchPad competition. They also placed 3rd for their poster at the SouthEast Biomedical Engineering Career Conference in Fall 2010.

Finally, in July 2011, they submitted a provisional patent for the final project design. The team was able to unite over these achievements, as well as develop a sense of pride and attachment to their project. When discussing her experiences at the conferences, Luedicke stated, “Suddenly the project was no longer just boring lab work, but a living entity that needed to be protected, promoted, and modified to grow successfully.”

Through this Creative Inquiry project, the students have learned in-depth bioengineering techniques, developed fundamental teamwork abilities, and broadened their skills into entrepreneurship. Townsend captured the team’s spirit best by saying, “When I graduate in the spring, I will have two patents, a paper, and a company under my belt. How many undergraduates can boast the same?” ■



“When I graduate in the spring, I will have two patents, a paper, and a company under my belt. How many undergraduates can boast the same?”

## Meet the Decipher Team!



Rachel Wasylyk graduated from Clemson in May 2012 with a degree in Biological Sciences and Communication Studies, earning both general and departmental honors as a member of the Calhoun Honors College. She was active in both Tri-Beta Biological Honors Society and Gamma Sigma Sigma, a national service sorority on campus. She was also a Supplemental Instruction leader in chemistry beginning in Fall 2009. Rachel is now working as the marketing coordinator for an architectural firm in Charlotte, NC. In her free time, she enjoys DIY crafting, volunteering, and spending time outdoors.

# Don't Judge a Book by its Cover: Camp Read-a-Rama

By Thomas Larrew

## WHAT STARTS WITH 'READING' AND ENDS IN 'FUN'?

Read-a-Rama! Camp Read-a-Rama is a program that gets kids from different backgrounds excited about reading. Launched in 2001 by Dr. Michelle Martin from the teacher education department, Read-a-Rama allows Creative Inquiry students to engage local children in an enjoyable, curiosity-nurturing environment. At each themed session, like "Campout!" and "Animalia," the undergraduate students read books to the kids, from Cinderella Penguin to Dora's Book of Words and everything in between. The Clemson students talk with the kids about the story to get them to start thinking critically, which is followed by fun-filled activities related to the tall-tale. According to Dr. Martin, "When every experience is tied to a book, it makes the transitions from book to life and back to book completely seamless. That results in lifelong, enthusiastic and committed readers."

In the 20-plus semesters of Read-a-Rama, the camp has touched the lives of hundreds of children. Kids become more eager to read while making new friends. With the young children coming from all different backgrounds, they also become more aware of other cultures and ways of life. A grandparent of one camper wrote, "Dear Dr. Martin, Well, the WOW factor is on for the Camp, and Read-a-Rama! Andrew loved the time spent with the other kids and the counselors, and is still talking about the hissing roaches! He is very much looking forward to next year."

Clemson students find themselves growing and learning, too. Students in this Creative Inquiry project get a taste of the teaching profession and, perhaps, some inspiration to keep working towards their goals. Clemson student Gabrielle Cloonan noted, "During the semester it is easy to get bogged down with the negative sides of the education profession, but seeing parents and children excited for books, stories and education really reminded me why I want to be a teacher."

Working with the children isn't all about teaching them. The work is inspiring for the undergraduate students, as well. Lauren Freeman explained, "Working for Camp Read-a-Rama has allowed me to apply knowledge I gained in my classes in a real world



setting in hopes of inspiring kids with a love of reading. Because children's literature is woven into all our activities, this passion for reading is everywhere and it's infectious! It is amazing to see readers with varying ages, abilities, and backgrounds come together over a common enthusiasm for books."

What started out as a way to encourage children of disparate backgrounds to read has evolved into much more. Clemson students interact with kids and have a real impact on their lives. Team member Rachel Warren sums up the value of her experience and the program itself, "Read-A-Rama taught me that spreading the joy of reading is one of the greatest ways to brighten someone's day and your own. It also showed me that if you have something you are passionate about, you should pursue it. Read-A-Rama is making a big difference in the community because someone decided to spread their love of books to others." ■



# Creative Inquiry Project Results in Kennedy Center Award for Playwriting

By Anne Jenkins

**MARK CHARNEY, CLEMSON UNIVERSITY'S RESIDENT PLAYWRIGHT AND DIRECTOR OF THEATER**, is the 2010 recipient of the David Mark Cohen National Playwriting Award given by the Kennedy Center American College Theatre Festival, the Association for Theatre in Higher Education and Dramatic Publishing Co.

The award is in recognition of Charney's latest play, *The Power Behind the Palette*, a drama developed as part of a performing arts department Creative Inquiry project. It premiered in November 2009.

The Creative Inquiry team was led by professors Mark Charney and Rick Goodstein, both of the performing arts department, and included undergraduates Jeffrey Russell, Ryan McCrary, Andrew Herrera, Aimee Pavlich, Lindsay McCullough, Ashley Wood, Chris Onken, Terry Brannen, Cassidy Fishman and Rebecca McBride.

The play explores the interests, arguments and struggles of Ambroise Vollard, delving into the mystery surrounding his death and the inevitable conflicts between commerce and arts. With original writing, scenery, costumes, lighting and music — all conceived by students and faculty in performing arts, music, history, visual arts, philosophy and English — the production is a brilliant example of how Creative Inquiry intersects all disciplines at Clemson.

The David Mark Cohen National Playwriting Award is presented to promote the writing and production of new plays while honoring and perpetuating the memory of David Mark Cohen, a professor of playwriting at the University of Texas-Austin.

As the winner of the 2010 Cohen award, Charney receives a \$1,000 cash award, in addition to a professional reading at the national conference of the Association for Theatre in Higher Education and an offer of publication by Dramatic Publishing. ■



# Raise Your Glass: The Connection Between Brewing and Driving

By Danielle Tom

## IT'S A THURSDAY EVENING IN DOWNTOWN CLEMSON.

The night is young, and many students are enjoying one of their favorite beverages. Alcohol flows as the lifeblood for many a college party, but the mechanics behind its production could yield new frontiers in the future of renewable energy. In its second semester, Dr. Terry Walker, Dr. Tim Teitloff, and David Thornton's Creative Inquiry takes students through the process of zymology, the science of fermentation.

The team is an interdisciplinary combination between the School of Agriculture, Forestry, and Environmental Sciences, Mathematical Sciences, and Environmental Engineering and Earth Science. Students first learn the basics of home brewing beer, then how this technology can be applied towards producing green energy.

Zymology is the science underlying ethanol production, which can be either a popularly consumed beverage if you're 21 and older, or a biofuel commonly found in your gasoline tank. David Carey, a junior chemical engineering student, explained his passion for the project by stating, "As someone who likes beer, loves science, and has a particular hankering for fiddling with experiments, I couldn't wait for the chance to combine the three into a delicious, illuminating, and personally intriguing venture."

When most people talk about biofuels, they typically think of ethanols derived from corn and soy. The problem lies in the fact that corn and soy are also food products, so the next step is to make ethanol out of materials that don't compete with other consumption needs. Nonfood plants include corn husks, pine straw, and switchgrass. The problem with using these other materials is that they contain a compound called lignin, which is tougher for yeast to digest and ferment.

Various methods are being researched in the bioenergy field to make lignin easier to process, including pressing the plant matter into a pellet or applying different types of pretreatments.

This Creative Inquiry started as a spinoff of the Green Energy and Biodiesel project. Before coming to Clemson, David Thornton previously worked on biorefineries for biodiesel. There, he met people in the grassroots biofuels movement who were developing small-scale biodiesel production systems for farms with common equipment. Since arriving at Clemson he has explored

developing similarly affordable small-scale biorefineries for ethanol production. Carey noted, "Beer, and ethanol in general, plays a large role in today's society (in the forms of alcoholic beverages and sustainable fuel sources), but this is nothing new."

Ethanol can be burned directly in gasoline engines, or can be reacted with plant-based oils for a completely renewable biodiesel fuel. While the team doesn't

have a model yet for ethanol production, the process is very comparable to something students might recognize: brewing beer. Both processes use similar methods.

These include preparation of plant matter, using enzymes and yeast to convert sugars to alcohol, analytics, temperature control, and sanitization. Starting materials for both are plant products, as beer uses barley and millet. For ethanol production the research team is testing sorghum, loblolly pine, switchgrass, and sweet gum grown at the Pee-Dee Research Station in Florence. Distillation further refines the product to make ethanol.

The team initially began by focusing on methods for converting starch into more usable sugars and monitoring the process. Recently, the students began working on designing and building



an open-source model that can be scaled to the user's needs for semi automated production of 12-gallon batches of ethanol. The students design all of the equipment to FDA standards, including the processing vessel, stands, programming, and controls. Thornton says, "The idea of 'open-source' is sort of a collaboration of the University and Grassroots missions of creating accessible knowledge for wide-spread implementation of renewable energy solutions. All of our designs will eventually be posted to our website and blog."

In addition to producing a scale-up refinery, the team hopes to produce enough ethanol to completely displace the methanol currently used in Clemson's biodiesel production. "This will result in a 100% domestically produced renewable fuel with high energy content and better cold flow performance over our current methyl ester biodiesel," says Thornton. Because of the nature of this Creative Inquiry, students are required to be 21 or older to participate. ■



“As someone who likes beer, loves science, and has a particular hankering for fiddling with experiments, I couldn't wait for the chance to combine the three into a delicious, illuminating, and personally intriguing venture.”

## Meet the Decipher Team!



Danielle Tom graduated Clemson in May 2012 with a Genetics major and Music minor. She has had a lifelong interest in both biological science (particularly animal science) and music. She played clarinet in Tiger Band and was active member of Kappa Kappa Psi, the national honorary band fraternity. Danielle is also fascinated by the growing world of science blogging as a communication medium between researchers and amateur scientists. She plans on attending graduate school studying either bioinformatics or phylogeny after graduating in August 2012.

# The Early Bird Might Not Get the Worm

By Briana Kloc

**HUMMINGBIRDS DISAPPEAR IN THE WINTER** and return in the springtime, hovering outside your window while drinking from a bright red feeder. Chirping birds are a sign that spring has finally arrived, shortly followed by blossoming trees and warm weather. However, as global climate change becomes a great concern in our society, science studies show that these natural cycles are changing. A Creative Inquiry team from the forestry and natural resources department is examining the spring arrival dates for several bird species to see how they compare with climate changes.

This Creative Inquiry team, led by Dr. Jason Courter and Dr. Ron Johnson, analyzes data compiled from both researchers and thousands of everyday people who call themselves citizen scientists. These volunteers, who may or may not have scientific backgrounds, contribute to databases by providing their own observations in nature. This citizen science method allows for a large collection of data by enthusiastic individuals over many geographic regions.

The Creative Inquiry team has compiled over 80,000 bird arrival dates, thanks to citizen science volunteers from the programs Journey North (1997-2010) and the North American Bird Phenology Program (1880-1969). Dr. Courter comments that the most rewarding aspect of the project is “working with students, watching creative ideas emerge from group discussions, meeting and networking with enthusiastic and knowledgeable contributors to various Citizen Science project, and showing students that they can meaningfully contribute to our understanding of large-scale ecological processes that affect us all.”

Ruby-throated hummingbirds are one of the birds that the team is focusing on. Their spring arrival dates are being compared to climate data from U.S. weather stations. The team has found that hummingbirds in the Eastern United States are arriving two weeks earlier than they did a century ago. Unsurprisingly, this corresponds with the recent trend of climate change. So what’s the harm of changing migration dates? While the temperatures are favorable for the birds, the major concern is that their food sources aren’t changing at the same pace. This poses a huge problem if the birds continue to arrive earlier, and the plants or insects that they typically consume are not available.

Climate change is not the only factor this group is considering, however. While the changing climate appears to be playing a role

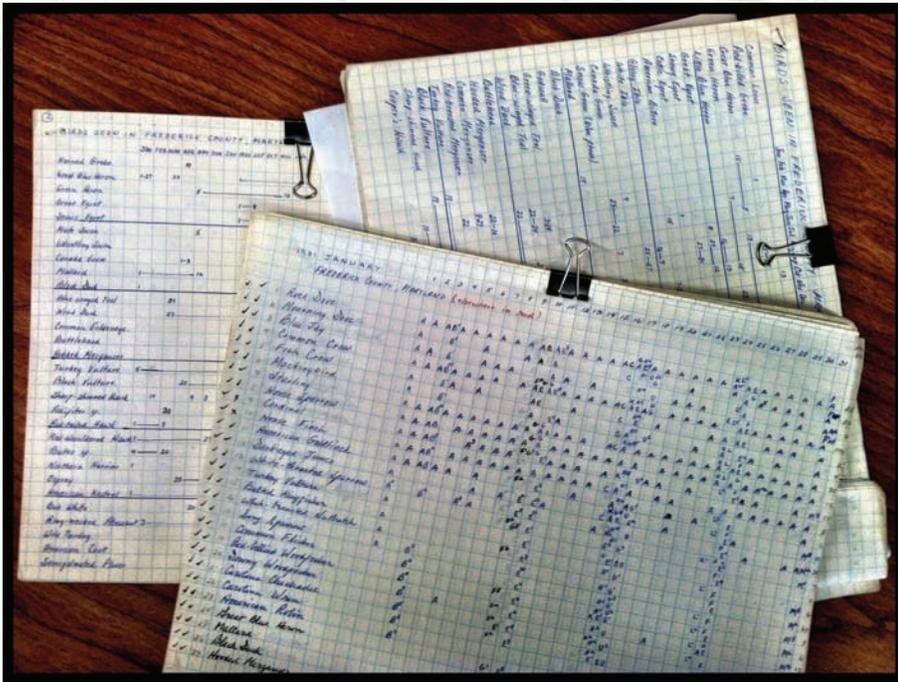


in bird migration, the Creative Inquiry team is also curious how backyard bird feeders are influencing arrival dates. Bird feeders are a reliable food source that may influence the places that birds frequent. Another aspect the team is examining is how often first arrival dates are reported on weekends by citizen scientists. Citizen scientists are much more likely to go backpacking, bird watching, or sit in their backyard on a weekend where they could notice the birds. Since weekends fall on different days each year, it’s important to see how this affects citizen scientist data. Additionally, the team is analyzing if food resources are changing as the bird migration patterns shift.

Corissa Boaman, an undergraduate who has been on the team for a number of semesters, noted, “My favorite aspect of this Creative Inquiry is getting all this new data that has never been looked at before, analyzing it, and working together as a group to figure out what everything means.” These students aren’t just analyzing data, though.

The group attended the 2012 Carolina Bird Club Winter meeting in Southport, NC, to present their results. They got the opportunity to give a survey about how citizen volunteers report the information they collect. While on this trip the group also enjoyed bird watching with an expert, seeing over 80 species of birds, including the federally endangered Red-cockaded woodpecker.

Team members strongly encourage anyone who appreciates wildlife and nature, ranging from hummingbirds to tulips to gray whales, to participate in a citizen science program such as eBird ([www.ebird.org](http://www.ebird.org)), Journey North ([www.learner.org/jnorth/](http://www.learner.org/jnorth/)), or Project Budburst ([www.neoninc.org/budburst/](http://www.neoninc.org/budburst/)). This project demonstrates that everyone can play a role in science and how valuable citizen scientists are in the natural sciences. ■



## Meet the Decipher Team!



Juan Villamizar is a senior Graphic Communications major at Clemson University. A native of Colombia, he grew up in Charleston, South Carolina. He is currently doing research on digital proofing and calibration techniques. He appreciates the creative aspects of prepress, and enjoys creative writing and photography. He spends his free time listening to music and playing strategy games against South Koreans. At home, he plays soccer and frisbee with his friends and family.

# The Next Performance Enhancing Drug: Sleep

By Thomas Larrew

**WE'VE ALL BEEN THERE:** slouching down in class, trying to peel your eyes open, suffering from that all-nighter. Especially in a college setting, sleep deprivation can be a normal part of life. Whether it is before a big exam or a project deadline, some people remain awake long after their normal bedtime to finish their work.

Although it is no secret that without a good night's sleep it is difficult to perform to the best of our ability, the effects of sleep deprivation on different types of performance variables are not well understood. Students participating in the Creative Inquiry team led by Dr. June Pilcher from the Department of Psychology are investigating the effects of sleep deprivation to better understand how sleep loss affects performance.

Dr. Pilcher's Creative Inquiry team has completed both partial and total sleep deprivation studies. The partial sleep deprivation study allowed participants to sleep at night for about four and a half hours and then complete tasks during the day. The total sleep deprivation studies required participants to remain awake overnight while completing tasks. In both types of studies, the participants completed a variety of tasks multiple times to assess changes in their performance due to sleep deprivation.

Testing participants during the day after limited sleep at night simulates partial sleep deprivation as experienced by many adults who voluntarily sleep less at night. Testing participants during the night simulates working night shifts as well as students attempting to study during an over-night "cram-fest." In both types of sleep deprivation studies, subjects became less engaged and had a decreased attention span. Performance on tasks that were less interesting (e.g., vigilance tasks such as driving a car) or tasks requiring active effort (e.g., focusing on a short term memory task) decreased under sleep deprivation conditions. Overall, the partial sleep-deprived participants performed better on the tasks than the total sleep-deprived participants; however, even partial sleep deprivation resulted in decreased performance on many of the tasks.



According to Dr. Pilcher, "What we are looking for is how we can best cope with sleep deprivation. This is particularly important under shiftwork conditions as seen in many health-care and industrial settings when the worker must be awake and functioning at night."

The Creative Inquiry team completed several studies examining reaction time and the ability to make correct choices in memory tests under sleep deprivation conditions. The team found that sleep-deprived students had slower reaction times. They were often less accurate especially on tasks that were not particularly interesting. Dr. Pilcher's team also studied the effects of sleep deprivation on language. A sample of non-native and native English speakers was evaluated. High level language processing, such as reading comprehension, was negatively affected under total sleep deprivation conditions. Meanwhile, lack of sleep had little to no effect on more basic language processing, like antonym identification.

When we think of sleep deprivation in real world settings (such as hospitals), it becomes important to consider if we can predict the effects of lack of sleep on performance. The Creative Inquiry team has completed preliminary studies to investigate this issue. They found that pupil diameter and saccadic velocity (how fast the random movements of the eyes occur) were predictive of change in performance under sleep deprivation conditions. The team theorizes that the slowing of the eye movement and pupil dilation may provide good indicators of excessive sleepiness and performance decrements found under sleep deprivation conditions.

The results found in the studies completed by Dr. Pilcher's Creative Inquiry team are useful for college students as well as society. Undergraduate Kristen Jennings noted, "Our sleep deprivation studies have provided valuable insight into the demands that sleep loss can place on individuals trying to complete various tasks. Recognizing how stress and fatigue can affect cognitive functioning and physical health is very applicable for college students and real-world workers with lifestyles commonly characterized by busy schedules and not enough sleep." All this goes to show that maybe you should just sleep on it. ■

# Raising Political Awareness

By Raquel Cobb

**SEVEN CLEMSON UNIVERSITY STUDENTS AND POLITICAL SCIENCE PROFESSOR COLIN PEARCE** attended the Association for Canadian Studies in the United States (ACSUS) Biennial Conference held in Ottawa, Canada.

The Creative Inquiry group, the only student presenters at the conference, showed their research on comparative political symbolism to the association panel. In it they observed and analyzed the response to political symbols in various countries, including Canada, the United States and Mexico. Led by political sci-

ence professor Michael Morris, student participants included Kristen Bender, a sophomore in global politics; Clair Dias, a sophomore in architecture; Brittany Ryan, a senior in political science; Jenny Tumas, a sophomore in communication studies; Leah Davis, a junior in political science; John Cassil, a junior in management; and Nicholas Baulch, a senior in language and international trade. All are students in Clemson's Calhoun Honors College.

The Association for Canadian Studies in the United States is a multidisciplinary membership-based organization commit-

ted to raising awareness and understanding of Canada and the bilateral relationship with the United States. The association supports research and academic activity through its publications, conferences and grant programs and promotes the academy through active advocacy and outreach.

The academic community plays an important part in helping the association educate policy-makers and the public-private sectors about the economic, political, trade, security, defense, environmental, technological, scientific and cultural dimensions of Canada-U.S. relations. ■

"Being a part of Creative Inquiry has taught me lessons of greater value and practicality than I ever could have gleaned from a textbook. It has provided me with real-world opportunities to collaborate with a team, balance responsibilities, communicate effectively with different personalities and learn more about how to lead and follow." -Alicie Wilson

## Meet the Decipher Team!



Alex Peterson is a Fairfax, VA native. Wanting to pursue her ambitions of being a graphic designer, she applied and was accepted to Clemson University's Graphic Communications program. She completed three internships during her education, as well as over 150 freelance hours. She graduated in August 2012 and is currently employed as a graphic designer at Erwin Penland in Greenville, SC.

# Teaching to Learn: Improving Science & Math Education for Kids

By Danielle Tom

**IT'S A TYPICAL SCHOOL DAY:** students sit at their desks, keep a close eye on the clock, scribble notes, and try to stay awake. After the lecture ends, how much information will be retained? Will the students even care about the topics discussed? Perhaps a more hands-on approach might give the information the power to stick. A Creative Inquiry led by Dr. Neil Calkin, Dr. Nicole Bannister Sinwell and Dr. Cassie Quigley plans on adapting a learning method from India and integrating it into South Carolina schools as a way to improve STEM (Science, Technology, Engineering, and Mathematics) education.

Currently, there is a lack of informal education; children learn topics formally in school, but not in an engaging or applicable method. In lower grades, teachers may even feel unqualified or uncomfortable teaching certain topics. Some for-profit programs exist for informal learning, but they tend to be expensive, which excludes a wide array of students.

The Agastya Foundation is a movement in India founded by entrepreneurs, educators, and teachers aiming to revitalize India's primary and secondary education using an affordable model that

“Team member Mary-Kate Spillane describes it as a ‘science experiment bookmobile’ traveling to different schools to teach experiments. The team will explain to the students how and why experiments work.”

This project, from the mathematical science and teacher education departments, looks at applying the Agastya method of learning to formal and informal STEM education. STEM topics are a major focus of many schools and government programs. According to a 2006 study by the United States National Academies (which include the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council), STEM education in the United States appears to be declining. Therefore, figuring out how to encourage learning in these fields could reverse this trend. An increase of interest in STEM topics is crucial for developing future engineers and scientists.

can be utilized in a variety of settings. Dr. Calkin uses a learning pyramid to describe the method: people only remember 5% of lectures and 10% of what is read, which is how most STEM classes are taught. People will remember 50% of what they see and hear, 70% of what they discuss with others, 80% of what they experience, and 90% of what they teach. Based on this pyramid, the Agastya method begins with teachers showing students how to complete basic science experiments. These students in turn teach other students how to perform these experiments. In some instances, a school will have a “Science Day” where students demonstrate what they learned to their parents.

The Creative Inquiry team is working to provide hands-on experience. Team member Mary-Kate Spillane describes it as a “science experiment bookmobile” traveling to different schools to teach experiments. The team will explain to the students how and why experiments work. A week later, these students will teach other children at a science day. “The light in their faces was beautiful to behold,” remarks Dr. Calkin about similar Science Days he saw in India. The team has spent the last two semesters planning and getting permission from schools to test this program, and finally began at Pendleton Elementary in May 2012. ■



Learn more about the Agastya method at [agastya.org](http://agastya.org)

# Hatching Urban Furniture for the Streets of Asheville

By Max Sewesky

**CLEMSON UNIVERSITY ARCHITECTURE STUDENTS ARE BEGINNING FINAL CONSTRUCTION** on a unique piece of urban furniture: The HATCHpad, which will find a temporary home on the streets of Asheville, N.C.

The project is part of a Creative Inquiry project directed by Doug Hecker, an associate professor of architecture at Clemson and the co-founder of fieldoffice, a nationally recognized interdisciplinary design studio.

The piece is being assembled with layers of rigid foam into a small outdoor room. The interior space has cave-like contours, which will provide space for ventilation and seating. The HATCHpad also will feature integrated iPads, speakers and projectors, which will display information and pictures about HATCH and the creative arts.

The team is building The HATCHpad in anticipation of HATCH, the project's namesake and a biannual creative arts festival held in Asheville. HATCH promotes

the flow of ideas and inspiration between professionals and enthusiasts, specifically those within the architecture, film, music, photography, fashion, journalism and design-technology disciplines.

The festival will take place April 14-17. The HATCHpad will serve as a bus stop and information hub, and because of its uniquely modern design, it also will function as an iconic gathering place for the citizens of Asheville and those attending HATCH.

The HATCHpad team is comprised of seven students working under Hecker's guidance. The students meet with Hecker twice a week to review their progress and work to complete the project.

"It's really just a constant process of evolution and refinement," said Brittany McGraw, a sophomore member of the HATCHpad team. "We bring in a new model and construction documents at the start of each week, and by the next week we may have something drastically different."

"HATCH has opened up many new learning experiences for me," said Rebecca Mercer, a junior HATCHpad team member. "I've learned to think about design from a construction point of view and how to give fabrication more consideration in my ideas." ■

More information about The HATCHpad is available on Facebook.

Information on HATCH is online at: [hatchexperience.com/](http://hatchexperience.com/)



# Cyberbullying and Beyond: Psychology in the Digital Age

By Zan Isgett

**THE OCTOBER 2006 SUICIDE OF 13-YEAR-OLD MEGAN MEIER** shocked parents and students nationwide. Meier, barely out of childhood and into adolescence, had felt such torment when a boy who had befriended her on MySpace.com suddenly turned on her, inflicting cruel remarks and public insults. According to subsequent law proceedings and police investigations, the boy was actually a mother-daughter team who had created the fake account to befriend and subsequently hurt Meier. Her story is just one example of many teen suicides attributed to cyberbullying.

Dr. Robin Kowalski, a professor in Clemson's Department of Psychology, works with a team of graduate and undergraduate students to investigate the relatively recent phenomenon of cyberbullying. According to Kowalski, the nature of cyberbullying differs from traditional bullying in two ways. First, there can be

“College cyberbullying victimization is associated with a myriad of psychological traits, including lowered self-evaluation, negative emotions, loneliness, depression, and anxiety.”

greater perceived anonymity on the Internet; perpetrators do not have to identify themselves, which can be very disarming for the victim. Second, the Internet provides continuous accessibility. Whereas a student is typically protected from traditional bullying once the school day ends, cyberbullying can occur at any time. Even if the computer or cell phone is turned off, messages can still be sent to the victim, and the victim knows that the information is there.

The Cyberbullying Creative Inquiry team has been working since 2004, and students have the opportunity to study multiple aspects of cyberbullying. One study conducted by the team has confirmed that, unfortunately, cyberbullying does not end with a high school diploma; about one in ten students have reported being victims of cyberbullying while in college. In fact, Dr. Kowalski and the students show that college cyberbullying victimization is associ-



ated with a myriad of psychological traits, including lowered self-evaluation, negative emotions, loneliness, depression, and anxiety. Brooke Baker, a junior Psychology major on the team, remarked that the research is so salient because “we constantly learn more about ourselves and people we’re close to.”

Students also assist in performing studies on the nature of cyber-communication. For instance, a recent study examined the willingness of participants to intervene in an incident of cyberbullying. For the experiment, researchers engaged in a scripted Instant Messaging chat room conversation with a participant, in which another “participant” (secretly a member of the team) was bullied by several others. In another set of studies, the team tested how participants reacted to either uncivil or sexually



harassing supervisors in the workplace. Participants were placed in a simulated work environment where they completed math problems for a “boss,” communicating solely via email. The rude, shocking, or sexually harassing comments caused participants to experience more negative emotions and feel less willing to work with their supervisor.

With so many different ongoing projects, it is no surprise that Dr. Kowalski’s students have presented their research at numerous conferences and even been published in several peer-reviewed journals, including *Journal of Positive Psychology* and *Progress in Transplantation*. Most recently, students have presented research at the 2012 Southeastern Psychological Association (SEPA) annual conference in New Orleans, Louisiana, and another regional conference in Johnson City, Tennessee. Clemson undergraduates on the team are frequent presenters at SEPA, where they have won a Psi Chi Research award, as well as national conferences, such as the one for the American Psychological Association (APA).

Currently, the team is beginning to explore different territory in psychological

research. They plan to extend their current research on cyberbullying to children and young adults with disabilities like dyslexia and ADHD. These groups face special challenges in the text- and stimuli-filled domain of the Internet, and may therefore be more vulnerable to victimization. In addition, the team is beginning to take on an entirely different topic: sports psychology. Reading papers on how a passion can become an obsession, the team hopes to eventually work with coaches at Clemson and sports medicine clinics to investigate the relationship between passion and sports.

Wherever the team may go with their research endeavors, the overarching goal of the team is to better understand how humans interact with the society and people surrounding them. “The Creative Inquiry team has opened my eyes more to the need of research in general,” stated Carrie Smith, an undergraduate on the team. “Hopefully,” Smith adds, “from conducting this research we will be able to have spread awareness and also help others to step up and take courage to protect the victim being cyberbullied.” ■

## Meet the Decipher Team!



Zan Isgett graduated from Clemson in May 2012 with a B.S. in Genetics. As a Clemson National Scholar, she had the opportunity to travel to the British Isles, Amsterdam, and Cape Town, South Africa. While some of her time is spent watching cat videos on the Internet, she also enjoys creative writing, DIY projects, board games, and dogs. She will be in the Social Psychology PhD program at UNC Chapel Hill in the fall of 2012, studying gene-environment interplay.

# They're Watching You: Conversation Analysis in Social Media

By Rachel Wasylyk

**UPDATING YOUR FACEBOOK STATUS AND ADDING PICTURES FROM YOUR WEEKEND TRIP** might seem like typical college activities, but there may be a lot more to these tasks. A new Creative Inquiry team is collecting information presented in social media outlets and analyzing how this material will affect numerous aspects of society, from businesses and stocks to law enforcement.

The team, led by Dr. Jason Thatcher, is using a Social Media Listening Center (SMLC) to collect what is communicated through social media sites, including Facebook, Twitter, YouTube, and LinkedIn, as well as various blogs and online social communities. Clemson University was the first campus in the United States to start a facility like this. The SMLC is a collaborative effort through Dell, Clemson University, and Salesforce Radian6, the platform for the program. The center uses six large screens to

“There are three things in life that I absolutely love: technology, statistics, and social media. Luckily for me this project hits all three of those passions.”

monitor thousands of conversations that are taking place online in real time. Dell provided the advanced technology, while Clemson offered them the opportunity to use this system in an academic setting. Salesforce Radian6 allows the students to track, monitor trends, and analyze discussions taking place in social media posts and comments.



In order to obtain the best results, the team works on building “profiles” using important and specific keywords. Senior Heather Woodward notes, “It isn’t easy. You have to put a lot of time and effort into your projects. If you have ever tried to use Google to search for something really specific, you have a small idea of what we do! You have to be persistent if you want to get any relevant results from your search.”

After capturing and compiling target conversations, the students work to filter, sort, and prioritize the information. While these collection procedures are interesting enough, students are taking it further and applying the results to real-life situations using analytical tools in Microsoft Excel. Woodward explains, “Social media is the great unknown in the marketing world.

No one is really sure how much it helps or hurts a company. It is important to analyze it and understand it so it can be used

correctly.” Most importantly, students are learning to monitor trends that arise from over 150 million sources of social media discussions.

The Creative Inquiry team is broken into numerous small teams that are working on independent projects simultaneously. For example, one group is currently analyzing comments about companies, like Nissan, to predict stock market changes. Another group is working with a local emergency line to set up a program that can help track or report crime. What have these efforts taught the students? “Be careful what you post! If we can formulate a search that can help find criminals, then your potential employers can probably find you,” Woodward advises.

The team is divided into two main sections based on levels of expertise, but they work in collaboration to learn and gain insight from each other. Students involved in this Creative Inquiry are majoring in a variety of disciplines, including marketing, business management, computer science, and engineering, among others. Kyle LePrevost, a student on the team, noted, “There are three things in life that I absolutely love: technology, statistics, and social media. Luckily for me this project hits all three of those passions.”

Through the real-time insight that this project provides, the students are able to use highly advanced technology to track conversations in numerous social media outlets on the internet. Businesses can use

this information to tailor their product line or marketing strategies, as well as determine the common public opinion of their company. While students are able to track information about major corporations, another question comes into view: where do we draw the line on the invasion of our privacy? ■



# More than Just a Walk Through the Park

By Briana Kloc

**IF YOU'VE NEVER VENTURED THROUGH THE SOUTH CAROLINA BOTANICAL GARDENS**, you should make plans to go there as soon as possible. It's not just because of the fluttering butterflies, the vibrant daffodils, or the splashing ducklings, either. You're in for a unique treat with some of the beautiful nature-based sculptures this garden features. A Creative Inquiry team is spreading this secret to the community. The nature-based sculptures scattered throughout the South Carolina Botanical Gardens are little-known treasures that this team is trying to publicize.

The Nature-Based Sculpture Program (NBSP) at the SC Botanical Gardens is one of the largest of its kind. This program boasts 15 sculptures scattered throughout the gardens with names like the Crucible and the Clemson Clay Nest. Since 1995, international artists have designed the sculptures, and volunteers construct them using natural materials. Unlike typical museum displays, these pieces of art leave much of the interpretation up to the visitors since there are no plaques or descriptions next to the art. There is no map guiding visitors to these sculptures, and often they are stumbled upon unexpectedly.

The students in this Creative Inquiry are participating in multiple projects to promote these natural sculptures with the help of Dr. Dylan Wolfe, a professor in the communications department.

“Because these sculptures are completely outdoors, they are dynamically changing.”

Because these sculptures are completely outdoors, they are dynamically changing. Students keep an archive of how these sculptures have changed over time and find ways to display this information to the public. They are accomplishing this by publishing a book, *Format is Message*, and peer-reviewed articles. The team is also focusing on service learning and is currently promoting the Moonlight & Magnolia Ball, a new gala fundraising event that supports the Botanical Gardens in creating a new Natural Heritage Garden.

Promoting the NBSP online is one of these students' most well-known activities. Their website, [NatureBasedArt.org](http://NatureBasedArt.org), is an online resource that teaches others about the sculptures around the Botanical Gardens. Students who work on the website learn how to use HTML, Wordpress, and Platform Pro in order to publish

information on the artists, sculptures, and history of the NBSP. They also have a WikiSpaces website for their digital archive. This collection of images allows anyone to search through the history of these artworks at their leisure.

Molly Ashforth, a student who has been working with Dr. Wolfe for two years, says that the most rewarding aspect of this project is allowing people to see parts of the Botanical Gardens that they did not even know existed. In addition, she has learned the particulars of website publishing, event planning, and fundraising, which will be valuable assets after graduation. While she has no favorite sculpture, she noted that most people favor the sculptures that serve an obvious purpose, such as the Earthen Bridge. Another student on the team, Hannah Allison, has a personal connection with the sculpture *Natural Dialogue*. “I grew up in Clemson, so I have tons of childhood memories playing in the creek by the sculpture and pretending it was me and my brother's fort,” Allison explains.

There haven't been any new sculptures in the Botanical Gardens since 2007, but with enough involvement, these students believe that the construction of sculptures can be continued in the future. For now, these nature-based sculptures provide beautiful scenery as they make up the natural aesthetics in the gardens. ■



# You've Got a Friend in Me

By Rachel Wasylyk



## FIFTEEN STUDENTS PLUS NUMEROUS CLEMSONLIFE MENTORS EQUALS ONE LIFE CHANGING EXPERIENCE.

Going away to college is a luxury that isn't available to many students with intellectual disabilities. However, with Clemson's unique program, students are offered the opportunity to gain postsecondary experience in a welcoming environment. The interim program director, Sarah Conklin, stated that "Typically, the statistics are low for adults with intellectual disabilities who live outside of their parent's home and have full-time employment. So this kind of program is building to change that and help those students."

The modified curriculum consists of courses specifically designed for the ClemsonLIFE program. Students enroll in classes that prepare them to live independently, including functional literacy, budgeting, banking, social skills, and health and safety. The only Clemson University course that they take is a leisure skill, which helps them stay active and interact with others.

In addition to taking these classes, the students also spend 20 hours a week working an independent job. The program notes that "higher education can be a vehicle for increased self-awareness and can provide access to social networks, employment, and independence."

While being on a college campus is important, interacting with other students and forming bonds with peers is essential. This is where two Creative Inquiry teams are involved. While one group of Clemson students acts as peer mentors, the other group focuses on teaching nutrition and healthy eating habits. Leland Chandler II is a current RA in the program and has served as a mentor in the past. He comments, "ClemsonLIFE is where we grow. 'We' is used because not only do the ClemsonLIFE students learn, the mentors learn as well."

In the mentoring program, the Clemson students meet with their mentees on a weekly basis to guide them through the adjustment to college life. During these meetings, they focus on fundamental life skills, such as goal setting and problem solving. Additionally, the students get together for extracurricular events, which helps improve the social skills of ClemsonLIFE students. Conklin notes "It's the social piece that you really can't buy... having someone to go to a football game with, or go to a basketball game with, or just go to lunch with is really a priceless experience."

Led by Rita Haliena from the food, nutrition, and packaging science department, the nutritional Creative Inquiry group focuses on instilling proper eating habits and cooking skills in the students. People with disabilities often suffer from obesity and diabetes, due to sedentary lifestyles and poor nutrition choices. The Clemson students assist them with creating menus and grocery lists on a weekly basis. Then, they get together in the on-campus apartments to properly prepare all of the meals. This guided process allows the ClemsonLIFE students to pick up basic kitchen skills.

These Creative Inquiry teams are fundamental to providing ClemsonLIFE students with social experiences they will never forget. Conklin noted, "Parents say that even from when they drop their students off in August to when they come home at Thanksgiving, it's like a completely different child." Simply having that support system and emotional backbone from their peers is invaluable to the students. These Creative Inquiry teams are touching lives every single day. As Chandler stated, "There is power stored inside of the ClemsonLIFE students, and I have witnessed dreams being fulfilled." ■



# Can You Please Hold My Hand?

By Rachel Wasylyk

**ANYONE WHO HAS SPENT TIME WITH KIDS** knows it all too well – they never seem to sit still. This is especially true in a hospital, where children are surrounded by strangers, needles, and scary-looking equipment. Trying to complete routine tests can be problematic. That's where an interdisciplinary Creative Inquiry team can help. Led by Dr. Todd Schweisinger from mechanical engineering and Dr. Arlene Johnsen from nursing, the team is

The need for a pediatric arm stabilizer extends past simply restraining a child's arm during intravenous procedures. Today, children are required to lie down on their backs when work is being completed, because this is the easiest way to hold down their arms. However, lying horizontally can increase the level of anxiety in the patients. If the children were allowed to sit upright, they would be able to see everything that was taking place around



developing a pediatric arm stabilizer to be used in the Greenville Children's Hospital. These devices can be utilized on a daily basis when nurses are completing intravenous procedures on young patients between the ages of two and six years old.

This project began two years ago and has evolved into a unique multidisciplinary collaboration among students and faculty. It started when Dr. Schweisinger, who volunteers with the Make-a-Wish Foundation of South Carolina, offered his engineering skills to a fellow volunteer who works at the hospital. Having limited knowledge about pediatric care, he recruited Dr. Johnsen to join the team. The original Creative Inquiry was comprised of students from bioengineering, mechanical engineering, and nursing.

As the project grew more complex, they sought expertise from a marketing student. Dr. Schweisinger commented, "I've been surprised how valuable it's been to have the students collaborate. I think the teams could have done it individually, but there really was a synergy of having the collaboration. We are really all one team. We just have different areas of expertise among the students." The individual skill sets that students bring to the team are vital to attaining the project goals.

them, thereby reducing their stress. The arm stabilizing device allows the children to remain in a seated position throughout the entire process.

Additionally, this equipment reduces the number of nurses present in the room, since no one will need to hold down the child's arm during the procedure. Children at the hospital are taken out of their bedrooms and into a specific treatment room for intravenous work, which establishes their bed as a safe zone. However, these special rooms are often small and crowded. Removing a nurse from the room will not only lower the stress of the patient, it will also increase hospital efficiency as the nurses are able to focus on other tasks.

Keeping all this in mind, it was necessary for the engineers on the team to specifically design the arm stabilizer for this environment. They created the device on wheels, so nurses can easily maneuver it around the pediatric treatment room. They also designed it to be tall and narrow, so it wouldn't take up extra space in the tight quarters.

Finally, they created a clamp on the side of the device so it could be attached to a child's bed and stabilize itself between the bed

and the floor. This way, no matter how much the children squirm, they won't be able to interfere with the medical procedures taking place.

“I am definitely glad that I took part in this Creative Inquiry because it not only gave me experience in my major, but it gave me something to be proud of.”

This valuable feedback helped the team rework the original model. In addition to this testing, the nursing students played an important role in communication between the hospital and the engineers. Devin Walford commented, “As the sole bioengineering major on the team, I was able to understand both the engineering and healthcare side of the project and worked as a liaison between the mechanical engineering and nursing students.” The nursing students would then communicate the information to the hospital staff.

This Creative Inquiry team is looking forward to a promising future. The intellectual property sub-committee has granted a provisional patent for the device, which provides them with protection over the next year. The Clemson University Research Foundation

will move forward with the patent if there is interest from the private industry in licensing the system. The team is now reaching out to medical device manufacturers, specifically ones that are familiar with the FDA approval process, in order to get the machine developed for hospital use. Therefore, the engineers are working on creating a showcase device that can be marketed to these companies.

Dr. Schweisinger notes, “We have the design on paper and we think it will meet all of our criteria.” The Greenville Children's Hospital currently has access to both the prototype and the assessment

questionnaire results, and is planning to conduct further research on the team's device, as well. Once all of these processes are complete, the team hopes to see their device being used in the hospital system.

Meaghan Cote, a mechanical engineering student on the team, commented, “I am definitely glad that I took part in this Creative Inquiry because it not only gave me experience in my major, but it gave me something to be proud of.” For now, the team is working hard to help make their dreams a reality – and help settle the fears of young children in the hospital. ■



The engineers alone would have difficulties in determining these needed characteristics for the device without the help of the nursing students. Communication between the different departments was vital to the successful production of the pediatric arm stabilizer. After the initial prototype was complete, the nursing students created a questionnaire and evaluation process to determine any design issues that needed to be readjusted. The nursing faculty completed tests on the device to help pinpoint any potential problem areas.



# The Balloon Release: Pre-Game Tradition or Wild-Game Malnutrition

By Thomas Larrew

**CANNON BLAST. ROARING CROWDS. THE TEAM COMES DASHING DOWN THE HILL.** As this happens, thousands of balloons are released into the air. This scene is familiar to anyone who's attended a Clemson University football game. However, the fate of these latex balloons is something less well known. An interdisciplinary Creative Inquiry team is investigating what happens to these colorful little guys through a four-part project.

The team is conducting studies on the distance traveled by balloons, their rate of degradation, the impact on animals from balloon consumption, and the public opinion of the balloon release. Cyrus Baird, an undergraduate on the team, noted, "The Creative Inquiries are set up so that you can learn in a fun environment: no textbooks, no lectures, real learning with real results you can see, which is why they are so appealing. Easily one of the best

"The Creative Inquiries are set up so that you can learn in a fun environment: no textbooks, no lectures, real learning with real results you can see, which is why they are so appealing. Easily one of the best decisions I've made in my education career."

decisions I've made in my education career." The faculty advisors for this project come from a range of different backgrounds, including Dr. Stephen Creager and Dr. Melanie Cooper from the chemistry department, Dr. Webb Smathers from the economics department, Dr. William Bowerman from the forestry and natural resources department, and Dr. Stephan Irwin from the school of agriculture, forestry, and environmental sciences.

The pre-game balloon release is an event appreciated school-wide, but few Clemson students actually know the history behind this tradition. In the 1983 game against Maryland, more than 360,000 balloons were released to set a new Guinness record. Since all of the fans loved it so much, the custom has stuck. But is this tradition hurting the environment?

Although the balloons used by Clemson University are 100% biodegradable and, according to balloon companies, should not adversely affect the environment, the team took a closer look at degradation rates in different situations. It's important to remember that this research focused solely on natural latex balloons without any strings, ribbons, or plastic clasps, and the balloons were not tied together. The balloons degraded well in a variety of terrestrial environments, but took considerably longer in aquatic environments, raising concerns about their effects on marine life. To see if the balloons could travel as far as the ocean, the team used a combination of GPS devices to track movements. The balloons traveled a median distance of 23 miles, but two or three made it as far as 280 miles (the distance from Clemson to the shore is about 250 miles).

The team also found that around 80 percent of a balloon is left intact in large pieces after its release. These sizeable pieces are thought to take longer to degrade and are potentially more dangerous to animals. This outcome led to another segment of the study: whether or not animals will eat these balloon fragments and if ingestion has any health consequences. The team tested quail, red-eared sliders (a type of turtle), and channel catfish. Quail and catfish are common species used in risk assessment. After allowing the animals to digest the latex, specific analysis and blood work tests were completed. Overall, there were no blockages or indications of adverse effects in the animals. It's also important to remember that these animals were exposed to higher quantities of latex than typical animals in wildlife – and they remained unharmed.

Finally, the team surveyed two major groups of people. To understand attitudes about the balloon release, the team questioned about 200 people at Clemson football games. About 40 percent thought the balloons were harmful. Still, the majority of fans believed Clemson's pre-game balloon release is important to the whole football game experience. The team then surveyed over 100 federal and state natural resource officials, as well as non-governmental organization members. These included wildlife rehabilitation and rescue, nature education centers, and environmental groups stretching from Virginia to Florida. While these officials believed that balloons were probably harmful, no one had any first-hand experiences to confirm their opinions.

The Creative Inquiry lasted three semesters and consisted of approximately 15 students. Dr. Irwin, the primary faculty adviser for this project, discussed the benefits of working with undergraduates on research. “Many students will go on to grad school. Without mentoring ahead of time, they may have no idea what they are getting into. By advising them in research, they’re getting a head start on exactly what they want to do – and when they get to grad school, they’re more prepared,” he noted.

At this point, while it seems safe to say that balloons are probably not hurting our environment, the team has given us some valuable insight into the previous predicament. We now know that balloons normally degrade fairly well (except in water), and that they have the potential to reach large body of waters, though it’s very improbable. It seems animals will consume balloon remnants, but these fragments don’t seem to present a long-term danger to wildlife. The final piece of the puzzle will be to present the data honestly and accurately to the fans and the public, and see if they will let it fly. ■



## Creative Inquiry Supporters

Creative Inquiry is supported by the Clemson University Provost, the office of Undergraduate Studies, industry and private donors.

We are grateful to all of our supporters.

We thank our Provost, Dr. Doris Helms, for her insight into the needs of Clemson students. Creative Inquiry would not exist without her innovative spirit and support.

We are indebted to the donors whose generosity has broadened and strengthened the Creative Inquiry program:

**Phil and Mary Bradley** are staunch supporters of Creative Inquiry. Their support includes funds for student projects and the annual Phil and Mary Bradley Award for Mentoring in Creative Inquiry.

**Lori Anne and Chalmers Carr**, who established a Creative Inquiry Endowment, we are grateful for their support.

Additional thanks to the **Clemson Alumni Association**, **Charles and Linda Watt**, and the **Harris Corporation**. We also thank the future gift commitment of our Legacy Donors, **Bob and Brenda Muldrow**.

### 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.

#### Award Recipients

2012 — John DesJardins, Bioengineering

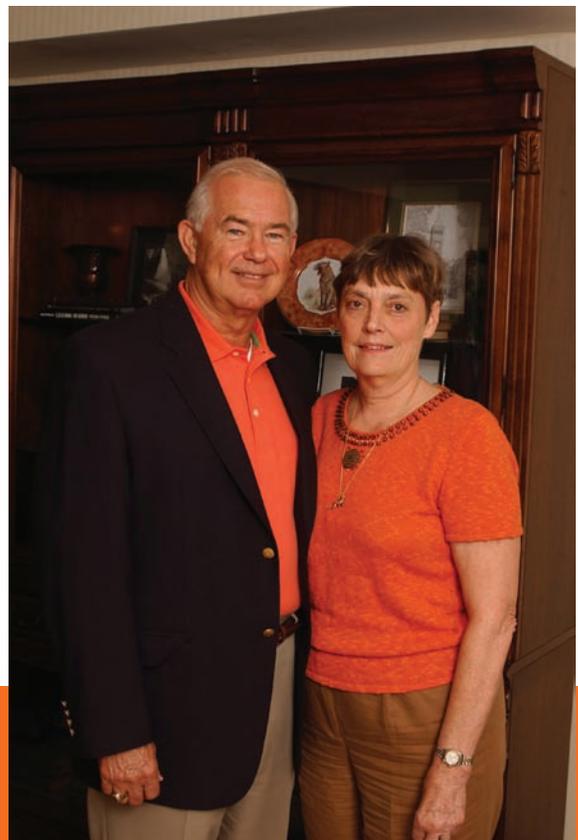
2011 — Delphine Dean, Bioengineering

2010 — June J. Pilcher, Psychology

2009 — Karen Kemper, Public Health Sciences

2008 — Susanna Ashton, English

2007 — Mark Charney, Performing Arts



# CLEMSON<sup>®</sup>

U N I V E R S I T Y

Office of Undergraduate Studies  
Creative Inquiry, E-201 Martin Hall,  
Clemson University, Clemson, SC  
29634-5105

