



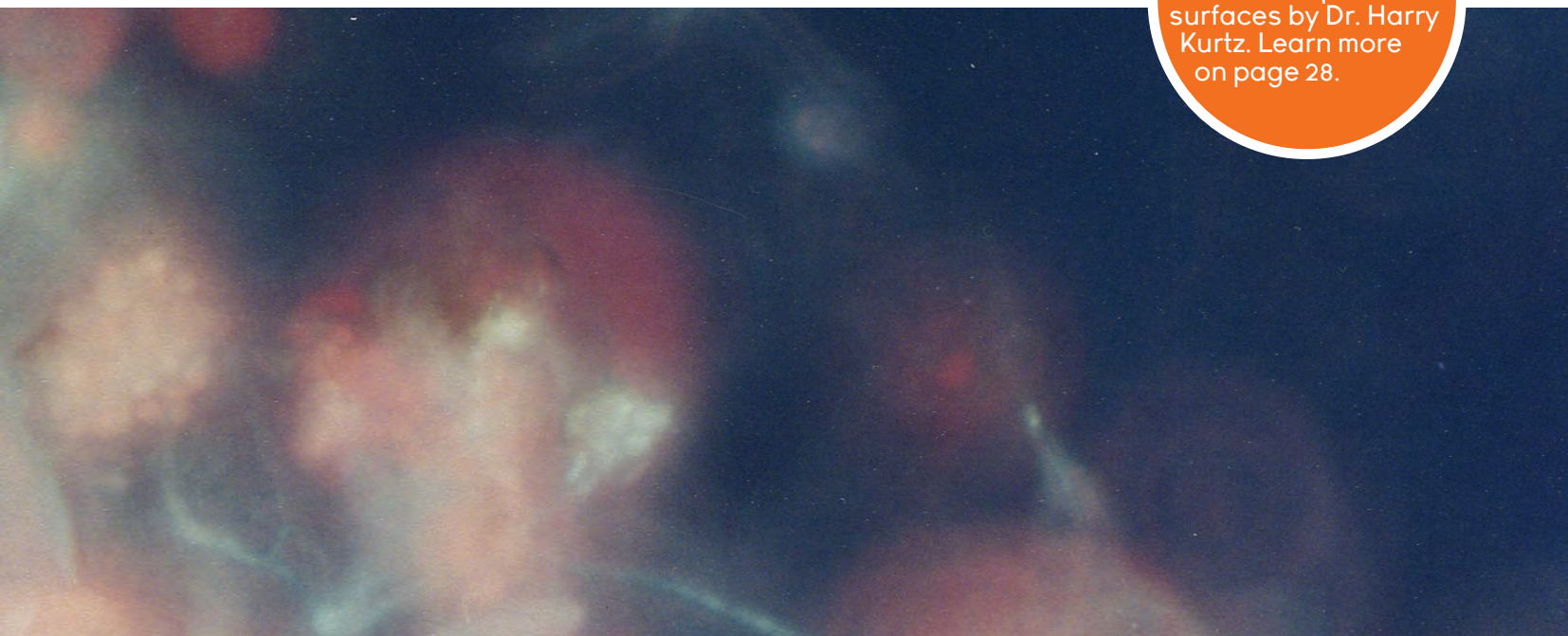
Decipher

2020 | A CREATIVE INQUIRY MAGAZINE

Believe it or not, this is not an image from outer space. It is a rock.
Learn more on page 28

VOLUME 9

The cover photo and this photo are images of microscopic rock surfaces by Dr. Harry Kurtz. Learn more on page 28.



FOLLOW US

-  @ciclemson
-  ciclemson
-  @ciclemson

CONTACT CREATIVE INQUIRY

Barbara J. Speziale
Director
(864) 656-1550
bjspz@clemson.edu

Cora Allard-Keese
Associate Director
(864) 656-0721
callara@clemson.edu

clemson.edu/ci

ABOUT *Decipher*

Decipher magazine is produced by a team of Clemson University's undergraduate students to highlight the accomplishments of their peers in Creative Inquiry, Clemson's unique brand of undergraduate research. Creative Inquiry is Clemson's way of engaging students in research topics they find interesting, in their own, other or cross-disciplinary fields of study.

Each year, more than 4,000 Creative Inquiry students explore topics ranging from investigating body shape evolution in fishes to studying changes in brain function associated with an increased risk for hypertension to exploring kinetic art. Their Creative Inquiry projects provide them with the tools they need to explore diverse problems and issues in our community and beyond and to come up with possible solutions. Students value these opportunities to exercise the skills they learn in the classroom and apply them to the real world.

From the more than 430 current Creative Inquiry projects, we selected 27 projects to feature in this magazine. Our team interviewed the faculty, graduate students as well as undergraduate students involved with each of these projects in order to write these articles and produce photographs and illustrations. Decipher is printed and distributed to students, faculty, alumni and friends of Clemson to make them aware of the many accomplishments of students in the Creative Inquiry program. For example, Creative Inquiry students and faculty have made more than 1,560 presentations at professional conferences, authored more than 488 professional publications and received more than 433 awards.

Decipher is also available digitally, as an interactive blog on the Creative Inquiry website (clemson.edu/ci). Visit our blog for more information and interactive project highlights.



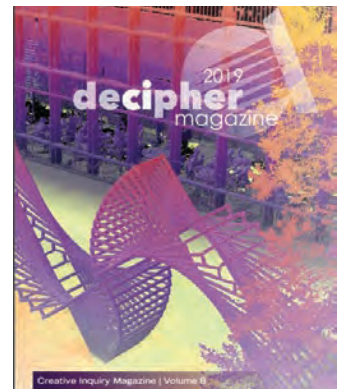
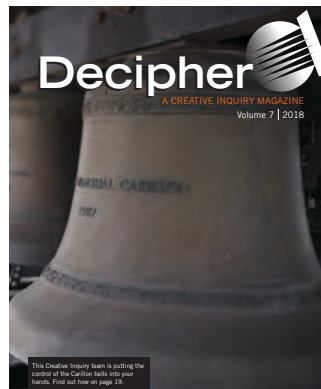
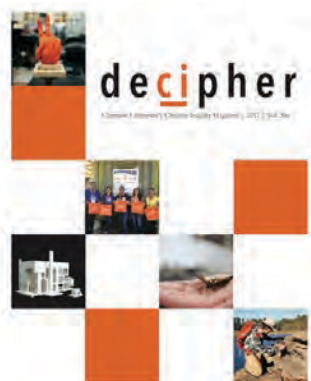
CREATIVE INQUIRY STAFF

- Barbara J. Speziale** | Director
- Cora Allard-Keese** | Associate Director
- Tullen Burns** | Project Coordinator
- Julie DuBose** | Fiscal Analyst
- Lindsay Hobbs** | Administrative Assistant
- Sagar Thakur** | Database/Web Manager
- John Morgan** | Graduate Assistant

DECIPHER STUDENT STAFF

- Colleen Blaine** | Editor
- Alex Richardson** | Assistant Editor
- Caitlyn Van de Meulebroecke** | Chief Graphic Designer
- Casey Pearce** | Assistant Graphic Designer
- Ana Licon Lopez** | Assistant Graphic Designer/Photographer
- Marc McCrary** | Photographer
- Allyssa Haygood-Taylor** | Writer
- Marilyn Hazlett** | Writer
- Anna Nottonson** | Marketing
- Viral Desai** | Marketing

DECIPHER





A LETTER FROM THE DIRECTOR

Barbara J. Speziale, PhD

If there was ever a time that demonstrated the creativity and resilience of Clemson students and faculty, 2020 has been that year. After leaving campus for Spring Break, we learned that all instruction would shift to online delivery for the rest of the semester, due to the COVID-19 world-wide pandemic.

CI projects, with our strong emphasis on hands-on, would seem to be some of the most difficult learning experiences to move online. But everyone managed the change, with numerous online meetings, remote data analyses and even at-home science activities. For example, Dr. Sharon Bewick in the Department of Biological Sciences sent her students home with microscopes and invertebrate samples to identify for a diversity study.

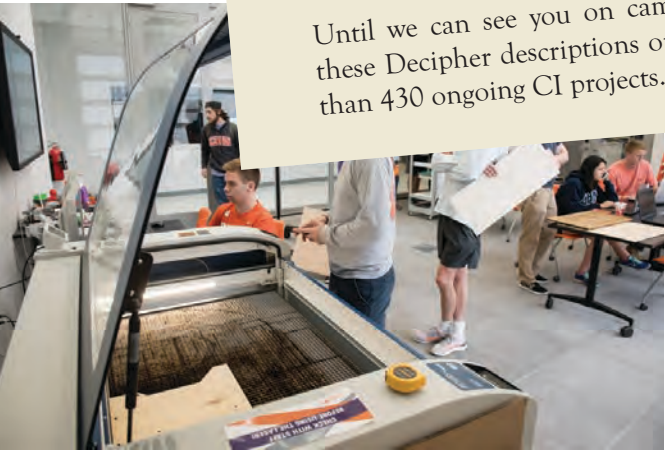
As I write this, Clemson's spring semester has ended and we are supporting more than 77 Summer CI experiences. Most will be accomplished through remote interactions. For example, Vanessa Patch, a junior wildlife and fisheries biology major, and Brinton Shinn, a senior wildlife and fisheries biology major, are processing photos from camera traps to investigate space use and temporal activity of coyotes, deer and lagomorphs. We added a unique program this summer—the Clemson COVID Challenge (CCC), that is bringing students and mentors together to develop ideas for addressing the problems of the COVID-19 pandemic. See page 5 for details.

CI owes a major thank you to the many mentors who persevered to offer their students the best possible engagement experience under very trying circumstances.

Until we can see you on campus again, please enjoy these Decipher descriptions of just a few of our more than 430 ongoing CI projects.



B. Speziale



CLEMSON COVID CHALLENGE

The Clemson COVID Challenge is a summer virtual research and design opportunity for teams of undergraduates to work on problems related to COVID-19 and potential future pandemics. Teams of students work with mentors to identify problems and then propose their ideas for solutions. Dr. Delphine Dean in the Department of Bioengineering partnered with the Creative Inquiry program to initiate the Challenge. The University of South Carolina joined as a co-sponsor.

More than 400 undergraduates are participating in 82 projects under the guidance of 126 mentors. Students and their mentors represent 16 institutions including Clemson University, the University of South Carolina (Beaufort, Columbia and Lancaster campuses), College of Charleston, Furman University, Kampala International University (Uganda), the Medical University of South Carolina (MUSC), Prisma Health,

Pennsylvania State University, University of Michigan, Winthrop University, Wofford University and two South Carolina High Schools (J.L Mann and Spring Valley).

The 82 teams each fall under one of five categories: Communication; Education; Healthcare/Technology; Policy/Economy/Logistics; or Society/Community. Each team will submit a pitch video, with the top teams winning prizes to support the continuation of their projects.

FOOD INSECURITY AND THE COVID-19 PANDEMIC

Mentor: Dr. Catherine Mobley, Sociology, Anthropology and Criminal Justice, Clemson University

This team is investigating the unique dimensions of food insecurity in the context of the COVID-19 crisis. Increased unemployment and social distancing in the wake of COVID-19 make it difficult to obtain adequate nutritious food.

The team is identifying, mapping and curating solutions to food system problems that have intensified as a result of COVID-19. They are collecting stories from all fifty states about innovations for addressing food insecurity and developing a platform, "A Thousand Seeds of Change," that connects communities and amplifies the voices of citizens who are initiating these real-world solutions. The team has created a website through which they will crowdsource these stories that can inform the development of a resilient food system in a post-pandemic society.



A Thousand Seeds of Change

PROTOTYPE DESIGN FOR AN OFF-ROAD AUTONOMOUS DELIVERY PLATFORM DURING A PANDEMIC


Mentor: Dr. Yiqiang Han, Mechanical Engineering, Clemson University

A team of seven students is working on the development of autonomous aerial and off-road ground vehicles that could serve to improve the logistical challenges imposed by a pandemic. The team is prototyping a last-mile delivery platform that consists of an off-road ground delivery vehicle, which also houses a delivery drone for situations where ground delivery is not possible. Their idea would potentially boost the economy by making access to goods and services safer and more attainable for a large number of people while also ensuring that everyone is practicing safe physical distancing guidelines.



TABLE OF CONTENTS

08 Science vs. Pseudoscience		16		29
10 Mastering the Mask		20		32
11 Wriggle While You Work		24		35
12 Meet Nate & the Mixed Reality Teaching Simulator		28		48
14 Crossing the Blood-Brain Barrier				
16 Robots in Our Community				
18 Becoming more Sustainable				
19 Measuring Happiness				
20 Waikiki and the World				
22 Balancing Market Growth & Product Loss				

- 
- 24** The Great Artificial Reef
 - 25** The Economics of Crime and Punishment
 - 26** I Do Love My Baby
 - 28** The Painted Deserts
 - 29** Artificial Intelligence for Racecars
 - 30** Brand Communications
 - 32** When Virtual Reality Gets Real
 - 34** The Crossroads Between Refuge, Detention and Hospitality
 - 35** The Rare Beauty of the Rocky Shoals Spider Lily
 - 36** Sights, Sounds and Sensory Bags
 - 38** Building Neuronal Circuits
 - 40** Technology-Aided Damage Assessment
 - 41** The Intersection Between Domestic Politics and Treaties
 - 42** Exploring Parasite Biology
 - 44** Architectural Aesthetics
 - 46** A.R.C.H.E.R.
 - 48** Creating and Curating
 - 55** Innovation Spaces

SCIENCE VS. *Pseudoscience*

BY COLLEEN BLAINE



Dr. Elliot Ennis leads the Pseudoscience in Popular Media Creative Inquiry project. Pictured left to right: Ennis, Anna Thompson, Katherine Hulsey, Emily Tobik and Katherine Skola.

CLEMSON
College of SCIENCE

Please indicate to which degree you believe the following statements apply to you.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I have an objective attitude.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to seek evidence to things presented to me as fact.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I accept many different views.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider myself an out of the box thinker.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The team created a survey in order to measure the extent to which people believe health claims presented by popular media sources.

Though many people claim that salt lamps clean the air in homes through natural ionization, this contention is not supported by scientific evidence. From Twitter to the popular celebrity news website TMZ, the Internet affects the way people see, understand and believe health claims. When modern media disseminates false information and treats conspiracy theories as truth, the result is a loss of critical thinking and distrust of science.

Led by Dr. Elliot Ennis in the Department of Chemistry, the Science and Pseudoscience in Popular Media Creative Inquiry project is working to discover the extent to which people believe claims put forth by Instagram influencers and companies trying to profit from remedy myths, bogus diet pills or unnecessary vitamin supplements.

Most of this team's research is completed through surveys disseminated via social media. The survey questions the beliefs of participants on popular trends in health care and personal hygiene. This allows the team to gauge how widely certain claims are accepted as well as to determine which science concepts are the most misunderstood. Participants answer questions ranging from if charcoal toothpaste whitens your teeth to if spicy foods cause stomach ulcers.

"It's like science Myth Busters. If we can inform [people] of what's true and what's not, we can help them make better financial decisions and health decisions," Katherine Hulsey, a senior food science and human nutrition major, said.

"My dream is to create a coffee table book," Ennis said. While a book filled with discredited science myths is a long-term goal, Ennis' team has created a blog that highlights health claims that are widely accepted, but are actually misconceptions. The hope is to increase overall science literacy and decrease conspiracies surrounding health education. "For me, the economic standpoint of all of these false

claims, solely to make companies money, is a big deal,” Hulsey said.

In a society where hasty WebMD searches are the norm, it can be difficult to uncover the truth about proper health and wellness practices. Fortunately, this Creative Inquiry team is working to make the scientific facts related to these health claims accessible and easy to understand. “Science is approachable,” Ennis explained, “it is not some scary thing to be feared.” By becoming

“For me, the economic standpoint of all of these false claims, solely to make companies money, is a big deal.”

-Katherine Hulsey

more aware of the claims that are promoted by Instagram influencers or discussed on popular talk shows, people will have the power to make informed decisions about their well-being. ●



Above: A screenshot from The Tigers Against Pseudoscience’s online blog.

DID YOU KNOW?

Three myths that have already been debunked by the CI team. They regularly update their blog to provide more information on their busted myths.

1

Spicy foods do not cause peptic ulcers, but spicy foods can make ulcers worse if you already have one.



2

There is not enough evidence to determine if activated charcoal is a teeth whitener.



3

There is little evidence to support that Ginseng supplements are beneficial to a person’s wellness, especially in the available dosages.





MASTERING THE

BY ALLYSSA HAYGOOD-TAYLOR

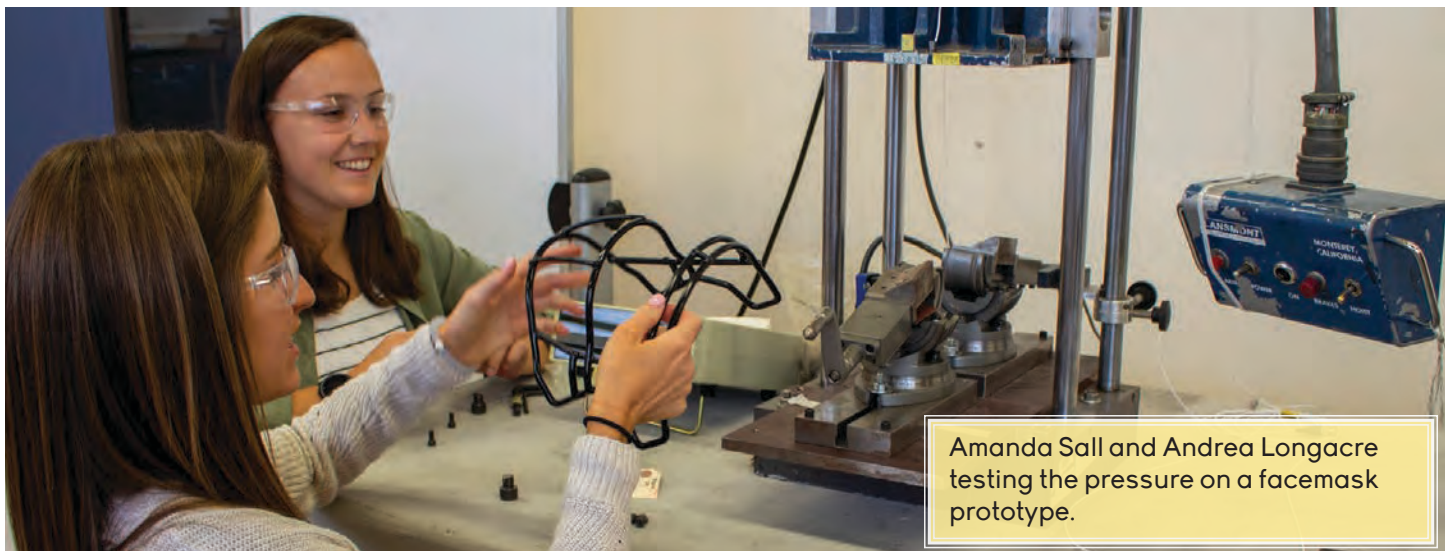
Left to Right: Amanda Sall, Andrea Fisher and Andrea Longacre

American football helmets, and protective gear overall, have rapidly evolved since the era of leather helmets. Technological advancements and data mining have led to the design and development of safer helmets, helping to prevent injuries within this intensely physical sport. The Football Facemask Performance Creative Inquiry project, led by Andrea Fisher, graduate student, and Dr. Gregory Batt, both from the Department of Food, Nutrition and Packaging Sciences, are working to further the advancements in safety by studying how head collisions impact football facemasks.

The project partners with D.W. Daniel High School's football program to collect data on their used facemasks. Specifically, the Creative Inquiry team focuses on offensive and defensive linemen facemasks. Data is collected through analyzing game film and recording the number of hits to the facemasks throughout the season. "At the end of the season, we study the facemasks in person by comparing stiffness between the control facemasks and used facemasks

to see the deviation of stiffness between the two," Andrea Longacre, senior packaging science major, said.

The results of this research will inform more than just the Daniel High School football team. The Creative Inquiry project's findings are expected to aid three specific groups: parents; equipment managers; and facemask designers, as they design, produce and distribute safe facemasks. "Creative Inquiry enables us to explore facemask testing on a pilot scale, while collecting data that would suggest how much one season affects a facemask, using the tests that we have developed," Batt said. The interdisciplinary team of packaging science and bioengineering majors hopes that the collection of data from other football teams will continue, increasing the facemask sample size. Ultimately, this Creative Inquiry team hopes to make playing football safer, one piece of equipment at a time.●



Amanda Sall and Andrea Longacre testing the pressure on a facemask prototype.



Wriggle

WHILE YOU WORK

BY COLLEEN BLAINE

Elementary school children are busybodies and staying still is a challenge. They move their legs, turn in their seats and put their head on their desks when they are bored. Their teachers have the challenge of developing strategies to combat and control these distractions in the classroom. The Activity in School-Aged Children Creative Inquiry project does just that by examining how physical activity affects behavior and performance in children.

Drs. Jennifer Bisson, June Pilcher and Sarah Sanborn in the Department of Psychology are collaborating with a team of students as they define and code observational data to help understand classroom behaviors. Their main goal is to observe how Bouncybands®, an innovative classroom tool that doubles as a toy, might allow for discreet student movement and increased focus throughout the day. These thick tension bands attach to the bottom of a school chair or desk legs, allowing the students to stretch their legs and release excess energy.

To test their hypothesis that Bouncybands® affect classroom behavior, the team analyzed the attentiveness of third and fourth graders attending an afterschool program. These students were given a written comprehension assignment as well as a Bouncyband® and were video-recorded. The Creative Inquiry students monitored these 20-minute video recordings, checking every 15 seconds for off-task behavior.

Many elementary school students who struggle to stay focused typically engage in three types of off-task behaviors:

passive (not looking at the assignment); verbal (talking to others); and motor (playing with something on the desk). Hanna Wagner Kent, a junior psychology major, originally thought she wanted to be a teacher, but this project has pushed her more towards occupational therapy and working with special needs children. “There needs to be more ways for kids to learn and wiggle while they work. They have so much energy, and figuring out how to deal with that when they’re little is important,” Kent said. Her work within this project is specifically related to body orientation (the direction the child is facing while sitting), classified as a passive behavior. “Some of them are just all over the place,” Kent said, “It can be pretty entertaining [to watch them]!”

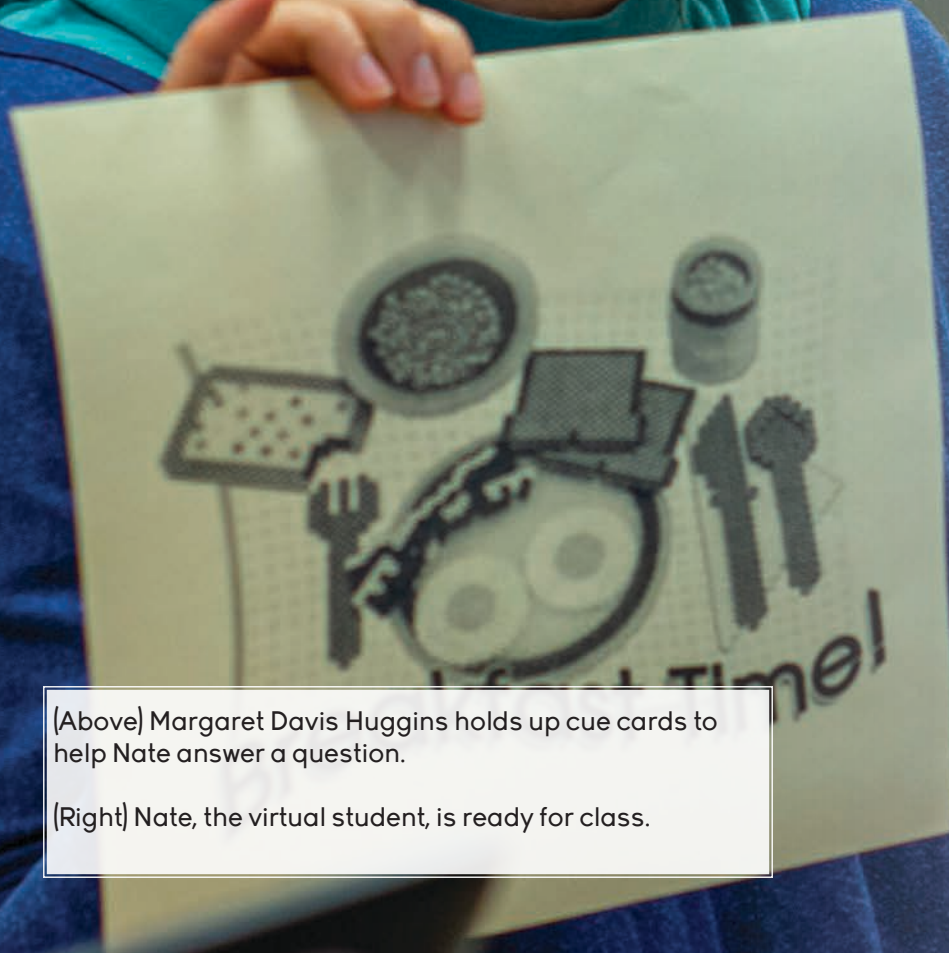
Each researcher must be detail-oriented, as not to miss any focus gaps in the student’s actions. Creative Inquiry team members must double check the original coder’s work. This is called reliability coding, and it helps eliminate any unconscious bias. Overall, the team’s findings show that students who exhibit more passive off-task behaviors at the beginning of the study benefit most from the Bouncybands®.

This Creative Inquiry team’s findings suggest that Bouncybands® are more than just a fun activity for kids. “Everything can be a tool or a toy, especially when it comes to the classroom setting,” Bisson said. Often, staying focused can be difficult for elementary school students, but in the Activity in School-Aged Children Creative Inquiry project, kids can feel free to wiggle while they work.●



MEET *Nate* & THE MIXED-REALITY TEACHING SIMULATOR

BY ALLYSSA HAYGOOD-TAYLOR



(Above) Margaret Davis Huggins holds up cue cards to help Nate answer a question.

(Right) Nate, the virtual student, is ready for class.

Nate is a middle school student who exhibits characteristics of a student with Autism Spectrum Disorder. A team of researchers at Clemson wants to help pre-service teachers learn how to work with students just like him. Nate is not just any student; he is an avatar created by the Pre-service Teacher Instruction Using Mixed-Reality Simulators Creative Inquiry project led by Dr. Shanna Hirsch and Sharon Walters in the College of Education. The team launched this simulation to offer future special education teachers a virtual classroom experience.

Mixed reality simulation is a promising technology in teacher training. In simulator scenarios, pre-service teachers practice instructional techniques with student avatars. This simulator fills a critical gap in teacher training by giving these future teachers the chance to pause, reflect and repeat teaching scenarios in a controlled, non-threatening environment.

This Creative Inquiry team is part of the Mixed-Reality Teaching Simulator Work Group led by Hirsch and Walters. The group is comprised of Creative Inquiry students, doctoral students and special education faculty members. This year the team focused on the simulation topic of the system of least prompts. This instructional method uses a prompt hierarchy rather than a single prompt to deliver supports to students. When a student responds incorrectly, the teacher provides increased assistance until the student responds appropriately. As a result, students are more successful, and the negative effects learners may experience from incorrect responses are decreased.

This spring the students conducted a randomized controlled trial. Thirty pre-service teachers were randomly assigned to practice the system of least prompts in the mixed-reality simulator (experimental) or to receive traditional instruction in a university classroom setting (control). The study started on campus but moved online due to COVID-19. The team was able to run the simulator through Zoom seamlessly. Preliminary results indicate the mixed-reality simulator group performed significantly better than the traditional instruction group.

Though this project is new, the Creative Inquiry team presented their research at two conferences this spring. The students presented their work at the Learning Sciences Poster Session, hosted by the Learning Science PhD program in the Department of Education and Human Development, and at the annual meeting of the South Carolina Council for Exceptional Children Conference in Myrtle Beach, SC. “It was interesting to present our research because it is a topic that hasn’t been touched on a lot and generally can be very useful for any pre-service teacher,” Marianne Beck, a junior elementary education major, said.

Looking forward, Creative Inquiry students will be assisting the Mixed-Reality Simulator Work Group design additional simulation experiences during the 2020–2021 school year. Whether the sessions are conducted in person, on campus or online through Zoom, Clemson pre-service teacher candidates will have additional opportunities to hone their instruction in a virtual classroom. ●





CROSSING THE BLOOD-BRAIN BARRIER

BY ALEX RICHARDSON



Due to the complex nature of the central nervous system (CNS), the effects of drugs in the brain can be adverse and unpredictable. To address some of these issues, the Modulating Nanoparticle Shape to Enhance Blood-Brain Barrier Delivery Creative Inquiry project mentored by Dr. Jessica Larsen in the Department of Chemical and Biomolecular Engineering, is exploring effective strategies for drug delivery to the brain. The overarching goal of the project is to develop nanoparticles that effectively cross the blood-brain barrier (BBB).

The blood-brain barrier is the body's first line of defense against infections that are able to reach the brain. The BBB keeps harmful chemicals out of the brain, but it also prevents many beneficial therapeutics from entering the brain. Less than 2% of small molecule drugs can pass the

(Above) Elizabeth Singleton and Austin Evers create polymeric nanoparticles using a syringe pump.

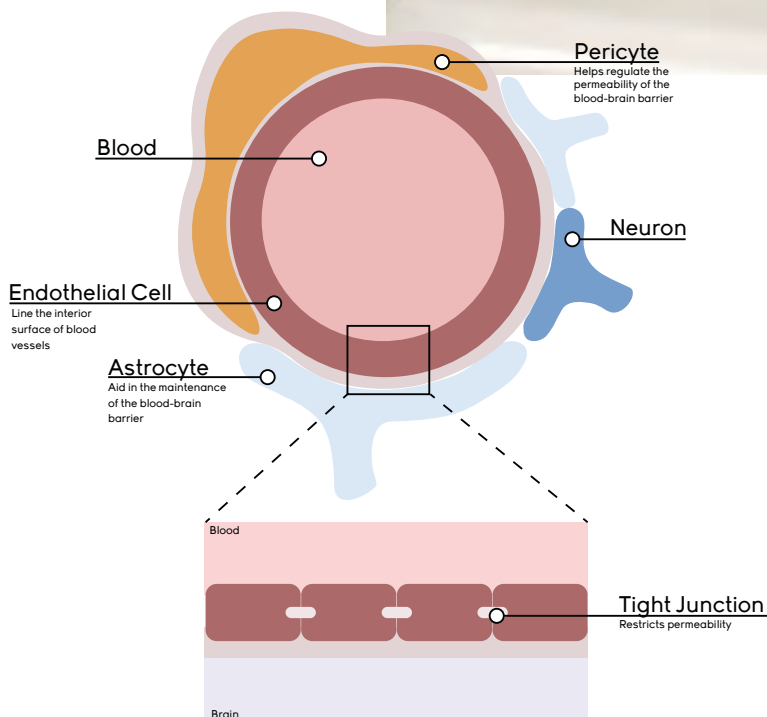
BBB. Larsen's Creative Inquiry team developed a method to change the shape of nanoparticles, which act as a protective layer around the drugs, allowing them to cross the BBB. The team is focusing their research on how shape impacts drug delivery using nanoparticles. To accomplish this, the team is utilizing osmotic pressure gradients to change spherical vesicle nanoparticles into more prolate-like shapes which are more effectively taken up by cells. This work led to a Creative Inquiry student first-authored paper in the journal *Nanotechnology*. These prolate shapes will allow for the development of more effective treatments for CNS disease.

The team is also working to better understand other aspects of the CNS including neurodegeneration—the loss of neuron function. Chloe Champion, a senior biochemistry major, is studying the correlation between CNS inflammation and neurodegeneration. Inflammation in the brain is linked to poor clinical outcomes in diseases of the central nervous system. Champion is trying to determine if certain cytokines (molecules that affect cell signaling) can cause normal cells to mimic disease cells in cultures. This research will contribute to a better understanding of CNS diseases.

This Creative Inquiry project is providing students the opportunity to gain lab experience, preparing them for future careers in biomedical research. “[This experience] provides independence by working on my own project allowing me to learn how to troubleshoot issues, which will prepare me future careers,” Champion said. Larsen believes that new treatments for neurological diseases will be developed through studying many facets of the CNS. •



Blood-Brain Barrier



(Left) A diagram of the Blood-Brain Barrier.

(Top) Students create nanoparticles loaded with Nile Red to study cellular uptake.

Meet the Team

Anna is a sophomore marketing major with a minor in general communication. She is from Boston, MA and loves snowboarding, hiking, traveling and dogs. Her favorite part of her position as a Marketing Intern for Creative Inquiry was designing new content for social media.



ROBOTS IN OUR COMMUNITY

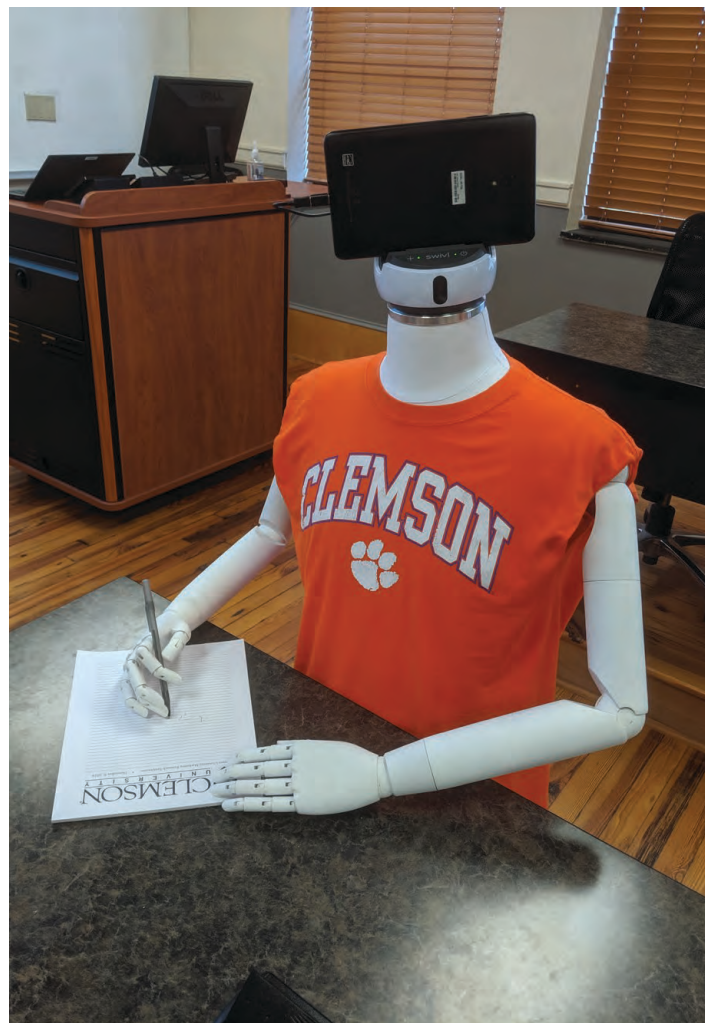
BY ALEX RICHARDSON



In the modern-day era of rapidly evolving technology, robots and artificial intelligence (AI) are entering the consumer space in the form of frontline workers. The Frontline Service Robots and AI Creative Inquiry project, led by Dr. Michael Giebelhausen in the Department of Marketing, studies consumer interactions with service robots. The overarching goal of this project is to determine how the public will react to robots in the service industry.

The team is studying the interactions between consumers and robots in multiple scenarios to gain insight into the different types of consumer reactions. One study is looking at the interactions between people and automated parking enforcement officers. The team discovered that when parking violators received tickets from humans, they tended to expect leniency, and if violators felt that a ticket was not deserved they were less upset if it was issued by a robot. Giebelhausen believes this reaction occurs because people do not expect empathy from robots, but they do expect empathy from humans.

The team is also researching interactions between customers and humanoid sales robots within a shopping environment. In this scenario, robots are randomly assigned to either agree or disagree with a customer's purchasing decision. The team found that if the robot disagreed with the customer's choice, people were often upset. However, customers that modified their choice based on the robot's input ended up having the strongest product preferences. The students



presented this research, “Opinionated Robots and their Impact on Frontline Service Satisfaction” at the 2019 Society for Marketing Advances in New Orleans, LA.

In a service setting close to home (higher education), the team is investigating if the presence of a robot affects student performance. They found that students performed better on pop quizzes when there was a telepresence robot in the room actively tracking the instructor’s movements—an important insight given the increased adoption of hybrid learning models. The resulting paper was accepted to the 2020 American Marketing Association’s Summer Educators Conference.

Ultimately, Giebelhausen hopes his students will learn to ask important questions and design experiments to answer them during their experience in the Creative Inquiry project. “I was challenged to really think outside the box. It’s astonishing how much consumer behavior is linked to innovation,” Grace McGlynn, a senior marketing major, said. As the world continues to develop around technology, artificial intelligence will likely become a part of everyday life. Although there may not be robots on the streets now, receiving a ticket from a robot may become common place in the future. ●

Meet the Robots



Humanoid robot that randomly agrees or disagrees with a consumer’s purchasing decisions.



This yoga robot demonstrates yoga poses at the front desk of a yoga studio.

BECOMING MORE SUSTAINABLE:

FOOD WASTE RECOVERY

BY MARILYN HAZLETT



Students volunteering at Clemson Community Care.

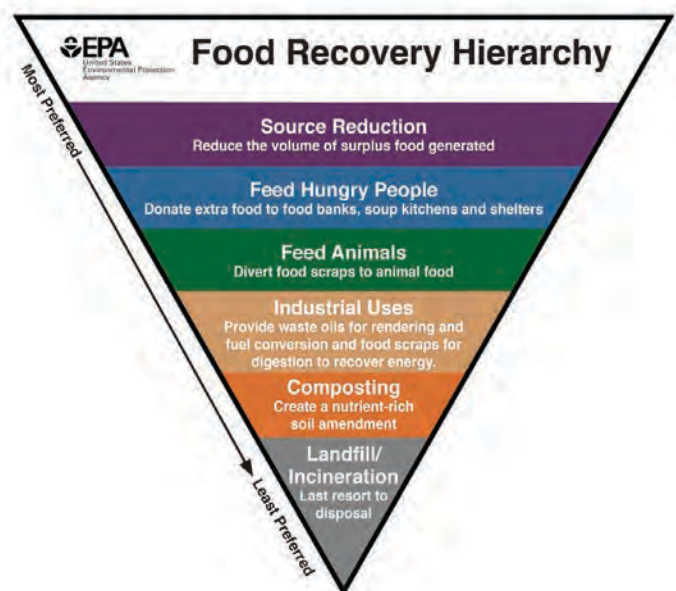
Clemson University's Sonoco FRESH initiative, supported by a philanthropic gift from the Sonoco Foundation, is committed to engaging undergraduates in their research focus areas through Creative Inquiry. Students in the Food Waste Recovery Initiative Creative Inquiry project, mentored by Dave Vandeventer and Tom Jones from Clemson University Recycling Services, are focusing on one aspect of that footprint—what happens to food that is not consumed. To address this, students investigated food recovery in depth, compared practices at peer institutions and began developing a plan to implement more sustainable practices at Clemson.

Guided by the United States Environmental Protection Agency's "Food Recovery Hierarchy," the team engaged in all levels of food recovery, including witnessing and assisting in the food recovery process at university events. For example, on football game day they learned how food was distributed to concessions and suites before the game and saw what happened to leftover food after the game; some is donated, some is composted and some is sent to the landfill. They also volunteered at food pantries and visited a homeless shelter to learn how donated food is utilized. The most eye-opening experience was visiting Clemson's organics recovery and compost facility—the Cherry Crossing Research Center—where most of Clemson's leftover food is sent. These and other experiences exposed the students to various levels of the hierarchy. The students found that Clemson excels at composting but needs improvement in the upper levels of food recovery such as reduction and donation.

After a thorough assessment of the Clemson campus, the team examined food recovery at other colleges and universities in the United States. They compared each schools' strengths and weaknesses to Clemson's. Their

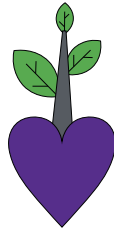
results will inform development of more sustainable food recovery practices at Clemson.

The success of this team can be attributed to its multi-disciplinary nature and the passion that all students have for this topic. The students represented four different majors in three colleges, all united by their interest and passion for recycling and food waste management. Emily White, a junior agribusiness major, said she has always been interested in food waste and food justice. Shemar Bryant, a junior management major, said the prevalence of food insecurity in his community inspired him to participate in this Creative Inquiry project. Bryant sees future opportunities for companies to develop sustainable solutions pertaining to food systems. ●



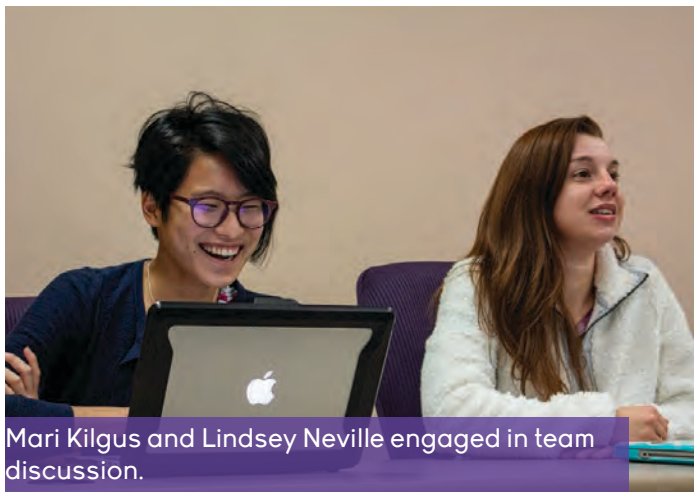
Source: U.S. EPA
Clemson is currently in the "composting" phase but this project seeks to move Clemson up the inverted pyramid.

MEASURING HAPPINESS



BY COLLEEN BLAINE

Happiness, and emotions in general, is an abstract concept that means different things to different people. The Happiness and Values Creative Inquiry project, led by Natalie Vanelli, graduate student, and Dr. Cynthia Pury, both in the Department of Psychology, explores the complexities of decision-making as they affect long-term and short-term happiness. The team studies how people respond when they are faced with two equally favored options, and if their decisions positively affect their long-term happiness.



Mari Kilgus and Lindsey Neville engaged in team discussion.

The main focus of this research is to measure happiness through the choices people make. Specifically, the team is investigating the correlation between happiness and decision-making by looking at specific domains: security; positive outlook; autonomy; relationships; skilled and meaningful activity; and contact with nature. Because these domains are difficult to track, the team created a scenario-based questionnaire that addresses each of these domains. The answers to the surveys allow the team to determine which domains respondents value the most, and therefore to understand how their decisions are based on these values.

“[This survey] will give us that hierarchy of where people think they place their values versus where they actually do in a real-world setting,” Anna Peterson, a junior psychology major, said.

The students in this project appreciate participating in a research project focused around a positive subject. “A lot of psychology studies are focused on the things that don’t make us happy, and I think this research is important to discovering more about where happiness comes from and how we can achieve more of it,” Mari Kilgus, a freshman psychology major, said.

Though in its infancy, the ultimate goal of this project is to understand how a person’s values align with the choices they make and how these choices inevitably affect their happiness. “People encounter situations where they have to choose between two pathways or decisions that represent what they value in the pursuit of their happiness,” Vanelli said. Through this Creative Inquiry project, people can better understand how the things they value affects their decision-making, and ultimately, their happiness. ●

“People encounter situations where they have to choose between two pathways or decisions that represent what they value in the pursuit of their happiness.”

-Natalie Vanelli

MEET THE TEAM

Originally from Myrtle Beach, SC, Marc is a senior visual arts major emphasizing in photography. His senior thesis exhibition focuses on high quality images of animals. When not working hard in the studio, he spends his time with the Clemson Photography Club and at home playing with his German shepherd and husky.





WAIKIKI *and the* WORLD

BY ALLYSSA HAYGOOD-TAYLOR

(Right) Ulupo Heiau State Historical Site is an ancient Hawaiian religious site that the team visited.
Photos taken by Frederick Nocella

When the average American thinks of a tropical playground, Hawaii often comes to mind. However, mass tourism on the island of Oahu has in some ways become toxic to the cultural landscape. The Waikiki and the World Creative Inquiry project, mentored by Dr. William Terry from the Department of History, is investigating the cultural authenticity of the tourist experience (i.e., if mainland tourists experience authentic cultural practices of the native people of the island), and the impacts of tourism and commodification of Hawaiian culture.

As part of the team's preliminary research to prepare for their trip to Hawaii, they identified experiences that appeared to have mainland influence as opposed to reflecting the genuine culture of native Hawaiians. The students' work focused on: the environmental impact of agricultural practices; cultural and pacific orientalism (the way Pacific people have been imagined

“...tourism itself creates a cultural landscape that is constantly changing.”
-Della Maggio

by Westerners as exotic others); culinary heritage and the struggle of preserving authentic, traditional foods; and American influence on how Hawaiian culture is sold to the rest of the world. The team examined these topics to identify performative authenticity—described as the interplay between tourism and authenticity. “Performative authenticity, such as lū'aus, are these very limited activities shown to tourists that perpetuate a culture while private practices are still being held,” Katie LaPorte, a junior history major, said. Whether lū'aus can be considered authentic experiences when removed from their original religious contexts is the sort of question the team is addressing.

When the team arrived in Waikiki, on the south shore of Honolulu, they hit the ground running. They studied the difference between popular tourist sites compared to local, sacred sites. The students visited less commercialized local markets and public religious sites to survey farmers and gain insight from native residents. They also worked with professors at the University of Hawaii, Manoa in Honolulu. This allowed each student to explore the island through a perspective dissimilar to their own. “We are wanting to experience Hawaii not tainted by tourism as tourism itself creates a cultural landscape that is constantly changing,” Della Maggio, a junior history and political science double-major, stated.

The Waikiki and the World Creative Inquiry project aims to present and understand the challenges that native peoples face in today's modern world. The commodification of Hawaiian culture has become common outside of the islands. For example, entire “lū'aus” spreads can be purchased at *Party City* or at tiki bars. These commercial products have dramatic impacts on the cultural landscapes presented to visitors in Hawaii, in that tourists have come to expect certain commercialized stereotyped experiences. This



project reinforces the efforts of those trying to preserve their native languages and authentic cuisine in the face of outside forces.

The COVID-19 pandemic affected some of the activities of the team's trip but they were able to complete some research and personally experience performative authenticity. Now, the team is working on compiling images, personal testimonies and surveys to highlight their experience and findings. Ultimately, the students aim to assimilate their materials into a collection for publication. This Creative Inquiry hopes to continue to draw light on the American tropical playground that is Hawaii, and the subtle and not so subtle effects of tourism on it. ●

Graphic Designer

MEET THE TEAM

Casey is a sophomore architecture and history double-major from Chicago, IL. When she isn't at a football game or in studio, she enjoys spending time at Clemson's lakes and painting.





BALANCING MARKET GROWTH & PRODUCT LOSS

BY ALYSSA HAYGOOD-TAYLOR

As businesses expand, analyses of effective production, storage and transportation are essential. Trulite Glass and Aluminum Solutions posed a question to Clemson's student researchers: What are the most efficient methods for delivering their main products, glass and aluminum panels, to construction sites and vendors with minimum breakage? This complex problem required an interdisciplinary approach. Thus was formed the Trulite Shipping and Next Generation Packaging Corporate Creative Inquiry project, with two disciplinary teams under the guidance of Dr. Bill Ferrell in the Department of Industrial Engineering and Dr. Gregory Batt in the Department of Food, Nutrition and Packaging Science. The students are using Trulite's data and observations at Trulite facilities to propose solutions to the multipronged issues.

Taking into account the packaging of the glass panels, distribution of demand points and locations of Trulite production facilities, the Creative Inquiry students were tasked to minimize loss and to conceptualize efficient and economical systems for packaging and delivery.

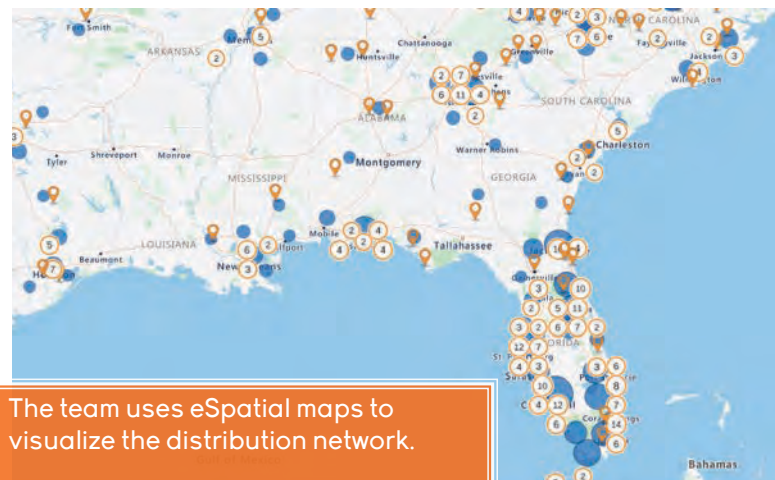
Trulite was interested in possible alternative containers for transporting glass. They currently use expendable wood racks and challenged the packaging science team to develop a rack that was more cost efficient and that better protected the glass. Further, Trulite wanted to expand distribution options beyond using their own trucks to include the use of commercial carriers so the team tested the forces that the Trulite racks undergo during transport. They used this test plan to evaluate the current glass packaging, observe rack handling at construction sites and partner with a local metal rack supplier to develop and prototype an alternative rack system.

While the packaging science team is examining designs for packaging, storing and transporting glass panels, the industrial engineering team is analyzing current production and shipping patterns to develop a plan to maximize efficiency of manufacturing and deliveries. The industrial engineering team analyzed Trulite data to map the distribution and density of past projects to identify ways to increase distribution efficiency and effectively grow into new markets. Initial recommendations include ideas such as realigning production in different plants, adding

distribution centers and developing different delivery strategies. This team is determining realistic options to handle the market growth projected for Trulite that would include both additional capacity of product and increased flexibility in their manufacturing facilities. The team used a specialized software package, eSpatial, for data visualization that helped both the team and Trulite decision-makers better understand the data and possible solutions.

The two teams have each developed relationships with Trulite through biweekly meetings and site visits to production plants. "We did two site visits, one each semester, but it was the first one that was our starting ground to visualize both the problem and possible solutions," Liz Parler, a senior industrial engineering major, explained. During one visit, the team had the opportunity to hear Trulite's CEO speak about the past year's business and the projection of the next year's success. "It was nice to see our own goals for the project and how it coincided with the CEO's vision of the company moving forward," Isaac Fields, a senior industrial engineering major, said.

This Corporate Creative Inquiry project and relationship with Trulite is giving students the opportunity to experience seeking solutions to the complex problems of market growth and product loss. Trulite will consider implementing the students' research, tests and ideas to enhance their production, delivery and packaging methods through minimized loss of glass products and strategic distribution of manufacturing plants and distribution centers.



“Working in conjunction with both the Packaging Science and Industrial Engineering Departments has enabled us to leverage diverse skill sets and consider significant improvements to our existing production, packaging and supply chain network. We’ve enjoyed working with the Clemson students and the value they bring to our organization,” John Schmitt, Director of Procurement at Trulite, said.

Both teams will continue working on this project with Trulite in the fall. ●



Creative Inquiry students visiting a Trulite facility in fall of 2019.



Though this is the first CI project with Trulite Glass & Aluminum Solutions, it is the second initiated by Clemson alumnus Kevin Yates ('94) the company's current CEO, who sponsored a previous Corporate CI project while he was at Siemens.

THE GREAT ARTIFICIAL Reef

BY COLLEEN BLAINE

Oysters are some of the best natural water filters. One adult oyster can filter 50 gallons of water each day. Oyster filtration removes algal biomass, thus clearing the water and positively impacting other underwater species. Unfortunately, oyster reefs are being destroyed by over-harvesting and effects of climate change. The Projects for Sustainable Development in Recovering and Developing Communities Creative Inquiry project, led by Dr. Caye Drapcho in the Department of Environmental Engineering and Earth Sciences, is identifying ways to help oysters do their job.

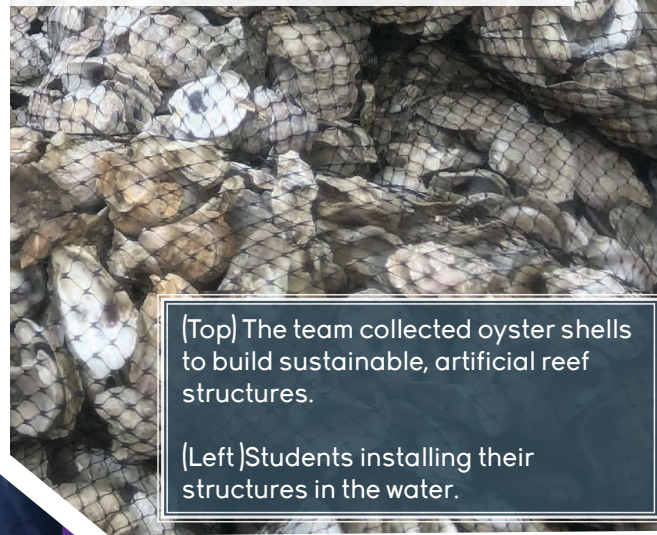
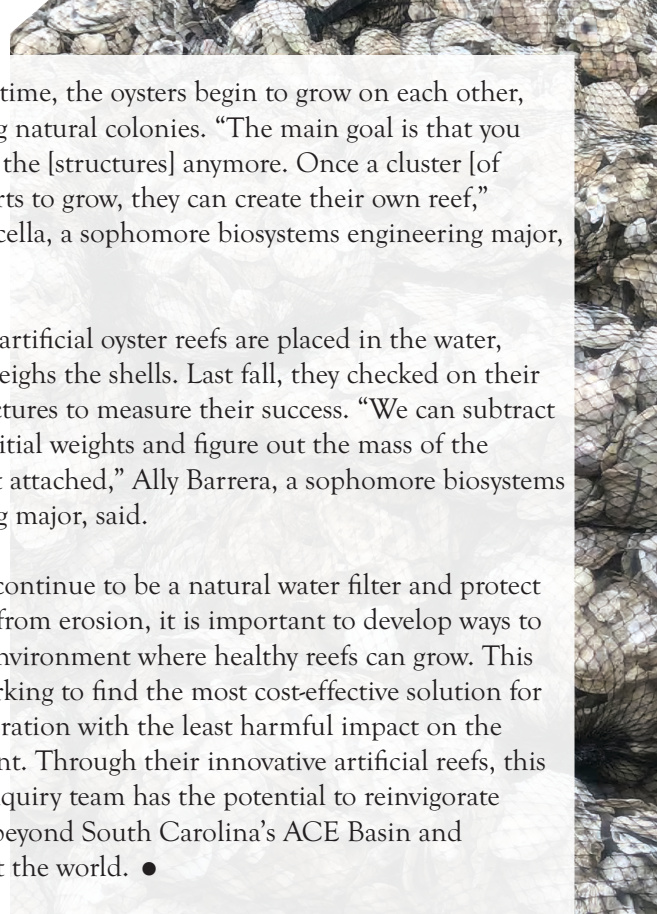
With populations increasing in coastal towns such as Charleston, SC, oyster reef restoration is important for the health of the coastline and water purification. To aid in restoration, this team collects recycled oyster shells and creates sustainable structures made of wire for the shells to attach to. They install these artificial reefs in the ACE Basin of South Carolina. “We are trying to find the most effective structure, with the least amount of labor,” Ean Tucker, a freshman engineering major, explained.

When the structures are placed along the coastline of the ACE Basin, oyster shells attach to the

wire. Over time, the oysters begin to grow on each other, establishing natural colonies. “The main goal is that you don’t need the [structures] anymore. Once a cluster [of oysters] starts to grow, they can create their own reef,” Freddy Nocella, a sophomore biosystems engineering major, said.

Before the artificial oyster reefs are placed in the water, the team weighs the shells. Last fall, they checked on their oyster structures to measure their success. “We can subtract off their initial weights and figure out the mass of the oysters that attached,” Ally Barrera, a sophomore biosystems engineering major, said.

As oysters continue to be a natural water filter and protect shorelines from erosion, it is important to develop ways to create an environment where healthy reefs can grow. This team is working to find the most cost-effective solution for oyster restoration with the least harmful impact on the environment. Through their innovative artificial reefs, this Creative Inquiry team has the potential to reinvigorate coastlines beyond South Carolina’s ACE Basin and throughout the world. ●



(Top) The team collected oyster shells to build sustainable, artificial reef structures.
(Left) Students installing their structures in the water.

THE ECONOMICS OF CRIME AND PUNISHMENT

BY ALEX RICHARDSON

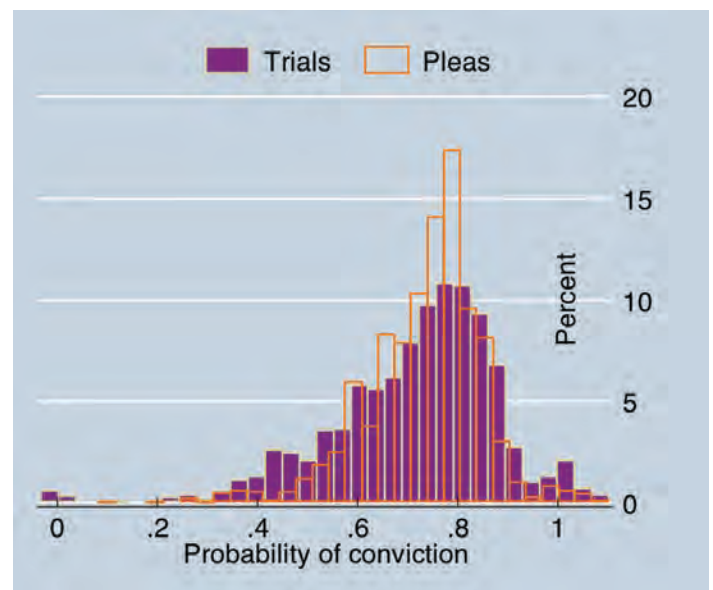
One consequence of a more urbanized America is crowded criminal dockets. Beginning in the late nineteenth century, courts responded by resolving cases through plea bargains. Plea bargaining increased incrementally until Prohibition, when courts were overwhelmed by defendants charged with violations of state and federal liquor laws. The Economics of Crime and Punishment in South Carolina Creative Inquiry project led by Dr. Howard Bodenhorn in the Department of Economics is evaluating the use of plea bargaining in Prohibition-era Greenville County, South Carolina.

When the production and sale of alcoholic beverages was prohibited in the United States between 1920 and 1933, courts implemented plea bargaining to expedite the proceedings. Plea agreements were completed in 15 to 20 minutes of court time, whereas trials sometimes lasted one to three days. Using plea bargains reduced per case court time and relieved time pressures on the system. During Prohibition, 40% of liquor cases were pleaded, as were half of larceny, and two-thirds of burglary cases. Today about 95% of all cases are resolved by plea.

This Creative Inquiry project seeks to understand the historical use of the plea bargain using modern economic models and statistical tools to analyze historical data from South Carolina's courts. The team developed predictive models, which estimated the probability of a person being convicted at trial based on each individual's personal and criminal characteristics. The predictive models were then used to estimate the probability of conviction at trial

among those who accepted a plea bargain. The findings are summarized in the graph, which shows that defendants who accepted pleas were more likely to be convicted at trial than those who actually stood trial. For example, about 11% of defendants with a 75% probability of conviction stood trial, whereas 17% of such defendants pleaded guilty. "It was interesting to figure out the truth in history," Nick Rucker, a senior economics major, said of the result.

By applying economic theory to evaluate the court system in South Carolina, the Creative Inquiry team recognized patterns that were not apparent. Their research has improved our understanding of the historical development of plea bargaining in the criminal justice system. ●



This graph shows a defendant's probability of conviction at trial (purple) relative to how likely they are to take a plea bargain (orange). Calculations are based on data reported in South Carolina Attorney General, Annual Report of the Attorney General for the State of South Carolina to the General Assembly (1919-1932).

2019-2020 team members are: Hayden Brown, a freshman pre-business major; Caroline Capps, a senior economics major; John McElhaney, a junior English major; and Nick Rucker, a senior economics major.

MEET THE TEAM

Alex is a junior genetics major with a biochemistry minor. Originally from Cincinnati, OH, he is glad to be living in a warmer climate. In addition to writing for Decipher, he studies parasitic protozoans in Dr. James Morris' lab at Clemson's Eukaryotic Pathogen Innovation Center. When not working he enjoys going to the lake with his friends and his Labrador Retriever, Zym.





“**I**Do Love My Baby” is the title of the recently published book featuring the work of 15 Creative Inquiry students in the Neonatal Abstinence Syndrome and Perinatal Substance Exposure Creative Inquiry projects mentored by Dr. Heide Temples and Dr. Mary Ellen Wright in the School of Nursing. Together, the multi-disciplinary team has collected stories from mothers suffering with opioid addiction and used their findings to influence healthcare for these families nationwide. Temples and Wright are the co-authors of the book with each student contributor highlighted within.

The goal of this Creative Inquiry project is to improve the recovery for mothers suffering from opioid addiction, for the health of both the mother and child. The team’s published research is being presented at professional conferences and distributed to hospitals and decision makers in the government and medical communities. The team is also sending their findings to public figures with the hope that by using their public influence they will help shape policy and transform public opinion of mothers suffering from addiction.

To collect data for their project on perinatal care and drug addiction, the team sent participant solicitations to

recovery centers in North and South Carolina. Even before publishing their findings, the community’s response to this team’s research was overwhelming. Mothers and families were eager to share their stories in hopes of positively influencing another family’s experience navigating raising a family in similar circumstances.

The students worked with Temples and Wright to conduct phone interviews with the participating mothers. Students then transcribed the interviews, omitting any identifying information, such as hospital locations and names. Once the stories were written, the team organized the stories chronologically for the book. Presented in the book as stand-alone chapters, each story focuses on the struggles and successes of a mother affected by opioid addiction. The book presents a powerful case for major adjustments to the professional care of mothers affected by addiction and the public perception of these women.

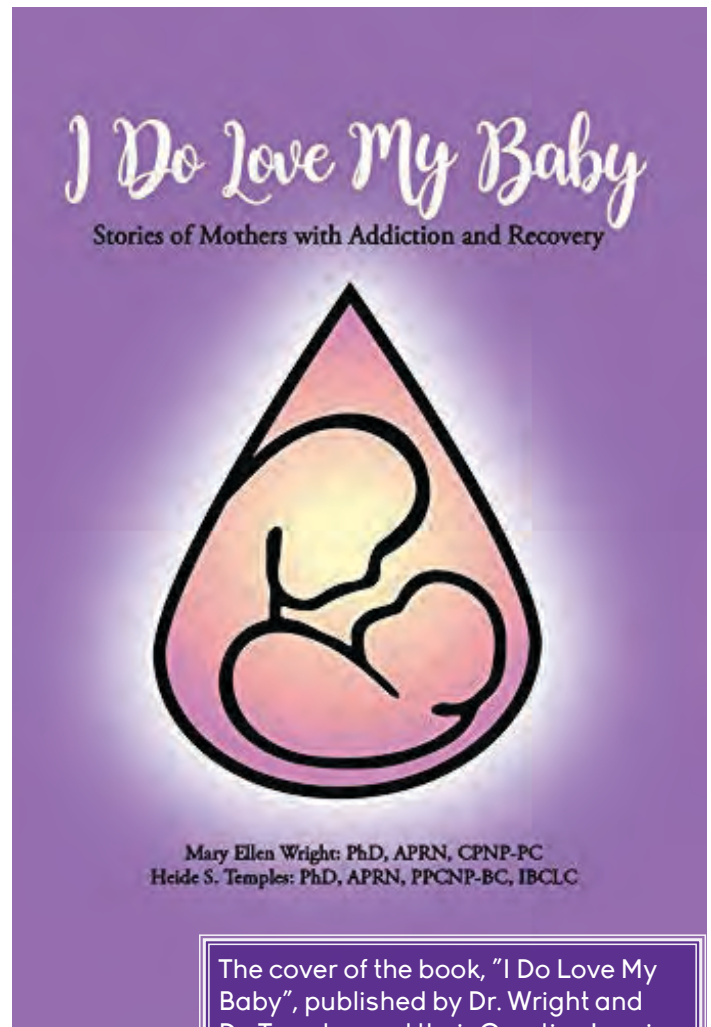
This project relies heavily on qualitative research. Within the medical field, published research is often primarily supported by significant quantitative findings and clinical trials; however, capturing the women’s perspective of recovering from addiction while raising a family required exploratory, story-based research.

Using a data analysis program called ATLAS.ti, students analyzed the transcripts identifying themes such as first pregnancy and first experience with drugs. The program returned over 160 themes. Across all of the stories, three major themes dominated: positive social support led to faster recovery; adverse childhood events were correlated with addictive behavior in mothers; and the loss of child custody was a positive push for the mother to recover from addiction.

The team’s work has received international attention. Collectively, the team has presented their research 21 times: 15 posters at nine conferences; three podium presentations; three papers submitted in peer-reviewed journals; and one book.

Unfortunately, due to the COVID-19 outbreak, students were unable to travel to present at the National Association of Pediatric Nurse Practitioners’ 41st National Conference in Long Beach, CA in March 2020 or the 2020 Association of Women’s Health, Obstetric and Neonatal Nurses Annual Convention in Phoenix, AZ in June.

Past and present members of this Creative Inquiry project hope their work will positively influence the care mothers affected by addiction receive during and after pregnancy. The team’s research provides specific suggestions for how to improve physical spaces, strengthen emotional support, aid recovery and ensure proper childcare. They all want their work to leave a lasting impact. •



The cover of the book, “I Do Love My Baby”, published by Dr. Wright and Dr. Temples and their Creative Inquiry team.

3 MAJOR THEMES EMERGED THROUGHOUT THE STORIES



1. Positive social support led to faster recovery from addiction.



2. Adverse childhood events were correlated with addictive behavior in mothers.



3. The loss of child custody was a positive push for the mother to recover from addiction.



THE PAINTED DESERTS



BY ALEX RICHARDSON



Dr. Harry Kurtz showing Jacob Futrell and Zachary Burton a test tube with microbial growth.

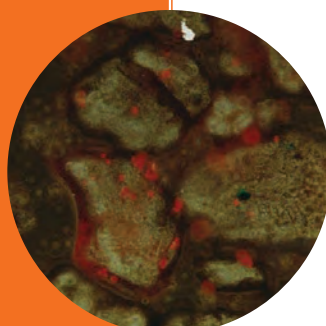
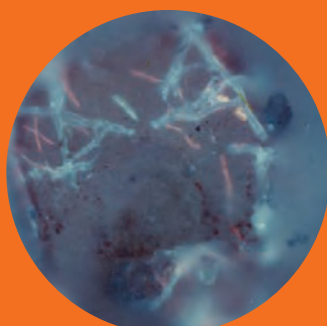
Throughout the deserts of southern Utah, rock formations exhibit beautiful colors. Within systems such as beaches and deserts, there are highly diverse ecological communities of microorganisms, also known as microbiomes. The Beaches and Deserts: The Microbial Cycling of Iron and Other Nutrients Creative Inquiry project led by Dr. Harry Kurtz in the Department of Biological Sciences is studying the impact that microbes have on these environments. The team is focusing on beaches and deserts because they are distinct, dynamic systems that are under pressure from climate change. Both ecosystems experience fluctuations in erosion, temperature and precipitation.

This team is investigating the role of microbes in metal and nitrogen cycling. Microbes require metal ions for growth and development, and research shows that metal ions are concentrated in the microbial biomass near the surface of the rock. These microbes likely form a biofilter, and the team is currently working to isolate key organisms involved in the process. To accomplish this, the team is developing growth media optimized for a target organism. Different characteristics of the organisms are exploited to develop base media which will allow for multiple generations of the target microbes to grow and develop to get a pure culture consisting only of the desired microorganism. The process of getting a pure culture often takes years, and many microbes cannot be completely purified. "It is very rewarding to be able to isolate individual microbes out of the environment and into a pure culture," Ronald Smithwick, a senior microbiology major, said.

By studying and identifying the organisms present in these desert systems the team hopes to evaluate the roles of different organisms in the environment and gain a greater understanding of the impact microbes have on the fundamental ecology of deserts. Through understanding the interplay between microbes and ecology, the impacts of climate change in desert environments will be better appreciated. ●

Auto-Fluorescence
Observed on Rocks

Photos taken by Kurtz.





BY MARILYN HAZLETT

Students in the AI for Racecars Creative Inquiry project, mentored by Dr. Yiqiang Han in the Department of Mechanical Engineering, are developing technology that could influence the next generation of off-road autonomous vehicles. Working in pairs, the students apply the programming skills they have acquired in their engineering and business courses to develop software specifically for unmanned vehicles. The students' goal is to gain experience in the autonomous automotive sector during their undergraduate years.

This research prepares students for industry careers and graduate education. In the course of the Creative Inquiry project, Han ensures that students learn programs such as Python and Robot Operating System (ROS) that are popular in industry and academic research. Students participating in the project have gone on to prestigious PhD programs and high-level industry jobs. Duncan Nicholson, a past team leader and licensed private glider pilot, is studying Aerospace Engineering at The Pennsylvania State University. Jamal Nasser, a senior computer science major, has interned at Microsoft, Google and Facebook since he joined the team.

Each semester, the Creative Inquiry project's focus shifts to best fit the interests and abilities of the participating students. In the Fall of 2019, students wrote an artificial

intelligence (AI) system for model racecars to play soccer. The students were able to control movements of the cars and the cameras mounted on each. The AI system taught the cameras to identify the 'ball'—a plastic cube—and move the vehicle toward it. Once physical contact was made with the ball, the vehicle shifted to search for the goal. Upon locating the target, the vehicle was programmed to push the ball into the goal and score! Currently, the team is focusing on expanding this platform to accomplish more generalized tasks such as off-road autonomous navigation and package delivery.

While we might not see soccer on the race track next NASCAR season, the skills students develop in this Creative Inquiry project can be applied to various types of mechanical and software engineering research. Through this project, Clemson students explore novel research in the rapidly growing field of autonomous systems, ranging from aerial-ground coordination and off-road package delivery to autonomous racecars playing soccer. ●



Dr. Yiqiang Han working with one of the team's vehicles.

BRAND COMMUNICATIONS

BY MARILYN HAZLETT



Nestled between cadence and agency, *Cadency* is the culmination of a year of research and creativity. The concept for this interdisciplinary student agency was developed in the Brand Communications: Research, Strategy & Student Agency Planning Creative Inquiry project under the direction of Katie Hildebrand from the Erwin Center for Brand Communications. Additional mentors for the project include Tina LeMay, Creative Director for Student Affairs Publications and Director of Campus Banner + Design, Jackie Herr, an Adjunct Lecturer in the Erwin Center for Brand Communications and Michele Cauley, a Professor of Practice in the Department of Marketing. Seven College of Business students collaborated with multiple units throughout and beyond campus to begin conceptualizing the growth and expansion of this student agency.

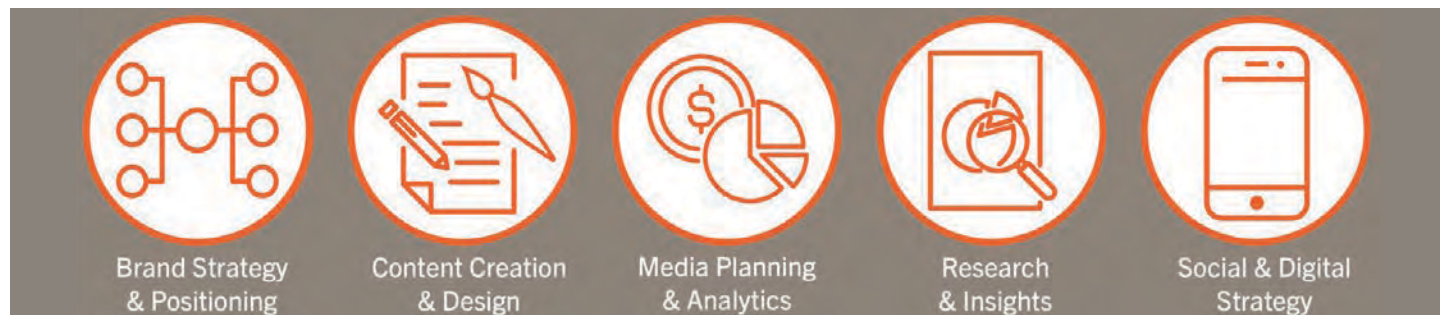
Cadency will partner with Campus Banner + Design with the goal to provide professional development in strategic and creative brand communications to students from a variety of backgrounds. *Cadency* will also contract its services to clients in local communities.

The foundational concept for the agency was perfected this year by undergraduate students in the Creative Inquiry project. Brianna Moore, a senior marketing major, started working with the Creative Inquiry team in Fall 2019. While the ultimate goal of the project and her professional goals are well-aligned, that was not her only inspiration for joining the team. “I joined this CI because of the ability it provided me to contribute a lasting impact on Clemson’s campus,” Moore said. “Through the creation of *Cadency*, future students will have the opportunity to do real agency work with real brands as undergraduates—which is an exceptional opportunity.”

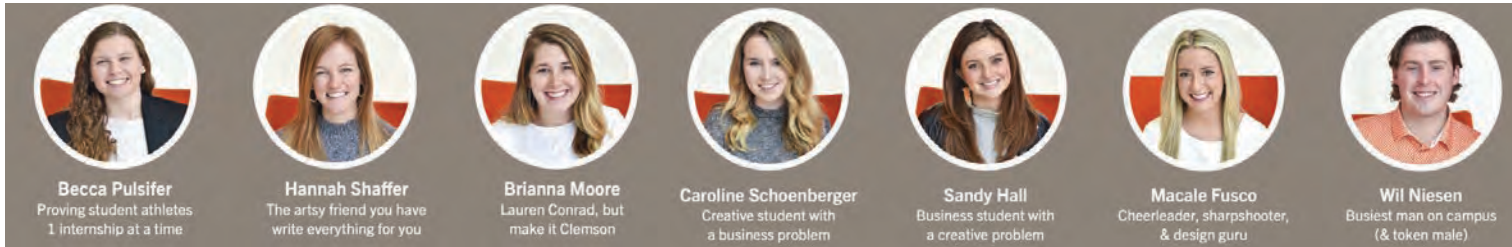
Cadency will be staffed by student interns through the University Professional Internship/Co-op (UPIC) Program. The interdisciplinary agency will serve



What they do



Meet the Crew



clients by producing high-end brand content and communications materials. *Cadency's* magic is that it combines students from a variety of disciplines and offers a critical balance between professionalism and relevancy as brands seek to know more about how to communicate with Gen-Z.

The *Cadency* model will likely involve a partnership between the Erwin Center for Brand Communications and Campus Banner + Design. The Erwin Center was founded in 2012 thanks to the generosity and commitment of Clemson graduate Joe Erwin ('79) and his wife Gretchen. The Center's mission is to provide students studying brand communications with hands-on experience through real brand projects. It offers classes in content and brand strategy, hosts the Clemson CMO Summit alongside Forbes and industry professionals and houses the Brand Communications minor.

The team planned an in-person pitch in New York City in late March. Unfortunately, the trip was canceled due to travel restrictions enacted in response to the COVID-19

pandemic. Instead, everyone logged on to Zoom and presented their pitch virtually. The Creative Inquiry team shared their past year of work, the proposed organizational structure and examples of *Cadency's* abilities and services. As a next step, the Erwin Center is working with internal Clemson University partners and Erwin Center Board members to test services in the Fall of 2020. ●

“Through the creation of *Cadency*, future students will have the opportunity to do real agency work with real brands as undergraduates—which is an exceptional opportunity.”
- Brianna Moore

Timeline





WHEN *Virtual Reality* GETS REAL

STUDYING IMPLICIT RACIAL BIAS IN VIRTUAL REALITY AND BEYOND

BY ALLYSSA HAYGOOD-TAYLOR

Imagine being able to have experiences and behave as a completely different person. Virtual reality (VR) offers such opportunities. The User Experience in Virtual Reality Games Creative Inquiry project allows students to develop a virtual reality game. Divine Maloney, a graduate student, and Dr. Andrew Robb, both from the School of Computing, mentor this project that addresses issues at the intersection of computer programming and sociology. Each semester this team researches, develops and programs an original video game.

The team's research focuses on the user experience. Specifically, they are investigating how users relate to their self-avatar. "Instead of seeing the avatar out there, a self-avatar in virtual reality is when you look down and can see it; the avatar overlaps your body," Robb said. Self-avatars are the mechanism in which players place themselves inside a game. This project aims to dissect the powerful and unexpected effects of self-avatars and virtual reality on a gamer's behavior by having them experience a self-avatar that does not physically resemble the player. For example, a tall avatar usually increases the confidence of the user. This Creative Inquiry team uses

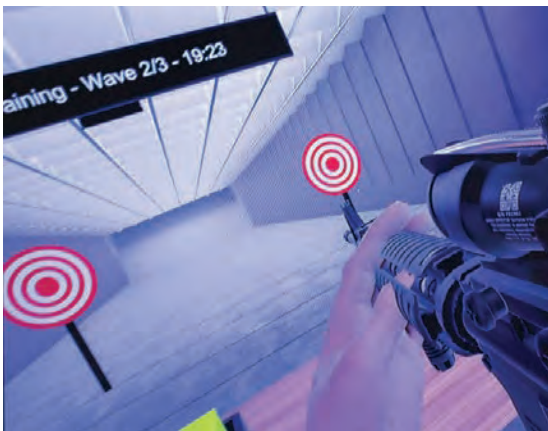


“A self-avatar in virtual reality is instead of seeing the avatar out there, you look down and can see it; the avatar overlaps your body.”
 -Dr. Andrew Robb



software such as the Unity3D game engine and the Oculus Quest VR HMD (Head Mounted Display) headset to both develop avatars and experience their basic and sometimes, complex characteristics.

Though computer programming is a large component of the project, the team is also investigating the psychological and sociological effects of disassociating, or mentally separating yourself, on video game users and self-avatars. The team recently completed a study on implicit racial bias in video games. Students created a VR simulation in which test subjects were given the task of shooting aliens versus humans. The team studied implicit racial bias by putting themselves into the game as avatars of a race or gender other than their own. The team then recorded how assuming an altered persona in a VR simulation affected each individual’s attitude and choices towards violent actions, such as shooting a gun.



The team presented their work at the annual IEEE Virtual Reality Conference in March, originally scheduled to be in Atlanta, GA. Due to the COVID-19 pandemic, the conference was hosted virtually. But the innate ability for this Creative Inquiry project to work in a virtual space allows them to continue offering students the experience of the complete developmental process of VR from initial research, software learning, game development and testing, to the publication of their findings. It is through this process that students of any major are able to be exposed to video game development and virtual reality software. ●

(Top) Depiction of a female avatar being chosen as a game character.

(Middle) Divine Maloney testing range of movements for controlling in-game movements.

(Bottom) A game screenshot from an avatar at the shooting range.



MEET THE TEAM

Allyssa is a senior English major and communication minor from Columbia, SC. She grew up a USC fan but that quickly changed when visiting Clemson her senior year of high school. You can find Allyssa writing at All In Cafe or hanging out with her dog, Senator.

THE CROSSROADS BETWEEN REFUGE, DETENTION AND HOSPITALITY

BY ALEX RICHARDSON



There are more than 200 detention facilities across the United States and, in recent years, more than 50,000 immigrants in detention at any given time. The Stories of Refuge, Detention and Hospitality Creative Inquiry project is working to better understand the connections between immigration, detention and hospitality for those detainees. Dr. Angela Naimou, in the Department of English, and Dr. Joseph Mai, in the Department of Languages, designed this Creative Inquiry project to expand students' understanding of what hospitality means for detained immigrants and their families.

The team visited the Stewart Detention Center in Lumpkin, GA, to meet and dialogue with the adult immigrant detainees that are housed at the center. Before visiting the center, the team wanted to understand how different people approached similar experiences. So, they read Valeria Luiselli's *Tell Me How It Ends*, which is a book-length essay that reflects on the author's time aiding unaccompanied children as they completed immigration intake forms. The team used this book and met with Amílcar Valencia of El Refugio to prepare for the visit with the people in detention. Some immigrants spoke about everything from their experience traveling to the United States to their outlook on life, and others just wanted to have simple, light-hearted conversations. The dialogue was intended to give detainees an opportunity to speak their minds and share their experiences. Through their visit, students were able

to develop a better understanding of how undocumented immigrants are treated in this country.

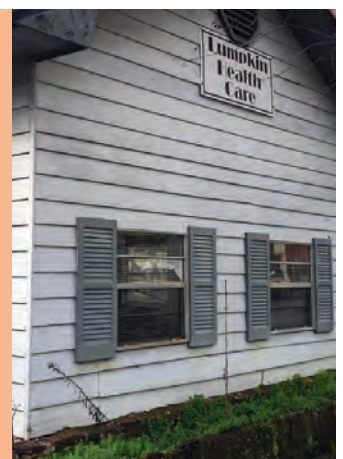
The team took part in a visitation program established by El Refugio, a hospitality house serving the immigrants at the Stewart Detention Center and their families. Mary Ann Fahmy, a sophomore Spanish and international health major, described El Refugio as a home designed to make everyone feel welcome by hosting families visiting detainees at Stewart Detention Center. "I associate El Refugio with Amílcar Valencia (the Executive Director), who showed us what hospitality means... After congratulating [a man] on his release, [Valencia] walks out with him, his hand on his shoulder," Fahmy said.

After their visits to the Stewart Detention Center and El Refugio, the Creative Inquiry team held a symposium on campus in fall 2019 to share the stories of the detainees at the center with the Clemson community. Through this event, more Clemson students have become aware of the experiences of immigrants increasingly held in mandatory detention while trying to gain refuge or return to ordinary life in the United States. The Creative Inquiry project plans to continue learning more about immigrant detention and about the hospitality and advocacy of organizations like El Refugio. Next year, the team will be exploring outreach through public events and their own writing. ●



Students meet with immigration lawyer, Marty Rosenbluth.

From left to right: Mary Ann Fahmy, Roann Abdeladl, Sam Jones, Dr. Angela Naimou, Marty Rosenbluth, Dr. Joseph Mai, Julia Laasch, Carly Malcolm, Sylvia Wu, Alexia Hopkins, Breana Franklin, Della Maggio.



THE RARE BEAUTY *of the* ROCKY SHOALS SPIDER LILY

BY ALEX RICHARDSON

Hannah Jellema kayaking along Stevens Creek where spider lilies grow

Rocky shoals spider lilies, *Hymenocallis coronaria*, were once prevalent in streams throughout the southeastern United States. As populations declined, the plant came under consideration for protection by the Endangered Species Act. Dr. Althea Hagan in the Department of Forestry and Environmental Conservation and her students in the Unraveling the Mystery of the Rare rocky shoals spider lily Creative Inquiry project are monitoring populations and trying to determine the factors contributing to the spider lily's decline.



A close-up of one of the spider lilies, taken by Dr. Althea Hagan

The rocky shoals spider lily is an important indicator species for overall stream health. Indicator species are organisms that are used to monitor the health of an environment when it is not practical to deploy water quality instruments. Streams with spider lilies growing in them are likely to be healthy. On the other hand, South Carolina streams that lack these plants may be candidates for restoration. Dam construction likely diminishes populations because it damages the natural habitat of this aquatic plant—the shallow rocky banks (shoals) of the streams. Dams may also

negatively impact the flow rate of water, thus compromising overall stream health.

The Creative Inquiry team is using methods from the “Adopt A Stream” program to monitor the health of streams with or without rocky shoals spider lilies. In this program, students measure and monitor water quality indicators such as pH, dissolved oxygen, phosphorous and nitrogen. The team is also looking at other factors such as the stream's flow rate and soil composition. Through studying the conditions of the streams, the team expects to identify the spider lily's ideal environment.

To further this Creative Inquiry team's research, Hagan is applying for grants in order to purchase the equipment needed to monitor streams remotely. This will allow the team to broaden the scope of their research, expanding data collections into neighboring states. By understanding the ideal growing conditions of the rocky shoals spider lilies as well as the causes of past population decline, this team will be able to develop effective restoration efforts in streams throughout the state of South Carolina. ●

MEET THE TEAM

Marilyn is a senior economics major with a minor in mathematical sciences from Potomac, MD. On campus, she is involved in student government, housing, sailing club and Greek life. She loves serving prospective students as a tour guide and sharing what it means to be part of the Clemson family.

Writer



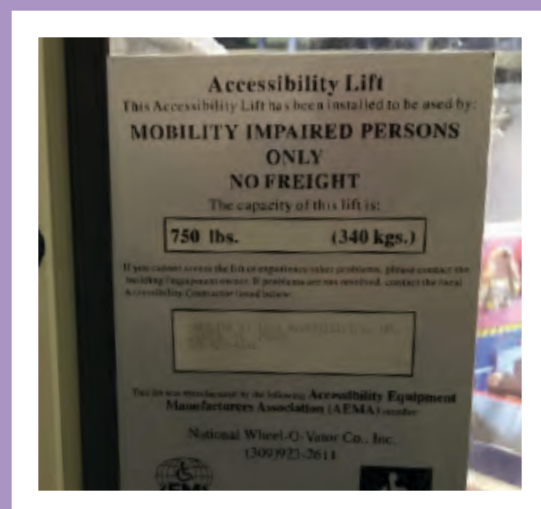
SIGHTS, SOUNDS AND SENSORY BAGS

BY ALLYSSA HAYGOOD-TAYLOR

Most children love field trips, whether it is to the museum, the aquarium or the zoo. But these experiences are not exciting for every child. Students with autism or sensory sensitivities can be overwhelmed when entering these venues if they lack necessary accommodations. The Out-of-Classroom Experiences Creative Inquiry project, led by Dr. Ryan Visser in the Department of Education and Human Development, travels to out-of-classroom learning venues to evaluate their accessibility accommodations.

This Creative Inquiry project is investigating how education-based venues service students with autism and sensory sensitivities. Rebecca Lamb, a junior special education major, views this project as necessary for addressing accessibility and adaptability issues. "What we want is to supply the knowledge of what students struggle with in these situations to the teachers as a resource," Lamb said. This Creative Inquiry team travels to local and regional out-of-classroom venues such as the Riverbanks Zoo in Columbia, SC. Accommodations for students with sensory sensitivities are often limited to sensory bags, which are kits provided by the front desk with items such as headphones or sunglasses to dim lights. Venues that do not have educational programs designed for K-12 students usually do not provide any accommodations.

Signage at the Georgia Aquarium denotes sensory-safe spaces.

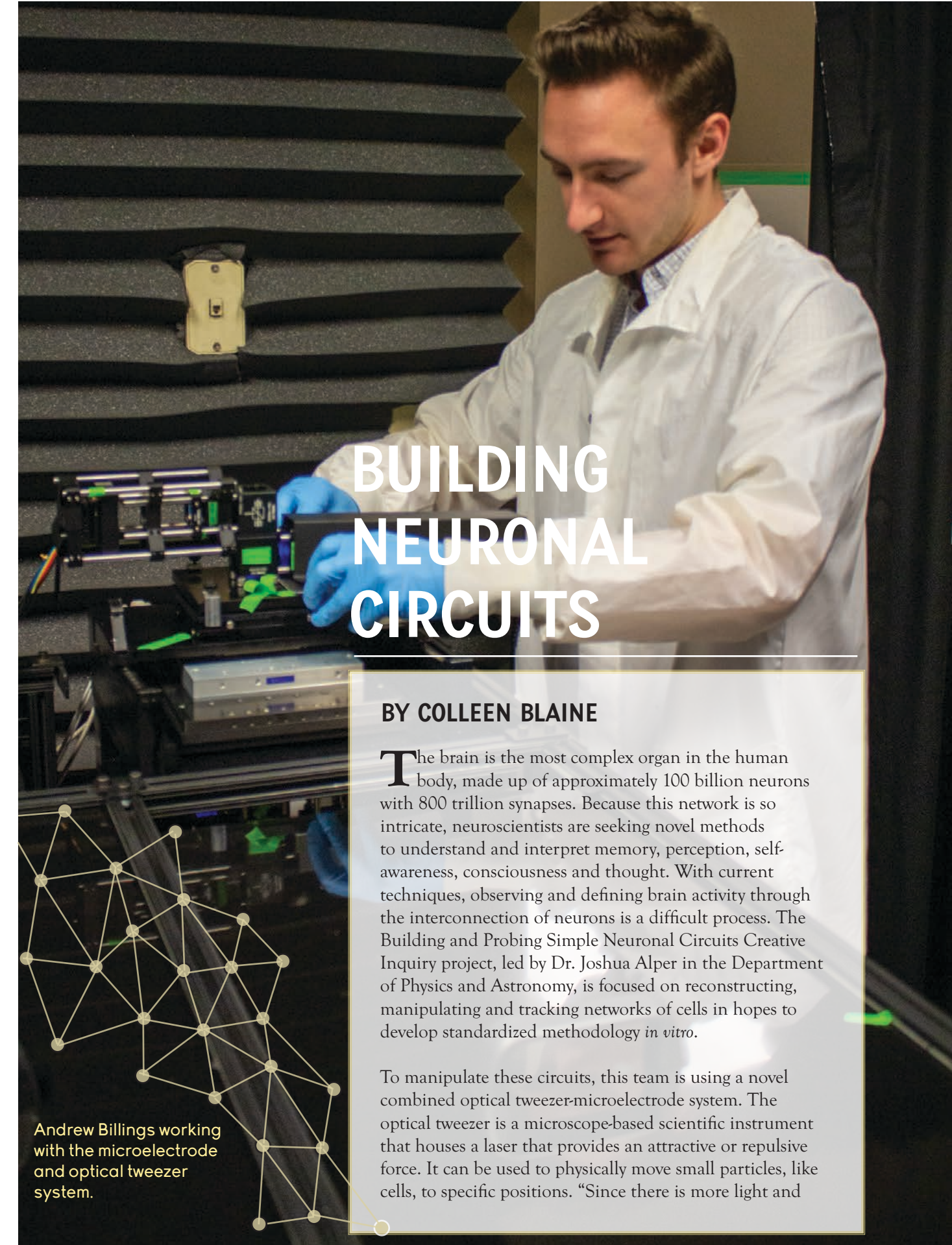


Inside the Georgia Aquarium auditorium.

Leah Stone, a junior special education major, views the efforts of this Creative Inquiry project as a resource to expand learning opportunities for autistic students beyond their classroom's four walls. "[We want] to inform people of how students with autism can be served best in the community," Stone said. The team is starting conversations with professionals and educational venues on what procedures should be in place to best serve students needing accommodations. One venue the team feels is succeeding in an effort to be more inclusive is The Children's Museum of the Upstate in Greenville, SC. This museum hosts weekly sensory days where they turn down the volume of sounds, the brightness of lights and even offer therapy dogs. According to this team, offering sensory days is one way to accommodate all visitors. Further, the museum directors inquired about future collaborations with the student team in order to strengthen the museum's accommodation program.

Looking forward, this team is excited to provide their recommendations to teachers and families who care for autistic students as well as to field trip venues as a resource for becoming more accessible. They are producing and publishing custom social stories or mini booklets that demonstrate to children what to expect in environments such as The Children's Museum of the Upstate, for which the students created. Children can review these booklets before going to the venue, so they are better prepared for the experience. This Creative Inquiry project strives to offer outlined and defined expectations for out-of-classroom venues as well as to prepare teachers for school trips, in order to make these experiences more accessible for students with autism or sensory sensitivities. Every student should have the opportunity to enjoy field trips, and this Creative Inquiry project is helping to make that possible. ●

The CI team outside of the Georgia Aquarium.

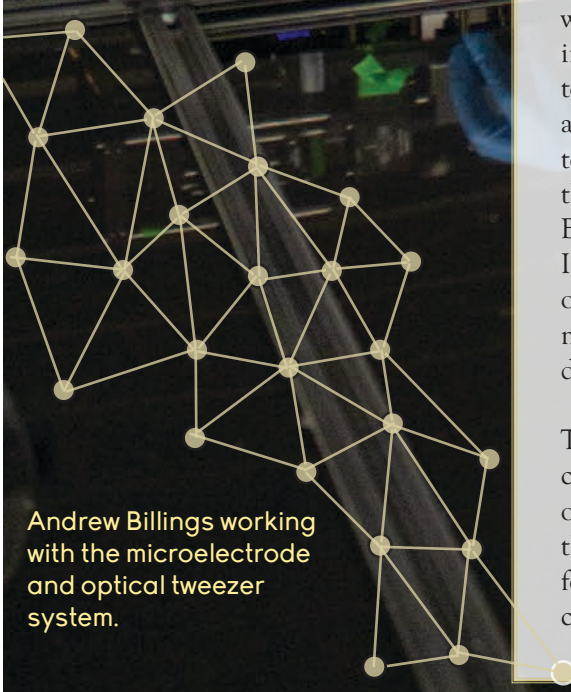


BUILDING NEURONAL CIRCUITS

BY COLLEEN BLAINE

The brain is the most complex organ in the human body, made up of approximately 100 billion neurons with 800 trillion synapses. Because this network is so intricate, neuroscientists are seeking novel methods to understand and interpret memory, perception, self-awareness, consciousness and thought. With current techniques, observing and defining brain activity through the interconnection of neurons is a difficult process. The Building and Probing Simple Neuronal Circuits Creative Inquiry project, led by Dr. Joshua Alper in the Department of Physics and Astronomy, is focused on reconstructing, manipulating and tracking networks of cells in hopes to develop standardized methodology *in vitro*.

To manipulate these circuits, this team is using a novel combined optical tweezer-microelectrode system. The optical tweezer is a microscope-based scientific instrument that houses a laser that provides an attractive or repulsive force. It can be used to physically move small particles, like cells, to specific positions. “Since there is more light and



Andrew Billings working with the microelectrode and optical tweezer system.

more intensity being refracted inside rather than outside of the laser, it changes momentum of the [particle] and pushes it back toward the center,” Andrew Billings, a senior mechanical engineering major, said.

The microelectrode system is an array of electrodes that sends excitatory electrical pulses and monitors the neuronal network’s responses with electronic circuitry. This system works in conjunction with the optical tweezer; while the tweezer enables the team to create specific, simple neuronal circuits, the microelectrode system allows the function of circuits to be tested. The team can track how fast or far cells can move and will eventually be able to generate a protocol for building neuronal circuits.

Once cells are placed within the system, the team will attempt to guide the growth of neurons and create synapses, which are the electrical connections formed through two adjoined neurons. Synapses are essential for brain functions such as memory; the strength between neurons is thought

Ultimately, we would like to build *in vitro* neuronal circuits, both open circuits and closed circuits, to demonstrate how small assemblies of neurons can form the foundations of thought, memory and perception.

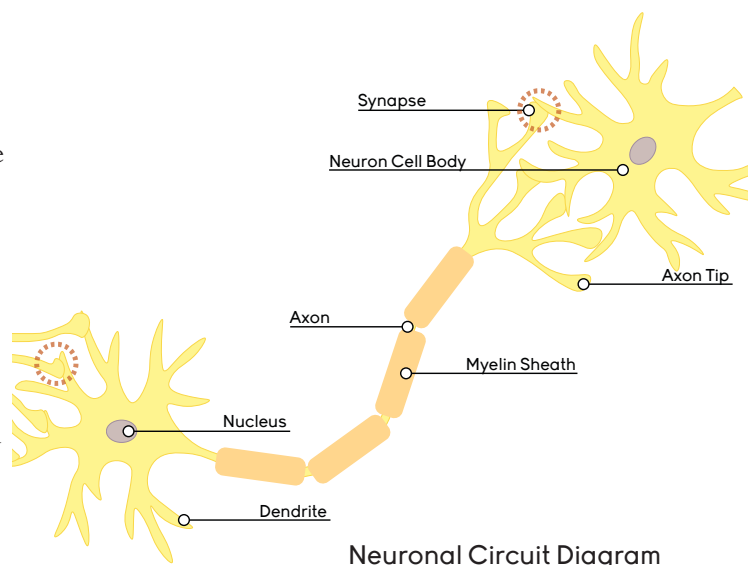
-Dr. Joshua Alper

to determine the formation of a memory. “Ultimately, we would like to build *in vitro* neuronal circuits, both open circuits and closed circuits, to demonstrate how small assemblies of neurons can form the foundations of thought, memory and perception,” Alper said.

Few studies have attempted to replicate neuronal circuitry using this particular system, and this Creative Inquiry project aims to standardize the method. The students hope that the use of the combined optical tweezer-microelectrode array system will help further the understanding of how neurons move and connect in the human brain. “This research could lead to much bigger research opportunities, especially since it could open the door to creating synapses or could help possibly restore regenerative mental capabilities,” Devante Kee-Young, a junior biochemistry major, said. In the future, this project’s work could assist other neuroscientists in exploring neuronal circuitry, which will allow for a more comprehensive understanding of complex brain functions such as cognition and memory. ●



DeVante Kee-Young is using a centrifuge to prepare cells for plating on a microelectrode array (MEA).



Neuronal Circuit Diagram

Technology-Aided DAMAGE ASSESSMENT

USING 3D SCANNERS TO OPTIMIZE HAIL
DAMAGE CLAIM PROCESSES ON VEHICLES

Dora Yang using the 3D scanner to scan a hail dented sheet of metal.



BY ALLYSSA HAYGOOD-TAYLOR

ally
do it right.

When dealing with a weather damaged vehicle, customers understandably have high expectations for assessing the damage to estimate repair costs. Technology may provide a more consistent and accurate method to hail damage assessment compared to traditional approaches using the skilled eye of an agent. To address this issue, Clemson University and Ally Financial have partnered in an effort to improve the process for these types of assessments. The Improving the Automotive Hail Damage Claim Process Using 3D Scanner Technology Corporate Creative Inquiry project led by Dr. Rachel Anderson in the Academic Success Center, and Dr. Todd Schweisinger in the Department of Mechanical Engineering, is investigating solutions for assessing hail-damaged vehicles.

The team is primarily focusing on using hand-held 3D scanning technology to assess vehicle body damage from hail. Before scanning vehicles, the team validated their methodology by scanning controlled dents on metal surfaces. They conducted a series of trials, dropping metal balls on metal sheets as well as a variety of car parts. "With the damaged metal sheets, we use a 3D scanner and calculate the time it took to scan, the correct lighting needed and if it was able to pick up even minute damage," Jared Gaidjunas, a sophomore bioengineering major, explained. The team also had the opportunity to analyze actual hail damage on a vehicle belonging to a student on the team.

Students in this project are split into three teams but all work together. The three sub-teams are the time and cost analysis team, the software team and the scanner performance team. Even with team separation, this Creative Inquiry project prides itself on fostering a collaborative environment. "Though we're assigned different tasks, we are all working to interface with the scanner and the software itself to quantify dents for assessment," Hunter Harkins, a sophomore general engineering major, said.

In these teams, the students are all addressing potential inefficient assessments from different angles whether it be through actual damage experimentation or software testing. Ultimately, they are working towards determining what scanner and software combination can best quickly and efficiently count and then quantify repair costs, even for the tiniest dent.

The team is fortunate to have weekly web conferences with representatives from Ally Financial. These meetings allow the students to interact and collaborate with the company directly. "Collaborating with students and faculty over the last two semesters was a wonderful experience. The entire team took an interest in Ally and asked many questions to understand our requirements. There was a spirit of teamwork that helped the students to look at hail damage scanning from different perspectives, which allowed them to make insightful recommendations. This included discoveries of what would work best as well as findings where scanning would be limited. Overall, the team was very engaged and pressed forward virtually once the pandemic occurred. A side benefit of the project was allowing students to learn more about Ally and what we do. We all had fun and found the program to be rewarding," Paul Sipes, Ally Insurance Field Operations Manager, said.

Eventually, the team hopes to present Ally Financial with an optimal solution for making their damage assessment process more accurate, time efficient and cost efficient. Ultimately, this Creative Inquiry team works to offer an in-depth, technology-aided system that optimizes 3D scanners and software to be used by Ally Financial in vehicle assessments. Though this Creative Inquiry's research is currently focused on creating accurate repair estimates for hail damage of a single vehicle, in the future, their studies could be used for field claims of hail damage to multiple vehicles such as at car dealerships. ●

THE INTERSECTION BETWEEN DOMESTIC POLITICS AND *Treaties*

BY ALEX RICHARDSON

In the American political system, there are two primary ways presidents enter into international agreements. Traditionally, treaties are the most well-known form of agreement; however, in the United States, executive agreements are used to complete the overwhelming majority of international agreements. The circumstances often dictate the preferred method for the agreement. Dr. Jeffrey Peake, Chair of the Department of Political Science, mentors The Domestic Politics of US Treaties Creative Inquiry project. This team is investigating case studies and collecting systematic data on international agreements, with the ultimate goal to write a book on the politics of treaties in the United States. The new book will update Peake's previous book published in 2009, and focus on recent case studies and the changing politics of treaties during the Obama and Trump presidencies.

Since treaties require two-thirds Senate approval, the President may instead decide to complete an agreement as an executive agreement, which in almost all cases can be implemented by the executive without Congress. Throughout the last half of the 20th century, 94% of all international agreements were executive agreements, and 6% were treaties. During the Obama presidency, the usage of treaties decreased and the majority of all international agreements during his presidency were executive agreements. This trend has continued with the Trump presidency, and the Creative Inquiry team is working to understand the domestic causes of the shift, as well as the foreign policy consequences. The record levels of partisan polarization in the Senate has made it more difficult for presidents to pass treaties through the Senate, and due to this, President Obama relied far more on executive agreements for international diplomacy. However, executive agreements have a weakness, as future presidents can easily leave the agreement. For example, President Trump was able to end American participation in two of President Obama's

signature international agreements: the Paris Climate Accords and the Iran Nuclear Agreement.

To study shifts in treaty-making, the students conduct extensive literature reviews, find case studies and collect data from the United States Department of State. The team believes that the shift from treaties to executive agreements is partly due to internal Senate politics. The Republican party, especially recently, tends to oppose multilateral treaties. Given the super-majority requirement, bipartisan agreement is necessary for Senate approval, but extraordinarily difficult to achieve given partisan polarization. As a result, numerous multilateral agreements languish in the Senate, including UN conventions on women's equality, the rights of the disabled, child rights and the law of the sea, among others.

While analyzing data and case studies, the team has gained valuable experience by presenting at the Midwest Political Science Association Meeting in Chicago. "The research skills that I gained through the Creative Inquiry and having the opportunity to present my own research at a national conference led me to be interested in furthering my understanding of the intersection between US politics and foreign policy," Maeve Cuddy, a senior political science major, said. ●

MEET THE TEAM

Ana is a sophomore architecture major with a french minor from Fort Mill, SC. In her free time, she likes to play tennis and read (her favorite book is the House of Spirits by Isabel Allende). She also really enjoys a few cups of coffee a day and eating at Five Guys.





EXPLORING PARASITE BIOLOGY

BY ALEX RICHARDSON

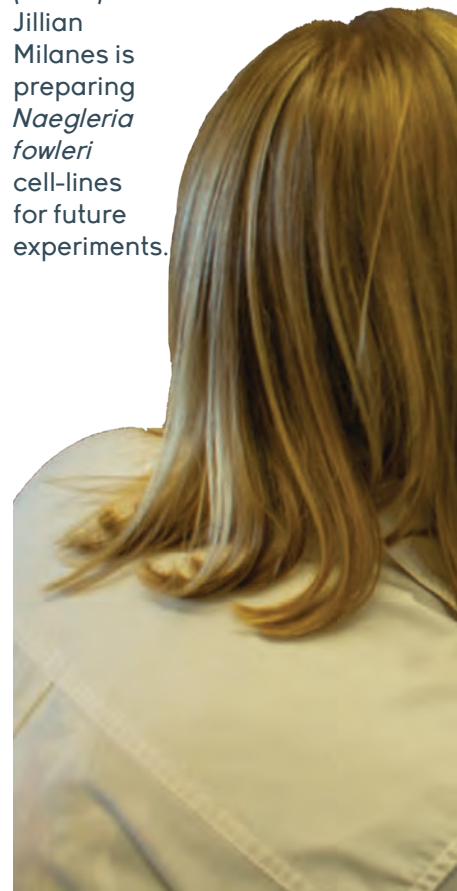
After swimming in contaminated water in Cumberland County, North Carolina, a man died from contracting a rare brain-eating parasite, *Naegleria fowleri*. With a mortality rate of 97%, it is crucial that more effective treatments are developed to fight this infection. The Exploring Nutrient Sensing in Protozoan Parasites Creative Inquiry project mentored by Dr. James Morris in the Department of Genetics and Biochemistry is investigating potential treatments for *N. fowleri* and other deadly parasitic organisms.

The team studies the metabolic pathways of multiple parasites including *N. fowleri* and *Trypanosoma brucei*. They hope to develop novel treatments for these deadly infections by targeting the parasites' metabolic biology. Sarah Grace McAlpine, a senior biological sciences major, is working to develop

fundamental research techniques needed to understand the basic biology of *N. fowleri*. This research will potentially advance the development of more effective therapies. "The current treatment for *Naegleria* is a seven-drug cocktail, and we really don't know what each drug does in the body," McAlpine said. Jillian Milanes, a graduate student in the Department of Genetics and Biochemistry, and McAlpine have successfully produced green fluorescent *N. fowleri*. Their goal is to establish parasites that permanently express the fluorescent protein so that Morris' collaborators can infect mice and follow the parasites as they interact with immune cells in the animal.

Trypanosoma brucei, the parasite responsible for African sleeping sickness, threatens millions of people from communities in sub-Saharan Africa. If left untreated,

(Above) Jillian Milanes is preparing *Naegleria fowleri* cell-lines for future experiments.

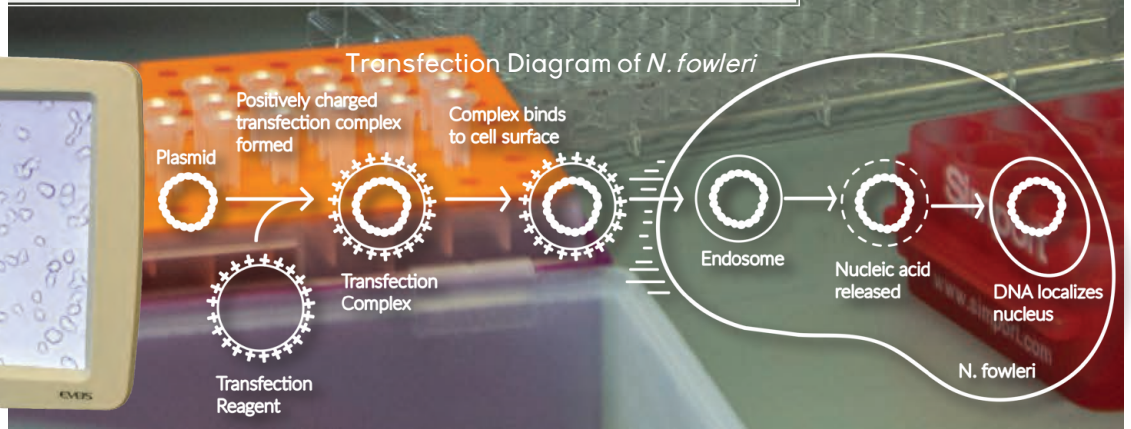
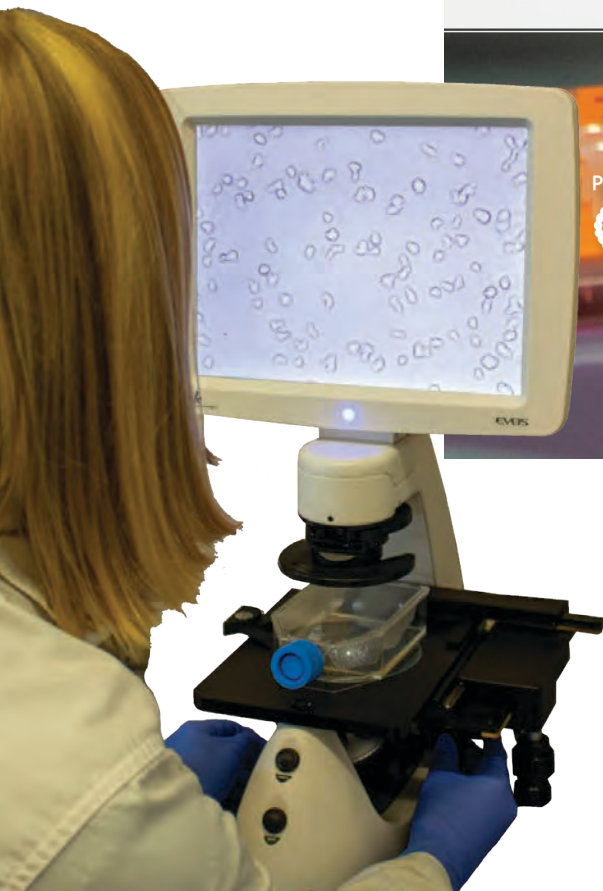
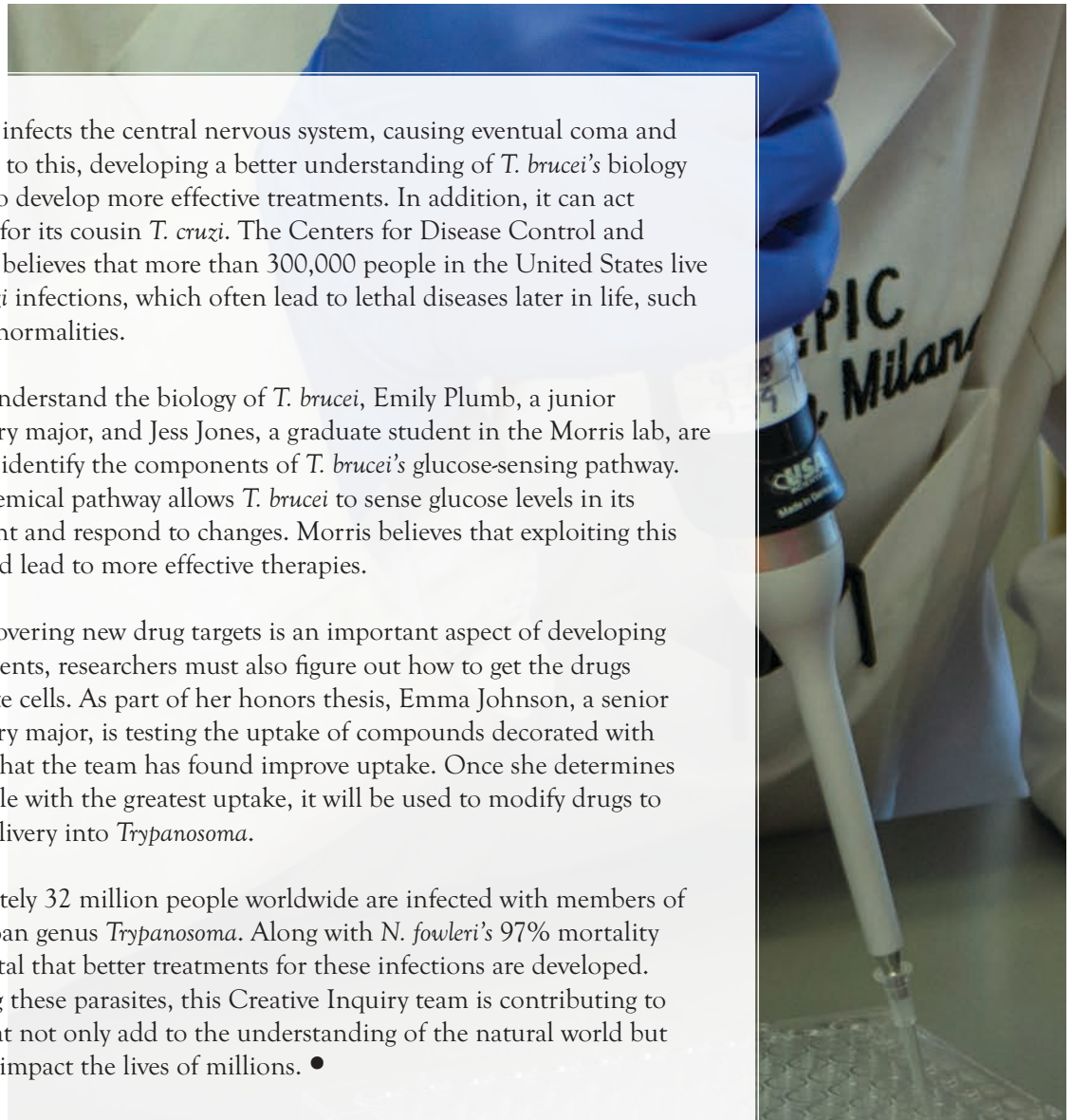


the disease infects the central nervous system, causing eventual coma and death. Due to this, developing a better understanding of *T. brucei*'s biology is needed to develop more effective treatments. In addition, it can act as a model for its cousin *T. cruzi*. The Centers for Disease Control and Prevention believes that more than 300,000 people in the United States live with *T. cruzi* infections, which often lead to lethal diseases later in life, such as heart abnormalities.

To better understand the biology of *T. brucei*, Emily Plumb, a junior biochemistry major, and Jess Jones, a graduate student in the Morris lab, are working to identify the components of *T. brucei*'s glucose-sensing pathway. This biochemical pathway allows *T. brucei* to sense glucose levels in its environment and respond to changes. Morris believes that exploiting this ability could lead to more effective therapies.

While discovering new drug targets is an important aspect of developing new treatments, researchers must also figure out how to get the drugs into parasite cells. As part of her honors thesis, Emma Johnson, a senior biochemistry major, is testing the uptake of compounds decorated with structures that the team has found improve uptake. Once she determines the molecule with the greatest uptake, it will be used to modify drugs to improve delivery into *Trypanosoma*.

Approximately 32 million people worldwide are infected with members of the protozoan genus *Trypanosoma*. Along with *N. fowleri*'s 97% mortality rate, it is vital that better treatments for these infections are developed. By studying these parasites, this Creative Inquiry team is contributing to projects that not only add to the understanding of the natural world but potentially impact the lives of millions. ●

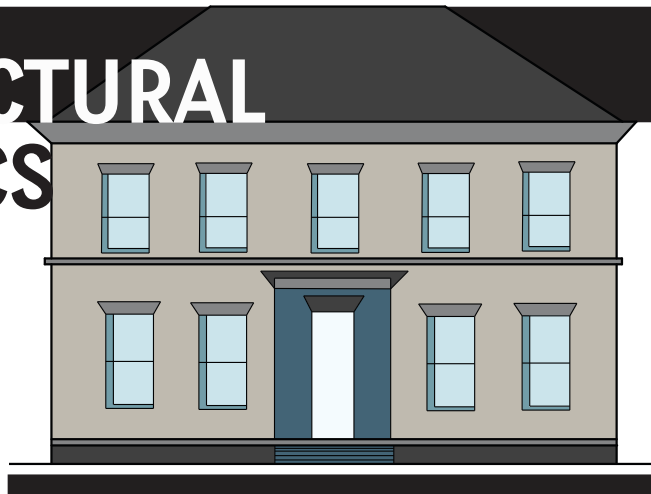


(Left) Sarah Grace McAlpine using a microscope to evaluate her cell-lines.

(Top) Jillian Milanes setting up a 96 well-plate to run an enzyme activity assay.

ARCHITECTURAL AESTHETICS

BY COLLEEN BLAINE



From ionic columns to twisting skyscrapers, architecture has changed drastically over the centuries. However, people can still recognize the beauty of the Parthenon just as easily as that of an elegant home in the Chicago suburbs. It can be difficult to quantify why a certain family is drawn to a certain house or how home designers appeal to certain homebuyers. The Artificial Intelligence (AI), Architecture Aesthetics and House Price Creative Inquiry project led by Dr. Lily Shen in the Department of Finance uses machine learning to determine how the beauty of a home affects its resale value.

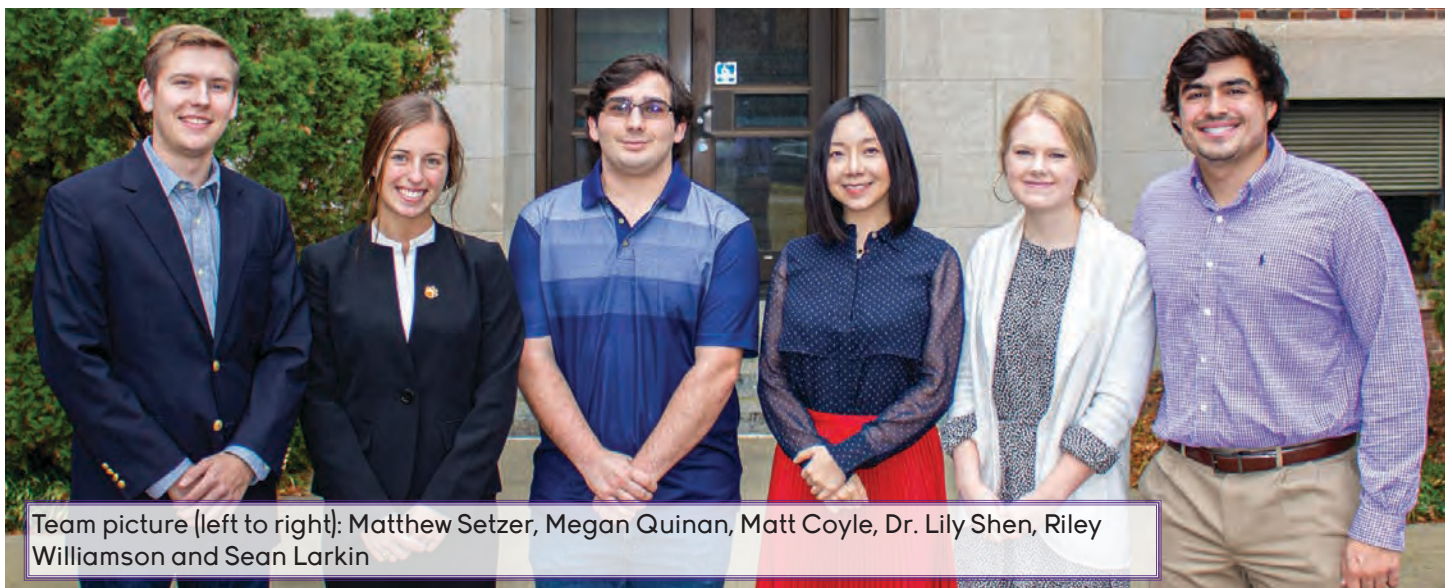
Although beauty is not a simple thing to quantify, Shen and her team are employing machine learning to establish an automated method for determining the value of a property. The team looks at four elements in the machine learning algorithms: the overall balance and symmetry of the house; the landscape of the exterior; the type of roofline; and the proportionality of the windows, regarding the amount and combinations of styles.

“In the housing market, potential buyers don’t just look at

the number of bedrooms, baths and square footage when searching for a new home, they also look at the unique qualities that the house has,” Megan Quinan, a senior accounting major, said.

For each of the four elements, students created a scale from one to five to determine how attractive the home might be to the average person. For example, relating to proportionality of the windows, if there were multiple window styles present on the house, this would result in a lower rating. Students provide points of reference for the computer to learn from such as the height of the ceiling or the size of a window. With each trial, the machine becomes better at predicting the initial assumptions. “It’s not magic! It really is efficient learning,” Shen said.

This project has captured the attention of finance and engineering students as well as policy makers working in the banking sector who are keen to explore how technology can help investors monitor financial risks. With housing market fluctuations, this research has the power to inform investors and bankers about the increased or decreased

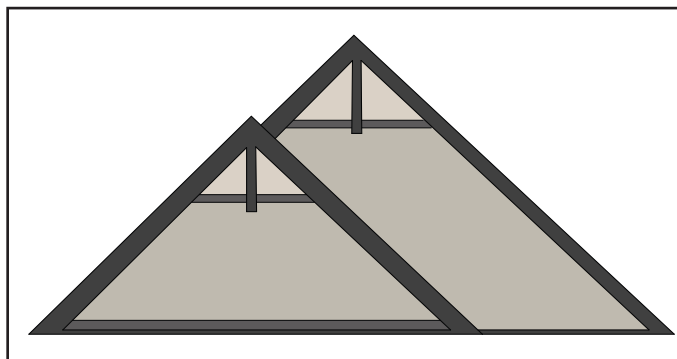


Team picture (left to right): Matthew Setzer, Megan Quinan, Matt Coyle, Dr. Lily Shen, Riley Williamson and Sean Larkin

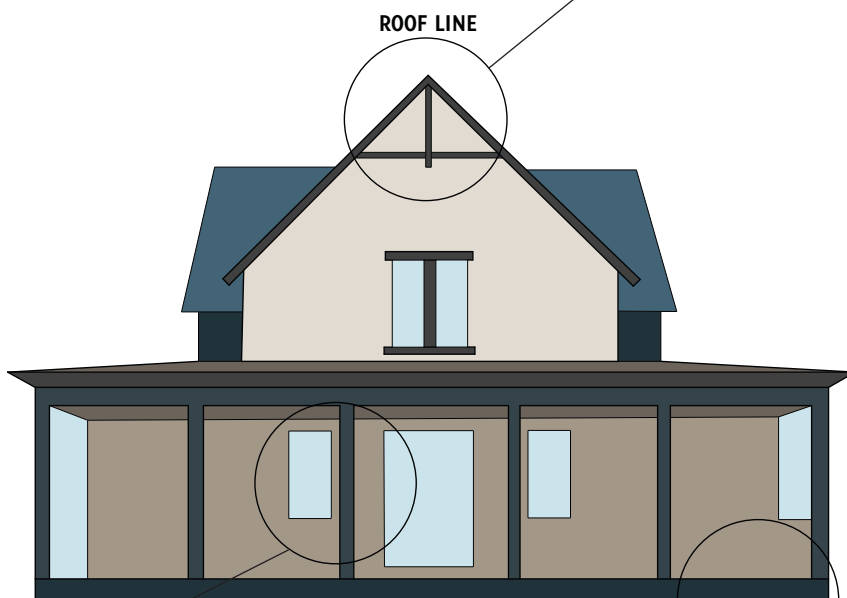
values of homes. In the future, this Creative Inquiry project hopes to become more financially-focused by answering questions about investment securities and institutional buyers.

Understandably, a machine cannot account for every aspect of someone's attraction to a certain house, so Shen highlights the importance of human and AI interactions within this project. "[This] research is more about how humans or investors, companies or individuals, can use the latest technology to create value and change the world," Shen said.

With the help of AI, technology can provide insight about a wide variety of topics in a more efficient and standardized way. This Creative Inquiry team is demonstrating how machine learning can simulate the human perspective and quantify the abstract value of beauty within architecture. ●



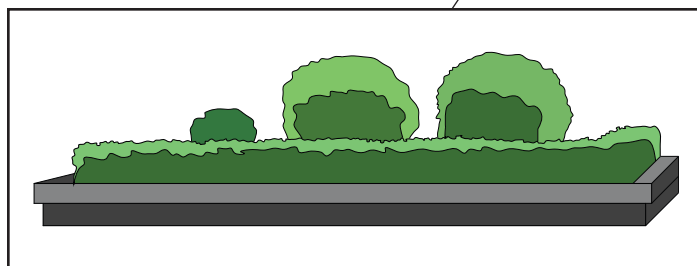
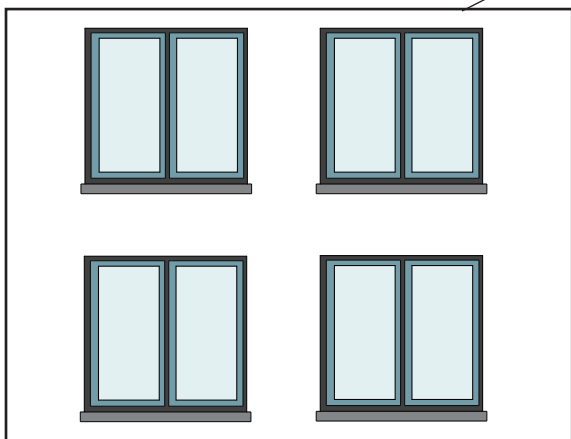
OVERALL BALANCE & SYMMETRY



ROOF LINE

WINDOWS

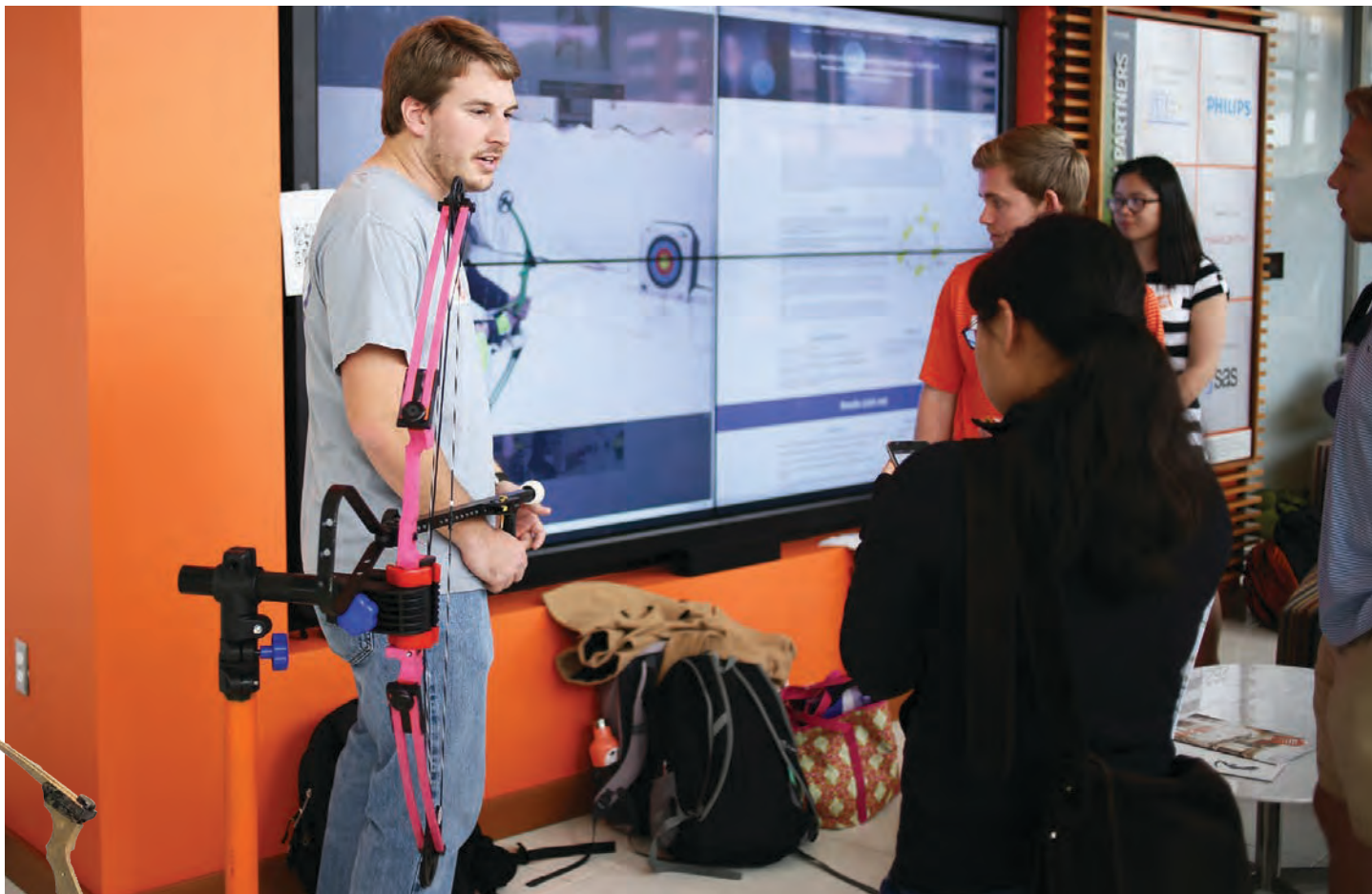
GARDEN



MEET THE TEAM

Caitlyn is a sophomore landscape architecture major with a minor in the social sciences from Charleston, SC. She enjoys exploring the many hiking trails around Clemson, as well as participating in the band and figure skating club.





The A.R.C.H.E.R. CI team presenting at FoCI 2019.

A.R.C.H.E.R.

BY COLLEEN BLAINE

Archery is a common physical education (P.E.) activity taught at K-12 schools; however, students with physical limitations are often unable to participate. The A.R.C.H.E.R. (Accessible Recreational Creations to Highlight Educational Reach) Design Works Creative Inquiry project led by Meredith Owen, graduate student, and Dr. John DesJardins, both in the Department of Bioengineering, is working to make archery accessible for all. The team collaborates with Anderson School District 4 to allow elementary school students with physical limitations to fully participate in the archery program.

The A.R.C.H.E.R. team works with P.E. teachers and Amber Reeves, a physical therapist in the district, in order to create adaptive archery equipment. By using engineering solutions to devise accessible

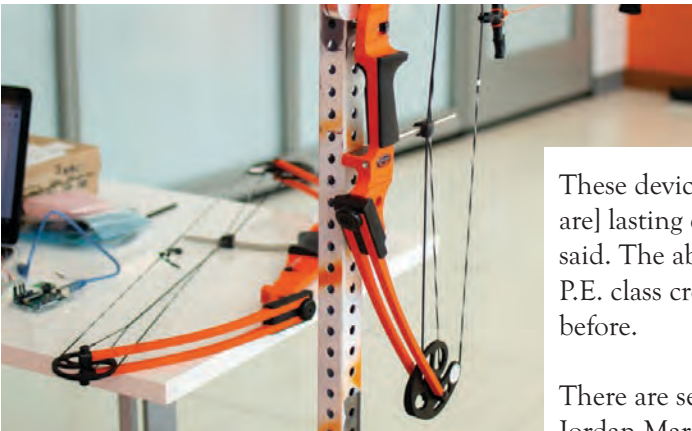
bow-and-arrow prototypes, the team gives students with physical limitations the chance to succeed in physical education. Each design is made to fit a specific student's need. "An engineer's job is to make things accessible whether its transportation, or refrigeration or sports equipment," DesJardins said.

First, the team determines the range of the student's abilities, from range of motion to strength capabilities. Then, they design the device and determine the best storage mechanism for that piece of equipment. The team has created 10 variations of these archery devices primarily to aid elementary school students. This Creative Inquiry team has truly made an impact in the district, thus far assisting 20 students in joining their peers in archery.



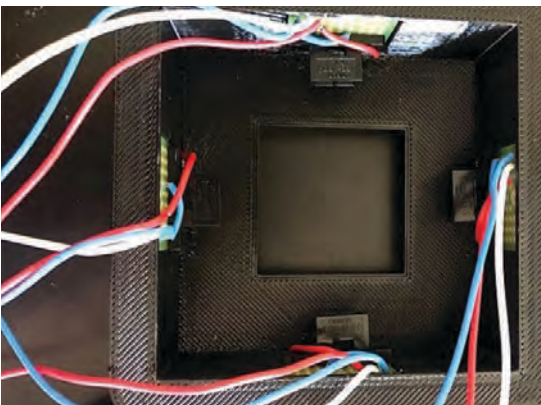
“An engineer’s job is to make things accessible whether its transportation, or refrigeration or sports equipment.”

-Dr. John DesJardins



These devices allow students autonomy—no assistance is required. “[These are] lasting devices and they [create] lasting impacts for students,” Owen said. The ability for these elementary students to participate in a regular P.E. class creates a sense of freedom and excitement they might not have felt before.

There are several success stories attributed to this Creative Inquiry project. Jordan Martin, a freshman bioengineering major, and her teammates experienced a special relationship with one student in particular, an 11-year-old with Becker’s Muscular Dystrophy. “At first, [the student] told us that he did not like archery anymore. A few weeks later, we visited him again with the stand the group created last semester and some ideas to help him generate more force. After a few shots, he hit the target! It was his first time ever doing that. He told us that he likes archery now and can’t wait for us to come back,” Martin said.



When student are unable to participate in a core class such as physical education, they can feel alienated or discouraged. This Creative Inquiry project has made a lasting impact on students in this local district by creating devices that give the gift of independence. The A.R.C.H.E.R. team has shown that anyone can shoot a bow and arrow, some just need a little extra help. ●

(Top) Students designed a modified trigger system to help a student with hand deformations release the bowstring.
 (Middle) A bow with a base so that students do not have to hold up the bow themselves.
 (Bottom) A sensor ring that is part of a sensor array that interacts with the aiming position of the bow.



MEET THE TEAM

Colleen is a senior marketing major with a minor in writing with a media studies emphasis from Boulder, CO. She enjoys running and going out to eat as well as traveling to visit her parents in London. She is excited about her position as Decipher’s Editor.

CREATING AND CURATING

BY COLLEEN BLAINE



Carrie Bull and Tiffany Oliver install labels for an art exhibition.

When attending an art exhibit, it is easy to appreciate an artist's work. What is less understood is that it takes an entire team to create a vision for the exhibit, collaborate with the artist and bring the event to fruition. This experience is the basis of the Clemson Curates: Visual Arts and the Clemson Campus Creative Inquiry project led by Denise Woodward-Detrich in the Department of Art. In this project, students have the opportunity to learn the ins and outs of art curation through the creation of exhibitions in locations throughout campus.

The creation of an art exhibition is a multifaceted process and this team works in every aspect of an event's development. The students define the overall theme for an exhibition, select artwork, properly care for and frame pieces, prepare artist profiles, plan the event opening and create marketing materials. The team is also responsible for establishing loan agreements if the artists' work is being borrowed from a gallery or museum.

“Creating exhibits that are engaging for the Clemson community can be a challenge, but nonetheless, it must be done so that people who are not exposed to art every day or have access to it can still experience the arts for free.”

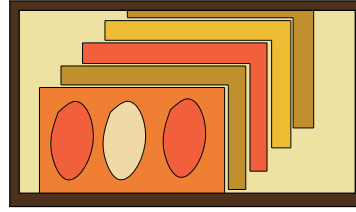
-Morgan Davis

“Creating exhibits that are engaging for the Clemson community can be a challenge, but nonetheless, it must be done so that people who are not exposed to art every day or have access to it can still experience art for free,” Morgan Davis, a sophomore health science major, explained.

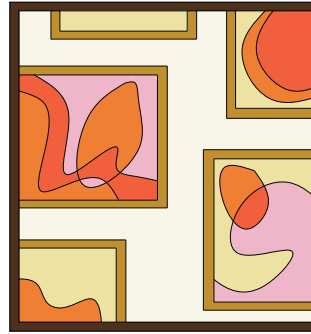
As requests have come in to mount art exhibits in multiple buildings throughout campus, the Clemson community has recognized the work of this team. Sikes Hall, the College of Arts, Architecture and Humanities Dean’s Gallery in Strode Tower, and the Brooks Center for the Performing Arts currently host exhibits designed by the Clemson Curates team. The ground floor of Sikes Hall is hosting the “NextUp Invitational IV” exhibit which includes 23 works by Clemson undergraduate students. These works were selected from 170 submissions in the Foundations Review. To be eligible to participate in the Foundations Review, students must have completed all foundation level studio courses in the Department of Art. “It is always one of our goals to underscore the talent that comes from our university in a way that will aid students in their ventures to become successful professionals after college,” Davis said.

The students in this project invest several semesters of time and preparation to plan one art exhibit—from conception to the final event. Through this project, students gain experience in curation and learn about the art industry from a professional perspective. Students not only work creatively to develop a story for the exhibit, but also must demonstrate professionalism when working with artists and one another. Overall, this team brings culture to Clemson through works of art, beginning in an artist’s studio and ending with a public exhibition. ●

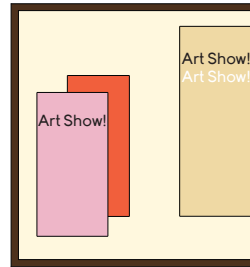
Exhibition Development



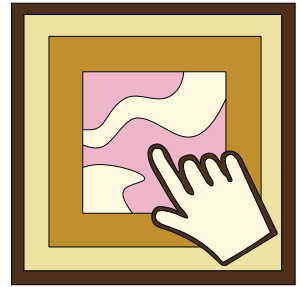
Theme



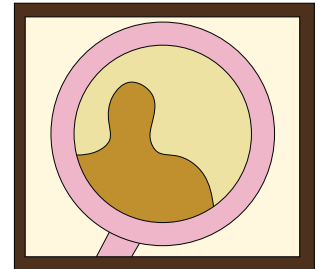
Frame artwork



Market event



Select artwork



Artist Profiles



A reception for artists and their families at the Department of Arts Foundation Exhibition.



IBM Watson in the Watt

The IBM Watson in the Watt Creative Inquiry project, mentored by Dr. Hudson Smith and Dr. Carl Ehrett from the Watt Family Innovation Center, collaborates with faculty across campus to bring the artificial intelligence technology of IBM Watson to a broad array of disciplines. In spring of 2020, the team worked on 15 active projects involving 37 students and 18 faculty members. Currently, one of their teams is working with Dr. Erica Walker in the Department of Graphic Communications on ColorNet, a patent-pending technology that performs color correction focused on improving the accuracy of brand colors, pixel-by-pixel. This type of technology is of particular interest for branding purposes. ColorNet uses elements of machine learning to identify areas of incorrect brand color, addressing only the necessary pixels without affecting surrounding colors. Although ColorNet can be used for any color, the team is currently working to color correct video for Clemson orange, Pantone 165 and Clemson purple, Pantone 268 during live sporting events. The ColorNet project is also gaining an international audience. They have collaborated in several demonstrations with screen manufacturers, video editing technology companies, projection companies and were invited to present at drupa trade show in Germany, the world's largest print technologies trade fair, which has been postponed until April 2021 due to COVID-19.



Something Very Fishy

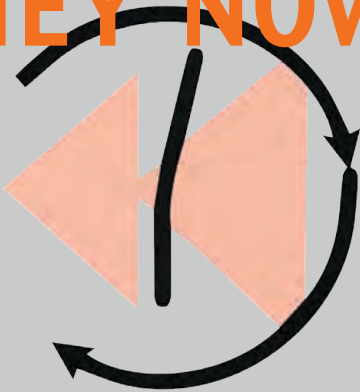
Aimed to develop and present exhibits on marine conservation to elementary school children, the Something Very Fishy Creative Inquiry, led by Dr. Michael Childress in the Department of Biological Sciences, has enrolled more than 60 undergraduates. The project has received two grants, one from the Arts Education Grant of the SC Arts Commission and the other a research grant from SC Sea Grant. These grants provide resources for the team to develop the Something Very Fishy student workbook. Students then analyze data from the workbook to develop training modules for other Clemson students seeking careers in marine science education. The Something Very Fishy team has also submitted a proposal to the National Science Foundation Advances in Informal STEM Learning panel. The motive behind the proposal is to encourage elementary school teachers to use an arts and science approach, STEAM, for teaching concepts of ocean health and climate change. Childress currently heads two other CI projects, having formed his first Creative Inquiry team, Conservation of Marine Resources, in 2008. "Every research paper we publish, every grant proposal we submit, every outreach program we share, would not be possible without the generous support of the Creative Inquiry program," Childress said. The initiative of professors like Childress allows Clemson students the opportunity to partake in innovative research opportunities.



History of Clemson House

The Clemson House was once an iconic building on Clemson's campus. In December of 2017 the hotel turned dormitory was demolished. Since then, Dr. Alan Grubb in the Department of History and the History of the Clemson House Creative Inquiry project have been collecting stories and artifacts to write a book about the history of this lost gem. From those who saw the construction of the building in 1950, worked as the first bellhops at the hotel or were the last students who lived in the dorms in 2014, this building is an important piece of Clemson's history. This Creative Inquiry project anticipates publishing a six-chapter book, *Remembering the Clemson House*, in the fall of 2020. The chapter topics include: construction of the Clemson House; the early years; activities and famous guests; becoming a dormitory; demolition of the Clemson House; and contributor information. The purpose of this publication will serve as a collective and beautiful ode to Clemson House, ensuring future students and alumni understand what the iconic neon red sign meant to Clemson.

WHERE ARE THEY NOW?



A VISIT WITH PREVIOUSLY FEATURED CI PROJECTS

PROJECT SPOTLIGHT:

Educational Children's Books About Nature

Explaining complex topics in an interesting and visually appealing manner to young children can be difficult. To address this the Educational Children's Books About Nature Creative Inquiry project, led by Suellen Pometto develops children's books depicting the natural world. To date, the team has written and illustrated five books—each exploring the natural world. Through this Creative Inquiry project, students learned to work with InDesign, to prepare the books for printing and developed crucial written communication skills.



BECKMAN SCHOLARS

This is Clemson's second year participating in the prestigious Beckman Scholars Program. Over three years, the Arnold and Mabel Beckman Foundation is supporting six exceptional undergraduate researchers as they complete 15 months of intense laboratory research under the direction of a select group of mentors drawn from the College of Science and College of Engineering, Computing and Applied Sciences.



Shaoni Dasgupta



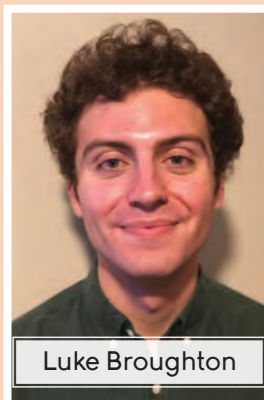
Nathan Matzko

Our first two Beckman Scholars, Shaoni Dasgupta and Nathan Matzko are completing their research this summer under the direction of Dr. Kerry Smith and Dr. Michael Sehorn, both in the Department of Genetics and Biochemistry. Dasgupta will be a Goldwater Scholar beginning in Fall 2020.



Hayden Tharpe

Three new Beckman Scholars, all rising juniors, were selected to begin their research this summer: Hayden Tharpe, a chemical and biomolecular engineering major working under Dr. Mark Blenner; Lauren Davis, a bioengineering major working under Dr. Melinda Harman; and Luke Broughton, a chemistry major working under Dr. Julia Brumaghim.



Luke Broughton



Lauren Davis

Support CREATIVE INQUIRY

WHAT DO YOUR DOLLARS DO?

Gifts to Creative Inquiry directly support student research. You can support students in multiple ways including, but not limited to: student travel to national and international conferences to present research and supplies for student research activities.

HOW TO DONATE

Make your tax-deductible gift by calling **864-656-5896**, giving online at iamatiger.clemson.edu/giving or sending a check payable to: Clemson Fund, PO Box 1889, Clemson, SC 29633
Note the check is for the Creative Inquiry Gift Operating Account.



THANK YOU TO OUR DONORS

Dr. & Mrs. William C. Alexander
Dr. Lawrence R. Allen
Mrs. Martha M. Ball
Dr. Elizabeth A. Baxley
Mr. Nathan L. Bohlmann
Mr. James R. Bottum
Bradley Family Foundation
Mr. & Mrs. Phil Bradley
Dr. Jeromy J. Britton
Mrs. Lisa C. Laudeman Campbell
Mrs. Sue G. Campbell
Mr. W.R. Campbell, Sr

Mr. & Mrs. Chalmers Carr III
Dr. Thomas M. Duncan
Eli Lilly & Company Foundation
Mrs. Sandra M. Fitt
Dr. Lawrence D. Fredendall
Mrs. Carolyn K. Funke
Dr. Jennifer E. Gerow
Mr. & Mrs. William T. Gillespie
Dr. Richard E. Goodstein
Ms. Lisa C. Grant
Mrs. Verna G. Howell

Mrs. Betty Hund
Dr. Debra Jackson
Dr. Antonis Katsiyannis
Dr. John A. King
Mrs. JoVanna J. King
Mrs. Lisa J. King
Ms. Patricia H. McAbee
Dr. Janice G. Murdoch
Dr. William T. Pennington
Mr. Marion L. Powell IV
Mrs. Margaret C. Pridgen
Mrs. Libby Rauch
Dr. Mary E. Richardson
Mrs. Kirsten J. Robertson
Mr. Wayne Roper
Mrs. Catherine T. Sams

Dr. Thomas R. Scott
Mr. & Mrs. Goz Segars
Dr. Jeromy B. Snider
Dr. Barbara J. Speziale
Mr. Joseph D. Swann
Titan Production Company, LLC
Mr. Harrison F. Trammell
Dr. Roger J. Troutman
Dr. Kay L. Wall
Ms. Anolyn K. Watkins
Dr. Charles K. Watt
Mrs. Karen A. White
Mrs. Kristen M. Williams
Dr. & Mrs. Samuel M. Willis, Jr



THE CARR FAMILY ENDOWMENT

Chalmers Carr III and Lori Anne Carr established an endowment to support Creative Inquiry teams working in fruit and vegetable crop production, rural economic development or community and business development. The project recipients of this award receive a financial supplement to further enhance their project activities.



Recipients:

Dr. Kirby Player
Rural Health Hubs
Dr. Douglas Bielenberg
Breaking bud: environmental control of bloom time in peaches
Dr. Feng Chen
Characterization of aromas and health benefiting chemicals of SC peaches
Dr. John McGregor
Shelf-life extension of fresh peach slices by surface crust freezing

BRADLEY AWARDS FOR MENTORING

Phil and Mary Bradley made the first major gift to Creative Inquiry and established an annual award to recognize a faculty member for outstanding work with undergraduate students. The Phil and Mary Bradley Award for Mentoring in Creative Inquiry consists of a plaque and a salary supplement. Creative Inquiry students nominate their faculty mentors for this award.



BRADLEY FACULTY AWARD RECIPIENTS

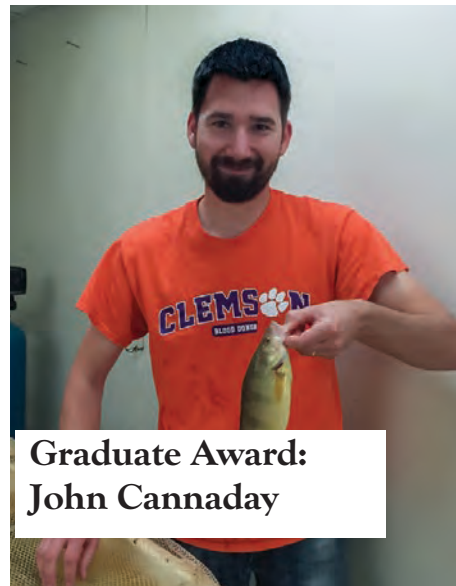
- 2020** | Dr. Jessica Larsen, *Chemical and Biomolecular Engineering*
- 2019** | Dr. Anastasia Thyroff, *Marketing*
- 2018** | Dr. Arelis Moore de Peralta, *Languages; Youth, Family and Community Studies*
- 2017** | Dr. Vladimir Reukov, *Bioengineering*
- 2016** | Dr. Michael Sehorn, *Genetics and Biochemistry*
- 2015** | Dr. Michael Childress, *Biological Sciences*
- 2014** | Dr. Heather Dunn, *Animal and Veterinary Sciences*
- 2013** | Dr. Marian Kennedy, *Materials Science and Engineering*
- 2012** | Dr. John DesJardins, *Bioengineering*
- 2011** | Dr. Delphine Dean, *Bioengineering*
- 2010** | Dr. June Pilcher, *Psychology*
- 2009** | Dr. Karen Kemper, *Public Health Services*
- 2008** | Dr. Suzanna Ashton, *English*
- 2007** | Dr. Mark Charney, *Performing Arts*



Faculty Award:
Dr. Jessica Larsen

BRADLEY GRADUATE STUDENT AWARD RECIPIENTS

- 2020** | John Cannaday, *Wildlife & Fisheries Biology*
- 2019** | Kylie Smith, *Biological Sciences*
- 2018** | Christopher Mayerl, *Biological Sciences*
- 2018** | Drew Morris, *Psychology*
- 2017** | Dotan Shvorin, *Industrial Engineering*
- 2016** | Alice Brawley, *Psychology*



Graduate Award:
John Cannaday

CORPORATE

There is no 'typical' Creative Inquiry (CI) project. From the start of the CI program, projects have originated from many diverse sources—including from a professor's research, students' ideas or observations of community or campus needs.

A founding tenet of CI is the intent to help Clemson students become thinkers, leaders and entrepreneurs, to be able to approach a task or problem and figure out how to solve it—and to do so in a wide range of disciplines.

In recent years, businesses have discovered the power of CI to develop talent, to attract interns and employees and to familiarize college students with the workings of their industries. The Corporate CI program allows industries to engage Clemson's creative, talented undergraduates in industry-relevant research projects.



CI

The results benefit all. Students gain understanding of real-world work topics and opportunities to network with potential future employers. Companies gain visibility on campus, insights into selected project topics and relationships that help recruit interns and employees.

The ideal Corporate CI project involves open-ended topics that can be addressed over two or more semesters of iterative exploration, design, implementation and evaluation cycles.

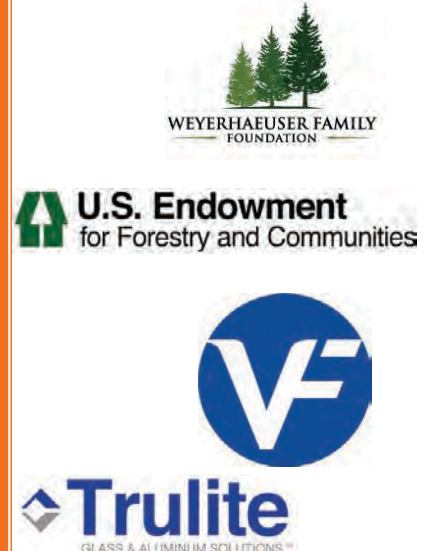
CI and industry—a natural expansion for the inquisitive minds of Clemson students and a contribution to building the workforce of the future.

Students in the Trulite Shipping and Next Generation Packaging Creative Inquiry visiting the Trulite facility.



Look for this icon throughout the magazine to identify Corporate CI projects.

THANK YOU TO OUR CORPORATE PARTNERS



INNOVATION SPACES ON CAMPUS

A variety of student-driven innovation spaces on campus offers all students opportunities to use advanced technologies with access to collaboration, instruction and support. Spaces in the Watt Family Innovation Center and Cooper Library include the Digital Interactive Arts Lab (DIAL), Immersive Space, Watt Student Makerspace, Adobe Digital Studio and Cooper Makerspace. Each area provides tools and software that encourage students to use technology for creative activities. In support of Clemson's goal to foster student engagement and innovation, these spaces offer guided, accessible and technology-aided tools to the entire university community.

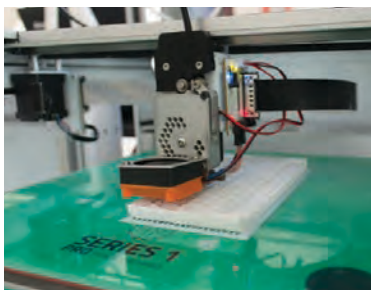
The **Adobe Digital Studio** is located on the fifth floor of the Cooper Library. This video and audio workspace is a product of the partnership between Adobe Inc. and Clemson University. This studio offers students guidance in using Adobe Creative Cloud software—which is free for all Clemson students—and houses advanced video and audio recording equipment. Staff and interns located in designated areas assist students with equipment and software. The Adobe Studio was created to expand the on-campus resources for students working on digital media projects, including class projects, creating commercials or recording podcasts.

The **Digital Interactive Arts Lab (DIAL)** was established in fall 2019 on the first floor of the Watt. The name emphasizes that freedom to create is the main objective in this lab space. DIAL uses virtual and augmented reality equipment to foster new forms of art and digital-centered activities to create interactive elements such as Snapchat filters.

The **Immersive Space** is a virtual reality (VR) hub equipped with multiple VR sets. Any student may sign into the space to explore VR capabilities. Faculty are increasingly reserving time for their classes to explore the educational capabilities of VR, guided by the Immersive Space student interns. Nursing majors are some of the most frequent users. They use this space to explore, analyze and study human anatomy in VR.



The **Watt Student Makerspace** offers equipment and tools such as 3D scanners and printers, laser cutters and direct-to-garment printers. Any student can use the space after completing a brief Canvas course to learn about the equipment and the Makerspace safety protocols. Students use this space for course work as well as to work on their personal creations. The Makerspace is guided by a student-run organization and supported by student government and the Watt Center.



The Makerspace recently expanded into Cooper Library by using capital improvement funds from Clemson University Student Government and adopting the same structure and training procedures as the Watt counterpart. The **Cooper Makerspace** provides less complex, but still innovative equipment such as a fabric printer for t-shirts, a vinyl cutter for stickers and other creative supplies such as glue, paint and glitter.



CLEMSON[®]
CREATIVE INQUIRY

Learn more at
www.clemson.edu/ci