# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Student Paper Award Competition</td>
<td>i</td>
</tr>
<tr>
<td>Message from the Editor</td>
<td>ii</td>
</tr>
<tr>
<td>The Editorial Board</td>
<td>iii</td>
</tr>
<tr>
<td>Grant Writing: Recent Big Winners!</td>
<td>v</td>
</tr>
<tr>
<td>StudentSpotlights</td>
<td>vi</td>
</tr>
<tr>
<td>National Science Foundation Student Spotlights</td>
<td>xii</td>
</tr>
</tbody>
</table>

**Bioaccumulation of $^{137}$Cs in Florida Green Watersnakes (*Nerodia floridana*) from Three Wetlands on the Savannah River Site** ................................................................. 19  
*M. Kyle Brown, Michaela Lambert, Amelia L. Russell, Dr. Tracey D. Tuberville, & Dr. Melissa Pilgrim*

**spARTanburg** ........................................................................................................... 29  
*Kayla McGill and Dr. Bridget Kirkland*

**Donald Trump: Constructing Masculinity, Easing Conservative Anxieties during the GOP Primary Election of 2016** .................................................................................. 35  
*Andrew Moore and Dr. Carolina Webber*

**Mercury Bioaccumulation in Florida Green Watersnakes (*Nerodia floridana*) Among Three Wetlands on the Savannah River Site** ................................................................. 43  
*Amelia L. Russell, M. Kyle Brown, Michaela Lambert, Dr. Tracey D. Tuberville, & Dr. Melissa Pilgrim*

**A Picture is Worth 1,000 Words: Graphic Novels in Teaching Speakers of Other Languages** .............................................................................................................. 53  
*Emily “Colie” Touzel and Dr. David Marlow*

**The Effects of Confidence in the Media on Political Participation in America** ................................. 60  
*Cody Turner and Dr. Abraham Goldberg*  

---

**BEST STUDENT PAPER**

Submissions with an undergraduate student as the first author were reviewed and ranked by our Editorial Board. The award program and review rubric are described at: [http://www.uscupstate.edu/researchjournal/](http://www.uscupstate.edu/researchjournal/). The winning submissions are marked by a ⭐ in the Table of Contents.
MESSAGE FROM THE EDITOR

USC Upstate is proud to announce publication of the ninth volume of the USC Upstate Student Research Journal. Our journal provides a glimpse into a few of the many high quality research activities conducted by talented students and faculty at USC Upstate. The Journal is a compilation of outstanding papers from numerous disciplines submitted by undergraduate and graduate students who have been involved in faculty mentored research, scholarly, or creative activities. Students involved in faculty mentored extracurricular projects enter the workforce with an enhanced skill set, including better problem solving, critical thinking, and teamwork skills. Since many students who are educated at USC Upstate become employed in the region, support of academic research has a direct and positive impact on the Upstate of South Carolina.

I would like to thank the contributing authors for providing a rich variety of outstanding articles on a broad range of exciting topics. In addition, I would like to express my extreme gratitude to the journal’s Editorial Board (see pages iii and iv to learn more about them). In a world where time is so very limited, their commitment to reviewing article submissions and providing constructive feedback to authors provides invaluable assistance in successfully producing journal volumes and in mentoring students in their writing endeavors. A special thanks to Veronica Quick, Graphic Design Artist in the USC Upstate University Communications Office, for designing the outstanding cover of this volume of the Journal. Thanks also to Les Duggins for taking many of the pictures of campus and our contributing authors. Finally, we would like to thank Dr. Clif Flynn, Interim Senior Vice Chancellor for Academic Affairs at USC Upstate, who is dedicated to enhancing faculty and student research efforts at USC Upstate.

If you have any questions or comments about the journal, or would like to receive a printed copy of the most recent volume of the journal, please contact Dr. Melissa Pilgrim, (864) 503-5781, mpilgrim@uscupstate.edu. The journal is also available online at the website: http://www.uscupstate.edu/ResearchJournal.

Enjoy!

Melissa Ann Pilgrim
Editor & Director of Research
Office of Sponsored Awards and Research Support
University of South Carolina Upstate
800 University Way
Spartanburg, SC 29303
THE EDITORIAL BOARD

**DR. MELISSA PILGRIM**
EDITOR-IN-CHIEF

Dr. Pilgrim is an Associate Professor of Biology and the Director of Research. Her primary research focus involves an integrative approach to investigating how ecosystems respond to environmental change (natural and anthropogenic). She uses herpetological systems as her animal models and currently has an army of undergraduate students working with her in a research group called Upstate Herpetology. She has published works in several journals, including the following: *Isotopes in Environmental and Health Studies; OIKOS; Copeia; and Southeastern Naturalist.*

**DR. JUNE CARTER**
ASSOCIATE EDITOR

Dr. Carter is a Professor of Spanish and Director of the Center for Teaching Excellence. Her research interests include Latin American narrative and film; Afro-Hispanic Literature; Latin American female writers; US Latino/a literature. She has published works in several journals, including the following: *Anuario de Letras; Latin American Literary Review; Caribbean Quarterly; The Rocky Mountain Review; Prismatic Cabral; and Studies in Afro Hispanic Literature.*

**DR. MICHAEL DINGER**
ASSOCIATE EDITOR

Dr. Dinger is an Assistant Professor of Management. His research interests include information security and IT workforce management. He has published his work in several journals, including the following: *MIS Quarterly; Information Systems Research; IEEE Transactions on Engineering Management; and Journal of Organizational Computing and Electronic Commerce.*

**DR. LYNETTE GIBSON**
ASSOCIATE EDITOR

Dr. Gibson is an Associate Professor of Nursing and the Director of Research in Nursing at the Mary Black School of Nursing. Her primary research is focused on increasing health equity in ethnic minorities. She is testing the effect of a community-based intervention on screening mammograms by African-American women. She has worked with several undergraduate nursing students in conducting and presenting this research. She was a 2014 *Summer Nursing Research Institute Fellow* at the Institute for Health Equity at the School of Nursing, University of Pennsylvania. She has published articles in *Applied Nursing Research, ABNF Forum, Journal of the National Black Nurses’ Association, and Clinical Nurse Specialist™.*
THE EDITORIAL BOARD (CONTINUED)

DR. TINA HERZBERG
ASSOCIATE EDITOR

Tina Herzberg, Ph.D. is an Associate Professor of Special Education and currently serves as Director of Graduate Programs for the School of Education. Her primary research interests are braille literacy and preparation of tactile materials for students who are visually impaired. Her research began with the exploration of quality in literary braille materials and has now transitioned to exploration of quality in math braille materials. Her work has primarily been published in the international peer-reviewed Journal of Visual Impairment & Blindness. Prior to her arrival at USC Upstate, she served as a general education classroom teacher, an itinerant teacher of students with visual impairment, specialist for a regional service center, and adjunct instructor.

ELAINE MARSHALL
ASSOCIATE EDITOR

Elaine Marshall is the Director of Sponsored Awards at USC Upstate. She has been with the University since 1996 and works with all faculty and staff on the Upstate campus who pursue and receive grant funding. Elaine holds a national Certified Research Administrator Designation from the Research Administrators Certification Council. She also has a BA in English and History and a MA in English Literature from Clemson, where she also taught full-time before coming to USC Upstate.

DR. BEN MONTGOMERY
ASSOCIATE EDITOR

Dr. Montgomery is an Associate Professor of Biology. His research focuses on the evolutionary ecology of plant reproduction and plant pollinator interactions. He is currently focused on the partitioning of pollinators among different species of Silene, a genus of wildflowers with a wide array of floral traits and multiple pollination syndromes. Dr. Montgomery is also interested in delayed self-pollination as a mechanism that allows for cross pollinations while also providing reproductive assurance. His longer term research interests include competition for pollination between different species and mechanisms for the maintenance of cytoplasmic male sterility (CMS) as well as repercussions of CMS for the maintenance of genetic diversity. He has been working with the Spartanburg Trees Coalition to work toward the eradication of Kudzu in the natural area on the USC Upstate Campus and is the de facto curator of the Upstate Herbarium. He has published his work in several journals, including the following: Biological Invasions, Oecologia, Annals of Botany, American Midland Naturalist, Oikos, and Botany.
**GRANT WRITING: RECENT BIG WINNERS!**

Universities benefit substantially when faculty members are awarded external grant monies for research or service projects. Applying for grant opportunities is a very time consuming and tedious process which often times goes unrewarded since most opportunities are highly competitive with only a small percentage being funded. Grant monies are often used to support student research assistants and thus can have a very positive impact on a student’s academic experience. We would like to congratulate all USC Upstate faculty members who have recently been funded.

**ALL GRANT WINNERS (2016)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akulli, Alexander</td>
<td>Generation Study Abroad Scholarship</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>Blair, Selena</td>
<td>SSS - Opportunity Network 2015-20 (Grant-in-Aid)</td>
<td>$26,352.00</td>
</tr>
<tr>
<td>Blair, Selena</td>
<td>SSS - Opportunity Network 2015-20</td>
<td>$263,603.00</td>
</tr>
<tr>
<td>Blevins, Sonya</td>
<td>Purchase of National League for Nursing (NLN) Scenarios</td>
<td>$13,000.00</td>
</tr>
<tr>
<td>Gibb, Katharine</td>
<td>Nursing Education and Research</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>Herzberg, Tina</td>
<td>South Carolina Arts Leadership for Success Academy</td>
<td>$32,800.00</td>
</tr>
<tr>
<td></td>
<td>Summer Arts Institute 2016</td>
<td></td>
</tr>
<tr>
<td>Johnson, Merri</td>
<td>Bodies of Knowledge Symposium, Spring 2016</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Merriweather, Helen</td>
<td>ACHIEVE 2016-17</td>
<td>$387,740.00</td>
</tr>
<tr>
<td>Pae, Holly</td>
<td>Project CREATE 2016-17</td>
<td>$76,231.00</td>
</tr>
<tr>
<td>Pae, Holly</td>
<td>Project CREATE 2016</td>
<td>$14,371.00</td>
</tr>
<tr>
<td>Parker, Jennifer</td>
<td>Logistical Support for the Coordination of Recruitment Events for Prospective Foster and/or Adoptive Parents</td>
<td>$69,875.00</td>
</tr>
<tr>
<td>Ruppel, Joshua</td>
<td>Precision Glycopolymer Bacteriochlorin Conjugates for Biomedical Applications</td>
<td>$53,649.00</td>
</tr>
<tr>
<td>Turner, Jack</td>
<td>Development of an &quot;Adopt-A-Stream&quot; Program in Spartanburg County</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>Waldrop, Susannah</td>
<td>NCAA Accelerating Academic Success Program</td>
<td>$100,000.00</td>
</tr>
<tr>
<td>Waldrop, Susannah</td>
<td>Strengthening USC Upstate By Investing in Student Engagement and Advising Success</td>
<td>$448,488.00</td>
</tr>
</tbody>
</table>

**Total $1,523,609.00**
STUDENT SPOTLIGHTS

Each volume of USC Upstate’s Student Research Journal reserves a section to celebrate the efforts, activities and successes of our students. The spotlights are typically divided into two major categories: Alumni Spotlights and Nontraditional Student Spotlights. Students featured in the Alumni Spotlight section are nominated by faculty members excited about the transition of USC Upstate students into jobs and professional programs following graduation. Students featured in the Nontraditional Student Spotlight section are nominated by faculty members impressed by the advanced time management skills and multitasking abilities of students facing extra challenges during their tenure at USC Upstate (e.g., return to learn students, students working outside jobs and/or having a family). Occasionally there are spotlights centered on unique programs that resulted in research and professional experiences for students in a given year. In the current volume, we spotlight five non-traditional students, two USC Upstate alumni, and student participants in a National Science Foundation Research Experiences for Undergraduates (REU) program at the Savannah River Ecology Laboratory.

NON-TRADITIONAL SPOTLIGHT: AMANDA ASHENFELTER

While I may be considered a non-traditional student, I believe that my life experiences are far more common now than in the past. I had my foot on the path of higher education right after graduating high school, like many of my classmates. However, the responsibilities of starting a new family soon took precedence over my studies at Spartanburg Community College.

Being a full-time single mom as well as a full-time employee, I thought that my chances of pursuing a degree had been put on hold indefinitely. While I enjoyed being able to spend time with my child during the formative years, the jobs I had were not challenging. They also were paths to nowhere – no future advancement, no training, no satisfaction other than a paycheck. I knew I had the potential to do more, to be more than another smiling face in retail.

Then, as cliché as it sounds, I met a man. He saw my potential and encouraged me to get back on the path I started on after high school. With his encouragement and support, I enrolled in the Certified Medical Assistant program at Virginia College. Juggling the responsibilities of childcare, maintaining a relationship, holding down a job, and taking classes was daunting. Yet those stressors unlocked a drive and passion for learning that had only been touched upon before.

I chose the medical field because of a family tradition of nursing, but that was only part of the motivation. I have always enjoyed helping others. Nursing would allow me to help those that needed it the most. Plus, I have always been fascinated by the complexity of the human body and how hands on the field is. I have never been one content to sit at a desk all day.

But nursing wasn’t in the cards just yet. That man I met...well, I married him. After receiving my certificate, I went to work at Carolina Medical Affiliates and worked with Dr. Gregory Valainis, MD, for four years. As a specialist in infectious disease treatment, I was exposed to fascinating cases during my tenure there. Those years, more than anything else, rekindled my desire to go back to school and get my nursing degree.

So, here I am, halfway through nursing school. I chose USC Upstate Mary Black School of Nursing because of the reputation of its skilled, dedicated educators and the quality of its graduates. The faculty members are supportive and accessible. The clinical classes and
opportunities to interact with real patients have been amazing. Surprisingly, my campus experiences in and out of the classroom have made me feel like a traditional student, which just adds to my positive experience at USC Upstate.

I am proud to be a Spartan and eagerly look forward to the day I can put RN at the end of my name. The path I have taken to get here has been long and convoluted, and sometimes I have stepped off that path. But I have never abandoned it or lost sight of my destination. My name is Amanda Ashenfelter, and I’ll be taking care of you one day soon.

NON-TRADITIONAL SPOTLIGHT: SAMUEL BELLMORE

My name is Samuel Bellmore. I was born and raised in Williamsport, Pennsylvania. I am married and have two wonderful kiddos. I am a 35-year-old active duty Soldier who has the distinct opportunity to participate in the Army Enlisted Commissioning Program as a first semester junior in the Mary Black School of Nursing. I am the first Soldier in the active Army to utilize this program here at Upstate. Upon graduating in May 2018 and passing the NCLEX, I will commission into the Army as a Second Lieutenant and serve the rest of my military career as a nurse.

I have spent the past 12 years of my life serving in the Army on active duty. I have been trained and have served as a Combat Medic as well as a Cardiovascular Technician (Sonographer and Cath Tech). I have traveled the world and have attended a few different universities while stationed at these various locations. Many times, there is a university or two that is on our base or very close by that will offer face to face courses. Each time I moved, I usually attended a new school. My educational journey has been packed in between moves, and while working full time as a father and a Soldier. For my efforts I have earned a Bachelor’s of Health Science from Trident University and a heap of other coursework in order to satisfy the requirements for nursing.

How did I end up here? My wife and I ended up choosing Upstate for nursing due to our desire to be able to live together while attending school. My wife, Amanda, is in her second year of Pharmacy School at Presbyterian College. We have a daughter and a son and we really wanted to have the opportunity to be a family during this busy time of our lives. USC Upstate is only about a 37-minute drive from our house and has provided me a home away from home for the past three months. Our family is so very blessed to have this opportunity to be together here in beautiful South Carolina.

Why Nursing? I have spent several years of my life in a healthcare community. I have experience in the ER and in Cardiology/Critical Care/OR settings. In all of these settings I noticed that the nurse, especially in the Army, is someone who is determined to improve outcomes. Nurses have a desire to excel in whatever process they become involved with – regardless of who the stake holders are. Many of the best leaders, soldiers, and mentors of mine have all been nurses. I personally enjoy enriching others and desire to have more time at the bedside with our veterans, our Soldiers and their dependents.

The Battalion that I deployed with to Iraq was the 1-36 Infantry, Spartans. I am honored to be a Spartan for the second time in my life. We had a motto in our unit that I find appropriate to apply to all aspects of life. It is “Deeds, Not Words”. I hope to embody that motto and have a positive impact here at Upstate and in the future as a competent, caring nurse. See you around campus.
NON-TRADITIONAL SPOTLIGHT: ALLISON JOHNSON

Allison Johnson, a non-traditional student who has additional roles as a mother and wife, transferred to USC Upstate in May 2015 to finish completion of her Bachelor’s Degree in Biology with a concentration in pre-medicine. Upstate provided her a path to pursue her desired career change from the financial industry, where she spent the preceding ten years, to healthcare. After taking Dr. Jonathan Storm’s Introduction to Ecology and Evolutionary Biology course during her first summer at Upstate, Allison expressed interest in small mammal research. For the following fall and spring semesters, Allison worked closely with Dr. Storm to analyze live-trapping and bot fly infestation data for white-footed mice collected in the Spartanburg, S.C. region. The purpose of their research was to determine the impact of bot fly infestation on daily movement patterns of white-footed mice. A significant difference in mean daily movements of infected mice as compared to uninfected mice was not found; however, a significantly higher maximum daily movement for infected female mice over uninfected female mice was observed. In April 2016, Allison presented Dr. Storm’s and her bot fly research at the SC Upstate Research Symposium and was awarded Best Student Oral Presentation in the Natural Sciences Category.

Research at USC Upstate helped Allison fine-tune time-management skills as she balanced a focus of home life with coursework and research. It also gave her an opportunity to apply meaningful statistical analyses and public speaking skills that she’d learned and practiced in Upstate courses. In addition, research experience was an invaluable contribution to her acceptance to medical school.

Allison will graduate from USC Upstate with her first Bachelor’s Degree in Spring 2017. She has been accepted into one of South Carolina’s allopathic medical schools for matriculation in Fall 2017, and is awaiting completion of her second interview scheduled with another school before making a school selection. In medical school and beyond, Allison looks forward to continuing her contribution to scientific knowledge and innovation through patient-directed research.

NON-TRADITIONAL SPOTLIGHT: MELINDA SIMPSON

I am in my senior year at USC Upstate in the Mary Black School of Nursing. I am 29 years old, an Army wife, and mother of two. My husband is an active duty Army Soldier and is stationed at Fort Lee VA as an instructor and commutes home several times per month during the school year. I am from Columbus NC, where I currently live. I was adopted by John and Hazel Hicks at the age of 7 months old and couldn’t have been more blessed. My senior year of high school altered the course and purpose of my life permanently. I was blessed with a strong, fierce daughter at the age of 17. After having my daughter through C-section, I was back in the operating room 7 days later. I had developed a life threatening infection and it was unclear whether it had been caught in time. After a lengthy recovery, I was determined to hit the ground running.

My college career was off to a bumpy start before it even began. I was a single teenage mother with a new born daughter, which to many, was a recipe for nothing but failure. However,
I was once told something that has often echoed through my mind at my lowest points and it was “You may not have chosen the easiest and straightest path for your life, but that doesn’t mean that the destination has to change.” My life’s journey has taken has been full of mountains and valleys. I’ve gotten married, moved away, lost loved ones, moved back, had another child, and still I stand. I want my story to be a tale a triumph but for the reader to also understand that it is far from over.

I chose to return to school at this point in my life, pursuing my Baccalaureate of Science in Nursing, not because I was unhappy with my career, but because I want to evoke change. I chose nursing as my profession at an early age. I didn’t think I could live with myself if at the end of every workday, I wouldn’t be able to say beyond a shadow of a doubt that I helped someone in such a way that they may forget my face but they would never forget my warmth, kindness, or caring actions. I was only 19 when I graduated from Isothermal Community College’s Licensed Practical Nursing program. By the time I graduate from USC Upstate, I will have been an LPN for 10 years and I can say that for every patient that I have made an impression on over the years, two more have made a lasting impression on me and the type of nurse I strive to be each day. I have worked in long term care and home health but have always found myself wanting to do more. By more, I do not mean that I felt like I was lacking in some way in caring for my patients but I keep finding myself wanting to help entire populations. I feel strongly that my heart is being called into research and possibly education. I plan to pursue a Master of Public Health with a concentration in epidemiology.

**NON-TRADITIONAL SPOTLIGHT: EMILY TOUZEL**

Emily “Colie” Touzel, is in her senior year as an Honors English major at University of South Carolina Upstate. As a transfer student from USC Union, Colie is glad to have experienced a small town environment while managing her organic farm, but wishes she had more time to be involved in the Honors and English programs at Upstate. Colie has presented at two Carolina Emerging Scholars conferences, the 12th Annual SC Upstate Research Symposium, and most recently the 9th Annual UNM Mentoring Institute Conference. Her final semester and Honors Capstone project will be fulfilled abroad at Hanze University in the Netherlands where she will pursue a Medialism focus on film creation.

Colie is grateful for the amazing professors she worked with in the Language, Literature, and Composition (LLC) department and the Honors program at Upstate. Much of her volunteer work in Spartanburg is thanks to her professors, their courses, and their constant inspiration. In Dr. Marlow’s Teaching English as a Second Language course, she began volunteering at the Adult Learning Center in downtown Spartanburg where she taught English to World Language Speakers. In an Honors course co-taught by Dr. Hernandez-Laroche and Dr. Hauptman, “The Twin Ills of Terrorism and Torture,” Colie volunteered at the Spartanburg County Detention Center tutoring inmates to help them acquire their GED. This experience inspired research in existential literature with Dr. Hernandez-Laroche, which led to writing the paper “On the Other Side of the Wall: Mentors, Prisons, and Existential Literature” for the UNM Mentoring Conference that they presented at together in October 2016.

“I am extremely thankful for the LLC faculty and staff who provided constant assistance throughout my time at USC Upstate. Dr. Kusch, Dr. Marlow, and Dr. Hernandez-Laroche have all
helped me immensely in multiple research projects; I would not, and could not, have accomplished everything I did at Upstate without them.” Colie also wishes to thank Dr. McConnell, Dr. O’Brien, and Dr. Canino for their support and guidance. Colie’s future plans include applying to graduate schools for community building and urban design programs. Her goal in life is to promote a sustainable change in lifestyle for communities around the world, all while making the most of every moment, telling corny jokes, and adventuring with my dog.

ALUMNI SPOTLIGHT: MATTHEW FORRESTER

Matt Forrester is a guitarist from the Upstate of South Carolina who has performed and worked in many areas of music over the past few years. Matt joined the USC Upstate Jazz Band while still attending the University. He took private instruction alongside completing his degree in Communications – Commercial Music. He graduated Cum Laude in the first group of graduates from the program in May 2012, and continued on in music around the Upstate.

Prior to joining the jazz band and enrolling at Upstate, Matt joined the New Life Baptist Fellowship worship team in Boiling Springs, SC. He has rehearsed and played with the band nearly every Wednesday and Sunday since joining the group, using many of the skills he learned while at college to further his playing and ability to sit in a band. Since then, they have recorded two albums that include worship standards alongside originals collaborated on by the band. To this day, he still remains an active part of the group.

Matt started playing shows around the Greenville/Spartanburg area by himself, playing as many as 50-75 shows a year. He also joined with other members from USC Upstate to form “The Big Show”, which performed in and won the Spartanburg Battle of the Bands in 2012. Shortly after, the group changed into the “Doug6”, named after their former USC Upstate professor Doug Scarborough. He continued playing with the group in different incarnations over the next couple of years, until the groups eventually dissolved. At the start of 2015, Matt joined a North Carolina native band “Melodious Culture”, and continued playing as an active member while forming the acoustic duo group His & Hers with his now wife Hannah Forrester. His & Hers is still active today.

In 2016, Matt began his teaching career as a lessons instructor at the newly opened Guitar Center store in Spartanburg. Besides guitar, Matt teaches piano, bass and ukulele. Matt has multiple students, and is involved in student recruitment activities as well as outside Guitar Center events. His students play in recitals, where they are expected to demonstrate what they have learned and how they have grown under his instruction. His motto for life, as well as what he hopes to pass along to his students, is that in life with patience, practice, perseverance, passion and a servant's heart you can succeed in all you desire to be.

ALUMNI SPOTLIGHT: JOEY MORRISSEY

Joey Morrissey’s experiences at the University of South Carolina Upstate began in the Fall of 2008, when he was accepted into the Scholar’s Academy as a freshman in high school. The program allowed him to take a variety of dual enrollment courses to complete a high school
diploma while also earning undergraduate course credits. He quickly became fond of the sciences, and after completing Biology 102 with Dr. Jonathan Storm, he was sure that he had found his niche. After three years in the program, Joey decided to graduate from the program a year early in order to fast track himself to a Bachelor’s of Science in Biology at USC Upstate.

Joey began his freshman year at the university with a Pre-Medical emphasis and started looking for ways to strengthen his application and improve his odds of professional school acceptance. After consulting with his academic advisor, Dr. Melissa Pilgrim, he took to heart two pieces of her advice that truly struck home. The first was to take the tough course combinations others avoided and truly challenge himself. This advice pushed him to take courses such as Comparative Animal Physiology, Comparative Vertebrate Anatomy, Immunology, and Developmental Biology that not only challenged him mentally, but also sparked a new passion that led him to change from a Pre-Medical emphasis to a Pre-Veterinary emphasis.

The second piece of advice was to get involved with research. After hearing about Dr. Jonathan Storm’s small mammal work in his courses, Joey decided to ask him about how he could get involved with the work. What started as a summer research stint working with white-footed mice quickly turned into a three year research assistantship in which he worked on multiple projects with white-footed mice, small mammals, and small carnivores. This stint not only provided a firsthand look into the research environment, it also allowed him to get involved in the process of writing scientific literature for publication. The research greatly improved Joey’s scientific thinking, but the greatest take away from the research was the relationships that he built through it. By leaving his comfort zone and entering this research stint, Joey met many like-minded students and gained a great professional network who not only supported him, but also pushed him to be better in the things that he pursued. He also gained a mentor in Dr. Storm who would challenge him in all facets at the university in order to push him to his limits and get the very best out of him. These colleagues were the driving force behind Joey graduating a semester early from USC Upstate and getting accepted into the College of Veterinary Medicine at the University of Georgia.

Currently, Joey is in his second year of Veterinary School. He is excelling in his courses due to the preparation he received at USC Upstate. Due to the love for wildlife that Joey discovered while doing research, he took a position on the Wildlife Treatment Crew, and he now serves as a manager on the crew. Upon graduation, Joey hopes to pursue a career in Small Animal Medicine where he can incorporate his work with wildlife as well.
2016 NATIONAL SCIENCE FOUNDATION RESEARCH EXPERIENCES FOR UNDERGRADUATES SPOTLIGHT

A COLLABORATIVE EFFORT MEANS STUDENTS WIN BIG.

In 2015, Dr. J Vaun McArthur of the University of Georgia and Dr. Melissa Pilgrim of the University of South Carolina Upstate were awarded a three-year National Science Foundation Grant that supports a Radioecology Research Experiences for Undergraduates (REU) program at the Savannah River Ecology Laboratory. The REU program provides the only hands-on training opportunity in radioecology for undergraduates in the world. Students are engaged in field and laboratory studies aimed at understanding (i) the fate of radionuclides in environmental systems; (ii) the impact of radionuclides on the environment; and (iii) biogeochemical and physiological processes by means of tracer studies. The REU research projects advance knowledge and contribute information that increases our understanding of how energy production impacts (i) water, soil, and food quality; and (ii) human and wildlife health. Excitingly, the REU program is possible because several agencies and universities are willing to collaborate. Specifically, the program would not be possible without the following partners (listed in alphabetical order): the Department of Energy, the National Science Foundation, the University of Georgia, The University of South Carolina Aiken, The University of South Carolina Columbia, and the University of South Carolina Upstate. By collaborating, undergraduate students from across the nation stand to gain hands-on training while being financially supported (for more details regarding the program please see http://srel-reu.uga.edu). Exciting aspects of the program for our USC Upstate participants include the opportunity to (i) work alongside a peer group from across the nation, (ii) work with scientists in research laboratories with advanced analytical capabilities, and (iii) start building their professional network. Summer 2016 was the second summer of the program; the pages that follow provide each 2016 participant’s research project abstract.

2016 PARTICIPANTS
2016 NSF REU SPOTLIGHT: JILL BANACH
Radionuclide Leaching from Reducing Cementitious Materials

Jill S. Banach1, 2, John C. Seaman3, Fanny M. Coutelot2
1 = University of Massachusetts Amherst, Amherst, MA 01003
2 = Savannah River Ecology Laboratory, University of Georgia, Aiken, SC 29802

ABSTRACT. At the Savannah River Site (SRS), low-level saltwaste solutions from nuclear material production are sent to the Saltstone Disposal Facility (SDF) as a final destination for safe disposal. Saltwaste is combined with dry feed components – blast furnace slag (BFS), fly ash (FA), and portland cement (PC) – to form a cementitious grout material known as Saltstone. Radioactive contaminants (e.g., 137Cs, 129I, 99Tc, U, and 238U) are immobilized in the cementitious material. Redox sensitive elements (99Tc and U) are retained in the Saltstone due to chemical reduction associated with BFS. Technetium-99 (99Tc; T1/2 = 2.13x105 years), a common fission product, is readily mobile in the environment in its oxidized form, Tc(VII). Instead of 99Tc, rhenium (Re) was used as a nonradioactive analog to evaluate the reductive capacity of Saltstone. A dynamic leaching experiment was conducted to study the mechanisms controlling the release of Re and other major saltwaste components, with critical leachate parameters monitored using a series of flow-through electrodes, e.g., pH, ORP, and EC. The data shows two different phases: an initial phase (0-10 pore volume) demonstrating high concentrations, followed by a second phase (10-40 pore volume) composed of low and constant concentrations (Si, Re, As, Ca, Na). The trend indicates an initial flush of highly soluble molecules, followed by slow dissolution. Further, data indicates that Re leaching from the column occurred at a faster rate than expected for 99Tc as almost 80% Re was recovered in the effluent solution. Overall, a greater understanding of the complexity of the saltstone system will allow us to use modeling to predict long term performance of Saltstone.

2016 NSF REU SPOTLIGHT: M. KYLE BROWN
Bioaccumulation of 137Cs in Florida Green Watersnakes

M. Kyle Brown1, 3, Michaela Lambert2, 3, Amelia L. Russell1, 3, Tracey D. Tuberville3,
Melissa A. Pilgrim1, 3
1 = University of South Carolina Upstate; Spartanburg, SC
2 = University of Kentucky, KY
3 = Savannah River Ecology Laboratory; Aiken, SC

ABSTRACT. The Savannah River Site (SRS) is a 780-km² United States Dept. of Energy (USDOE) owned property with a history of radioesium (137Cs) contamination in reservoirs associated with the nuclear reactor cooling process. Radioesium is a long-lived gamma-emitting radionuclide that can bioaccumulate in biota. The Florida Green Watersnake (Nerodia floridana) is a primarily piscivorous species with trophic links to terrestrial and aquatic food webs. A wide range of intraspecific size variation and a preference for permanent still waters (e.g., cooling reservoirs on the SRS) make N. floridana an ideal model for studying bioaccumulation of 137Cs in a top predator. Our study quantified 137Cs concentrations in N. floridana captured from three SRS reservoirs (Par Pond, Pond B, & Pond 2) with unique contamination histories, and determined if snake 137Cs body burdens increased with size. We used a NaI gamma detector to determine each snake’s 137Cs body burden. Average 137Cs body burden of snakes from Pond B (0.67 Bq/g ± 0.05) was significantly higher than the average 137Cs body burden of snakes from Par Pond or Pond 2 (0.09 Bq/g ± 0.05 & 0.03 Bq/g ± 0.02, respectively). Of the three locations sampled, Par Pond and Pond B showed significant correlations between increasing body size and 137Cs body burdens (r² = 0.56, p = 0.008 & r²=0.29, p=0.008, respectively). Our results indicated that N. floridana can be a useful model organism for examining the fate of radionuclides in aquatic ecosystems.
2016 NSF REU SPOTLIGHT: DEONTE BURSTON
Influence of long-term Environmental Contamination and Parental Body Burden on Metal Tolerance in Southern Toads (Anaxyrus terrestris)
Deonte Burston1,3, Wes Flynn2,3, Cara Love2,3, David Scott3, Stacey L. Lance3
1 = Fort Valley State University, Fort Valley, GA
2 = Odum School of Ecology, University of Georgia, Athens, GA
3 = Savannah River Ecology Laboratory; Aiken, SC

ABSTRACT. Amphibian species and populations exhibit varying levels of tolerance to heavy metals commonly found in the environment. Heavy metals are common byproducts of agricultural, urban and industrial practices and do not degrade in the environment, producing environments where multi-generational exposure can occur. One of the leading causes of metal contamination is energy production, particularly coal combustion. The Savannah River Site used several coal combustion power plants for energy production and supports ≥40 species of amphibians, offering an ideal location to examine the effects of heavy metals on amphibians. The ash plume wetland has been impacted by coal combustion waste for decades, providing an excellent opportunity to investigate the impacts of multi-generational metal exposure on amphibian communities inhabiting the area. Metal exposure can result in increased mortality and reduced growth rates in amphibians, yet uncertainty still persists regarding the long-term impacts of exposure to these contaminants and the potential for adaptation. We investigated how parental body burdens of metals affect offspring survivorship, and if metal exposure of parental populations affects offspring metal tolerance. We collected adult southern toads (Anaxyrus terrestris) from a contaminated and three reference wetlands, bred them in the lab, and used the resulting larvae in a time-to-death assay using copper as a proxy to assess heavy metal tolerance. We found offspring from parents collected at the ash plume wetlands had half the risk of mortality in response to Cu over the exposure period and time-to-death was significantly prolonged. Further, we found no evidence that parental or embryo metal body burdens negatively impacted survivorship of larvae exposed to metals early in life. These results suggest that multigenerational exposure to heavy metals in the environment can result in those populations developing elevated tolerance to heavy metals, above and beyond negative effects associated with the maternal transfer of metals to offspring.

2016 NSF REU SPOTLIGHT: C. SHELDON DAVIS
Multiple Stressors in Larval Anurans: Ranavirus and Chronic Copper Exposure
C. Sheldon Davis1,2, R. Wes Flynn2,3, Cara N. Love2,3, Stacey L. Lance3, and David E. Scott3
1 = Clemson University, Clemson, SC
2 = Savannah River Ecology Laboratory; Aiken, SC
3 = Odum School of Ecology, University of Georgia, Athens, GA

ABSTRACT. Coal-fired facilities operated on the Savannah River Site from 1951 to 2012. Byproducts of combusted Amphibians are experiencing global declines due to a variety of natural and anthropogenic stressors. The causes of many declines are complex; however emerging infectious diseases, including ranavirus (RV), and contaminants have both been implicated. Heavy metals are common environmental contaminants due to human activities and can negatively affect growth, development, and survival at levels commonly found in the environment. RV is an emerging infectious disease implicated in die-offs globally, but how these commonly occurring stressors interact is still largely unknown. To determine how metals could influence susceptibility and interact with disease, we exposed southern toad (Anaxyrus terrestris) and eastern narrowmouth toad (Gastrophyne carolinensis) larvae to environmentally relevant levels of copper (Cu) in combination with a local RV strain. We obtained larvae by breeding adults collected from known metal-contaminated and reference wetlands on the Savannah River Site. Viable embryos were collected and exposed to a range of Cu levels for the duration of the experiment. To assess potential lethal and sublethal impacts on larvae we measured growth rates, survivorship, and RV loads. While survival probability was not affected by Cu in either species, Cu did have a significant negative effect on growth rates for both species. RV exposure negatively affected growth rates in both species, however survival probability was only reduced in narrowmouth toads. Across both species, larvae exposed to both Cu and RV had lower mean viral loads than those not exposed to Cu, though the differences are not statistically different. We did not detect any interactions between RV and Cu on survival and growth. These results highlight the difficulty in predicting interactions between environmental stressors in amphibians and suggest that RV can negatively impact amphibians even in the absence of increases in mortality.
2016 NSF REU SPOTLIGHT: CHRISTIAN DICKS
The Interaction of Radiation and Copper on the Incidence of Antibiotic Resistance

Christian A. Dicks\textsuperscript{1,2} & J. Vaun McArthur\textsuperscript{2,3}
\textsuperscript{1} = Claflin University, Orangeburg, SC
\textsuperscript{2} = Savannah River Ecology Laboratory, Aiken, SC
\textsuperscript{3} = Odum School of Ecology, University of Georgia, Athens, GA

\textbf{ABSTRACT.} The effects of legacy heavy metals and low dose ionizing radiation from nuclear production include previously unsuspected impacts on microbial communities. Previous studies have demonstrated increased levels of antibiotic-resistant microorganisms are more likely to be found in conditions with higher exposure to either metals or radiation than in uncontaminated reference sites. Here, we report the screening of different isolates from 2 different locations on the Savannah River Site and examine the combined effects of ionizing radiation and copper exposure on incidence of antibiotic resistant bacteria. We hypothesized that antibiotic resistance levels in aquatic bacteria will increase to higher levels with exposure to Copper Sulfate (Cu\textsubscript{2}SO\textsubscript{4}) and ionizing radiation than similar bacteria exposed to either radiation or copper. Water from Pond B was filtered-sterilized, and used to prepare all treatments which included controls and two concentrations of Cu\textsubscript{2}SO\textsubscript{4}. Bacteria collected from Pond B and Fire Pond biofilm plates were inoculated to treatment flasks, incubated and 20 isolates obtained from each treatment. Each isolate was screened against 23 different antibiotics and these results used in a discriminant and classification analysis. Patterns of antibiotic resistance were significantly different based on source of biofilm and Cu treatments. For the controls and low Cu the patterns differed depending on where the inoculum was obtained. Bacteria from Pond B had unique patterns of resistance when compared to Fire Pond bacteria in the same treatments. There was considerable overlap in the patterns of resistance of bacteria grown under the 0.5 Cu treatment from the two ponds. Classification analysis found that isolates could be correctly classified into site and treatment with > 85% accuracy. Some combinations were 100% correctly classified based on their antibiotic resistance patterns. Exposure to copper has differing impacts on levels of antibiotic resistance depending on the previous exposure to ionizing radiation.

2016 NSF REU SPOTLIGHT: EMILY EDWARDS
Internal CO\textsubscript{2} Change in Response to Reduced Photosynthetic Availability

Emily Edwards, Mackenzie Dix, & Doug P. Aubrey
Savannah River Ecology Laboratory, Aiken, SC

\textbf{ABSTRACT} Photosynthesis provides the substrate for growth and maintenance of plant organs. Terminating photosynthetic transport to roots via stem girdling reduces soil CO\textsubscript{2} flux (a proxy for belowground respiration) and internal CO\textsubscript{2} concentration at the base of tress (a proxy for root respiration). However, it remains unclear how reductions in photosynthesize availability, as opposed to complete termination, influence root respiration. We reduced photosynthesize to roots by approximately one-half by girdling one of two-stems to determine if root respiration could be maintained with reduced substrate. We terminated the supply of photosynthesize to another set by completely girdling their stems. The partial reduction of photosynthesize transport did not influence internal CO\textsubscript{2} concentration for at least a week. Complete termination of photosynthesize transport decreased internal CO\textsubscript{2} concentration within days. Trees with terminated photosynthetic transport had the greatest percent difference in internal CO\textsubscript{2} concentration when compared to the untreated group. The trees with simply reduced photosynthesize, thus far have not shown a great difference in comparison to control. Though it appears that root respiratory demands can be satisfied by one-half photosynthesize production, it remains uncertain if this can be maintained for longer periods of time. Additionally, it is unclear how other major sinks for photosynthesize (eg aboveground growth) may be influenced. Belowground respiratory demands may be a higher priority than growth. Trees could also have stored carbon within a large root system, which can buffer root metabolism when new substrate is unavailable. Future research should determine the full extent photosynthetic transport reduction has on metabolic rates.
2016 NSF REU SPOTLIGHT: CHRISTINA M. FULGHUM
Bioaccumulation and Biomagnification of Radiocesium in Littoral Zone Biota from a Cooling Reservoir on the Savannah River Site
Christina M. Fulghum1,2, Alexis Korotasz2,3, Albert L. Bryan Jr2
1 = University of South Carolina Aiken, Aiken, SC
2 = Savannah River Ecology Laboratory, Aiken, SC
3 = Stetson University, Deland, FL

ABSTRACT. Radiocesium, a long-lived radioactive isotope produced as a byproduct of nuclear fission, occurs in various aquatic ecosystems located on the Savannah River Site (SRS) in Aiken, SC after past releases of contaminated wastewater into cooling reservoirs. The presence of radiocesium in aquatic systems poses a risk for both animals and humans and could potentially move from aquatic systems to terrestrial. One such system on the SRS, Pond B, is an ideal site for examining radiocesium accumulation in aquatic biota and accessing potential movement through trophic levels. Three locations within Pond B (inflow, Heron Island, outflow) were sampled to examine for potential site-specific differences in accumulation. Sediment samples and biofilm samples were also collected to establish base levels of cesium in the trophic system. Minnow traps and dip-netting were used to collect benthic invertebrates (N=1) and fish species (N=4) from the littoral zone of Pond B. All samples collected were processed in an auto gamma counter for radiocesium levels. Radiocesium levels in sediments in and biofilms were relatively uniform among the 3 sites with only a few exceptions. Similarly, radiocesium levels in biota (Odonate larva, Mosquitofish, Bluegill, Warmouth, Redfin Pickerel) were relatively consistent among both sites and species. The results did not support the occurrence of site-specific differences in radiocesium accumulation or biomagnification through the system, keeping in mind that our sampling method affected sizes of biota examined. Our findings do indicate the continued accumulation of radiocesium in Pond B biota > 50 years post-release at levels ranging from 0.0530 – 6.0799 Bq/g (dry wt.).

2016 NSF REU SPOTLIGHT: MICHAELA M. LAMBERT
Sublethal Effects of 137Cs and HG Contamination in Florida Green Watersnakes (Nerodia Floridana)
Michaela M. Lambert1, M. Kyle Brown2, David L. Haskins3,4, Amelia L. Russell3, Melissa A. Pilgrim3, Tracey D. Tuberville3
1 = University of Kentucky, Lexington, KY
2 = University of South Carolina Upstate, Spartanburg, SC
3 = Savannah River Ecology Laboratory, University of Georgia, Aiken, SC
4 = D.B. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

ABSTRACT. Due to their relatively long lifespans and high trophic positions, many reptile species are susceptible to negative impacts from contaminants that bioaccumulate. Nuclear and industrial activities on the Savannah River Site (SRS) have resulted in areas with mercury (Hg) and radiocesium (137Cs) contamination. Both contaminants are known to bioaccumulate in reptiles and may alter their physiology. From 10-30 June 2016, we captured Florida Green Watersnakes (Nerodia floridana) from three permanent wetlands (PAR pond, Pond B and Pond 2) that were previously nuclear cooling reservoirs. We quantified the 137Cs whole body burden and total Hg concentration in tail tips of each snake. To estimate the effect of contaminant concentrations on snake metabolism, we used a SABLE flow through respirometry system to quantify total O2 consumed by each animal (VO2). Oxygen consumption ranged from 0.04 mL/hr to 56.78 mL/hr and averaged 12.233 mL/hr ± 1.130. The average VO2 for Pond 2 (8.044 mL/hr ± 0.796) was significantly lower than that of Pond B (16.678 mL/hr ± 2.329), and PAR pond (19.694 mL/hr ± 4.145). Interestingly, Pond B and PAR pond snakes had the highest levels of contaminants (137Cs highest at Pond B and Hg at PAR pond). Multiple regression revealed that snake VO2 was significantly and positively associated with Hg and 137Cs concentrations (p < 0.001; Hg coefficient = 10.24, 137Cs coefficient = 12.27). Roughly one-quarter of the variation in VO2 was associated with contaminant concentrations (r² = 0.26). The association between Hg and 137Cs concentration and oxygen consumption may indicate higher energetic costs associated with contaminant exposure. However, several factors impact snake metabolism (e.g., size, sex, and reproductive condition) and could also impact among-site variation in oxygen consumption. Our future analyses will include more complex models that let us refine our interpretation of the magnitude of contaminant effects on Green Watersnake metabolism.
2016 NSF REU SPOTLIGHT: BROOKE E. LINDELL
Distribution of Trace Elements and Cs$^{137}$ in Sediments of a Coastal Plain Stream Impacted by Industrial Activities
Brooke E. Lindell¹ ², Dean E. Fletcher², John C. Seaman² ² = College of Charleston, Charleston, SC
¹ = Savannah River Ecology Laboratory, University of Georgia, Aiken, SC

ABSTRACT. A 2014 study of contaminants in stream sediments revealed average concentrations of eight elements to be elevated above their Ecological Screen Values (ESV) in a beaver pond on a coastal plain stream located on the U.S. Department of Energy’s Savannah River Site (SRS), South Carolina. Previous studies also illustrated the importance of slow water depositional zones in accumulation of contaminants. The current study compares this beaver pond to those in other systems and investigates the distribution and potential source areas of contaminants upstream of the originally studied pond. We collected composite sediment samples from the previously studied beaver pond and depositional areas in McQueen Branch tributaries between the beaver pond and upstream industrial areas. Samples were also collected from Meyers Branch, another SRS stream potentially affected by periodic industrial runoff, as well as a reference beaver pond unaffected by industry. A total of 44 sediment samples were processed and analyzed to determine the concentrations of 16 trace elements and Cs-137. While detected levels of Cs-137 were low, our analyses found concentrations of over 7 elements to exceed their ESV in sediments in or near sedimentation basins at the heads of two tributaries and in the previously studied beaver pond. Concentrations tended to attenuate downstream of these headwater basins. Levels were also lower in reaches of stream that were severely scoured by excessive stormwater runoff. Concentrations of many elements were positively correlated to both organic matter and clay content, although organic matter appeared less influential in ponds and basins where an exceptional abundance of organic matter occurred. It appears that sedimentation basins and beaver ponds play an integral role in the storage and subsequent redistribution of contaminants in the study streams. Future studies should further evaluate the source, fate, and effects of contaminants entering this and similar stream systems.

2016 NSF REU SPOTLIGHT: NIA PEAK
Effects of Parental and Early Life Exposure to Metals on Genome Methylation in Two Anuran Species
Nia A. Peak¹ ², Cara N Love² ³, R Wes Flynn² ³, David E. Scott², and Stacey L. Lance²
¹ = Claflin University, Orangeburg, SC
² = Savannah River Ecology Lab, University of Georgia, Aiken, SC
³ = Odum School of Ecology, University of Georgia, Athens, GA

ABSTRACT. Amphibians respond to metal contaminants in a variety of ways. Species and populations differ in their tolerance to elevated levels of metals in the environment, yet little is known about the mechanisms driving this variation in tolerance. DNA methylation is an epigenetic mechanism that regulates gene expression and can be altered by metal exposure. We designed our study to quantify how 1) early life exposure and 2) parental exposure to heavy metals affect genome methylation of two amphibians, southern toad (Anaxyrus terrestris) and eastern narrowmouth toad (Gastrophryne carolinensis). We collected adults from two metal-contaminated and two non-contaminated wetlands on the Savannah River Site, bred adults in the lab and assigned offspring to one of three copper treatments in a factorial design. Embryos were kept in their treatments until after hatching (GS25), when collected them for DNA extraction. We quantified the relative percent genome methylation in the DNA samples using a 5-mC DNA ELISA kit. We found that relative percent DNA methylation was altered by both Cu exposure and population metal exposure history in both species. Southern toad larvae exhibited reduced methylation when exposed to copper early in development, and offspring from the contaminated site showed lower levels of methylation independent of Cu treatment. Furthermore, Cu exposure appeared to have a weaker effect on methylation levels in offspring from the contaminated site relative to those from the reference site. Narrowmouth toad larvae showed decreasing mean levels of methylation with increasing Cu exposure in offspring from the reference site and increasing mean levels methylation with increased Cu exposure in offspring from the contaminated site. These data suggest that both early life and parental metal exposure could be affecting methylation levels in these species and that an epigenetic mechanism could explain some of the differences in metal tolerance between species and population.
2016 NSF REU SPOTLIGHT: AMELIA RUSSELL
Mercury Bioaccumulation in Florida Green Watersnake (Nerodia floridana) Among Three Wetlands on the Savannah River Site
Amelia L. Russell1,3, M. Kyle Brown1,3, Michaela M. Lambert2,3, Tracey D. Tuberville3, and Melissa A. Pilgrim1,3
1 = University of South Carolina Upstate, Spartanburg, SC
2 = University of Kentucky, Lexington, SC
3 = Savannah River Ecology Laboratory, University of Georgia, Aiken, SC

ABSTRACT. Anthropogenic activities have significantly increased the amount of mercury cycling globally. Mercury can become bioavailable, accumulate in organisms, biomagnify in food webs, and can negatively impact wildlife health. Mercury contamination on the Savannah River Site (SRS) is a result of atmospheric deposition, coal combustion, and use of contaminated water from the Savannah River in nuclear reactor cooling reservoirs. Florida green watersnakes (Nerodia floridana) are top predators that inhabit the reservoirs and can serve as bioindicators of mercury contamination. We used minnow traps and funnel traps to capture snakes from three reservoirs: Pond B (n=23), Pond 2 (n=44), and PAR pond (n=11). We took tail clip samples from captured snakes and quantified the total mercury (THg). Total mercury concentrations ranged from 0.167 to 2.096 mg/kg dry weight. Snakes from PAR pond had significantly higher average THg (0.567 ± 0.176 mg/kg), than snakes from Pond 2 (0.293 ± 0.029 mg/kg) and Pond B (0.293 ± 0.027 mg/kg). In addition, there was a significant relationship between snout-vent length and THg in N. floridana from Pond B (r=0.669, r²=0.447, p<0.001) and Pond 2 (r=0.463, r²=0.214, p=0.002). Florida Green Watersnakes are primarily fish eaters. Interestingly, snake mercury levels were much higher than the Environmental Protection Agency (EPA) reference dose for daily fish consumption (i.e., 0.00001 mg/kg/day) and 3 snakes were at or above the EPA’s no consumption threshold for individual fish (i.e., 1.9 mg/kg). There is potential for snakes to serve as a bioindicator of Hg contamination levels as they may relate to human consumption of fish in aquatic systems. Future efforts should determine what proportion of total mercury detected was methyl-mercury, the most bioavailable form of mercury in aquatic systems.
Bioaccumulation of $^{137}$Cs in Florida Green Watersnakes (*Nerodia floridana*) from Three Wetlands on the Savannah River Site

**ABSTRACT.** The Savannah River Site (SRS) is a 780-km$^2$ United States Department of Energy (USDOE) property with a history of radioesium ($^{137}$Cs) contamination in reservoirs associated with the nuclear reactor cooling process. Radioesium is a long-lived gamma-emitting radionuclide that can bioaccumulate in biota. The Florida green watersnake (*Nerodia floridana*) is a primarily piscivorous species with trophic links to terrestrial and aquatic food webs. Large intraspecific size variation and a preference for permanent still waters (e.g., cooling reservoirs on the SRS) make *N. floridana* an ideal model for studying bioaccumulation of $^{137}$Cs in a top predator. Our study quantified $^{137}$Cs concentrations in *N. floridana* captured from three SRS reservoirs (Par Pond, Pond B, and Pond 2) with unique contamination histories, and determined if snake $^{137}$Cs body burdens increased with body size. Average $^{137}$Cs body burden of snakes from Pond B (0.67 Bq/g ±0.05) was significantly higher than the average $^{137}$Cs body burden of snakes from Par Pond or Pond 2 (0.09 Bq/g ±0.05 and 0.03 Bq/g ±0.02, respectively; p<0.01). Par Pond and Pond B showed significant positive relationships between body size and $^{137}$Cs body burdens ($r^2 = 0.56$, $p < 0.01$ and $r^2=0.29$, $p<0.01$, respectively). Average $^{137}$Cs body burdens for *N. floridana* captured in Pond B were higher than the European Economic Communities guideline for fresh meat. Our results indicated that *N. floridana* can be a useful model organism for examining the fate of radionuclides in aquatic ecosystems as well as the potential hazards of consuming fish from areas contaminated with radionuclides.

**M. Kyle Brown** is a 2016 graduate of the University of South Carolina Upstate. Kyle became a member of Dr. Melissa Pilgrim’s undergraduate research group Upstate Herpetology in January 2015. His research experience includes conducting anuran call surveys for the North American Amphibian Monitoring Program and using automated recording systems to monitor the calling activity of anurans in the Piedmont region of South Carolina. Kyle was chosen to participate in the 2016 National Science Foundation Radiocology Research Experiences for Undergraduates at the Savannah River Ecology Laboratory, where he worked under the direction of Drs. Melissa Pilgrim and Tracey Tuberville examining radioesium accumulation in Florida green watersnakes (*Nerodia floridana*). Kyle’s research interests include the effects of climate change and anthropogenic disturbances on herpetofauna, as well as wildlife conservation in general. Kyle plans to attend graduate school with the ultimate goal of becoming a Wildlife Biologist. Kyle’s hobbies include herping and playing with his son Lucas.

**Michaela Lambert** is a senior at the University of Kentucky majoring in both Natural Resources and Environmental Science, and Equine Science and Management. Michaela’s research experience began in 2015 when she started working in Dr. Steven Price’s Herpetology and Stream Ecology Lab at UK. Michaela has participated in numerous research projects, including a mark-recapture study of natricine snakes that examines anthropogenic effects on behavior, a study evaluating both trap effectiveness when capturing the Common Mudpuppy (*Necturus maculosus*) and gene flow among populations, the genetic analysis of endangered freshwater mussels, a study examining the impacts of forest management techniques on reptile and amphibian species, and evaluating wetland suitability as amphibian
habitat. Her current research in the Price lab focuses on evaluating the relationship between anuran calling patterns and environmental conditions. As part of the Radioecology REU, Michaela is working with Drs. Tuberville and Pilgrim investigating the effects of contaminants on the metabolic rate of water snakes.

**AMELIA L. RUSSELL** graduated from the University of South Carolina Upstate with a B.S. in Biology in the Fall of 2016. Her undergraduate research experiences began with Dr. Jonathan Storm where she assisted with ongoing small mammal research. Amelia became an active member of Upstate Herpetology, an undergraduate research group managed by Dr. Melissa Pilgrim. As part of Upstate Herpetology her research focused on amphibian conservation. In the Summer of 2016, Amelia was a research technician for Drs. Tracey Tuberville and Melissa Pilgrim. She worked alongside students in the National Science Foundation Radioecology Research Experiences for Undergraduates investigating the effects of environmental contaminants on Florida green watersnakes (*Nerodia floridana*). Amelia plans to continue her education in a Wildlife Ecology graduate program. She is interested in wildlife conservation and investigating the impacts of anthropogenic environmental degradation on wildlife and human health. Amelia enjoys public outreach, and spreading awareness of how small changes in one’s everyday life can make a vast difference in preserving natural resources.

**DR. TRACEY D. TUBERVILLE** is an Associate Research Scientist at the University of Georgia’s (UGA) Savannah River Ecology Laboratory, near Aiken, South Carolina. She received her B.S. in Biology from Furman University (1993), M.S. in Conservation Ecology and Sustainable Development (1998) and Ph.D. (2008) in Ecology from University of Georgia. Her research interests are in applied conservation and management of reptiles and amphibians, including translocation and reintroduction as conservation tools.

**DR. MELISSA PILGRIM** is Director of Research and an Associate Professor of Biology at USC Upstate. She joined the faculty at USC Upstate in the Fall of 2006. Her primary research focus involves an integrative approach to investigating how ecosystems respond to environmental change (natural and anthropogenic). Her research program integrates field ecology, biogeochemistry (e.g., stable isotopes), and ecophysiology. She earned her Ph.D. from the University of Arkansas in 2005 and transitioned to a post-doctoral research position at the University of Georgia’s Savannah River Ecology Laboratory (SREL). Many of her current research initiatives still involve collaborations with SREL faculty and students. In addition, she has an army of undergraduate students working with her in an undergraduate research group called Upstate Herpetology. Her publications range from book chapters in Herpetology volumes to scholarly articles in isotope, ecological, and herpetological journals. She currently serves on the Editorial Board for Herpetologica, as a Council Member of the South Carolina Academy of Science, and as the Upstate Regional Coordinator for the North American Amphibian Monitoring Program.
1. Introduction

Nuclear power accounts for approximately 11% of the global energy supply and use of nuclear power is expected to grow in years to come [1]. In addition, nuclear weapon reductions that began at the conclusion of the Cold War are now slowing and the capability to produce nuclear weapons is spreading to more countries throughout the globe [2]. With the use of nuclear power and the manufacture of nuclear weapons comes the risk of environmental contamination resulting from the release of radionuclides created in the process of nuclear fission. Nuclear disasters and accidental releases, such as the Chernobyl incident in 1986 and Fukushima incident in 2011, have highlighted risks associated with nuclear energy production. Therefore, it is important to understand the challenges that emerge when radioactive contaminants created during the fission process are released into the environment.

While several radionuclides can be accidentally introduced to the environment, radiocesium (\(^{137}\)Cs) is of particular concern. Radiocesium is a long-lived (i.e., physical half-life roughly 30.17 years) gamma-emitting radionuclide that can persist in water, air, and sediment after release into the environment [3]. In addition, radiocesium can bioaccumulate (i.e., radiocesium concentrations increase in an organism over time) and biomagnify in food webs (i.e., radiocesium concentrations increase as trophic level increases) [4]. Radiocesium is an analog for potassium and can be incorporated into potassium transport systems as organisms assimilate food [5]. Thus, acute (e.g., radiation sickness and death) and sublethal (e.g., DNA double-strand breakage and altered physiology) effects can result from \(^{137}\)Cs exposure [6]-[7].

Cesium’s propensity to concentrate in muscle tissue potentially places predators and other consumers, including humans, at risk of exposure. Furthermore, if highly mobile organisms accumulate \(^{137}\)Cs there is a risk that the contaminant could be transported well beyond the site of origin [7]. For example, species of game birds such as the mourning dove and wood duck have been shown to accumulate \(^{137}\)Cs from contaminated sites before moving to unaffected sites where they can be harvested for meat and consumed by hunters [7]-[8]. Fish present an even greater risk of human exposure to \(^{137}\)Cs as they are a common diet staple, especially in the southeastern United States. Additionally, frying fish (i.e., most common method of preparation) can increase the \(^{137}\)Cs concentration in fish muscle [9].

The Savannah River Site (SRS) is a 780 km\(^2\) United States Department of Energy (USDOE) property with a history of \(^{137}\)Cs contamination. From the 1950’s to the 1980’s the SRS operated nuclear reactors to build nuclear weapons. Throughout that time, measureable amounts of \(^{137}\)Cs were released into surrounding air and waterways on the SRS through airborne and liquid releases [10]. The sediments of associated water bodies, including former cooling reservoirs, are still contaminated with \(^{137}\)Cs. In addition, there are areas where both sediment and surface-level contamination persist.

In the current study, we quantified whole-body \(^{137}\)Cs concentrations in Florida green watersnakes (\(Nerodia floridana\)) captured on the SRS. Florida green watersnakes are the largest of the watersnakes found in North America [11]. They are a seldom-studied snake that inhabit permanent bodies of water, such as the nuclear reactor cooling reservoirs found on the SRS. \(Nerodia floridana\) are top predators with links to both aquatic and terrestrial foodwebs. Thus, they are a potential bioindicator for studying the fate and transfer of \(^{137}\)Cs within an ecosystem. Moreover, \(N. floridana\) are primarily piscivorous and can be used to assess potential exposure of anglers who consume fish captured from areas contaminated with \(^{137}\)Cs. Our specific study objectives were to (i) quantify \(^{137}\)Cs body burdens in \(N. floridana\) from three contaminated SRS cooling reservoirs and (ii) determine if \(^{137}\)Cs body burdens increase with snake size.
2. Methods

Study Site

We trapped snakes from three former nuclear reactor cooling reservoirs on the Savannah River Site in Aiken, South Carolina (Figure 1). Par Pond is the largest of the three sites (1068 ha), followed by Pond B (87 ha) and then Pond 2 (23 ha). Each site varied in $^{137}$Cs contamination history. All reservoirs received thermal effluent from either R-reactor, P-reactor, or both. Through the 1950’s and early 1960’s Par Pond received effluent water from R-Reactor. Beginning in 1961, cooling water from R-Reactor was sent through a new canal system that included R-canal and Pond B, until R-Reactor was decommissioned in 1964. P-Reactor began discharging into Par in 1961, through a system of canals and precoolers-ponds including: Pond 2, Pond 5, and Pond C. The precoolers-ponds were used until 1988 when P-reactor was closed [12]. While there have been documented releases of $^{137}$Cs to both Pond B and Par Pond, there have been no documented direct $^{137}$Cs releases from P reactor into Pond 2; however, Pond 2 received secondary $^{137}$Cs contamination due to recirculated water from Par Pond and prior releases from R reactor [10],[12],[13]. The $^{137}$Cs persists mainly in the sediments of all 3 reservoirs. Of the 3 reservoirs, Pond B has been indicated to have the highest surface levels of $^{137}$Cs contamination (determined by a 1998 aerial flyover).

Data Collection

We set minnow and funnel traps at each of the three focal wetlands to capture snakes. We set 20 trap arrays of 4 minnow traps and 1 funnel trap per array for a total of 100 traps at each wetland. We placed traps along the water’s edge 2 – 3m apart. We checked traps each morning during 10-30 June 2016. We transported captured snakes to the Savannah River Ecology Laboratory near Aiken, SC for processing.

We obtained a mass (to nearest 1 g) for each snake on the day of capture. Within 48 hrs of capture, we performed $^{137}$Cs whole-body counts using a 10.2-cm X 15.2 cm NaI(Tl) gamma detector coupled to a personal computer equipped with Canberra Genie 2000 gamma spectroscopy software. The NaI (Tl) gamma detector was surrounded by lead bricks to prevent outside sources of radiation. We obtained background counts by placing an empty holding container into the well counter for 1800 seconds before beginning a whole-body count. We acquired whole-body counts of individual snakes by placing the snake into a holding container and then placing the holding container in the detector for 900 seconds. We converted the background corrected gamma counts to Becquerels per gram (Bq/g).

We then held snakes at the laboratory for seven days for further processing (e.g., metabolic rates, snout-vent length measurement to nearest 0.1 cm, sex determination, mercury analysis, and individual marking via PIT-tag). Following data collection, we released snakes at their capture location.

Data Analysis

We used EXCEL (2013) and SPSS for data management and analyses. To evaluate whether average snake size varied among sites, we used analysis of variance (ANOVA). We utilized analysis of covariance (ANCOVA) with SVL as a covariate to compare the average $^{137}$Cs body burdens of snakes from each reservoir while controlling for size. We used simple linear regression to examine the relationship between SVL and $^{137}$Cs body burden of snakes from each of the three reservoirs.
3. Results

We captured a total of 88 *N. floridana*. Average snout-vent length (SVL) for all snakes was 47.2 cm (range: 23.0–82.0 cm). However, average SVL varied among sites (Figure 2) and ANOVA revealed the among-site differences were statistically significant (F=15.63; df=2, 75; p<0.001). Tukey HSD identified each site mean as significantly different from the other (Figure 2).

Average $^{137}$Cs body burden for all snakes was 0.22 Bq/g (range: 0.00–1.03 Bq/g). However, average cesium body burden also varied among sites (Figure 3). Analysis of covariance with SVL as a covariate indicated significant among site differences in mean $^{137}$Cs body burden (F=78.29; df=2,73; p<0.001) after controlling for size. Šidák’s test indicated that the average $^{137}$Cs body burden of Pond B snakes were significantly higher than the average $^{137}$Cs body burdens of Par Pond and Pond 2 snakes (Figure 3). All but one of the 17 snakes captured from Pond B had $^{137}$Cs body burdens above the European Economic Community (EEC) limit for $^{137}$Cs in fresh meat (Figure 3).

For two of the three reservoirs (Pond B and Par Pond) there was a statistically significant positive relationship between SVL and $^{137}$Cs body burden (Figure 4). At Pond B, 29% of the variation in $^{137}$Cs body burden was explained by variation in SVL (p<0.01), while at Par Pond, 56% of variation in $^{137}$Cs body burden was explained by variation in SVL (p<0.01).

4. Discussion

We documented $^{137}$Cs body burdens in snakes from all three study sites. Interestingly, the relationship between snake body size and $^{137}$Cs body burden observed in our work supports findings of previous studies examining the relationship in reptiles and fish [14]-[15]. Snakes are gape limited predators and the increases in $^{137}$Cs with body size we observed may indicate diet differences between large and small snakes, and support the idea that $^{137}$Cs has the ability to bioaccumulate and biomagnify in aquatic systems. Previous studies conducted comparing the levels of $^{137}$Cs in snakes and prey items have shown a two – three-fold trophic increase in $^{137}$Cs from prey item to snake [16]. Adult *N. floridana* normally feed upon fish that occupy a higher trophic status than the prey items of juvenile *N. floridana* [11]. Thus, it is reasonable to consider that larger *N. floridana* receive a higher $^{137}$Cs intake from prey items than do smaller *N. floridana*. Alternatively, Scott and colleagues [14] hypothesized that higher metabolic rates in juvenile yellow-bellied sliders (*Trachemys scripta*) led to higher rates of $^{137}$Cs elimination and subsequent lower concentration rates overall. If a similar relationship exists in snakes, it could provide another explanation for lower $^{137}$Cs levels in smaller *N. floridana*.

The among-reservoir variation in $^{137}$Cs body burdens was consistent with contamination histories of the three cooling reservoirs we sampled. On average *N. floridana* captured from Pond B had significantly higher $^{137}$Cs body burdens than snakes from the other cooling reservoirs. Numerous studies have been conducted examining $^{137}$Cs levels in biota inhabiting Par Pond and Pond B. In all studies, Pond B biota had higher $^{137}$Cs levels compared to Par Pond biota. In fact, one study found that nearly all aquatic biota in Pond B contained levels of $^{137}$Cs nearly 1000 times the levels associated with global nuclear fallout [3], [16] – [17]. Relative to Pond B and Par Pond, fewer studies have been conducted concerning Pond 2. However, $^{137}$Cs contamination has been documented for biota inhabiting the reservoir [12] and our work contributes to the limited database.

Our work with *N. floridana* allowed us to study the fate and transfer of radionuclides in aquatic ecosystems. The levels of radiocesium detected in *N. floridana* during our 2016 study speaks to the persistence of radionuclides in aquatic systems, as contamination of our sites occurred
approximately 30-50 years ago. Snakes captured from Pond B in our study have $^{137}\text{Cs}$ levels comparable to those observed in snakes from Par Pond during years directly following $^{137}\text{Cs}$ releases (Table 1). It was particularly alarming to document radiocesium levels in fish-eating snakes that were above the European Economic Communities limit for fresh meat consumption. Much like *N. floridana*, humans are top predators who often rely on fish as a source of protein [9]. Collectively, our work demonstrates that long-lived reptiles, such as *N. floridana*, can serve as bioindicators of contamination issues humans may face as they consume fish from local waterways – even if contamination of the area occurred many years prior.

## 5. Tables and Figures

![Image](image.png)

**Figure 1.** Distribution of study sites on the Savannah River Site. Circles indicate sampling locations. Figure taken from [12].
Figure 2. Average snout-vent length (SVL) of *N. floridana* captured at each reservoir. Letters indicate statistically significant among-site variation in SVL. Sample sizes are indicated above each bar.
Figure 3. Average $^{137}$Cs-body burdens of *N. floridana* captured at each of the three reservoirs. Letters indicate statistically significant differences in average $^{137}$Cs-body burdens. Sample sizes are given above each bar.
Figure 4. Relationship between body size (SVL) and Cs-137 body burden of *N. floridana* captured in each of the three reservoirs.

Table 1. Whole body $^{137}$Cs levels observed for *N. floridana* in our 2016 study compared to levels previously reported for multiple species of *Nerodia* in a similar study conducted in 1974 [16].

<table>
<thead>
<tr>
<th>Location:</th>
<th>Average whole-body $^{137}$Cs ± 1SE (pCi/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par Pond (1974)</td>
<td>27.7 ± 12.5</td>
</tr>
<tr>
<td>Par Pond (2016)</td>
<td>2.4 ± 4.3</td>
</tr>
<tr>
<td>Pond B (2016)</td>
<td>18.0 ± 14.0</td>
</tr>
<tr>
<td>Pond 2 (2016)</td>
<td>0.8 ± 0.5</td>
</tr>
</tbody>
</table>

6. Acknowledgements

We would like to thank the following organizations, institutions, and individuals: United States Department of Energy, National Science Foundation, Area Completion Projects, Savannah River Nuclear Solutions, Savannah River Ecology Laboratory, University of South Carolina Aiken, University of South Carolina Columbia, University of South Carolina Upstate, University of Kentucky, University of Georgia, Kimberly Price, David Haskins, Kurt Buhlmann, Perry Bovan, Bobby Kennamer, Chris Leaphart, Phil Vogrinc, JD Willson, and fellow REU students. The research is based upon work supported by the Department of Energy under Award Number DE-FC09-07SR22506 to the University of Georgia Research Foundation. Animals were collected under South Carolina Department of Natural Resources Permit #02-2016, and all animal
procedures were conducted in accordance with Animal Use Permit A2016 02-066-Y1-A0 and approved by the University of Georgia IACUC.

7. References

**ABSTRACT.** Street Art has been under scrutiny for many years, recently it has been issued a new lease on life. People have begun viewing Street Art, not as a nuisance, but as an object of beauty. From small towns and communities to major metropolitan hubs both here in America and worldwide, Street Art is gaining in acceptance. During the last decade, “street art” has found its admirers, its detractors, its collectors, its aspiring and “superstar” artists, its commercial promoters and documentarians, and its Web sites, galleries, and festivals, but it has not until now, found its scholar to systematically untangle and clarify these complicated networks for an academic audience [1]. Much of this rapid interest is due to the ever-increasing presence and popularity of social media providing a platform for Street Art to go viral. Internet has changed the ways we think about placing art in public spaces. The art can colonize spaces that previously wouldn’t be considered without possibility of digitization. The public also evolved into a new species of quick circulation, and it seems the viral art displays the same behavioral patterns in the digital world as street and graffiti art in their original context [2]. There are also a lot of examples of how artists are making art having in mind the power of social media. For instance, DS, a stencil artist would never have the chance for his work to make the point it did, if there were no help of the social networks. This work would easily have been forgotten or not understandable if he/she didn’t post a photo on their Twitter account. And now, it became viral [2].

We have demonstrated how in the past Street Art has been viewed versus today’s popular opinion. We also discussed the Street Art movement in Spartanburg, and how the community’s view of this form of art has begun to be reformed. Street Art started to be displayed in a positive light, and our discussion has shown the affects of the practice.

**KAYLA MCGILL** Kayla McGill is a graduate from Boiling Springs High School and a junior at USC Upstate where she is pursuing a degree in Graphic Design. Kayla accompanied Dr. Bridget Kirkland as the student assistant on the journal submission, where they undertook the project of investigating Street Art and its effects on communities. The focus of their submission was Spartanburg and the city’s “Love Where You Love” campaign, which is stimulating the art community.

**DR. BRIDGET KIRKLAND** was born in 1976 in Philadelphia, Pennsylvania, and was raised in Erie, PA. She graduated from Mercyhurst University with a Bachelor’s of Fine Arts in Graphic Design and a minor in Photography and Marketing. In 2013 she earned her Master of Fine Arts in Art and Design from Winthrop University. She is an assistant professor of graphic design at the University of South Carolina Upstate, in Spartanburg, SC. She is also co-director of the student run design agency, “The Studio” housed in the George Dean Johnson, Jr. College of Business and Economics, incubator known as the Greenhouse.

Kirkland has consistently been selected to participate in shows and exhibits across the southeastern region. Her work is also featured in “The Secret Collection” at El Secreto Hotel in Isla Mujeres, Quintana Roo, Mexico. Kirkland is a member of several professional regional and national art and design organizations.
1. Introduction

Street Art has been considered a taboo subject for decades. The term is most commonly associated with vandals and gangs, mainly in reference to location tagging. In recent years a new light has begun to dawn and we, as a society, are rethinking Street Art. Through social media the awareness of Street Art has begun to explode, encouraging artists to take to the streets and establish themselves. With this newfound spotlight on Street Art society is changing its perceptive on the topic. Many storefronts are encouraging the presence of Street Art. There are even those who are making a business out of the practice of this art form. Seen in cities both large and small, Street Art seems to come with limitless boundaries on subject matter. In this article Street Art will be discussed in different lights, from how it was viewed, to the current ever-changing opinions being formed.

2. Methods

To discuss Street Art, one must first know what defines Street Art. According to Art Republic, Street Art is "any art developed in public spaces [3]" Art Republic also states this term may encompass graffiti, guerrilla art, video projection, street posters, flash mobs, and so on; but then continues on to describe the differences between graffiti and Street Art. Many artistic articles seem to use these two terms synonymously, while simultaneously stressing the differences. Specifically Street Art is typically associated with studios and art movements, as opposed to the more negative connotation surrounding graffiti. But the question remains: are they the same? Gangs use gang symbols in the marking of their territories. In the Street Art world this is commonly known as “tagging.” Many consider this graffiti as opposed to Street Art and therefore they would be considered two different forms of public expression. However, when studying the works of artists such as the famed Banksy, the line between Street Art and graffiti is blurred. In this article, Street Art will be in reference to a broad spectrum of mediums and practices and generally will not be referring to tagging, graffiti, or similar types of self-expression [3]. The main difference between graffiti writing and street art is intention. Graffiti writers are not interested in the general public understanding their artwork. They are primarily concerned with other graffiti writers who can decipher the coded tags and appreciate the style of the writing. Street Art on the other hand, by using humor, irony and absurdity, communicates on a more conceptual level than graffiti writing (Figure 1). Street art often combines seemingly unrelated slogans and images. By altering the original intent of a commercial image, the final meaning changes.

When developing these definitions, one must assume that much thought goes into Street Art and certain processes must be followed. One cannot simply slap paint on a wall and call it Street Art. It should invoke emotion and add to the space it is occupying as opposed to just taking up space. Street Art should also allow the area it is occupying to continue functioning as designed. For example, if an artist installs a statue in a park, for it to be a successful installment it should not hinder the public’s ability to use and enjoy the park [4].

3. Results and Discussion

In many communities Street Art is quickly becoming the recipient of enthusiastic approval, instead of past reactions of disgust or disdain. An interactive art object in the public space provides a pretext for conversations and in some cases for cooperation between strangers. If the intervention encourages playful interactions and brings joy to the participants, while the participation is not obligatory, the place of the intervention will be attended repeatedly and more actively. By providing the conditions for enjoying the stay in the place and the company of accidental passers-by, art intervention launches sustainable connection to the place. In many
cases interactive objects or repetitive creative action serve as an axis for emerging citizens’ network [5]. Street Art is now being viewed as a welcomed addition to cities worldwide and has begun being documented as enhancing a city’s atmosphere by giving visual interest to the public. Studies discussed in “The Streets are Art” tell of how people are reacting to Street Art in a positive light. This encouragement is giving artists a new canvas: their towns. Artists are expanding their creativity by exploring their cities and expressing themselves for all to see. It allows them to break free from the binding walls of studios and paint the town red – literally. Street Art can also boost an artist reputation and name. Business owners and city officials are reportedly beginning to commission murals and other forms of Street Art for their buildings. One such example is the Hub City Art building in Downtown Spartanburg, the owner commissioned world-renowned street artists Ishmael (from Spartanburg, S.C.) and Yamabushi, “Beyond Civilization” (Figure 2). The building owner granted complete artistic freedom of what they decided to create for the structure. The “Beyond Civilization” theme is taken from the book, written by, Daniel Quinn offering a guide for possible solutions to the problems he sees with the current state of civilization.

Zavakos also reports Street Art is impacting citizens in a radical way. Inhabitants are likening the effect of Street Art to walking through a fairytale-esque environment. Many have commented that seeing Street Art reminds them of their childhood; taking them back to their roots of drawing on the sidewalk with chalk (Figure 3), and returning that creative spark that for many, seems to dim as the years progress [6].

“I think that public art can be a reflection of how a community feels about itself,” according to Aimee Wise, Spartanburg Artist that has contributed to the local street art movement. Her piece, titled, “Call It,” can be seen on 360 Union St. (Figure 4). It is a mural that commemorates the ideals of J.C. Strobe, longtime employee of the Beacon Drive-In and local legend [7]. Exposures mentioned by Wise can definitely be seen in Spartanburg. The “Love Where You Live” campaign has been gradually progressing over the past several years. Accompanying this development is an influx of local Street Art including the famous “Love Where You Live” mural that debuted in 2014 (Figure 5). This mural, painted by Russell Bannan, Lily Knight and other local artists, was commissioned to serve as a reminder of just how memorable Spartanburg can be. Jordan Clayton, Director of the “Love Where You Live” campaign, has a dream of the mural becoming one of Spartanburg’s calling cards, as well as a popular meeting spot for the community. This mural, along with several others showcased throughout the city, has received numerous positive remarks, all echoing the pride people are feeling for Spartanburg. A casual search on Instagram™ or Facebook™ will show countless “selfie” shots and group photos with the bright and colorful pieces of the “Love Where You Live” mural as their chosen background [8].

4. Conclusions

From primitive Caveman drawings to tagged bridges, underpasses and railway boxcars, Street Art has always been and will always be on display. Street Art provokes a visceral impact. The Street Art of today could arguably be said to be working towards a movement where communities see a resurgence of the arts in multiple forms. It can be used to bring people together, to discuss pressing topics, or to simply make someone smile. Street Art is an interactive form of art that allows citizens of all ages, races and genders to be a part of their city and to feel pride in where they live.

5. References

6. Figures

![Image of street art]

**Figure 1.** DS Artwork, Bad Kitty and The Remover.
Figure 2. Ishmael and Yamabushi, “Beyond Civilization”; Hub-Bub Studio Warehouse, 149 South Daniel Morgan Avenue.

Figure 3. Artist Unknown, found on the sidewalk of East Main Street.
Figure 4. Aimee Wise and Abe Titus, “Call It”; 360 Union Street.

Figure 5. Russell Bannan, Lily Knight, “Love Where You Live”; Corner of West Main and South Spring Street.
Donald Trump: Constructing Masculinity, Easing Conservative Anxieties during the GOP Primary Election of 2016

**ABSTRACT.** This study provides a critical/feminist cultural analysis of the political rise of Donald Trump during the 2015 Republican primary election. Trump emerged as the Republican nominee despite his lack of political experience and in spite of a pattern of politically incorrect language targeting women, immigrants, Muslims, and nation states such as China and Mexico. Trump's unprecedented victory necessitates a close look at the communications he made with his constituency. This essay provides an inductive qualitative textual analysis of 10 Trump campaign speeches between June and October of 2015 in order to illustrate Trump's appeal among White working class men. Understanding Trump’s performances of masculinity provides insight to the success of this unconventional entrepreneur's campaign. Gender research establishes the existence of multiple forms of masculinity in any given context and how an idealized hegemonic masculinity arises above subordinate masculinities. Typically, such research provides insight to the emergence of a singular hegemonic masculinity such as a technocratic rational (cerebral) white collar masculinity or a physical (body) working class masculinity. This study illuminates how these classic constructions of masculinity are simultaneously performed by Trump through his violent and competitive language and his ongoing narrative about himself as a great builder. Trump’s performances of both of these classic forms of masculinity enable his appeal as the real man for the job in an age of masculinity in crisis.

**ANDREW MOORE**

graduated from USC Upstate in 2015 with a B.A. in Communication (Mass Media). Before his time at Upstate, he spent six years as an award-winning print and digital journalist, covering everything from crime, to courts, sports, and presidential politics. Since then, he’s also gained experience in the business world, coordinating communication and marketing efforts for a major software company. He is now a graduate student in Clemson University’s Master of Arts in Communication, Technology, and Society (MACTS) program, as well as a graduate teaching assistant there. His goal is to teach communication and media studies at the college level.

“It was communication faculty like Dr. Carolina Webber, Dr. Ben Myers, Dr. Warren Barreiss, Dr. Michelle Garland, and Allison Ludwig that really inspired me to pursue my current career track,” Moore said.

Moore said the research project featured in his journal submission was really a natural extension of the partnership he enjoyed with Dr. Webber during his senior year at USC Upstate.

“Dr. Webber’s experience using a critical perspective was crucial in helping me develop the framework for this research,” Moore said. “When the time came to refine the article for submission to this journal, I already had a unique comfort level with how Dr. Webber works. It has really been a fulfilling and unique process to learn the ropes of new communication theory as an undergrad, and then co-author a product you can be proud of alongside your mentor.”

Moore’s favorite part of the experience, at least in retrospect, was challenging himself to broaden his horizons. “Most scholars have their ‘pet’ theories and methods, and this project forced me to immerse myself in a communication theory with which I’d had limited experience,” Moore said. “There is something magical in learning enough about a subject of scholarship to join the academic ‘discussion’ in that field.”
DR. CAROLINA WEBBER is an Assistant Professor of Communication Studies. She joined the faculty at USC Upstate in the Fall of 2014. Her areas of research include Organizational Communication and Cultural Studies. Dr. Webber’s program of research and teaching interests explore relationships among identity (race, ethnicity, class, gender and sexuality), power and organizing in social institutions such as the work place, higher education and media. She earned her Ph.D. in Speech Communication from the University of Utah. Her article “Racial and Ethnic Nomenclature: Embracing Multiple Latino/a Identifications” was published in The American Mosaic: The Latino American Experience in 2011. Her essay “Navigating Dominating Tactics in the Classroom and Tenure process: A Wise Latina’s Postcolonial Autoethnography” is currently under review with a national journal. She recently participated on a panel discussion at the National Communication Association on November 12, 2016. She will present an essay at the Western States Communication Conference in Salt Lake City, Utah (February 2017) and participate on a panel at the Southern States Communication Association in Greenville, S.C. (April, 2017). Dr. Webber is originally from Houston, Texas.

Andrew Moore was a student in Dr. Webber’s senior seminar course during the Fall 2015 semester. She enjoyed working with Andrew as he explored feminist theory and critical methodology. Andrew’s research project was among the best in the class. Indeed, the former chair of FACS, Dr. Benjamin Myers, lauded Andrew’s presentation as the best senior seminar project that he had ever heard during his ten years at Upstate. Andrew’s intellectual rigor and hard work ethic will enable his success in the Department of Communication, Master of Arts in Communication, Technology, and Society program at Clemson University.

1. Introduction

Presidential candidate Donald Trump, an entrepreneur, is as widely known for his harsh directness and blunt personality as he is for his business acumen. Trump has no experience in governance. Yet, among a field of more than a dozen candidates, which included a presidential legacy name in Jeb Bush and two candidates popular in critical swing states -- John Kasich in Ohio and Marco Rubio in Florida -- Trump's popularity soared. Trump's success during the primary election is equally puzzling given his unabashed rhetoric, which is widely viewed as racist, nativistic and misogynistic. For example, Trump was among the leading proponents of the birther movement that challenged President Barack Obama’s American citizenship [1] in order to discredit his right to the presidency. Trump’s criticism of Obama is rooted in a hegemonic desire to reclaim, for White men, the most venerated position in the country [2]. Throughout America’s history, being seen as “presidential” or worthy of such a high office has become tantamount with who most effectively embodies masculinity. The construction of ideal presidential leadership is predicated upon “male dominated institutions and patriarchally- constructed value systems” [3]. Our review of feminist /critical communication and political research provides insight to how performances of masculinity are deeply connected with Trump’s appeal among conservative voters in general and uneducated White working class men in particular.

In the 1990’s, gender was at the forefront for many communication scholars, with much of the focus having been placed on femininity. As the decade progressed, however, thinkers like Ashcraft and Flores, Hanke, Mumby and Trujillo, among others began to further explore relationships between communication, masculinity, and power. Mumby, noting how generalized and “common sense” traditional constructs of masculinity have become, writes about the importance of resisting the urge to view male power as a “monolithic structure” [4, 5]. Similarly, Hanke urges moving beyond this common sense viewpoint to consider how masculinities are
reconstructed and resurrected through a correspondence between an ideal masculinity and institutional power [5]. Mumby confronts natural tensions and contradictions between common constructions of masculinity, but goes on to primarily focus on only two of those constructions - brains and brawn [4]. Mumby defines these traditional manifestations of masculinity as being physical, shop floor masculinity on one hand, and cerebral, technocratic rationality on the other [4]. Communication research on masculinity is heavily influenced by Connell’s discussion of hegemonic masculinity.

Connell suggests that masculinity is not a singular nor apolitical social construct. Rather, multiple masculinities and femininities are socially constructed in ways that produce hierarchical arrangements of gendered bodies in particular contexts (e.g. school, work, family etc.). At the top of this gendered social hierarchy is the hegemonic masculinity (the idealized image of manhood), followed by subordinated masculinities, men marked by differences in race, sexuality and class status. Recognizing the existence of multiple masculinities is the first step to understanding how a hegemonic masculinity emerges in a given political and historical context [6]. All masculinities are constructed through contrast with femininity. Some men, deemed too feminine are excluded from masculinity through what Connell describes as a vocabulary of abuse, [such as] nerd, sissy and so on [6]. According to Connell, hegemonic masculinity is not a fixed character type, rather it is constructed through gendered practices that seek to ensure men retain their apex position in the social hierarchy [6]. Hegemony, according to Gramsci is a dialectical relation of power that includes the coercive power of a state apparatus and the consent of the dominated to their own subordination [7]. This consenting process is based on the latter’s identification with the ruling elite or the uncritical acceptance of relations of power and domination. This struggle for power is addressed in academic research on presidential politics.

Pham argues that Trump’s criticisms of Obama were rooted in a hegemonic desire to maintain or ensure White dominance in the nation’s political machine [2]. The relationship between power, social hierarchies, and the political process is nothing new in political scholarship. This is fortunate, because there exists only a small amount of peer-reviewed literature on Trump himself. That fact necessitated a look into the more general idea of power and politics, rather than the central personality of this research.

Khan and Blair examine the 2008 Democratic Presidential Primary, and how Hillary Clinton, a one-time favorite to win her party’s nomination, was relegated by the media to the role of the spouse of Bill Clinton. Khan and Blair argue that the attention Bill Clinton received was indicative of broader, more traditional gender roles, and that such coverage of the former president’s charm and celebrity among progressives affirmed hegemonic attitudes about masculinity as a proper trait for the presidency [8]. The coverage thrust men into the political forefront, even when Mrs. Clinton, as the candidate, should have been the central figure. Khan and Blair suggest further research into the evolving concept of masculinity in politics [8]. Similarly, Gibson and Heyse’s rhetorical analysis of a 2008 Sarah Palin speech, also demonstrate how Palin sabotaged her own intended goal of being thought of in terms of rugged individualism when she focused too much on her maternal and spousal roles, which reaffirmed traditional gender scripts and hegemonic masculinity [9].

Additionally, even successful female candidates perform better when eschewing femininity and embracing “tough” masculine qualities [10]. German Chancellor Angela Merkel and former British Prime Minister Margaret Thatcher both demonstrated the allure of projecting strength and masculinity with a dominant presence, but managed to do so while succeeding in the advantage of talents considered traditionally feminine, such as utilizing superior coalition building skills [10]. Merkel’s performance of masculinity does not necessarily achieve the status of hegemonic masculinity nor does her power trickle down to other women.

Conservatives’ leveraging of John Kerry’s dissent in wartime and the perception of French weakness exemplifies hegemonic masculinity in the political arena, and reaffirms the mechanisms
by which male dominance is ensured [11]. Traditional masculine constructs are many, but include the obvious, such as aggression, athletic prowess, and domination [6]. The idea of breadwinning and advancement in an occupational setting is likewise a deeply entrenched masculine ideal [12]. Heteronormativity also remains a key element of today’s masculinity, as demonstrated by the 2002 U.S. Senate race in Montana, which saw a Republican campaign ad seek to paint his Democratic challenger as gay in hopes of swaying voters [13]. The traditional construction of masculinity in America continues to revolve around power and violence [14], but is also experiencing pushback from an evolving society that no longer adheres to the norms the White male patriarchy is accustomed to, leaving masculinity in a state of “crisis” [15].

Understanding presidential politics through a critical/feminist communication lens will yield a greater understanding of discourse of power, politics and masculinity. From this perspective we conceptualize communication as the central means through which social actors constitute identities. Here we specifically explore how Trump’s ascendance in the polls reflect deeply-held views of masculinity in the conservative base. To this end, we examine what and how Trump expresses his candidacy as the right man for the job. We examine his use of language on the campaign trail and how it might appeal to those with a vested interested in White male patriarchy.

2. Method

In order to better understand Trump’s success in national polling, the author performed a textual analysis of Trump’s campaign speeches. Ten speeches between 30 minutes to 60 minutes in length were selected based on geographic location. The speeches were given in Arizona, New York, Oklahoma, Texas, South Carolina, Alabama, and Tennessee from June through October of 2015. It was during this time that Trump saw his rapid ascendance in the polls. These speeches were transcribed from archived footage from CNN and C-SPAN’s respective web sites, unless transcriptions were already made available by these outlets. These transcriptions totaled more than 200 pages of text. A close reading of the transcripts was conducted, as each transcript was read line by line to identify overarching constructs or motifs. Patterns of language, commonality in ideas expressed, and frequently used words and phrases, including gendered ones, were sought. This process was repeated through an inductive, open coding strategy aimed at letting constructs emerge from the speeches [17]. This process resulted in the emergence of the overarching constructs competition and violence, and the fable of “Trump the Builder,” which serves to bridge classical constructions of masculinity.

3. Results

Our analysis was guided by the research question: Why, given a field of experienced politicians in the GOP race, did Trump experience so much success? What did he say that has resonant power within the conservative constituency? Our analysis strongly indicates that Trump’s messages were laced with language rooted in traditional views of masculinity. Trump’s performances of toughness reflect what Connell describe as a hegemonic masculinity demonstrated through an expressed capacity for violence “to sustain their dominance” [6]. Trump’s gendered performances also include forms of White and working class masculinities.

Toughness

Trump uses violence and competition in language, deploying verbiage and modifiers that indicate a priority on winning. This is accomplished through metaphors related to sports, violence, military, war, games, and various scenarios in which a winner must emerge.
Donald Trump:  
Constructing Masculinity, Easing Conservative Anxieties During the GOP Primary Election of 2016

Competition

When Trump announced his candidacy for the presidency on June 16, 2015, he compared U.S. trade with China as akin to football. He states, “It’s like the New England Patriots and Tom Brady and having them play your high school sports team. That’s the difference between China’s leaders and our leaders.” In that same speech, Trump made use of another game metaphor, saying America’s leaders “have all the cards,” but “don’t know how to use them,” because they “don’t understand the game.” Treating international trade and macroeconomics as a game to be won or lost, Trump also lamented what he perceives as America’s status as a “loser” when it comes to trade deficits. “We lose on everything, We lose on jobs. We lose on money. We lose on everything,” he said in Dallas. “These sports metaphors were used explicitly to criticize the Obama administration including Secretary of State Hillary Clinton.

These sports metaphors enable Trump to discursively feminize the Obama administration as he differentiates himself and his supporters as real winners. In his September 14 speech in Dallas, Trump asserted that his supporters constitute a majority with a single-minded pursuit of victory. “I think we should call it - maybe we should call it the noisy, the aggressive, the wanting to win, the wanting to win majority. That’s what it is. We want to win,” Trump said, later adding. “We’re going to have so many victories, at some point they’re just going to be coming out of your ears.” Jackson Katz acknowledges “the pervasive use of sports metaphors in presidential discourse and how the language of sport functions to construct a masculine ideal for leadership at the heights of political power [18].” After telling a Dallas crowd they were the “wanting to win majority,” he also said, “we are tired of getting pushed around by incompetent people.” While discussing military might in New York, he said “nobody will be pushing us around,” demonstrating awareness of masculine expectations. “I beat China all the time.” Trump bragged. In another speech, Trump draws on pugilistic metaphor when he called conservative rival Jeb Bush a “lightweight.”

Verbs of Violence

Jackson Katz explains that mass mediated messages “construct violent masculinity as a cultural norm. [14]” Trump used violent language, termed here by the first author as verbs of violence—words that evoke thoughts of militarism and war—in his speeches in front of crowds numbering in the thousands. In multiple states including Texas, Tennessee, New York, South Carolina, Oklahoma, Arizona, and Alabama, Trump made use of words like “killing,” “kill,” and “ripping” to describe interactions with non-White countries he believes are undermining American success, such as Mexico, China, and Japan. In his announcement speech in New York, Trump stirred controversy by saying that Mexico was sending its criminals to the United States, calling for greater border security and deportation of illegal immigrants. His border zone language is militaristic in nature, performing territorial masculinity. “We have no protection,” Trump said. In South Carolina, Trump called “border security” a “huge problem,” and in Arizona he said Mexico was “killing us at the border.” Connell writes that violence can be “used as a means of drawing boundaries and making exclusions” [6]. Trump’s violent and militaristic rhetoric has this effect of setting boundaries and excluding those he deems undesirable. In New York, Trump told his supporters that “China has our jobs and Mexico has our jobs” to construct these countries as threats to working class Americans.

Furthermore, Trump has on several occasions used gun ownership to project strong, masculine qualities. Channeling Charles Bronson, Trump told an audience in Tennessee “I have a license to carry in New York. Can you believe that? Nobody knows it. Somebody attacks me, oh they’re gonna be shocked.” Trump then exalted Bronson’s Death Wish film series, adding, “today you can’t make that movie, because it’s not politically correct.” In Trump’s announcement speech in June, he shared how a couple told him they were arming themselves to not only
promote gun ownership, but gun use. “We now have a gun on every table,” Trump quoted two supporters as saying. “We’re ready to start shooting.” In addition to his frequent use of verbs of violence, Trump frequently boasts his reputation as a successful businessman.

Rationality

Trump also performs a masculinity aligned with the cerebral rather than physical characteristics. This is apparent through his self-affirmations as a rational and intelligent individual as compared to his unintelligent and incompetent opponents. In New York, Texas, and Arizona, Trump used multiple forms of “they don’t know what they’re doing,” to attack both President Barack Obama and the other candidates within Trump’s own party. “We have incompetent politicians. Not only the president,” Trump told a Phoenix crowd in July. “This is going to be an election that’s based on competence,” Trump said in his announcement speech. “Because people are tired of these ‘nice people.’” Trump continued to call politicians in Washington “bad negotiators,” “stupid,” “in an attempt to play to potential voters’ understandings of intelligence and rationality. He states, “China laughs at us. They laugh at our stupidity.” Trump’s constant self-assertions of himself as a superior intellect as well as his status as a wealthy White entrepreneur naturalizes the ease with which he is able to perform a cerebral masculinity. In effect, he represents for his supporters a hegemonic masculinity that can assuage their anxieties over their perceived loss of power, as evidence by the occupation of the presidency by subordinate masculinity.

The Great Builder

Language revolving around borders (specifically the America-Mexico border) is often accompanied by Trump’s obsession with forging a reputation as a builder. During a September speech in Texas, Trump spoke on his mission to build a vast wall separating America and Mexico, and in doing so, invoked a masculine projection of territoriality in a war scenario, but also made use of one of his favorite rhetorical devices – the fable of Trump the Builder. “Oh, do I know how to build? Greatest. One of the greats,” Trump said, later adding, “this is a Trump wall. This is a real wall,” and “you know, if I ever put my name on it, I want a gorgeous wall.” Trump’s masculine narrative as the performer of great architectural feats remains consistent throughout his campaign speeches today. While in New York in June, Trump recalled how he was urged against expanding into lower Manhattan due to cutthroat competition in the area. But Trump explained to his father that he had to make the move. “I gotta build those big buildings. I've gotta do it, Dad. I’ve gotta do it,” Trump recalled, later proudly listing the vast monuments to his legacy, including Trump Tower, 1290 Avenue of Americas, the Bank of America building in San Francisco, and 40 Wall Street in New York City. The first author terms these repetitive construction stories “Monuments to Masculinity,” as they allow Trump to assert a physical projection of masculinity without being a physically imposing person.

4. Discussion

Mumby established that there are two classic constructions of masculinity for men in the professional environment: Working-class, shop floor masculinity, and intelligent technocratic rationality [4]. Trump, however, has made use of both constructs. The brains versus brawn dichotomy doesn’t seem to apply to Trump. He has constantly made use of his “builder” motif to come across as a “doer,” so to speak, while his claims of competency speak to masculine understandings of male rationality. Both intellectual prowess and physical representation of his greatness can be demonstrated this way.
Donald Trump:
Constructing Masculinity, Easing Conservative Anxieties During the GOP Primary Election of 2016

Trump’s performances of masculinity also introduce a new representation of masculinity, the great builder who creates “Monuments to Masculinity.” This performance asserts physicality in a way that does not sacrifice the cerebral construct of masculinity. Rather, this form of masculinity draws on both classic forms of masculinity. Forging a reputation as a builder of great things – as a constructor of imposing skyscrapers or great walls supposedly protecting against foreign invaders – has allowed Trump to both physically manifest the masculinity he so desperately wants to project, but it also serves as a testament to his business acumen, which can be seen as an expression of his rational masculinity. This performance of masculinity eases the anxieties of a constituency that feels disempowered and views a way of life slipping away.

In “Slaves With White Collars,” Ashcraft and Flores explore performed masculinity and male identity in 21st century middle class White America through the text of films such as Fight Club. Ashcraft and Flores see film as a way for disillusioned men to reclaim their primal masculinity. While that piece of scholarship delves into a work of fiction, similar anxieties can be seen at a play in Trump’s campaign speeches. The primal masculinity, as the authors explain is hegemonic in nature – what the protagonists are really mourning is their perceived slip in patriarchal control due to shifting paradigms about gender [15].

Ashcraft and Flores describe masculinity in crisis essentially as “manhood threatened by feminizing forces” - an identity crisis in which traditional performances of masculinity lose leverage and significance in the current culture, thereby prompting anxiety by white men who have traditionally enjoyed power and privilege [15]. Trump’s various performances of masculinities represent a rallying cry for traditional White masculinity to “take back” what has been taken from them in an era of a black president, legalization of gay marriage, and other social developments that challenge the gendered hierarchy that has persisted for so long in America. In short, conservative, heterosexual, White men are growing nervous about their place in the world, and Trump speaks to their anxiety. Trump’s performances of masculinity provide these disillusioned Americans with an avenue for cathartic expression. Trump performs masculinity without hesitation via traditional ways of brains and brawn, but goes a step further by constructing a new manifestation of masculinity by cultivating an image of himself as a builder of great physical tributes to his own greatness. Through Trump, Americans longing for a re-established hierarchy in which their preferred masculinity - a White male - is in power. Trump’s penchant for war and sports metaphors and violent language, according to Ashcraft and Flores is predictable. “Indeed, violence has become a familiar balm for embattled professional men. [15]”

In many ways Trump’s words are a clarion call to arms in the battle for masculinity. A plea to “mobilize and fight to regain control, if not life” [15]. Trump’s words assuage anxieties among the conservative base. “Don’t worry,” Trump said in front of a Phoenix, Arizona audience. “We’ll take our country back very soon. Very soon.” Soothing the wounds of challenged masculinity is a skill Trump has publicly embraced.

By performing multiple and often simultaneous forms of masculinity in any given speech, Trump invigorates a disillusioned base, soothing its anxieties, and reinforcing the values of hegemonic masculinity. In addition to these multiple masculinities, Trump successfully bridges two classic forms of masculinity based on physical and cerebral attributes.

5. Conclusion

Our study revealed a general agreement and fit with previous scholarship on hegemonic masculinity and masculinity in crisis. Our inductive qualitative textual analysis on Trump’s speeches was designed to yield a better understanding of his appeal to his core constituency of White working class males.

Weaknesses of this analysis include a limited sample size and limited scope. Only 10 texts were analyzed for this study, meaning further constructs that may more comprehensively explain
Trump’s appeal could emerge given further study. Also, Trump’s rhetoric is confined in this study to campaign speeches. Further research may glean more insight into Trump’s appeal through analysis of his social media interactions, debate performances, or interactions within other formats. Finally, future research should examine the intersectionality of race, class, gender and sexuality in Trump’s performances of masculinity.

6. References

Mercury Bioaccumulation in Florida Green Watersnakes (*Nerodia floridana*) Among Three Wetlands on the Savannah River Site

**ABSTRACT.** Anthropogenic activities have significantly increased the amount of mercury cycling globally. Mercury (Hg) can become bioavailable, accumulate in organisms, biomagnify in food webs, and negatively impact wildlife. Mercury contamination on the Savannah River Site (SRS), South Carolina, is a result of atmospheric deposition, coal combustion, and use of Hg-contaminated water from the Savannah River in nuclear reactor cooling reservoirs. Florida green watersnakes (*Nerodia floridana*) are top predators that inhabit the reservoirs and can serve as bioindicators of mercury contamination. We captured snakes from three reservoirs: Pond B (n=23), Pond 2 (n=44), and PAR pond (n=11). We took tail clip samples from captured snakes and quantified the total mercury (THg). Total mercury concentrations ranged from 0.167 to 2.096 mg/kg dry weight. Snakes from PAR pond had significantly higher average THg (0.567 ± 0.176 mg/kg), than snakes from Pond 2 (0.293 ± 0.029 mg/kg), and Pond B (0.293 ± 0.027 mg/kg). In addition, there was a significant positive relationship between snout-vent length and THg in *N. floridana* from Pond B (r²=0.447, p<0.001) and Pond 2 (r²=0.214, p=0.002). Florida green watersnakes are primarily fish eaters; interestingly, snake mercury levels were much higher than the Environmental Protection Agency (EPA) reference dose for daily fish consumption (0.00001 mg/kg/day) and three snakes were at or above the EPA’s no consumption threshold for individual fish (1.9 mg/kg) [8]. There is potential for Florida green watersnakes to serve as bioindicators of Hg contamination levels as they may relate to human consumption of fish in aquatic systems.

**AMELIA L. RUSSELL** graduated from the University of South Carolina Upstate with a B.S. in Biology in the Fall of 2016. Her undergraduate research experiences began with Dr. Jonathan Storm where she assisted with ongoing small mammal research. Amelia became an active member of Upstate Herpetology, an undergraduate research group managed by Dr. Melissa Pilgrim. As part of Upstate Herpetology her research focused on amphibian conservation. In the Summer of 2016, Amelia was a research technician for Drs. Tracey Tuberville and Melissa Pilgrim. She worked alongside students in the National Science Foundation Radioecology Research Experiences for Undergraduates investigating the effects of environmental contaminants on Florida green watersnakes (*Nerodia floridana*). Amelia plans to continue her education in a Wildlife Ecology graduate program. She is interested in wildlife conservation and investigating the impacts of anthropogenic environmental degradation on wildlife and human health. Amelia enjoys public outreach, and spreading awareness of how small changes in one’s everyday life can make a vast difference in preserving natural resources.

**M. KYLE BROWN** is a 2016 graduate of the University of South Carolina Upstate. Kyle became a member of Dr. Melissa Pilgrim’s undergraduate research group Upstate Herpetology in January 2015. His research experience includes conducting anuran call surveys for the North American Amphibian Monitoring Program and using automated recording systems to monitor the calling activity of anurans in the Piedmont region of South Carolina. Kyle was chosen to participate in the 2016 National Science Foundation Radioecology Research Experiences for Undergraduates at the Savannah River Ecology Laboratory, where he worked under the direction of Drs. Melissa Pilgrim and Tracey Tuberville examining radioesium
accumulation in Florida green watersnakes (*Nerodia floridana*). Kyle’s research interests include the effects of climate change and anthropogenic disturbances on herpetofauna, as well as wildlife conservation in general. Kyle plans to attend graduate school with the ultimate goal of becoming a Wildlife Biologist. Kyle’s hobbies include herping and playing with his son Lucas.

**Michaela Lambert** is a senior at the University of Kentucky majoring in both Natural Resources and Environmental Science, and Equine Science and Management. Michaela’s research experience began in 2015 when she started working in Dr. Steven Price’s Herpetology and Stream Ecology Lab at UK. Michaela has participated in numerous research projects, including a mark-recapture study of natricine snakes that examines anthropogenic effects on behavior, a study evaluating both trap effectiveness when capturing the Common Mudpuppy (*Necturus maculosus*) and gene flow among populations, the genetic analysis of endangered freshwater mussels, a study examining the impacts of forest management techniques on reptile and amphibian species, and evaluating wetland suitability as amphibian habitat. Her current research in the Price lab focuses on evaluating the relationship between anuran calling patterns and environmental conditions. As part of the Radioecology REU, Michaela is working with Drs. Tuberville and Pilgrim investigating the effects of contaminants on the metabolic rate of water snakes.

**Dr. Tracey D. Tuberville** is an Associate Research Scientist at the University of Georgia’s (UGA) Savannah River Ecology Laboratory, near Aiken, South Carolina. She received her B.S. in Biology from Furman University (1993), M.S. in Conservation Ecology and Sustainable Development (1998) and Ph.D. (2008) in Ecology from University of Georgia. Her research interests are in applied conservation and management of reptiles and amphibians, including translocation and reintroduction as conservation tools.

**Dr. Melissa Pilgrim** is Director of Research and an Associate Professor of Biology at USC Upstate. She joined the faculty at USC Upstate in the Fall of 2006. Her primary research focus involves an integrative approach to investigating how ecosystems respond to environmental change (natural and anthropogenic). Her research program integrates field ecology, biogeochemistry (e.g., stable isotopes), and ecophysiology. She earned her Ph.D. from the University of Arkansas in 2005 and transitioned to a post-doctoral research position at the University of Georgia’s Savannah River Ecology Laboratory (SREL). Many of her current research initiatives still involve collaborations with SREL faculty and students. In addition, she has an army of undergraduate students working with her in an undergraduate research group called Upstate Herpetology. Her publications range from book chapters in Herpetology volumes to scholarly articles in isotope, ecological, and herpetological journals. She currently serves on the Editorial Board for Herpetologica, as a Council Member of the South Carolina Academy of Science, and as the Upstate Regional Coordinator for the North American Amphibian Monitoring Program.
1. Introduction

Anthropogenic activities have significantly increased the amount of mercury (Hg) cycling globally [1]. The activities result in organismal exposure to elemental, inorganic and organic forms of mercury [2]. All forms are toxic to living organisms and are associated with a variety of health effects (e.g., neurological disorders, and immunosuppression) [3]. Most studies focus on inorganic and/or organic mercury – the forms largely acquired by organisms through absorption and ingestion, rather than inhalation. Industrial waste is the primary source of inorganic Hg in the environment; industry is a source of both nonpoint and point source Hg pollution. Atmospheric deposition from industrial emissions can travel miles from point sources due to global wind patterns and ultimately land on the surfaces of rivers, lakes, and the Earth’s oceans. Industrial waste disposal in waterways is a direct point source of Hg in aquatic environments.

Inorganic mercury can accumulate in exposed organisms. However, the most bioavailable form of mercury is methyl mercury (MeHg). As inorganic mercury enters aquatic systems it is converted to methyl mercury through bacterial methylation [4,5]. There are many environmental and biological factors affecting mercury Hg methylation. Wetlands with fine-grained sediments promote the biomethylation of Hg. Elevated water temperatures, low pH, anaerobic conditions, and high dissolved organic carbon concentrations increase rates of Hg methylation [6]. Typically, methyl mercury preferentially accumulates in organisms via absorption or ingestion.

Not only does mercury bioaccumulate in organisms, it has been shown to biomagnify through successive trophic levels [6, 7, 8]. For example, fish occupying higher trophic levels accumulate more mercury than fish occupying lower trophic levels [9]. Specifically, primarily piscivorous large-mouth bass (Micropterus salmoides) and channel catfish (Ictalurus punctatus) accumulate more Hg than sunfish (Lepomis sp.), which feed on a lower trophic level (i.e., medium-large invertebrates). Age and size of an organism can also impact patterns of Hg exposure, accumulation and biomagnification in a system. The size and type of prey consumed can change as organisms grow, thus there can be ontogenetic shifts in diet and subsequently the trophic level prey occupy.

On the Department of Energy’s Savannah River Site (SRS) in Aiken, South Carolina there are several anthropogenic sources of Hg, including atmospheric deposition, coal combustion used to produce steam energy for the SRS, and use of contaminated Savannah River water for cooling nuclear reactors and maintaining reservoir water levels [10]. We quantified Hg bioaccumulation in Florida green watersnakes (Nerodia floridana) captured in three former cooling reservoirs on the SRS. The cooling reservoirs we sampled included: Pond B, Pond 2 and PAR Pond. Our first objective was to evaluate among-site differences in Hg concentrations of Florida green watersnakes. Our second objective was to determine if Hg concentrations were correlated with body size of Florida green watersnakes. We hypothesized that larger watersnakes would carry a greater Hg contaminant load.

2. Methods

Study species

We targeted Florida Green Watersnakes (Nerodia floridana) for the present study. Florida green watersnakes are residents of cooling reservoirs on the SRS, as they are typically found in open, lentic aquatic environments with floating vegetation and grasses [11]. In addition, N. floridana are primarily piscivorous and top predators in aquatic ecosystems. They are relatively long-lived reptiles with the potential to be exposed to Hg for extended periods of time. Closely related species of watersnakes (i.e., Nerodia sipedon) are known to bioaccumulate contaminants including Hg [7].
Study site

We sampled Florida green watersnakes on the U.S. Department of Energy’s Savannah River Site (SRS). The SRS is an 800 km² former nuclear productions site located along the Savannah River near Aiken, South Carolina, USA. The SRS is classified as a Superfund Site by the Environmental Protection Agency and is considered an ideal setting for field-based studies on the effect of contaminants on wildlife [8, 12, 13]. SRS has an abundance of natural and man-made wetlands; each wetland varies in size, physical structure, hydrology, vegetation, degree of disturbance, and level and type of contamination [8].

Prior to the Emergency Planning and Community Right-to-Know Act of 1986, there were no regulations that required the SRS to track quantities of Hg released into the environment – except in the separation and tritium facilities [10]. However, mercury was used in many SRS facilities. For example, approximately 105 kg of Hg was used to recover plutonium from plutonium-aluminum scrap during a single charge [10]. Most of the Hg used on-site was recycled or disposed of in seepage basins, underground waste tanks, or solid waste disposal facilities. In 1990, the SRS Air Emission Inventory concluded 92 out of the 98 production facilities on-site discharged atmospheric Hg. For example, the combustion of coal used for steam energy at the SRS was estimated to release 556 kg of Hg with an average concentration of 0.12 ppm from 1980–1993 [10]. Since the 2000’s, the United States’ Clean Air Act has moved toward the regulation of Hg emissions in coal-fired electric steam generating production facilities; therefore, it is assumed Hg releases have decreased on the SRS. However, Hg is considered a persistent toxin that can remain in an environment for long periods of time by continuously cycling among elemental, inorganic, and organic forms; consequently, unregulated Hg emissions from years’ past will have long-lasting effects.

Mercury was also a major pollution source for the Savannah River. In the 1970’s, a Hg-cell type chlor-alkali plant upstream to SRS discharged up to 5 kg of Hg per day into the Savannah River, eventually reducing operational discharges to 0.11 kg per day [10]. In 1971, Savannah River Hg levels were at its highest, but declined over the next 10 years due to mitigation of point source industrial pollution [14]. Since the Savannah River borders the western edge of the SRS, the river was used as an accessible water resource for nuclear reactors. Specifically, the SRS pumped Hg contaminated water from the Savannah River to cool nuclear reactors during production. This water was then discharged through a series of canals and thermal cooling reservoirs.

We captured snakes from three cooling reservoirs: Pond 2, Pond B, and PAR Pond. All three reservoirs have a history of exposure to Hg contaminated water. Pond 2 is the smallest reservoir and made up a portion of the canal system connecting P reactor to PAR pond [15]. Pond B is an 80-ha reservoir constructed in the late 1950’s and was used from 1961-1964 an as effluent pathway from R reactor to PAR pond [16]. PAR pond is the largest reservoir and was constructed in 1958 to be an 1100-ha cooling reservoir for P and R nuclear production reactors. Water from the Savannah River was used to cool the reactors and from 1958-1988 PAR pond received thermal effluent from the nuclear reactors.

Field sampling of snakes

We collected watersnakes between 10-30 June 2016. At each wetland, we set a trap line of 20 arrays of 4 minnow traps and 1 funnel trap per array, for a total of 100 traps per wetland. We checked traps daily and brought captured snakes into the lab for processing.

Laboratory processing of snakes

We collected a series of data from captured snakes. We determined sex by probing. We measured snout-vent length (SVL; length from snout tip to cloaca) and tail length (TL; length from cloaca to tail tip) by stretching each snake along a meter stick. We also recorded the mass of each snake. We took approximately 1 cm tail clips for Hg analysis. We obtained wet weights for
each tail clip and stored tail clips in a -60 °C freezer until an ample number of samples were ready for Hg analysis.

**Mercury analyses**

Once we had an adequate number of tail tips to complete a mercury run (the mercury analyzer could hold 40 samples), we dried tail clips for a minimum 24 hours at 40 °C. We recorded the dry weight of each tail tip. We used thermal decomposition, catalytic conversion, amalgamation, and atomic absorption spectrophotometry by a DMA-80 Tri Cell Direct Mercury Analyzer (Milestone, Shelton, CT, USA) to determine total mercury (THg) concentrations in tail tips. For quality assurance, we used two blanks and two standard reference material checks, TORT-3 and PACS-2, (National Research Council of Canada, Ottawa, ON) before sampling began and after every 10 samples. We also ran flour, nitric acid, and 3 blanks after every 20 samples to clean the DMA-80 and ensure proper Hg analysis. The minimum detection limit for total mercury (THg) in tail tissue was defined as three times the standard deviation of the procedural blanks (0.0000475 ppm). The average percent recovery of the standard reference materials was 101.4%.

**Statistical analyses**

We used Microsoft Excel and SPSS software for data management and analyses. All averages are presented as means ± one standard error (SE). We used Analysis of Variance (ANOVA) to evaluate among-site variation in average snake body size and Tukey’s HSD to confirm significant differences between average snout-vent-length at each wetland. We used Analysis of Covariance (ANCOVA) to evaluate among-site differences in average snake Hg concentrations with size, or snout-vent-length, as a covariate. We used Sidak’s test to evaluate any significant differences in average snake mercury concentrations. We used regression analyses to assess the relationship between snout-vent-length and THg.

**3. Results**

We captured a total of 76 snakes: 43 from Pond 2, 23 from Pond B and 10 from PAR Pond. Snout-vent length of captured snakes ranged from 29 - 82 cm and averaged 40.4 cm, 52.5 cm, and 64.1 at Pond 2, Pond B and PAR Pond, respectively. Analysis of variance (ANOVA) indicated significant among-site variation in average snake size (Fig. 1; ANOVA: F (2,73) = 14.75; p < 0.001). Post-hoc test revealed that average SVL was significantly different between each wetland pair. Therefore, on average watersnakes from PAR pond were the largest and Pond 2 watersnakes were the smallest.

Total mercury concentrations of captured snakes ranged from 0.167 ppm to 2.10 ppm and averaged 0.233 ppm, 0.293 ppm, and 0.567 ppm at Pond 2, Pond B and PAR Pond, respectively. Because we determined that snake size differed significantly among sites, we used ANCOVA with size as a covariate to evaluate differences among sites in average THg. Analysis of covariance indicated that among-site differences in average THg were not significantly different after controlling for the effect of body size (Fig 2; ANCOVA: F (2,73) = 2.120, p = 0.127).

Because THg did not vary among sampling sites, tail samples from all sites were combined to assess the relationship between body size and THg in Florida green watersnakes. Regression analysis indicated a significant positive relationship between size and THg concentration, with 36% of the variation in Hg concentrations explained by variation in SVL.

**4. Conclusions**

We detected Hg in snakes from all sites; however, there were no statistically significant differences in average THg among sites. It would be interesting to refine our mercury analysis.
and determine the actual amount of MeHg in the Florida green watersnakes sampled, as it is the most bioavailable and most detrimental form of Hg. In addition, the relatively limited mobility of snakes, as compared to predatory birds and mammals, should make snakes more precise indicators of local contamination levels [17]. Future extensions of our work could include using stable isotopes to evaluate primary sources of Hg to each of our study wetlands [18].

As predicted, Hg levels increased as snout-vent length increased. Snakes are gape limited predators and their diet changes as they grow larger. The largest snakes are able to consume the largest prey items, which often feeding at high trophic levels. Therefore, larger snakes are likely exposed to higher diet mercury relative to smaller snakes. In addition, larger snakes may be older than smaller snakes, which increases the amount of time they are exposed to contamination. Interestingly, our work complements that of the Long-lived reptile project on the Savannah River Site [8]. The THg mercury levels we observed in Florida green watersnakes fall between Hg concentrations in yellow-bellied slider turtles (Trachemys scripta scripta) and American alligators (Alligator mississippiensis) collected from two of the same sites. Yellow bellied sliders are opportunistic omnivores. As juveniles, sliders are carnivorous consuming mostly insects; however, as adults, they change to an herbivorous diet consuming primarily plant matter [19]. American alligators consume a wide-variety of prey, including: snails, fish, turtles, snakes, and small and medium sized mammals [20, 21]. Research has shown that yellow-bellied sliders, Florida green watersnakes and American alligators feed at sequentially higher trophic levels; therefore, the pattern of change in Hg levels we observed is indicative of what would be expected if biomagnification was occurring in the aquatic systems we sampled (Table 1). We hope to better quantify the degree of biomagnification in our wetlands by expanding our work to include Hg analyses of prey species available to snakes.

Total Hg levels found in Florida green watersnakes were much greater than the Environmental Protection Agency’s reference dose for daily consumption (i.e., 0.0001 ppm/day; Figure 4) [22]. There was also an individual from Pond B that was above the EPA’s no consumption threshold for individual fish (i.e., 1.9 ppm; Figure 4) [22]. While many cultures in the United States do not typically consume snakes, watersnakes do prey on the same species of fish highly sought after by anglers [9, 23]. Therefore, Florida green watersnakes can reveal potential exposure risks to humans who may consume fish from Hg-contaminated aquatic systems.

5. Acknowledgements

We would like to thank Kimberly Price, Kurt Buhlmann, and Kirsten Work for trapping assistance; David Haskins for assistance with trapping and snake processing; and the entire Larry Bryan Lab for several sample donations. Perry Bovman from Radiological Control ensured a safe working environment in the field, and Angela Lindell provided training and support in the Analytical Laboratory. We thank our partner/home institutions: the University of South Carolina Aiken, the University of South Carolina Columbia, and the University of Kentucky. Also, thanks to the University of Georgia’s Savannah River Ecology Laboratory for serving as our home away from home and making our research experience possible. In addition, a huge thank you goes to Wendy Bogard and Ian Scollon for being a constant reminder to never settle for less than your dreams. Funding was provided by the National Science Foundation and the Area Completion Projects of Savannah River Nuclear Solutions. The research is based upon work supported from the Department of Energy under Award Number DE-FC09-07SR22506 to the University of Georgia Research Foundation. Animals were collected under South Carolina Department of Natural Resources Permit #02-2016, and all animal procedures were conducted in accordance with Animal Use Permit A2016 02-066-Y1-A0 and approved by the University of Georgia IACUC.
6. Tables and Figures

Figure 1: Average snout-vent length (SVL) of Florida green watersnakes (*Nerodia floridana*) differed significantly among the three study sites (ANOVA: $F(2,73) = 14.75$, $p < 0.001$). Letters above bars (a, b, & c) represent statistically significant differences ($p < 0.05$) between species as indicated by Tukey's HSD. Data are presented as means ± 1 SE.

Figure 2: Average total mercury (THg) in tail tips of Florida green watersnakes (*Nerodia floridana*) was not significantly different among three study sites (ANCOVA: $F(2,73) = 2.120$, $p = 0.127$). Data are presented as means ± 1 SE.
Figure 3: Effect of snout-vent-length (SVL) on total mercury (THg) in Florida green watersnakes (*Nerodia floridana*) (all sites combined; Regression: $r = 0.60$, $t = 6.49$, $d.f. = 75$, $p < 0.001$).

Table 1: Comparison of total mercury levels in Florida green watersnake (*Nerodia floridana*) data from our study to those reported for Yellow-bellied slider turtle (*Trachemys scripta scripta*) and American alligator (*Alligator mississippiensis*) from PAR Pond and Pond B [8]. Sample types (wet weight or dry weight) and units (ppm) are indicated.

<table>
<thead>
<tr>
<th>Species</th>
<th>PAR (ppm)</th>
<th>Pond B (ppm)</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow-bellied Sliders</td>
<td>0.087</td>
<td>0.049</td>
<td>Blood, wet</td>
</tr>
<tr>
<td>Florida Green Watersnakes</td>
<td>0.567</td>
<td>0.297</td>
<td>Tail clip, dry</td>
</tr>
<tr>
<td>American Alligators</td>
<td>1.484</td>
<td>1.875</td>
<td>Tail scutes, dry</td>
</tr>
</tbody>
</table>
Figure 4: Effect of body size on total mercury (THg) in Florida green watersnakes (*Nerodia floridana*) (all sites combined; Regression: \( r = 0.52, t = 5.29, d.f. = 76, P < 0.001 \)). Red lines indicate the Environmental Protection Agency’s recommended daily consumption limit (0.001 ppm/day) and no consumption limit (1.9 ppm) of mercury in fish for humans [22].

7. References


[16] Environmental Protection Agency. 1995. EPA superfund record of decision: Savannah River Site (USDOE) (PAR POND Unit), Aiken, South Carolina.


A Picture is Worth 1,000 Words:
Graphic Novels in Teaching Speakers of Other Languages

**ABSTRACT.** The use of comics and graphic novels in language-learning classrooms encourages students of all ages and cultures to learn in challenging, yet enjoyable environments. By employing comics and graphic novels as multimodal texts and language acquisition tools, teachers can introduce lessons within a range of topics and skill levels. Therefore, students who read comics and graphic novels can discover and recognize various forms of context clues and symbols to introduce ideas and acquire new languages through different, innovative mediums. Emphasizing the idea of ‘play’ in a classroom can build new foundations that students might not have previously noticed. This paper explores topics in English as a Second Language classes at the Adult Learning Center (ALC) in Spartanburg. To highlight various activities of innovative language-learning and taking an “anything goes” pedagogical approach, I introduced lessons at the ALC using games, creative writing, and a graphic novel. I discovered that the utilization of comics and graphic novels can assist world language speakers to better analyze English in any capacity to further the development of critical thinking and language acquisition.

**EMILY “COLIE” TOUZEL** is in her senior year as an undergraduate Honors English major at University of South Carolina Upstate. Her final semester and Honors Capstone project will be fulfilled abroad at Hanze University in the Netherlands, where she will pursue a Medialism focus on film creation. Colie’s interest in graphic novels and comics fueled her desire to delve further into the realm of how multimodal mediums combining art and literature can contribute to language learning. Through service learning at the Adult Learning Center (ALC) and in Dr. Marlow’s class, Colie grew extremely interested in the value of graphic novels and comics as a medium and tool to benefit teaching English as a second language. In class, Colie had the opportunity to discuss lessons and theories that contribute to English language learners (ELL) and also presented visual comics to illustrate various experiences of ELL students. Her favorite parts of researching include discovering that some of her favorite graphic novels, *The Arrival* by Shaun Tan and *Maus* by Art Spiegelman, were already being facilitated in studies to encourage voluntary reading for World language speakers and having the chance to employ the former in her own lessons. She also greatly enjoyed getting to know the students at the ALC, helping them with English, and, in addition, learning more about their different cultures and languages. Colie is currently applying to graduate schools for community building/urban design. She enjoys spending her time learning, striving for excellence, traveling, cooking, being near family, and adventuring in the woods with her dog, Torrence. Colie’s goals in life include making those around her happy and building a more sustainable, inclusive, and creative world.

**DR. DAVID MARLOW** is Professor of Linguistics and English as a Second Language and has served at USC Upstate since 2004. He received his Ph.D. in Applied Linguistics from Ball State University and retains his dedication to real-world applications of academic work. Accordingly Dave blends his research with his teaching and his life, reaching out to underserved
populations at home and abroad with and through Upstate students, researching effective use of technology in the classroom, and sharing in publication his own experience in raising bilingual kids in these largely monolingual United States. Dave also regularly mentors student research and has published seven co-authored papers with seven different students in this journal since 2009. In everything he does, Dave seeks to make a meaningful difference in people’s lives.

1. Introduction

As this world expands in population and technology, cultures are interweaving together as one continuous web of growth. Artistic creations offer a closer look into human existence, where artists represent actions and emotions through multiple media projects. Comics and graphic novels represent a genre of literature that introduces the combination of writers and artists who create worlds which mesh and flow across, between, and amongst cultures all over the world. Teachers and students alike may benefit from exploration content across various mediums. There are countless areas where art and literature combine to represent all manner of human imagination and awareness, of which teachers of the English language can create lessons around to engage and motivate students. By employing a variety of comics and graphic novels, teachers can build material surrounding culture, identity, coming-of-age, birth, death, animals, magic, science, and much more. As people age, language acquisition becomes more challenging [1], thus, even though some might be tempted to relegate comics to younger students, creative mediums of development facilitate learning for students of all ages. Comics and graphic novels engage creative areas of the brain and aid in acquisition of other languages. Adding visual to textual context clues helps students understand texts that might otherwise be too complicated.

Although language learning can be frustrating, immersing oneself into a culture is one of the best ways to acclimate to a language [1]. However, cultural immersion is not always practical, or even possible, which explains the importance of public school and outside programs like Spartanburg’s Adult Learning Center (ALC) which supports many different world language speakers learning English. These spaces are essential to developing language skills, but also help build groups who support one another, especially in dealing with the anxieties and barriers from inexperience in the culturally dominant language. Therefore, classrooms should embody a safe place for students who are learning English for the first time; the development of such classrooms is detailed in Michelle Maxom’s how-to book, For Dummies: Teaching English as a Foreign Language [1]. When deciding on a lesson plan, Maxom suggests teachers encourage students to learn techniques they cannot or will not necessarily acquire with ease from language immersion, noting also that in order to teach English, teachers need the ability to understand multiple cultures and must be flexible and facilitate skills in unique, memorable ways.

Similarly, classes like Dr. David Marlow’s Teaching English as a Second Language (TESL) course at USC Upstate provide students with practice and tools to become teachers, while also giving them hands on experience with service learning. Both Maxom and Marlow agree on the importance of teachers easing the anxiety students feel in learning a new language, especially because multilingual students are already facing cultural and other barriers. One method supported by both Maxom and Marlow is reading graphic novels. As noted above, graphic novels can be used in a ESOL classroom to reinforce diverse cultural connections through artistic creativity in relation to reality, as well as encourage students to create their own stories or comics while taking advantage of visual learning to help literary pedagogy [1]. Lessons based on these techniques enable non-native English students to cultivate a repertoire of learning tools and foundations to build on in expanding their English language development. Accordingly, this paper investigates the use of comics and graphic novels in ESOL classes: texts that introduce the concept of ‘play’ as a pedagogical method, and my experience volunteering at the ALC where I focused on innovative teaching techniques introducing games, songs, storytelling, and graphic novels.
2. Playing with Innovative Methods

Although there are benefits to relying on already prescribed formulas and how-to lessons, it is important for teachers to pursue creative mindsets similar to what they expect from their students. In his text, "Outline of an Anarchistic Theory of Knowledge," theorist Paul Feyerabend [2] introduces the concept of developing new techniques through "theoretical anarchism" because of its likelihood "to encourage progress [more] than its law and order" counterpart. He creates an argument against the scientific method to embrace a "humanitarian" reality instead of strict formulas to abide by. Going against the same old methods people are accustomed to releases the pressure surrounding a specific practice and in turn, allows the mind to freely ponder different ways of developing techniques that could garner improved solutions [2] & [3]. Moreover, Feyerabend [2] suggests "the only principle that does not inhibit progress is: anything goes." He places the ball in his audience's hands, inviting them to create and consider literally anything. This remains the only unrestricting idea because the only limitations consists of one's imagination [2] & [3]. In this way, Feyerabend gives people a golden ticket, introducing a no-holds barred world without borders, a mind without structure to allow humanity the option of creation without barriers [2] & [3]. He also encourages a communal aspect to theoretical anarchism, because "uniformity . . . endangers the free development of the individual" [2].

Although this anti-method that Feyerabend proposes invites many different arguments, hypotheses, new theories, and interpretations, he does not propose a new pedagogical approach; he leaves it up to each individual, or rather, each new group of individuals to decide for themselves. For some teachers, this may seem like an obvious awakening, but for many, after having a set of pedagogical rules drilled into their brains for the majority of their lives, it may be difficult to see classroom opportunities in a new light. In this way, if a teacher refuses to let students read a particular genre of texts like comics because they not meet the traditional definition of literature, the teacher may actually be blinding students to genres they would like to read. Instead, teachers should employ Stephen Krashen's "Free Voluntary Reading" [4] which builds on Noam Chomsky's observations of the innateness of human language. Krashen suggests that teachers encourage students to engage in reading whatever they like which has proven to be one of the best tools to improve language skills. Furthermore, when students read material they find entertaining or enlightening, they develop their understanding of the language of the text, and may even improve their skills in their native languages [4] - [6].

Unfortunately, when teachers decide not to employ techniques like 'Free Voluntary Reading,' they close doors that might never be discovered because of strict guidelines for classroom structure. Teachers who accept the value of creation embody Feyerabend's refusal of a universal method and Krashen's research of voluntary discovery [2] - [4]. Uri Alon [3] also encourages us all to play outside our specific disciplines to find new ideas in his Ted Talk. He illustrates the idea of 'play' by discussing his improvisation group and plays a song on ukulele in search of discovery. These innovative proposals of working with anti-methods and playing through the struggles of creation harness the importance of different modes of teaching.

3. Teaching ESOL with Graphic Novels

Recent studies have shown improvement in reading and writing skills when teachers employ comics and graphic novels as tools to enhance multilingual students’ language acquisition [4] - [9]. Although the written word by itself has many positive and admirable qualities, comics and graphic novels add a multimodal dimension which enhances texts. These multimodal planes can help multilingual students become better acquainted with language while also connecting them emotionally and culturally in ways traditional texts are unlikely to produce [5] & [6]. One teacher, Stephen Cary, encourages the use of graphic novels in his essay, Going Graphic: Comics at Work
in the Multilingual Classroom [10]. He highlights the benefits of using graphic novels with world language speakers, while acknowledging that some comics might be too simple or may display ‘raunchy’ scenes, suggesting however that these only increase the effectiveness of comics, because “the power of images to command attention, to move, to directly communicate, explains...why comics are such a powerful learning medium” [10]. Both Cary and Maxom [1] suggest the value in different types of comics to encourage reading, critical thinking, and learning proficiency will ultimately contribute to a teacher’s lesson plan.

ESOL teachers often use children’s books to work with beginner language students no matter their age, yet this can occasionally feel demeaning to older students, whereas comics are often less age-related and thus can have a more positive impact on students of all ages [1] & [10]. Cary notes the range of comics available means, “there are comics for emerging, developing, struggling, and near-native-proficient” students, and that there are even comics without words at all [10]. Even in classes that are not directly related to literature, teachers are taking advantage of graphic novels to examine the world and help multilingual students better understand and connect with information. The installation of comics and graphic novels in the classroom gives students a wide variety of materials to choose from including the medium’s genre, artistic style, writer, length, word-use, symbolism, and subject matter.

Traditional textbooks can often discourage students who are not fond of reading and cause a lack of motivation for further exploration [7]. A Social Studies teacher, Sarah Mathews, recognizes this struggle in her search for other options to reach those students, and thus includes Shaun Tan’s The Arrival in her classroom [7]. This graphic novel “displays the complexity of migration within a text that does not feature a single word” yet, Mathews uses this text to focus on strengthening her students’ “vocabulary development, visual literacy skills, and understanding...of social studies concepts” [7]. An in-depth look at immigration – leaving and arriving in a new country - The Arrival shows immigration’s effects on a person without being specific to any one race or place by including all types of people indiscriminately. Works like this truly bring students together and help them understand they “are not alone in their experiences,” and with the opportunity to read The Arrival, students enrich their “visual literary skills as they decode symbolic images, utilize context clues to interpret messages and unpack layers of meaning within illustrations” [7] - [9]. Although this graphic novel does not include any words, it affords students the opportunity to hone many skills needed to decipher the story and think and talk critically about its meaning through analysis of the story’s flowing artwork. Students are motivated to employ vocabulary and related constructs they have already learned in Social Studies; moreover, the wordless story leads students to ask for and internalize new vocabulary and concepts [7]. Using a book without any words also enables students learning English to make use of the vocabulary they have and practice structures they know without needing to learn new ones from the text.

Similar to The Arrival, many graphic novels focus on serious and intellectual matters or emotional, spiritual, and historic events, which help facilitate topics in the classroom like “racism and immigrant otherness [which] resonate[s] with multilingual students” [5] & [8]. Christian Chun [5] describes his use of graphic novel, Maus by Art Spiegelman, in an English as a Second Language high school class to promote “students’ multi-literacies practices.” Chun notes that by creating an environment that encourages second language learners, substantive graphic novels can literally illustrate events which relate to students “who come from marginalized communities,” and accordingly compliment multifaceted development of practice in their reading skills [5]. Moreover, graphic novels like Maus focus on several senses within a two-dimensional page: sound words, visual movement, artistic techniques like shading, art mediums, colors, etcetera. Therefore, reading the text creates an engaged reading called ‘a spiraled process’ that “mutually reinforce[es] and intertwine[s]...students’ senses of their identities” and causes readers to begin to understand how they can critically learn and think with context clues which reinforce previous information and knowledge learned in the text and in class [5] & [9]. Graphic novels which address
serious subjects require complex thinking and deciphering skills to interpret what each page represents and wants to describe. Furthermore, the combination of artwork develops imagination in students so they can begin trusting and fashioning their own ideas whereby motivating and inspiring them to express themselves in English [5].

Another recent study, implemented by Kilçkaya and Krajka [6], examines the creation of comics by Turkish students to demonstrate and build on techniques in English. Twenty-five multilingual students in a five-week long course made their own comics illustrating aspects of “grammar form/function;” the teacher then uploaded the comics to a wiki website where other students could see and comment on each other’s work. Of the twenty-five students, only one did not enjoy the creation of comic strips; others expressed extremely positive feelings about the assignment: some saying they preferred making them to other activities they would have done instead (even video games). Although some said they “hate grammar,” they still enjoyed creating “comic strips although it [sic] was about grammar.” Others said they shared the comic strips with their families, and finally, some said they applied these skills in the creation of their own stories outside of class [6]. Creating comics gave students the opportunity to “have control over the content of the material” [6] a variety of ‘play’ which can also be extended through encourage students to work on projects of their own choosing, letting the students teach, and developing a story with “Once Upon a Time” [1], [2], [6]. The use of comics with an emphasis on grammar allows students to imagine a story and take control by forming a specific project with their own creative license. Additionally, sharing the strips online, allows the students to see their classmates’ creations, help one another, and collaboratively learn from mistakes [8] & [9].

4. Implementation & Exploration: Graphic Novels and Beyond

With the assistance of the research in this paper, Maxom’s how-to guide [1], and Dr. Marlow’s course, potential and current teachers who are interested in teaching English—or any language for that matter—to speakers of other languages can better analyze their process to develop more sound techniques for teaching. After a service learning trip to Nicaragua where I, twelve of my fellow peers, and two professors were thrust into the much different structure of a school in the small mountain community of Palacaguina for a few days, it became apparent how flexible and spontaneous one needs to be to jump into a classroom in another country. Similarly, in working with multilingual people from multiple cultures inside the United States, a teacher experiences similar needs for flexibility and spontaneity. No amounts of preparation could have equipped me for the fast-paced, often seemingly-unstructured classrooms in Palacaguina, but having this experience sandwiched between Maxom’s text and Dr. Marlow’s course helped me reflect on creative approaches to classroom experiences and led to this paper.

Even though I did not have the opportunity to use comics or graphic novels in Nicaragua, I did bring my ukulele to encourage ‘play’ for the development of unique practices to introduce English lessons with song and dance. By creating an atmosphere of anything goes [2], we were able to embolden ESOL students to communicate with us in English and have fun while adding new words and cultural practices to their repertoire. For instance, we played the song, "Head, Shoulders, Knees and Toes" which got students moving and interacting with the music and learning new vocabulary, while also discovering a cultural song from the U.S. Playing and asking students to join us for a learning collaboration had everyone smiling and enjoying an innovative environment.

Despite Feyerabend’s [2] contention that anything goes, attempting to use comics in Palacaguina could have been detrimental given such a short time frame. Over a longer period, however, I found through my time at Spartanburg’s Adult Learning Center (ALC), that utilizing different lessons to practice multimodal texts displays a benefit in language acquisition. I was able to bring in The Arrival, the graphic novel discussed above for the Beginner English class.
After displaying the art and flipping through the pages on a projector, I asked students what they thought certain pages could mean. Many of them understood the conclusion of discovering and living in a new place and related to the content on a personal level, even though there are not any words within Shaun Tan’s story. Although some of the students in this class were barely able to introduce themselves in English, they were able to work together to understand that the art-illustrated a story. Some students were confused at first and needed extra encouragement from me, but eventually all were able to engage in a conversation about their differences and similarities as people and question what the main character experiences. Moreover, as a class we were able to review and employ previously learned vocabulary. While some students did not realize they were gaining knowledge from analyzing The Arrival, they were actually better able to comprehend their surroundings when engaging in exercises like evaluating artistic stories. This finding is well-supported in the literature [7], [8], & [9]. When I explained the importance of different mediums to my students, they expressed their interest in games, movies, and songs that have helped them learn English, and were excited that graphic novels could also be a resource.

As a precursor to lessons implemented for the Beginner class, I used a practice lesson entitled, ‘Once Upon a Time,’ in Dr. Marlow’s course to develop imagination and creative writing skills with my fellow peers. ‘Once Upon a Time’ allows students to create their own worlds based on three categories: a person, a place, and an objective [1]. These categories were written on pieces of paper which my peers chose out of a pile, and then used to write their stories during class. Lessons like ‘Once Upon a Time’ encourage creativity and link to the creation of comics done by the students in Turkey. Moreover, these lessons are fun and encourage spontaneous learning as well as critical thinking skills which finally lead into the end goal to have students make their own comics. These writing techniques help develop fast thinking and writing in English which further assists teachers’ awareness of which students need extra work, as well as who will be more willing to engage in creating their own stories and, later, comics.

Because of time limitations, the students at the ALC did not create their own comics during my time with them, but we did lay the groundwork with games like Scrabble and Telestrations to develop sentences from words found in Scrabble and drew pictures to describe the words and phrases in Telestrations. Telestrations is a mixture of Pictionary and Telephone, where players are given a word or phrase and have to draw out the word using art, and then it is passed to the next player who guesses the drawing, and the next player draws that word, and so on. This game was more frustrating than Scrabble because of the need to understand the word and phrase, and then apply artistic abilities to the word. In the beginning, this was a frustrating task for the ALC students because they were not used to playing word games in class. With help from me, we ended up laughing at the interesting drawings and the hilarity of the end result of the words. After this lesson, I realized I would need more foundation to build up to drawing their own comics or include this technique in a more advanced class. Scrabble was also daunting at first, so I minimized their focus to matching words with similar words, including words which rhymed or looked the same. Eventually, I asked students to create words from the Scrabble tiles in their native languages, which made them excited to engage in conversation about their different languages in a multilingual classroom.

5. Reflection & Conclusion

Many stand-alone comic strips, like those in a newspaper, require readers to understand a cultural or humorous reference. Therefore, it is imperative that teachers carefully select materials to be used in the classroom; not all graphic novels will be appropriate, but those with complete stories, connectable to students’ experiences like The Arrival, can prove effective as these provide different lessons for each segment. Moreover, not all comics and graphic novels are entertaining or light-hearted, which could be confusing at first for students who are new to these art forms. A key benefit of graphic novels with serious subject matter revolves around their relatability to adults.
as an examination of many factors including: life, death, immigration, transitions in life, and history [7], [8], & [9]. Most importantly, these forms of literature elicit students’ abilities in English, enable them to port their native-language analysis skills into English, and to use words they know as they are induced to learn new ones. Teachers of adult multilingual learners specifically may find these particularly helpful, because teachers can expect more from adults with the equal challenge and genuine interest comics and graphic novels provide [1].

Students of all ages can connect and appreciate what they are reading with graphic novels and comics because of the immense amount of material available within many different genres and styles. As evidenced in Stephen Krashen’s research, students will not want to read if they are not interested, and by facilitating these forms of literature, teachers can combine multiple language levels to ensure everyone has something to read which encourages students to continue reading further outside the classroom [4]. Language acquisition requires critical thinking skills that students can hone more readily with multimodal texts because they can imply the symbolism in drawings and context clues to decipher the big picture [7]. Within this framework of reading, writing, critical thought, play, visual understanding skills, and relating to the material, students increase their language proficiency and acquire English in an enjoyable atmosphere.

6. References

The Effects of Confidence in the Media on Political Participation in America

**ABSTRACT.** In America, confidence in the media and political participation are often studied. It is an area of major interest in academia. This paper expands upon that large field of research and highlights new connections and possibilities for future research. This paper analyzes the effects of confidence in the media on two methods of political activity; voter turnout and public meeting attendance. An analysis of state-level data shows that confidence in the media does not have an effect on these forms of political participation. However, a secondary analysis finds that educational attainment and confidence in the media have a significant positive relationship; as educational attainment increases, confidence in the media also increases. The analysis also supports the long-held notion that educational attainment and age significantly affect political activity, adding more evidence to the large body of literature that states the same. These findings reinforce the current body of literature and also open doors to new research exploring the reasons why educational attainment increases confidence in the media. The conclusion offers suggestions for future work on confidence in the media, based upon the findings of this research.

**CODY TURNER** attended Greenville Technical College for two years and then University of South Carolina Upstate for the final two years. He has always enjoyed writing and has had a keen interest in politics so he decided to major in Political Science. Cody graduated in 2016 with a Bachelor of Arts in Political Science. His favorite part of the research process was testing how confidence in the media relates to level of education. Cody thought it was exciting to find significant relationships and bring new and meaningful knowledge into the world. To others who are interested in conducting research, he advises you to find a topic you are interested in and dedicate yourself to seeing it through to completion. Cody's hobbies include riding his bike, playing Call of Duty and playing Fun Run 2 on the iPhone.

**DR. ABRAHAM GOLDBERG** is an Associate Professor of Political Science and serves as Director of Service – Learning and Community Engagement at the University of South Carolina Upstate. He authored the *South Carolina Civic Health Index* and has published numerous academic articles about the relationship between the urban built environment, social connectivity, and resident quality of life. Abe regularly supervises undergraduate research projects and teaches courses in urban planning and policy, public administration, civic engagement and American politics. He earned his doctorate from West Virginia University.

1. Introduction

Policy decisions cannot reflect citizens’ beliefs when people do not engage the political process. Accordingly, the health of our democracy relies upon an active citizenry. Active and enlightened political engagement requires access to valid and relevant information so that people can develop thoughtful political perspectives. This makes the media a critical institution for a democratic society [1]. However, confidence in the media is reaching a record low, raising serious
concerns about whether people have the resources necessary to be enlightened political participants [2]. If the media is not trusted and people do not believe the information provided, they could view participation in the political process as a futile activity. This paper examines the effect that confidence in the media has on political participation in the United States and presents the hypothesis that lower levels of confidence in the media reduce political participation rates.

2. Literature Review and Theory

Confidence in the Media

Following a review of relevant literature, this section develops a theory on why and how confidence in the media likely affects political participation rates. Confidence in the media ensures that the news is viewed as valid and legitimate [3]. However, the credibility of the news media has been called into question, as confidence rates across several American institutions have declined [4]. The public’s confidence in the media has sharply decreased since the mid-1970s, and even more drastically in the 1990s and early 21st century [1]. This is partially due to the fragmentation of major news networks and the entrance of alternative news sources, which has hurt source credibility [5]. The result of this declining confidence leads people to doubt the validity of the information they receive [1]. In the 2016 election, so-called fake news, which is basically blatant falsehoods presented as truths, was majorly promulgated through Facebook and other social media sites [6]. President Obama and other world leaders even went so far as to criticize Facebook for not doing more to stop the dissemination of fake news [6]. This biased and false news will likely lead to an even more severe decline in trust of the media.

The media has been found to have some effect on voters’ decisions during elections [1]. However, the media’s perceived effect by the public is higher than its actual effect [7]. There is a lack of academic evidence showing that the media affects the ultimate result of elections [7]. Studies have found that the media has strong effects on attitudes towards politicians, but a much smaller effect on actual policy measures with tangible consequences [8].

The literature addresses the persistent decline in confidence in the media and the fact that many people no longer view news networks as credible. Further, the attitudes people hold toward the media can influence their voting decisions and how they arrive at those decisions. However, it is yet to be determined whether or not these attitudes actually affect political participation. This paper expands the literature by examining whether attitudes towards the media affect participation in the political process.

Political Participation

A common definition of political participation is activities by private citizens that attempt to influence elections and the actions of leaders [9]. The most popular form of political participation in America is voting [10]. However, American voting rates are typically lower than those of other democratic nations [11]. Americans rank highly in informal political activities such as talking about politics with other people, but voter turnout consistently falls below the democratic average [11]. Table 1 shows the percentage of the voting age population that turned out to vote in recent national elections from 2012-2016 in several nations. This table illustrates how low United States voter turnout is in comparison to other democratic nations [12].
Table 1. Voting Age Population Turnout Percentage Among Democratic Nations

<table>
<thead>
<tr>
<th>Country</th>
<th>Voter Turnout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium (2014)</td>
<td>87.2%</td>
</tr>
<tr>
<td>Turkey (2015)</td>
<td>84.3%</td>
</tr>
<tr>
<td>South Korea (2012)</td>
<td>80.4%</td>
</tr>
<tr>
<td>Israel (2015)</td>
<td>76.1%</td>
</tr>
<tr>
<td>France (2012)</td>
<td>71.2%</td>
</tr>
<tr>
<td>Netherlands (2012)</td>
<td>71.0%</td>
</tr>
<tr>
<td>Germany (2013)</td>
<td>66.0%</td>
</tr>
<tr>
<td>Mexico (2012)</td>
<td>64.6%</td>
</tr>
<tr>
<td>Canada (2015)</td>
<td>62.1%</td>
</tr>
<tr>
<td>U.K. (2015)</td>
<td>61.1%</td>
</tr>
<tr>
<td>Spain (2016)</td>
<td>60.9%</td>
</tr>
<tr>
<td>Slovakia (2016)</td>
<td>59.4%</td>
</tr>
<tr>
<td>U.S. (2012)</td>
<td>53.6%</td>
</tr>
</tbody>
</table>

One major contributing factor to such low voter turnout in the United States is the responsibility of the citizen to register to vote. This in effect makes voting a twostep process. In most other democratic nations, the government automatically registers citizens, which makes the process easier [12]. Another factor is the fact that the United States holds its elections on a Tuesday. Many Americans are at work during this time. This can be contrasted with the vast majority of other democratic nations, which hold their elections on the weekend and give their citizens election day off [12]. Compulsory voting also drives up the participation rate. America does not inflict any type of penalty for people who do not vote, while Belgium has a policy of disenfranchising citizens who repeatedly do not vote [13].

Voting in elections is the most common form of political activity; however, there are other ways for people to engage the political process. This includes writing or calling your congressmen, volunteering or working for a political campaign and donating to an individual or campaign. It has even been argued that these other forms of political activity can be more effective than simply voting [14]. Talking to, working for, or donating to a candidate or a candidate’s campaign can certainly make that individual more likely to listen to you and consider your thoughts on potential policies. These activities also require a considerable amount of resources; free time, disposable income, organization and communication skills, and some level of political information and education.

The ability to participate in the political process is fundamentally affected by resources including education, time, money, and command of the English language [15]. The amount of each of these resources that individuals have will directly affect their ability to participate in the political process [15]. People with more income and education are simply more likely to participate in the political process than others. Historically, Caucasians have been more politically active than African-Americans and Latinos [16]. However, when socioeconomic advantages of Caucasians are taken into account, all demographic groups are equally likely to participate in protests and other forms of political activities [17]. In the 2012 election, the African-American population actually voted at a higher rate than Caucasians in South Carolina [18]. Interestingly, some research has found that underrepresented groups are more likely to participate in American cities, due to strong community networks and norms of participation [19]. The entire group sees it in the interest of the group as a whole to participate or vote a certain way, which influences many individuals to do so [19].
3. Research Model

This paper argues and will test the notion that confidence in the media affects whether people are politically active. Past research shows that the media influences voters’ decisions once they get to the poll. However, no known research tests whether confidence in the media influences a person’s decision to vote in the first place. It is likely that confidence in the media affects political participation because people will not be inclined to act on political information that they do not view as trustworthy or valid. Therefore, we propose the following hypotheses:

H1: As confidence in the media decreases, voting in the 2014 midterm election decreases.
H2: As confidence in the media decreases, the percentage of people attending public meetings in 2014 decreases.

4. Methodology

The dependent variable for this research is state-level political participation rates. Two specific activities will be analyzed: voting in the 2014 midterm election and the percentage of people to attend a public meeting in 2014. The independent variable is state-level rates of confidence in the media. Two control variables drawn from the literature will be included in the analysis to understand the independent effects of confidence in the media on political participation: educational attainment and age.

Voting data are drawn from the United States Election Project [20]. Voting is measured as the percent of the voting eligible population in each state that voted in the 2014 midterm election. Attendance to public meetings is measured as the percentage of individuals in each state that attended a public meeting in 2014. Confidence in the media data are drawn from the Corporation for National and Community Service [21]. States are given a confidence in the media score by adding the percent of those who report having “some” and a “great deal” of confidence in the media. Higher scores equate to higher levels of confidence in the media; whereas lower scores equate to lower levels of confidence. Educational attainment is measured as the percentage of people in each state aged 25 or above who completed a bachelor’s degree or more [22]. Age is measured by taking the median age of residents in each state [23]. After reviewing summary statistics of the major variables, the hypotheses will be tested using Ordinary Least Squares regression analyses.

5. Results

This section presents the findings, and will be followed by a conclusion section that ties the results into the literature and proposes ways to build upon this work. Table 2 provides summary statistics of the primary variables. Nevada has the lowest confidence score at 51.6. The highest score of 72.4 belongs to Washington DC. Perhaps the physical proximity to the federal government infrastructure influenced perceptions of the media. South Carolina scored 62.2, which is about average.

Indiana had the lowest voter turnout score at 27.8. This may be due to the state’s restrictive voting procedures including a 6:00 pm deadline on Election Day, the earliest in the country. [24]. Maine, which allows residents to register on Election Day, had the highest voter turnout rate [25]. South Carolina scored 34.8, slightly below the national average.

Indiana had the lowest public meeting attendance score at 5.8. This may be reflective of a larger strain of political disengagement in the state, given that Indiana also had the lowest voter turnout score. Vermont had the highest public meeting attendance score at 18.6. This may be due to Vermont consistently ranking at the top or near the top in education based on its school
system and student achievement [26]. South Carolina scored 9.4, slightly below the national average. The appendix section provides the exact numbers for each state.

Table 2. Descriptive statistics of major variables

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in the Media</td>
<td>51.6</td>
<td>72.4</td>
<td>62.4</td>
</tr>
<tr>
<td>Voter Turnout</td>
<td>27.8</td>
<td>58.1</td>
<td>39.3</td>
</tr>
<tr>
<td>Public Meetings</td>
<td>5.8</td>
<td>18.6</td>
<td>9.7</td>
</tr>
</tbody>
</table>

Table 3 presents a multivariate regression analysis with voter turnout as the dependent variable and confidence in the media as the primary independent variable, controlling for educational attainment and age. It demonstrates that the median age in a state is a significant predictor of that state’s voter turnout rate. It also finds that the percentage of the population in a state with a bachelor’s degree or more is a significant predictor of that state’s voter turnout rate. Consistent with the literature, states with older and more educated residents have higher voter turnout rates. Confidence in the media was not found to be a significant predictor of voter participation rates. Accordingly, the first hypothesis cannot be supported.

Table 3. Multivariate Regression Analysis for Voter Turnout

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in the Media</td>
<td>-.392</td>
<td>.265</td>
</tr>
<tr>
<td>Bachelor’s or More</td>
<td>.399*</td>
<td>.212</td>
</tr>
<tr>
<td>Median Age</td>
<td>1.186*</td>
<td>.483</td>
</tr>
</tbody>
</table>

*p<.01

A multivariate regression analysis was also conducted using public meeting attendance as the dependent variable. The results are reported in Table 4. As demonstrated below, state-level educational attainment has a significant, positive effect on the percent of residents who attend public meetings by state in 2014. States with a higher rate of residents with a bachelor’s degree or higher had greater attendance to public meetings. However, the second hypothesis cannot be supported since confidence in the media was not found to predict change in the dependent variable, nor was age.

Table 4. Multivariate Regression Analysis for Public Meeting Attendance

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in the Media</td>
<td>-.065</td>
<td>.111</td>
</tr>
<tr>
<td>Bachelor’s or More</td>
<td>.285*</td>
<td>.089</td>
</tr>
<tr>
<td>Median Age</td>
<td>.047</td>
<td>.202</td>
</tr>
</tbody>
</table>

*p<.01

The two hypotheses cannot be supported since confidence in the media was not found to be a significant predictor of state-level voter turnout or public meeting attendance. However, as a control variable, educational attainment was found to predict political participation. This supports a long line of research that examines the relationship between socioeconomic status and many forms of political activity. Table 5 presents findings of a bivariate analysis between all major variables and confidence in the media. Because educational attainment is so central to political
participation, this follow-up analysis will emphasize its connection to confidence in the media. A Pearson’s Correlation test is used since the variables provide interval data.

### Table 5. Pearson’s Correlation of Major Variables with Confidence in the Media

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pearson’s r</th>
<th>Significance (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voter Turnout</td>
<td>-.016</td>
<td>.910</td>
</tr>
<tr>
<td>Public Meeting Attendance</td>
<td>.115</td>
<td>.421</td>
</tr>
<tr>
<td>Median Age</td>
<td>.278*</td>
<td>.048</td>
</tr>
<tr>
<td>Educational Attainment</td>
<td>.418*</td>
<td>.002</td>
</tr>
</tbody>
</table>

*p<.01

The follow-up analysis does not identify a significant correlation between voter turnout and confidence in the media or public meeting attendance and confidence in the media. The follow-up analysis identifies a medium significant relationship between median age and confidence in the media. States with older residents have more confidence in the media ($r = .278$). Older residents may remember a time when the media was viewed as a more trustworthy institution and may associate the media in its current state with the more positively viewed incarnation of the past. The follow-up analysis also identifies a strong significant relationship between education and confidence in the media ($r = .418$). States with more educated residents also have more confidence in the media. Perhaps educated residents have more ability to discern what information can be believed and also are better able to fact check statements, leading them to have confidence in the media. It is possible that those with less education are less trusting of all institutions. The follow-up analysis provides an important foundation for future research, particularly given the public’s fading confidence in the media.

### 6. Conclusion

Although the theory and hypotheses of this paper cannot be supported, the findings offer several important points to digest. First, this paper reinforces past findings that socio-economic status is a reliable predictor of political participation [15]. Important questions about the status of representative democracy in America must be considered if lower-income and less-educated residents are consistently underrepresented in elections.

Second, the follow-up analysis shows that educational attainment has a positive and significant correlation with confidence in the media. As educational attainment improves, so too does confidence in the media. This is an important finding worthy of future investigation. As previously stated, it is possible that less educated people have less confidence in all institutions, not just the media, and this distinction warrants further study. However, also likely is the notion that people with more education are more comfortable with the media because they are more equipped to separate fact from fiction. By earning a bachelor’s degree emphasizing critical thinking skills and information literacy, students are effectively learning how to evaluate the information they receive from media sources. Because education is such a strong predictor of political participation, it is worth better understanding its influence on confidence in the media.

Even with deteriorating confidence in the media, educated people still retain a higher trust in the media on average. This is a strong beginning in researching the relationship between education and confidence in the media. Perhaps more educated people’s higher confidence in the media reflects confidence in themselves and their own abilities, honed through education, to make sense of the political information that they are presented. This presents a strong argument in support of the need for education, as having confidence in the media and various other institutions will translate into more willingness to be involved in those institutions and the political
process. If less educated people are more disengaged from the media and institutions overall, their voices will not be heard by, and their views not reflected in, those institutions.

Thirdly, it is possible that the findings were influenced by the research design. The sample size is a major limiting factor as state-level data only allows an n of 51. Shifting the unit of analysis from states to individuals could yield different results. A larger sample size could find more significant results. Shifting the focus from states to individuals would also allow future research to account for demographic characteristics that affect political participation rates. Perhaps people who have higher rates of distrust in the media are mobilized to attend rallies and identify more with a certain party.

Fourth, the findings clearly indicate that it is vital we focus on improving education rates in the United States. A more educated electorate can more readily and confidently make sense of the political landscape and participate in the political process and make better and more informed political decisions. These improved decisions can improve the quality of our elected representatives and ultimately the quality of the policies they create. Policy that stimulates and improves education is vital to having a politically informed and active electorate and a better functioning government. These findings may show that education is the cure to political apathy and that alone is an outstanding finding that can contribute to the literature that already so strongly confirms that education is vital to a healthy democracy. Perhaps the most consequential demographic change in the United States will be the increased education of the populace.

7. References


## 8. Appendix

### Table 6. Descriptive Statistics for All States

<table>
<thead>
<tr>
<th>State</th>
<th>Confidence in the Media</th>
<th>Voter Turnout</th>
<th>Public Meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>65.5</td>
<td>32.9</td>
<td>7.7</td>
</tr>
<tr>
<td>Alaska</td>
<td>54.8</td>
<td>54.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Arizona</td>
<td>59.2</td>
<td>33.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Arkansas</td>
<td>58.3</td>
<td>40.1</td>
<td>6.2</td>
</tr>
<tr>
<td>California</td>
<td>61.3</td>
<td>29.9</td>
<td>6.9</td>
</tr>
<tr>
<td>Colorado</td>
<td>57.9</td>
<td>53.7</td>
<td>12.2</td>
</tr>
<tr>
<td>Connecticut</td>
<td>64.1</td>
<td>42.3</td>
<td>10.3</td>
</tr>
<tr>
<td>Delaware</td>
<td>68.8</td>
<td>34.3</td>
<td>11.8</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>72.4</td>
<td>35.3</td>
<td>16.1</td>
</tr>
<tr>
<td>Florida</td>
<td>59.4</td>
<td>42.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Georgia</td>
<td>57.1</td>
<td>38.2</td>
<td>6.8</td>
</tr>
<tr>
<td>Hawaii</td>
<td>70.9</td>
<td>36.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Idaho</td>
<td>63.6</td>
<td>39.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Illinois</td>
<td>65.1</td>
<td>40.2</td>
<td>7.4</td>
</tr>
<tr>
<td>Indiana</td>
<td>63.6</td>
<td>27.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Iowa</td>
<td>68.8</td>
<td>49.8</td>
<td>11.2</td>
</tr>
<tr>
<td>Kansas</td>
<td>65.5</td>
<td>42.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Kentucky</td>
<td>60.3</td>
<td>44.2</td>
<td>6.2</td>
</tr>
<tr>
<td>Louisiana</td>
<td>58.9</td>
<td>43.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Maine</td>
<td>63.8</td>
<td>58.1</td>
<td>15.0</td>
</tr>
<tr>
<td>Maryland</td>
<td>71.6</td>
<td>41.7</td>
<td>10.1</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>66.1</td>
<td>44.1</td>
<td>9.8</td>
</tr>
<tr>
<td>Michigan</td>
<td>63.8</td>
<td>42.7</td>
<td>8.6</td>
</tr>
<tr>
<td>Minnesota</td>
<td>63.8</td>
<td>50.4</td>
<td>11.9</td>
</tr>
<tr>
<td>Mississippi</td>
<td>58.5</td>
<td>29.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Missouri</td>
<td>63.1</td>
<td>31.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Montana</td>
<td>61.0</td>
<td>46.9</td>
<td>13.4</td>
</tr>
<tr>
<td>Nebraska</td>
<td>61.0</td>
<td>40.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Nevada</td>
<td>51.6</td>
<td>29.3</td>
<td>7.1</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>62.5</td>
<td>47.6</td>
<td>14.1</td>
</tr>
<tr>
<td>New Jersey</td>
<td>62.3</td>
<td>31.1</td>
<td>6.8</td>
</tr>
<tr>
<td>New Mexico</td>
<td>67.2</td>
<td>35.4</td>
<td>10.2</td>
</tr>
<tr>
<td>New York</td>
<td>64.8</td>
<td>28.2</td>
<td>7.3</td>
</tr>
<tr>
<td>North Carolina</td>
<td>60.6</td>
<td>40.8</td>
<td>6.8</td>
</tr>
<tr>
<td>North Dakota</td>
<td>66.1</td>
<td>43.8</td>
<td>14.6</td>
</tr>
<tr>
<td>Ohio</td>
<td>59.2</td>
<td>35.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>58.4</td>
<td>29.9</td>
<td>7.1</td>
</tr>
<tr>
<td>Oregon</td>
<td>56.0</td>
<td>50.9</td>
<td>10.7</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>64.2</td>
<td>36.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>70.7</td>
<td>41.7</td>
<td>9.2</td>
</tr>
<tr>
<td>South Carolina</td>
<td>62.2</td>
<td>34.8</td>
<td>9.4</td>
</tr>
<tr>
<td>South Dakota</td>
<td>68.2</td>
<td>44.3</td>
<td>14.7</td>
</tr>
<tr>
<td>Tennessee</td>
<td>61.1</td>
<td>28.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Texas</td>
<td>63.9</td>
<td>28.3</td>
<td>6.4</td>
</tr>
<tr>
<td>Utah</td>
<td>54.0</td>
<td>29.7</td>
<td>14.7</td>
</tr>
<tr>
<td>Vermont</td>
<td>65.9</td>
<td>38.9</td>
<td>18.6</td>
</tr>
<tr>
<td>Virginia</td>
<td>62.2</td>
<td>36.6</td>
<td>10.3</td>
</tr>
<tr>
<td>Washington</td>
<td>58.1</td>
<td>41.2</td>
<td>12.6</td>
</tr>
<tr>
<td>West Virginia</td>
<td>61.8</td>
<td>31.2</td>
<td>6.5</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>57.6</td>
<td>56.6</td>
<td>12.9</td>
</tr>
<tr>
<td>Wyoming</td>
<td>56.0</td>
<td>39.0</td>
<td>10.6</td>
</tr>
</tbody>
</table>
USC Upstate Student RESEARCH JOURNAL

FALL 2016

VOLUME IX

USC UPSTATE FALL 2016

UPSTATE

USC UPSTATE

UPSTATE