



# illuminated

GRADUATE RESEARCH MAGAZINE





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# FROM THE SCHOOL OF GRADUATE STUDIES

The East Tennessee State University School of Graduate Studies is proud to present *Illuminated*, a magazine that showcases the excellent work of our graduate students and their faculty advisors. There are over 2,400 students enrolled in graduate programs at ETSU. *Illuminated* presents some of our students' research and creative works that make meaningful contributions to various disciplines, and contribute to our strong graduate programs. *Illuminated* features research and creative projects that are currently happening on campus, and provides updates on alumni of ETSU graduate programs.

Enjoy!

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Are you excited about your research and would like to share your hypothesis or findings? You might be a perfect fit for *Illuminated*. There is more than one way to get involved!

For current graduate students and their advisors:

Are you or one of your graduate students working on a culminating experience (e.g., thesis, dissertation, capstone)? Your research could receive additional exposure through *Illuminated Magazine* and help educate the rest of the campus about your department and program. This is a unique opportunity to get your work recognized!

For current graduate students and their advisors:

Did you or one of your students get accepted into an excellent doctoral program or receive an excellent career opportunity? We want to hear about it! Share your story in the "Where Are They Going?" section.

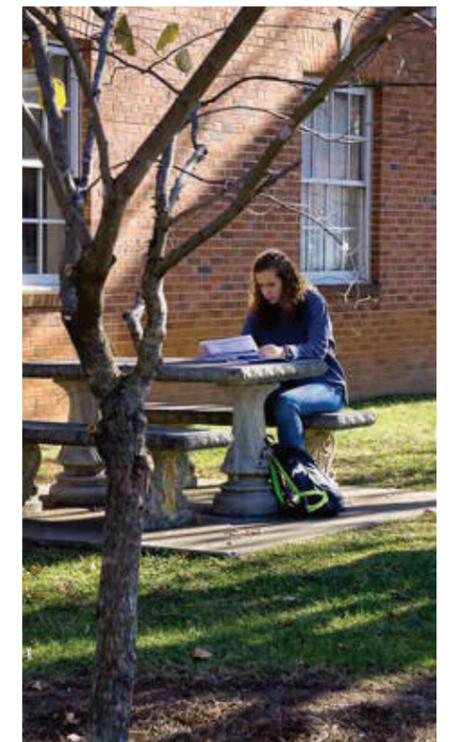
For former graduate students and their advisors:

Do you know an outstanding student who graduated from ETSU more than a year ago? We want to hear from them! The "Where Are They Now?" section features former ETSU graduate students who are now professionals in positions across the country.

A downloadable form is available at:

[http://www.etsu.edu/gradstud/documents/illuminated\\_nomination\\_form.pdf](http://www.etsu.edu/gradstud/documents/illuminated_nomination_form.pdf)

For more information on nominating students or getting featured in *Illuminated*, please contact: Dr. Karin Bartoszuk, [bartoszu@etsu.edu](mailto:bartoszu@etsu.edu).



# HAILING THE FUTURE

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN

Over the last decade, ride-sharing services such as Uber and Lyft have changed how people travel. Still, these systems are not in universal use, due to their dependency on smartphones and regulations that hamper or exclude them from competing in a wide range of markets worldwide. Edward “Ed” Hall and his team of students seek to create an alternative, public domain system, embedded in a city’s transportation infrastructure that supports the use of kiosks as well as smart devices for hailing rides.

Ed began his career in computer science by obtaining an Associate of Science degree in Networks and Programming. This led him to ETSU’s Department of Computing in the College of Business and Technology. At ETSU, Ed received his Bachelor of Science degree in Computer Science. He then pursued further education from the Department of Computing, enrolling in the department’s Master of Science program in Applied Computer Science.

Ed has pursued the department’s practice-oriented route to earning his M.S. degree, which requires students to complete a project with real-world applications. In spring 2017, Ed and a team of fellow students began work on a new taxi hailing system. This system, which was inspired by research conducted by ETSU’s Dr. Md. Asad Hoque, is intended as an alternative to those used by ride-sharing companies. The team, which Ed leads, includes M.S. students Sanford Gabrielle, Allison Ivey, Chris Maness, Nicolas McMahon, Nick Kyte, and Elizabeth Turbyfill. These students come from a diverse pool of computing disciplines with varied expertise, including taxi driving (Allison). This range of experiences and ideas has been instrumental for the project’s success.

The taxi hailing project required Ed and the team to research, design, program, and implement a prototype for a system that can replace traditional street hailing for major metropolitan areas. The project focused on using dedicated short-range communications (DSRC), an emerging U.S. Department of Transportation standard for vehicular communication, to signal taxis of potential passengers within range. The approach’s innovation lies in its use of the faster and more reliable DSRC to communicate through a city’s established traffic infrastructure. DSRC is currently being used as collision aversion technology in new model vehicles, and is being built into self-driving vehicles. A second innovation is the system’s use of kiosks for taxi hailing in the form of Internet-enabled, pole-mounted tablet computers. Taxi drivers would have a dash-mounted receiver that communicates with these kiosks and notifies passengers when a taxi accepts their hail, and how long it will be before their taxi arrives.

Ed notes that the team needed to plan for a variety of difficult, real-world issues when designing their system. The system, for example, must ensure that drivers can accurately identify their passengers, instead of blindly accepting whomever first approaches the taxi. Such line-jumping behavior could be especially troublesome at venues like Madison Square Garden, where crowds are often large and emotions can run high. The team suggested the use of a deli-counter-like ticketing system to mitigate possible confrontations at such locations. Another issue was the possibility of lost communication between taxis and the DSRC system, due to equipment failure or signal range limitations. Once again, the system cannot fully solve this problem - but it can mitigate it by detecting the outage, informing all parties as best as it can, and reestablish a hail in progress if the outage is brief.

To facilitate the system’s development, Ed, Sanford, and Elizabeth completed independent studies during summer 2017. As part of these studies, the three built a functioning test network at ETSU’s Innovation Lab from DSRC equipment obtained by Dr. Hoque. What the students learned from this network allowed the entire team to hit the ground running in the fall with a clear understanding of DSRC. As part of this study, Ed, Sanford, and Elizabeth developed strategies for dispatching taxis, managing driver-rider communication, and built the core of the project’s messaging system.

As part of this project, Ed and team members co-authored three publications. Two were presented at the Intelligent Transportation Services (ITS) World Congress in Montreal and the IEEE International

Conference on Dependable, Autonomic and Secure Computing in Orlando. The third will be presented at the 2018 Intelligent Transportation Services conference, which will occur in Detroit this June. Ed and the team also plan to submit a journal article for publication once their work is complete.

The advisor-mentee relationship is very important to the graduate school experience and is often considered a key aspect in the development of innovative ideas and projects. Dr. Phil Pfeiffer of the Department of Computing believes that autonomy is key to the development of novel approaches to problems and projects. Ed notes that Dr. Pfeiffer helped him blueprint the project’s necessary components and to determine the system’s potential points of failure as well as the best way to address them. Dr. Pfeiffer is also free with advice, says Ed, who appreciated the ability to control the decision-making process. Having the freedom to make mistakes and learn from them, in Ed’s opinion, has helped him grow as a student, professional, and person.

Ed is scheduled to graduate in May 2018. He has obtained a lecturer position in ETSU’s Department of Computing, and plans to apply for further education through the program. His main interests for future research and projects include alternative and novel applications for networked embedded systems.

Ed’s time at ETSU has taught him much, especially his capstone project. Leading such a diverse group of colleagues has forced him to reevaluate his understanding of team management and opened his mind to new perspectives on leadership. The capstone project also strengthened his programming skills, and led him to work with faculty and staff at a level he never expected. As he approaches the end of his master’s program, Ed has this advice to offer current and future graduate students: Take on a project, thesis, or dissertation that scares you. If you aren’t willing to challenge yourself and your preconceived notions, then you, as a graduate student and future professional, will not receive the maximum benefit from the process. //



Dr. Phil Pfeiffer (left) and Edward Hall



# THE EFFECTS OF “BATH SALTS” ON THE BRAIN

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN

Serena Allen began her foray into higher education as a student athlete at the University of Tennessee at Chattanooga. Serena was initially on a pre-law track, but found her passion for science. She then changed her major to a pre-professional medical track in which she excelled. Serena was set to attend pharmacy school at the end of her undergraduate career, however she began to feel stagnated and in need of a substantial change. So, she decided to study abroad in Edinburgh. She enjoyed her time in Scotland so much she stayed and pursued her master's degree in Medicinal Chemistry at the University of Edinburgh. After completing her master's degree, Serena chose to continue her education by pursuing a doctoral degree. She narrowed her potential programs to the University of Tennessee and ETSU. Dr. Brooks Pond, an associate professor in Pharmaceutical Sciences, was Serena's deciding factor. Specifically, Dr. Pond's research on psychostimulant drugs sparked Serena's interest, because she loved how it integrated biology and chemistry.

Serena's research focuses on the psychostimulant drugs popularized as “bath salts”. These drugs gained popularity in the early parts of this decade, when users believed them to be safer, legal alternatives to cocaine and methamphetamine with similar highs. The compounds in “bath salts” are synthetic derivatives of cathinone, a psychostimulant derived from the khat plant. Forensic analysis shows that the most prevalent synthetic cathinones in “bath salts” are mephedrone, methylone, and methylenedioxypropylone (MDPV). As such, Serena chose to focus on these compounds in her study. Serena's project is novel in its approach. Prior work in the field focused on investigating the effects of the drugs individually, but because “bath salts” are mixtures of these compounds, Serena wanted to look at the drugs' effects in combination. The potential for drug interactions between the cathinones is high, as all three compounds interact with the same targets in the brain: the dopamine, norepinephrine, and serotonin transporters. Would the effects be greater in combination, lesser, or neither? That was the question for Serena as she began designing her experiment.

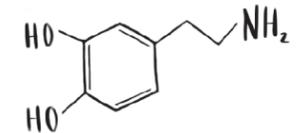
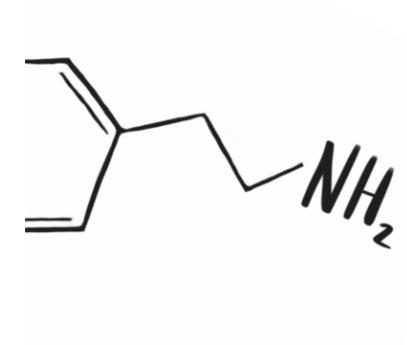
The first portion of her project was to determine the effects of these compounds, individually and in combination, on an important chemical messenger, dopamine (DA), in the brain. Serena used high performance liquid chromatography (HPLC), a chemistry technique used to separate, identify, and quantify each component in a mixture, to analyze the amount of DA and its metabolites in the brain to see how the brain responded to the cocktail of compounds. She specifically looked at the reward and locomotor pathways in the brain, as the drugs in question interact with dopamine transporters (DATs) in these pathways. Serena used two dosing schedules to test the chronic and acute effects of the drug combination in mice brains. The acute exposure was a single dose, after which samples were removed 15 minutes after injection. Chronic exposure consisted of injections every other day for two weeks, and then samples were removed 48 hours after the final injection. Serena looked specifically at areas of the brain known to utilize DA. Notably, she found that the individual drugs all increased DA, yet the drugs in combination increased DA to a greater extent. In order to understand the consequence of the elevated DA behaviorally, Serena measured the motor activity in her animals, as DA typically increases locomotion. While the drugs in combination appeared to have an additive effect of DA levels in the brain, Serena found that the combination actually caused a decrease in motor activity. She believes this is due to the animals exhibiting a behavior known as stereotypy, which is repetitive localized movement. In the mice, stereotypy was expressed through excessive and obsessive self-grooming. In her chronic model, Serena found that the DA elevations caused by the individual cathinones were maintained, while the DA following combination treatment was significantly depleted. As excessive DA can lead to toxicity of brain cells in response to certain drugs, Serena hypothesized that this decreased DA with chronic combination treatment of the cathinones may be due to toxicity.

This led her to phase two of her study, in which she looked at several proteins important in DA signaling, specifically the DAT, tyrosine hydroxylase, monoamine oxidase, and vesicular monoamine transporter protein (VMAT) to determine if the drugs in combination were in fact more toxic than when they were used individually. She found that all the proteins, with the exception of VMAT, were decreased when the drugs were taken in combination, a possible sign of neurotoxicity. Then, Serena created sections of the brain tissue and stained her sections to identify DA neurons to further determine the level of toxicity caused by the combination of drugs. After performing cell counts, Serena found that there were no significant decreases in DA neuron number (no cell death), despite a decrease in DA and the various proteins within DA neurons. Therefore, the drugs seem to induce what Serena and Dr. Pond call a “functional lesion,” whereby the drugs acutely increase DA, leading to the downregulation or decrease in DA and several key proteins in DA neurons following chronic exposure. This is a promising finding for “bath salt” abusers, because these “functional lesions” are potentially reversible. Serena's work is also important, because she and Dr. Pond are the first scientists to show the massive impact of this combination of drugs on the DA synapse.

Serena has presented and attended several conferences including the Experimental Biology meeting, where she received a graduate travel award. She was also recently invited to give a presentation at the American Chemical Society annual meeting on research she conducted with Dr. Pond on the development of new analytical methods.

Key to the professional and personal development of graduate students is developing a strong rapport with faculty. Serena found this in her work with Dr. Pond. While their personalities are on opposite ends of the spectrum, the adage that opposites work well together is exemplified through Serena's success. Serena would like to thank Dr. Pond for her generous support, and the independence to design and conduct her studies. Dr. Pond says Serena is easy to work with, because not only is she a great writer, she is intelligent and motivated in her pursuits.

Serena plans to graduate in May of 2018. She hopes to find work in the pharmaceutical industry to continue research under the neurology umbrella. As she moves forward into the next phase of her career, Serena has some advice for future and current graduate students. Find a mentor you can form a strong relationship with and openly communicate with, but also try to assert your independence as a researcher when possible. Serena also reminds us to be more humble and reflective in terms of scientific achievements and interpersonal relationships, and to find balance between academia and your personal life. //



Chemical structure of dopamine

Serena Allen (left) and Dr. Brooks Pond pore over some of the data from their last test on the mice.



DRS. FOX, MIMS, AND BARTOSZUK WITH OLAKUNLE JOSEPH ONI

# BACKING UP THE UNSUNG HEROES OF APPALACHIAN EDUCATION

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN



Dr. Mims reviews data from the team's work throughout the Appalachian Mountains.

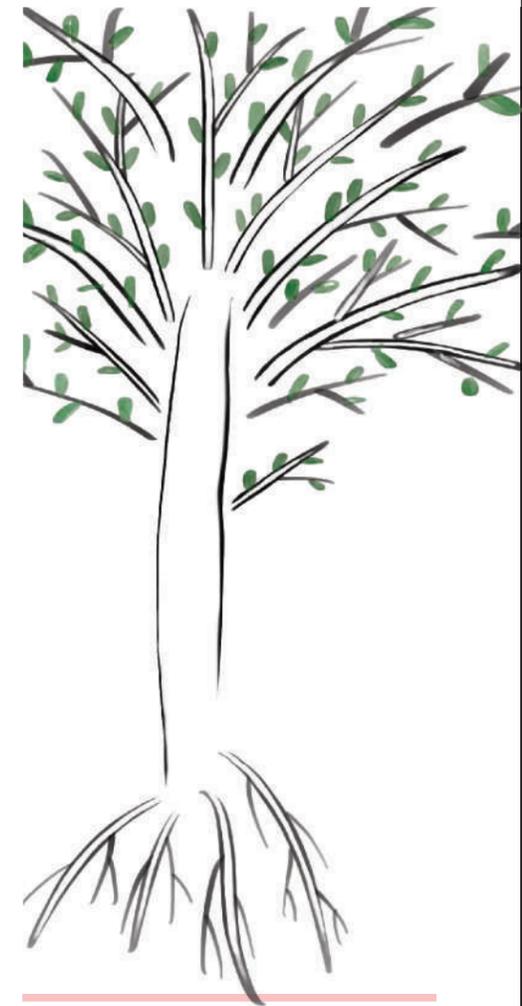
Few careers have a higher attrition rate, also known as turnover, than educators, and none more so than special education teachers. Yet, little effort has been put into determining the reasons behind this high attrition rate, especially in rural, isolated communities such as those found throughout the Appalachian Mountains. Drs. Jim Fox, Pamela Mims, and Karin Bartoszuk began to wonder what they could do to better understand why the turnover rate for special education teachers was so high, and what they could do to support and foster self-efficacy and decrease the rate of attrition.

Previous literature on the topic suggests that teachers perceive themselves as having a lot of stress, and that, coupled with a lack of support, especially in rural counties, are main causes of teacher burnout. Drs. Fox, Mims, and Bartoszuk began developing research into stress burnout rates, and professional development in special education professionals in Northeast Tennessee. Initial research began within the region by recruiting teachers to participate in bimonthly online conferences. This "Teacher Support Project" was funded by an ETSU RDC research grant. These conferences were primarily discussion based and allowed teachers in the field currently to express their beliefs, ideas, and concerns. Teachers who were recruited were also given support from the project that included reference materials, and behavioral management materials. Dr. Mims and Dr. Fox also had the opportunity to conduct in-class observations in several classrooms across the region. They factored in the number of children within the schools who were on free and/or reduced-cost lunch to quantify the affluence or lack thereof in counties across northeast Tennessee. This region is particularly challenging for teachers, staff, and researchers, because it is geographically very diverse, with educational settings ranging from one-room schoolhouses to countywide K-12 schools.

Based on interviews conducted through online conferences, and in-person interviews, Drs. Fox, Mims, and Bartoszuk decided to apply for a Spencer small grant to fund more extensive research that sought to look at more specific metrics and ways to more effectively measure burnout rates among special education teachers. The Spencer Foundation provides grants to researchers interested in investigating the ways in which education can be improved across the world. They proposed an online survey to be distributed to teachers across a 100-mile radius that includes not only northeast Tennessee, but also western North Carolina, southwestern Virginia, and southeastern Kentucky. The survey components include demographics on the participating educators such as degrees they hold, professional training they have received, and the type of town in which they work (rural versus city). The survey also measured burnout using the Copenhagen burnout inventory, which is a questionnaire that measures personal, work, and client-related burnout. Participants were also asked to rate the professional development topics which they benefitted from the most and the courses from which they benefitted the least. Lastly, participants rated their own self-efficacy, which is defined as the extent of one's belief in their own ability to complete tasks and reach goals; in this case whether or not they are effective teachers for their students. The survey was then distributed across 55 counties in the 100-mile radius and about 200 responses were received. The preliminary research questions of this study were to explore the associations between rural and urban areas, and teacher burnout in addition to self-efficacy and professional development. Preliminary results from the aforementioned survey seem support that there is a difference between rural and other schools in the quality and quantity of professional development, which can increase self-efficacy and lower burnout. The next phase of this ongoing research will look into mediation and moderation models, which will help address the issue by offering high quality professional development and helping increase teachers' self-efficacy to positively affect the burnout rate.

In the course of pursuing a research project such as this, Drs. Fox, Mims, and Bartoszuk decided to recruit the help of a graduate assistant to upload the survey, clean the data they collected, and work on the analysis of said data. They found the right student for the job in Olakunle Oni, a second-year graduate student studying epidemiology in the College of Public Health. Dr. Bartoszuk believes that it is a wonderful opportunity to recruit students from various disciplines for projects such as this, because it helps teach graduate students to develop new skills and learn various methodologies that can be applied in a novel way to their future research endeavors. Originally from Nigeria, Olakunle earned a medical degree in medicine and surgery prior to coming to ETSU to pursue his master's in public health. His previous experience with statistical programming and data collection made him an ideal candidate for this assistantship. Olakunle's role in the study was to follow up with special education directors to collect data from their districts, and then pool and clean that data for analysis. Olakunle was able to present the preliminary data analysis at the American Council of Rural Special Education conference in Salt Lake City, Utah, with Dr. Mims. Olakunle learned a great deal from working on this project and working with interdisciplinary mentors. Olakunle learned not only how to complete data analyses but also how to record and arrange that data for easy access in the future. After his experience on this project, Olakunle says he feels even more confident in his ability to see a research project through from the beginning to the end results. Possibly even more important to him as a professional, Olakunle feels that his experience with Drs. Fox, Mims and Bartoszuk has taught him to be an effective professional developer and manager. Olakunle plans to graduate in the spring of 2018 with his M.P.H. and then has plans to apply for a research-driven Ph.D. course of study in either epidemiology or a medical residency program. Dr. Fox would also like to thank Kaitlin McCormick, an APS student and special education major, who helped conduct the data analysis on this project.

One of the overarching goals of this project was to take a step back and look at the current practices regarding teacher burnout rates, and determining what can be done to help those teachers prevent burnout and increase their self-efficacy. While Dr. Fox contends that education has changed greatly over the last several decades, many of the same issues still exist. There are constantly new mandates for education that further complicate education research and reform. Teaching is undoubtedly one of the most noble careers a person can endeavor, but it is also one of the more burdensome careers as well. Dr. Fox believes that it is too often within research there are many good ideas, but matching and implementing those ideas within realistic and diverse settings is a major constraint. Yet, while there are those devoted to improving the lives and welfare of our teachers and their students, there is hope for a brighter future for all. //

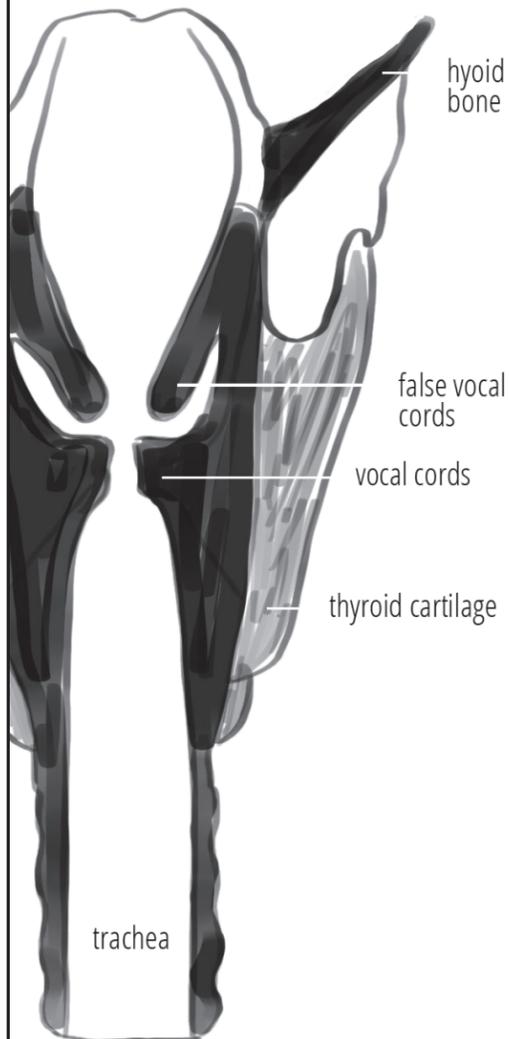


Dr. Bartoszuk, Olakunle Oni, and Dr. Fox.



# CARING FOR A PERFORMER'S "INSTRUMENT"

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN



Heather Smith has a passion for the arts that spans her entire life and career. She holds a bachelor's in theater and has had much success as a performer, teaching artist, and director. As a teaching artist, she worked at a school for children with cerebral palsy. Heather was working on a production of *Hamlet* with her students when she had an epiphany. As she watched her students perform the famous line "To be or not to be", each in their own unique way, some using simple gestures to convey the meaning, some using utterances or traces of the words, she was struck by the joy that these students felt in expressing themselves. It was in that moment that she realized how deeply important it is for each person to have a "voice" that is heard. Heather had felt for some time that there was more she could be contributing to the world beyond her theater skills. Her students that day were the catalyst that pushed Heather to pursue her master's degree in speech-language pathology. Her hope was to combine the disciplines of theater and speech-language pathology, as they seemed a perfect match in many ways. Heather chose "to be". Not long after, she packed up her life in Philadelphia and headed south to begin her next chapter.

As a performer, Heather has always been fascinated by the voice, the performer's instrument. She knew this was the area of speech-language pathology that she wanted to focus on. She found her mentor in Dr. Chaya Guntupalli who is a speech-language pathologist specializing in voice, with extensive research experience. As Heather considered different topics for her thesis, she conducted a literature review in which she found a study by Beeman (2016), that surveyed voice teachers about their perceptions of their students' vocal behaviors during singing and speaking. This inspired Heather to choose a topic on students' perceptions of the vocal health education they are receiving from their voice teachers, since there was a lack of existing literature on this topic.

To conduct a study such as this, Heather knew she would need a multi-disciplinary committee, spanning both speech-language pathology and the performing arts. Dr. Chaya Guntupalli agreed to serve as Heather's thesis chair. Dr. Brenda Louw, Chair of the Department of Audiology and Speech-Language Pathology, and Dr. Sun-Joo Oh, a professor of vocal music at ETSU, agreed to be her committee members. Heather calls the committee "my dream team," Dr. Guntupalli representing the voice side of the research, Dr. Louw with her expertise in survey research within the field of speech-language pathology, and Dr. Oh representing the vocal music side of the research.

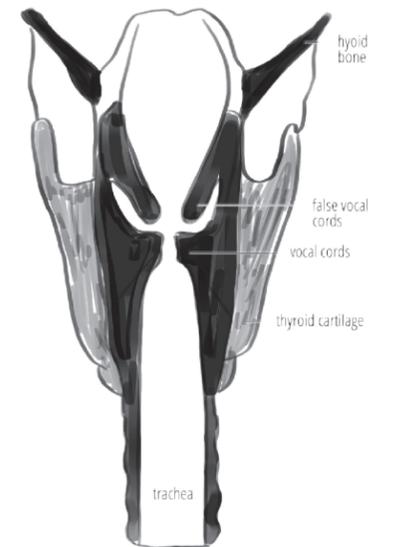
Heather decided that the best method of data collection for her study was a survey that targeted five key areas: the relationship between the speaking voice and singing voice, vocal health and prevention of injury, awareness of voice issues, vocal rehabilitation and the professionals to contact, and the educator-student relationship. Heather's target population for her study was undergraduate vocal music and theater majors, between their sophomore and senior years. Upon completion of the initial survey, a panel of four experts across both vocal music and theatre reviewed the survey. The panel provided suggestions for improvement of the survey in regard to content and clarity for the performance student population. Heather made changes to the survey and created a second draft. Dr. Louw encouraged Heather to undertake a pilot study, guiding her in both the development and execution of the study. She was able to attend a studio session conducted by Dr. Oh, where thirteen of her students studying vocal music reviewed Heather's survey materials. The students answered a series of questions, which helped Heather to evaluate the overall effectiveness of the survey. The students were very enthusiastic in their comments and gave her many helpful suggestions for improvement, many of which Heather was able to implement in the final version of her survey. Heather was then able to obtain IRB approval to distribute her survey.

Heather contacted educators in 568 music departments and 165 theatre departments across the nation. She was pleased to receive incredibly positive responses from educators, who passed Heather's

survey along to their students. One hundred forty-nine vocal music majors and 103 theatre majors completed the study. Results from the study indicated that students report compliance of the vocal health strategies their voice teacher has given them and a belief that preventative strategies should be a part of their voice lesson. However, when asked about compliance of individual elements of vocal hygiene, they reported low levels of compliance. They believed there was a connection between the singing and speaking voice. Students need further instruction on vocal health and have a poor understanding of the speech-language pathologist's role within the voice care team. They believe their voice teacher is the primary authority on their voice, and trust their voice teacher in terms of managing their vocal health and referrals for their voice problems. Students also seek advice from their voice teachers about their personal life. Future directions for the study include further research into the perceptions of both teachers and students on vocal health, forming relationships between voice teachers and speech language pathologists specializing in voice in order to develop best practices and consistency in vocal health education nation-wide, and the development of voice care teams to aid in prevention and treatment of student voices.

The relationship Heather has formed with her committee and especially with Dr. Guntupalli has been crucial to her development both personally and professionally. Dr. Guntupalli credits Heather's success to her receptiveness to constructive criticism, her openness to feedback, her dedication, and diligence. Heather would like to thank Dr. Guntupalli for her constant support, her dedication to the project's success, and for holding her to a higher standard.

Heather's research, titled "Vocal Health: Awareness and Perceptions in Undergraduate Vocal Music and Theatre Majors," was accepted for presentation at the Voice Foundation's 47th Annual Voice Symposium: Care of the Professional Voice. Heather plans to graduate with her M.S. in Speech-Language Pathology in May of 2018. Post-graduation she plans to apply to clinical fellowship positions in voice across the country and hopes to continue her research. As she completes this chapter, Heather has some advice to offer future and current graduate students. Be diligent, try to do something for your thesis every day. Even if it's something small like reading a journal article, it will give you a feeling that you've accomplished something. Don't be afraid to think outside of the box. Find creative ways to approach your research. This will stimulate you and interest others in your work. //



Anatomical structure of the larynx

Dr. Chaya Guntupalli and Heather Smith demonstrate one of the easiest and most fun methods to warm up one's vocal cords-- humming through a straw into a cup of water!



# WHERE ARE THEY NOW?

LAWRENCE LOVING // BUSINESS ADMINISTRATION, M.B.A. // 2015



## Why did you choose ETSU for your education?

As a Johnson City native, ETSU first attracted me because it was familiar. I knew the programs within the College of Business and Technology are well-respected, and I was intrigued to learn from the top-notch faculty. The MBA program was flexible enough that I could also maintain a career while working on my degree, which made attending an even more appealing option.

## What is your current position and/or research?

I currently work at the Niswonger Foundation as coordinator of the CareerConnect program.

## What does your current position/research entail?

CareerConnect is a workforce readiness program for high school students in grades 10-12 that focuses on career exploration, soft skill development, and real-world work experience. I meet with small groups of 10th and 11th grade students in Greene County once a month after school. Then during the summer, CareerConnect students participate in a two-week Summer Experience designed to give them the chance to get deep dive looks at career opportunities in the area. The goal for our students is for them to graduate from the program knowing not only what career they want to pursue, but also equipped with the skills and knowledge necessary to be successful in that career.

## How did your time at ETSU prepare you for your career?

My time at ETSU thoroughly prepared me for leading CareerConnect. One of the focuses of the MBA program is sharpening and strengthening analytical and problem-solving skills. My professors drove home the importance of using data and innovation to overcome organizational challenges. While I was at ETSU, I was able to hone my ability to analyze and overcome these challenges, allowing me to provide a better experience for the students I work with. As CareerConnect continues to grow, I'm confident the skills I developed at ETSU will serve me well.

## What advice would you offer current or future graduate students?

I would encourage future students to let their passions and interests guide their time in a graduate program. If you are pursuing a graduate degree, you are probably already passionate about the field, but you need to dig deeper. Find that thing you are really driven to achieve, and use your graduate experience as a tool to launch you toward that goal. //

JAMI WINSTROM // DIGITAL MARKETING, M.S. // 2017



## Why did you choose ETSU for your education?

At the time of application, ETSU was one of the few accredited universities in the country to offer an online degree program in digital marketing. Also, it came up first in my search query, which was a good signifier for me! More importantly, after researching the school, I became enamored with the quality of the school, and the excellent communication that I had with the professors/staff before applying to the program.

## What is your current position and/or research?

Currently, I'm in my dream role as the Director of Digital Marketing and Deployment Strategies for Navigate Works in the ever-beautiful Holland, Michigan.

## What does your current position/research entail?

My role is to design and deliver digital marketing programs as part of an integrated marketing strategy to support the expansion and growth of our clients' services and products. As the newest addition to the Visionquest Team, Navigate is a business development and marketing agency. Tommy's Express and Tommy Car Wash Systems is a major client focus for me, where I manage their three AdWord accounts as well as digital deployment strategies. I also have the privilege of strategizing for other businesses/clients including real estate, food service, manufacturing, CRMs, and more. We help both

existing organizations and start-ups develop effective strategies for taking a business to market effectively. Our services include strategic planning, brand development, graphic design, web design and development, digital marketing, video production, and professional coaching.

## How did your time at ETSU prepare you for your career?

I was challenged coming into the program with an undergraduate degree in English. My undergraduate studies prepared me to be a good content marketer. However, making data-driven marketing decisions was something that was not in my comfort zone. I had amazing professors in this program, who noticeably took the time to care for me and my success. Professors that go above and beyond are the staple of this program, and they truly want everyone who applies themselves to be successful.

## What advice would you offer current or future graduate students?

Stick to it, keep going, and don't give up. Learn for a lifetime, and make a difference to the people in the world around you. //

JENNA MIDDLEBROOKS // COMMUNITY AND BEHAVIORAL HEALTH, M.PH. AND DR.PH. // 2015

## Why did you choose ETSU for your education?

I chose ETSU because it is a small school, and the faculty I spoke with were very supportive of my interests in oral health. I grew up in a rural area in north Florida and after becoming a dental hygienist, I wanted to increase access to oral health services, as well as bridge the gap between dental and medical professionals. ETSU was the only school I looked at that had any interprofessional health care classes. I also had family in Appalachia for many generations, and I wanted to learn more about the region and Appalachian culture. (Plus: There's banjos!)

## What is your current position and/or research?

I am the Director of Dental Operations at Mountain Health and Community Services (MHCS) in San Diego, California.

## What does your current position/research entail?

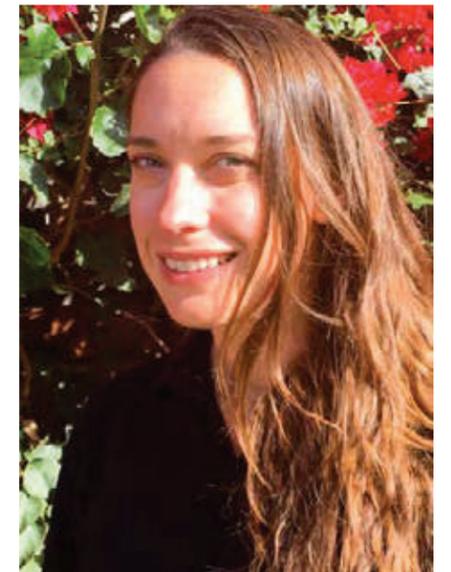
MHCS is a non-profit health care clinic that provides a variety of services to low-income families. I was hired in 2017 to open our first dental clinic, which is co-located with primary care, pediatrics, behavioral health and acupuncture. We plan to open a second clinic in the summer of 2018. As Director of Dental Operations, I am responsible for the policies and procedures that affect the dental department. I oversee dental staff and administration of clinical dental care. I work closely with our primary care providers and Director of Nursing to ensure that higher risk patients are accessing dental care and their overall health care. On a county level, I work with other community health clinics and public health programs to improve access to care, oral health literacy, and establish best practices dental public health programs. I also work with local schools, community centers, senior centers and assistance programs such as WIC to provide oral health education, dental screenings, and help connect patients to dental services. I plan to start a school-based sealant program once our second dental clinic is up and running.

## How did your time at ETSU prepare you for your career?

The public health program at ETSU was very experiential; and being able to apply the coursework to real-life situations taught me a lot about critical thinking, problem solving, and being flexible enough to calmly handle any obstacle I encounter. I was able to participate in the development of the Interprofessional Education and Research Program, which served as a catalyst for my approach in integrating brand-new dental programs into a well-established medical system.

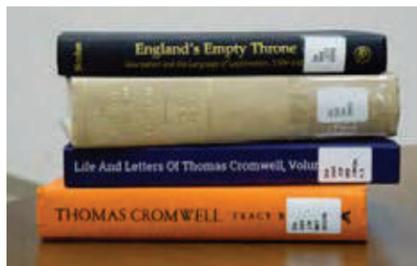
## What advice would you offer current or future graduate students?

1. Break things down into small increments. A class may be really stressful and something you are not interested in at all, but you can do anything for three months. And when you get to the end-comps, dissertation, board exams—you look back at all the things you did in those little three-month periods. If you got through all of that, you can get through the next thing.
2. It is perfectly normal to feel like you have no clue what you are doing sometimes. //



# TUDOR ROSES, MILANESE MERCENARIES, AND THE LAW THEY MANIPULATED TO MAINTAIN POWER

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN



Some of the books Heather has used to research.

The rise of the Tudor dynasty and the Renaissance were tumultuous times in the history of the English monarchy and the Italian oligarchy, respectively. As one dynasty upended another, there were near-constant struggles to obtain and maintain power. For Heather Alexander, the question became how did those in power sustain it through the legal systems of the times?

Heather Alexander started her journey in higher education at East Tennessee State University in the hopes of becoming a forensic anthropologist. She earned a Bachelor of Arts in both history and anthropology. Between her junior and senior years of undergraduate studies, Heather attended field school, a program that teaches students the hands-on aspects of anthropological studies and research. However, Heather discovered that forensic anthropology was not the right path for her, and it was time to reevaluate what she wanted to do, study, and eventually become.

Heather contends that she has always been fascinated by history. As a member of the Honors College at ETSU, Heather completed an undergraduate thesis that focused on recently discovered biological/anthropological evidence to determine if the portrayal of Richard III of England in Tudor propaganda was accurate. This work would continue to inspire Heather, leading her into the master's program in history and to her current research topics, which include England, Italy, and 20th century Ireland. Heather is particularly fond of English history, because it was an incredibly interesting and riotous period. England was also an obvious choice for Heather, because she speaks the same language, and thus, nothing could be lost in translation from her sources. Heather also branched out into other topics including legal history in Florence, and the Anglo-Irish war.

Heather's research involved using a variety of sources including legal documents, journal articles, and archived texts from the era to study the cultural history of England, Italy, and Ireland. She was interested specifically in the legal structures of power that were used to maintain status and hold over various populations. The Tudor period has been a major focus of Heather's research from undergraduate to graduate studies, and her current research looked at sumptuary laws regarding fashion during this time in England, and how the Tudors used fashion to exert social control over their subjects through pseudo-caste systems. Tudor kings also often used fashion to set themselves apart from other nobility and to justify their political motives and actions, such as executions of political rivals. In one such case, King Henry VIII executed the Earl of Surrey because he violated the sumptuary law that prevented noblemen from wearing gold or purple clothing, which was the exclusive right of the royal family. In her studies of Florence, Italy, Heather focused on how historians interpreted laws and how they portrayed lawyers during the Renaissance period. Heather conducted an independent study of the oligarchic families, specifically the Medici of Florence, as well as the Sforza and Visconti of Milan, and the legal powers they gained from the manipulation of traditional legal structures. Dr. Brian Maxson, Heather's faculty advisor, says that the thread that ties all of Heather's work together is determining how people legitimate power and use legal structures of the times to exert control over others.

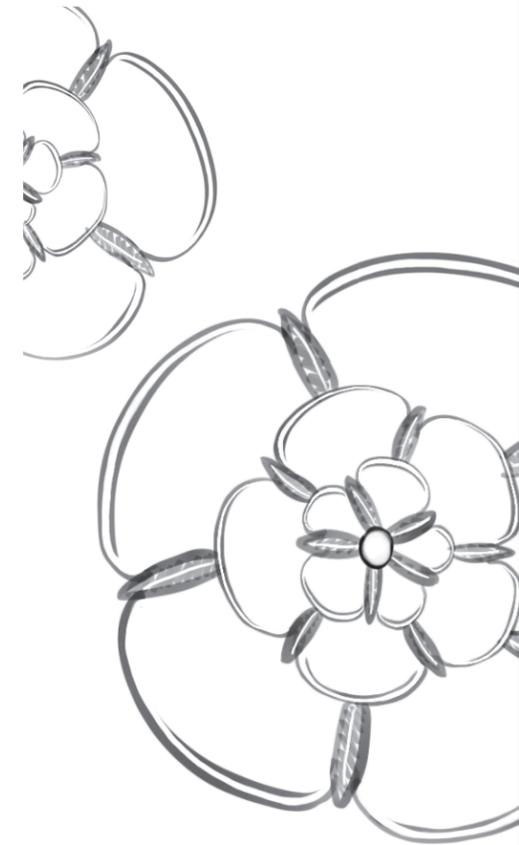
Researching historical events, times, people, and places is complex. It is often difficult to find a specific topic, and much of the ground work for Heather's research was background reading and determining key scholars in her field of interest, then using those key scholars' primary sources to help specify her own topic of interest. Therefore, the majority of Heather's time has been devoted to finding legal, historical, and anthropological sources, and from those sources, determining what is and is not important to her cultural history studies. Defining importance is a key aspect of research, and the

most difficult task to achieve. Dr. Maxson credits Heather's success in the program to her mastery of that skill, which has allowed her to work through the vast body of literature.

Despite the scope of her research, from England to Florence to Ireland, across several centuries, Heather was able to find several commonalities in her research. Specifically, between Tudor England and Renaissance Florence, while one was a monarchy and the other an oligarchy, respectively, both used the legal structures put in place before them to legitimate their power whether or not they had a specific claim to it. Heather's research into Irish history was an entirely different perspective, an outlier in her own words, as she focused on the Anglo-Irish war and the Irish citizens' attempt to overthrow the traditional power structures. Heather has attended and presented her current and past research at several conferences including the Boland Symposium and the Appalachian Student Research Forum, hosted by ETSU.

One of the most influential relationships formed during graduate school is the one between a mentor and mentee. Heather and Dr. Maxson have been working together for the past two and a half years, and have developed a strong working relationship. However, this mentee-advisor relationship was a matter of chance. During her undergraduate studies, Heather lost a member of her thesis committee and Dr. Maxson was suggested as a possible replacement. After their initial meeting, Heather left Dr. Maxson no choice but to join her thesis committee. Later, when Heather was reevaluating her plans for post-graduation, Dr. Maxson became an obvious choice for her faculty advisor for her master's program. Heather has since taken many classes taught by Dr. Maxson, which led to many conversations that helped Heather form and work through ideas. In addition to Dr. Maxson, Heather would like to thank Drs. Rankin, Fritz, and Newcomer for their guidance and advice throughout her studies.

Heather's research into sumptuary laws of Tudor England and the manipulation of laws and legal structures by Milanese mercenaries in Florence has helped her decide to pursue a law degree. She plans on taking a year off to prepare for her LSATs and law school applications, and then plans to apply to law schools across the nation. After her time at ETSU, Heather would highly recommend ETSU's School of Graduate Studies, because it hosts a diverse and accomplished faculty. Heather's advice to future graduate students would be to take advantage of ETSU's staff and expansive catalog of courses. //



Dr. Brian Maxson and Heather Alexander have spent a great deal of time in the library, so any more they feel second nature.



# POSITIVE DEVIANCE: AN ASSETS-BASED APPROACH TO SOLVING HEALTH DISPARITIES

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN

Olivia Egen found herself at a crossroads after completing her Bachelor of Arts degrees in biology and anthropology at the University of Northern Iowa. She had ambitions to pursue a medical career, and worked as a certified nursing assistant during her studies; however, during that time she had the realization that this was not the path for her. She discovered public health through a flyer, and ETSU through the SOPHAS application portal for public health applicants. After much research into the program, Olivia came to ETSU for her master's degree, which she earned in Health Services Management and Policy. Olivia was able to be part of the re-accreditation process for the College of Public Health post-M.P.H. Olivia chose to remain at ETSU to pursue her Doctor of Public Health degree, this time in Community Health. She credits the faculty and staff of ETSU as the deciding factor for choosing to attend ETSU for a master's degree and her continuation at ETSU.

Health disparities (defined as preventable differences in disease, injury, or access to health care based on socioeconomic status) have always been of interest to Olivia, which is why she chose to make it the overarching theme of her dissertation. Olivia was inspired by work she completed during the first two years of her doctoral program with Dr. Randy Wykoff, Dean of the College of Public Health. In their work they examined all counties in the United States and identified the top and bottom 2 percent, based on median household income, and then compared them on measures including health behaviors, health outcomes, and social and environmental factors. Olivia noticed during this study that some of the poorest counties were in fact achieving better than expected health outcomes. This made Olivia wonder why these counties are healthier than expected, which led her to the development of her dissertation topic. For her dissertation, Olivia looked at outlier counties, i.e., those counties with better health outcomes for their income quartile, to determine why they are healthier than their counterparts. Olivia looked at such metrics as male and female life expectancy, potential years of life lost, percent fair or poor health, and physically unhealthy days to determine if counties had better than expected health outcomes. To conduct her study, Olivia utilized a positive deviance framework, a theory in community health that originated in the 1970s that uses qualitative research to identify outliers. The theory states that in every community there will be individuals who are making healthy choices who can influence others to make the same choices, making it unnecessary to bring interventions into the community, because they are already there. Olivia sought to identify values and structures that are already in place within these healthier-than-expected communities to determine if they are more likely to be found in positive deviant counties.

Olivia, under the guidance of her faculty advisor, Dr. Katie Baker, conducted a literature review to determine metrics that should be used to identify outlier counties within subsections of comparable counties. A social and material index was created in order to identify comparable counties, because it allows for the comparison of multiple variables at once, versus looking at a single variable at a time. Once all counties had a social and material index value she divided the counties into quartiles, which means she grouped counties into four equal-sized subsections. She looked at several health outcomes to determine which counties were unexpectedly healthy including female life expectancy, male life expectancy, years of potential life lost, and percent of fair and poor health and physically and mentally unhealthy days. She then looked at differences in the health care systems and in the public health systems within these counties.

Olivia hypothesizes that counties that exhibit positive deviance will have better access to health care, i.e., they will have things such as clinics for preventive measures and larger public health budgets. At

the time of the interview Olivia was in the data collection phase of her study, and was just about to begin analysis.

In the body of scholarly literature on poverty and health care outcomes, there are not many articles that address what public health tools are already in use in communities. Instead they only seek to identify outcomes of interest and possible interventions that could be employed. What Olivia hopes to do with her research is bring more light on an assets-based approach to public health, i.e., assessing what a healthy community is already doing and use that to influence interventions. These interventions are more readily accepted and therefore more successful.

Presentations can be a key experience for a graduate student, as it helps teach students to speak not only to their professional colleagues, but to an interdisciplinary audience as well. During her time at ETSU, Olivia presented her research on health disparities several times, including at the annual Tennessee Public Health Association conference. Another process during which Olivia learned a great deal about conducting and publishing public health research was the peer evaluation process following the submission of journal articles for publication. By receiving constructive criticism and advice from her peers Olivia and her co-authors were able to publish an article on poverty and health that was featured in the *American Journal of Public Health*, and covered by media outlets such as *ABC News*, the *LA Times*, and more.

The phrase "it takes a village" can be as easily applied to a research project. It often takes a diverse group of professionals to develop, implement, and draw conclusions from a study. Olivia, during her time at ETSU, was able to create key relationships with mentors and colleagues across disciplines in the College of Public Health. Olivia would like to thank Dr. Wykoff for teaching her to focus on the big picture, which has helped shape her thinking. Olivia would also like to thank Drs. Amal Khoury, Kate Beatty, Nathan Hale, and Deborah Slawson for their support and advice during her time at ETSU. Olivia has formed a strong working relationship with her faculty advisor during her doctoral program. She would like to give special thanks to Dr. Baker for her support, input, and guidance, especially for helping her re-focus her project when portions became overwhelming. Dr. Baker commends Olivia for going above and beyond to maximize her footprint on ETSU, and for taking the next best-step in public health through her work. She has taken advantage of all opportunities presented to her, and it has prepared her to make a difference in the world of public health practice.

Olivia plans to graduate in the summer of 2018. She has applied to a number of fellowships and public health positions at universities. As she approaches the end of her graduate work at ETSU, Olivia has this advice to offer current and future graduate students: take opportunities as they come, because you can handle more than you think. Say "yes", you won't be disappointed. //

Dr. Katie Baker and Olivia Egen

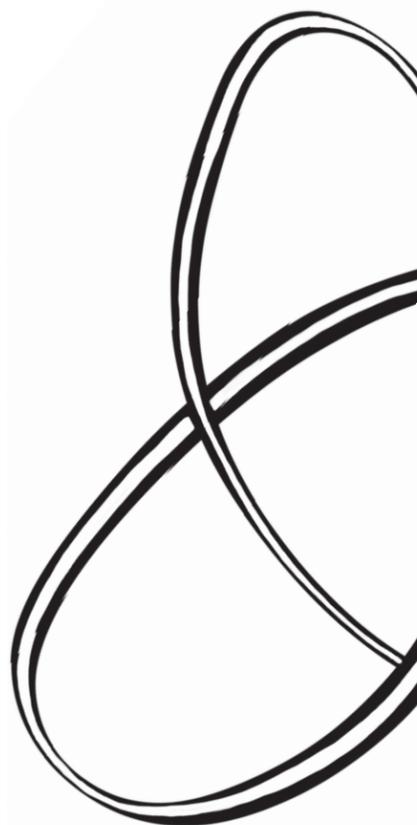


# THE PURE MATH BEHIND BRAIDS

WRITTEN BY KATHLEEN TATRO //  
PHOTOS AND ORIGINAL ART BY CARLYNN OWEN



A small sampling of the books Andrew has used for his research on knot theory.



Andrew Sweeney's passion for the theoretical underpinnings of mathematics is obvious to anyone who speaks with him. He began his academic career in higher education at Carson-Newman University to earn his bachelor's degrees in Applied Physics and Mathematics, which he completed in 2014. Andrew then moved to Walters State Community College in Morristown, Tennessee, where he earned an associate's degree in Psychology in 2016. It was at Carson-Newman that Andrew developed his interests in abstract algebra and pure mathematics. In his continued pursuit of higher education, Andrew then decided to pursue a master's degree in Mathematical Sciences at ETSU, which he chose for the welcoming environment and dedicated faculty and staff.

During the second semester of the master's program in Mathematical Sciences, students like Andrew are asked to find a faculty mentor to help them find, develop, and complete their theses. In March of 2017, Andrew was working to find his faculty advisor when he met with Dr. Rick Norwood, a professor of mathematics and statistics at ETSU. Dr. Norwood's research in knot theory and topology would help to inspire Andrew's thesis topic on the knot theory, topology, and Jones polynomials of braids, specifically braid group B2.

Knot theory in mathematics is defined as the study of closed curves in three dimensions. Knots are formed when strands cross and loop around each other, and then the two ends are joined. The knots are then classified by the number of crossings. Andrew's particular interest in knot theory was concerned with the closures of these braids from group B2, which are knots with two strands, and determine if two braids are ambient isotopic to one another. Two knots are ambient isotopic when they can be continuously deformed into one another. Andrew was also interested in the Jones polynomials associated with the braids in group B2. A Jones polynomial, discovered by Vaughn Jones in the mid-1980s, is an invariant of an oriented knot or link, which is assigned a variable with number coefficients. Invariants are defined as a property of mathematical objects, like knots and braids, that remain unchanged when transformations are applied to that object. Invariants are very useful in classifying a variety of objects.

To establish a foundation of knowledge and understanding of knot theory, Andrew read several key sources suggested by his faculty advisor Dr. Norwood; these tomes included *Kauffman's Knots and Physics* and Lickorish's *Introduction to Knot Theory*. These titles and others laid the groundwork for Andrew's thesis. Once he had an understanding of the proponents and tenants of knot theory the next phase of his project was to learn to visualize the braids of group B2 in two and three dimensions. Andrew was able to accomplish this by drawing various braids, and then working through reference material to understand how to get from braids to their Jones polynomial. One of the key points that Andrew had to comprehend to develop his Jones polynomials for braid closures was that group B2 is cyclic, which means that these braids can be generated by a single element, which is a member of the set of braids with two strands. In B2, knots and links formed by the closure of a braid, i.e., connecting the top of each strand to the bottom with a loop which does not cross any part of the braid, are classified as all positive crossings or all negative crossings, since if it has both kinds of crossings, one positive crossing and one negative crossing can cancel each other. In a positive crossing, the first strand passes under the second strand. In a negative crossing, the first strand passes over the second strand. Andrew's research is important, because it provides additional information about the Artin braid group and leaves many possibilities for continued research. Andrew's theoretical work in knot theory could also serve as groundwork for researchers who are interested in DNA, and more specifically the presence of cut DNA.

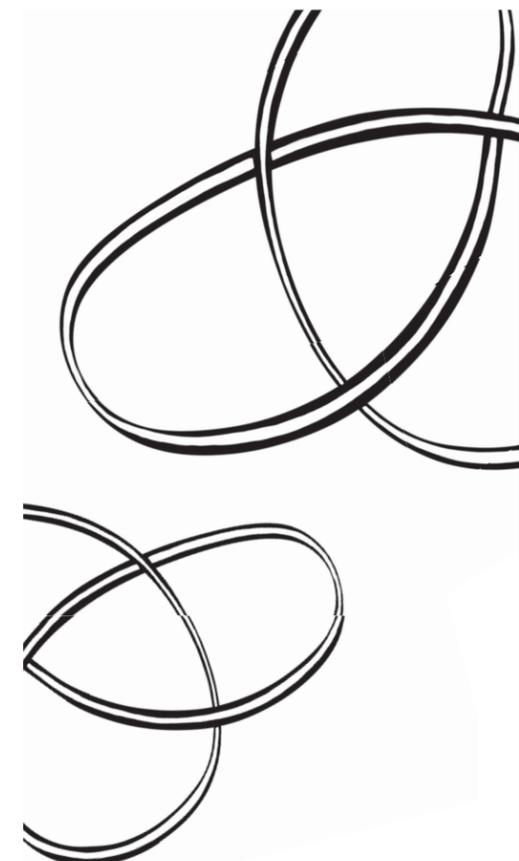
There are three key findings that Andrew discovered in the course of his thesis work regarding the knot theory of two-stranded braids. First, Andrew found that as the number of crossings within a given braid increases, so does the number of terms in its Jones polynomial. Second, he found that when two braids are stacked on top of each other and fused together, the Jones polynomial of this fusion is equal

to the value of the first braid's polynomial multiplied by the second braid's polynomial. Lastly, Andrew looked at tricolorability, which is the ability of a knot to be colored with three colors and is often used to classify knot isotopes, and found that braids that had polynomials with a number of terms that is a multiple of three are tricolorable. Andrew also found that two knots need to be continuously deformed through a sequence of Reidemeister moves, which refers to one of three potential local moves on a knot diagram, to show tricolorability. Thus, Andrew proved that, when two braids are ambient isotopes, if one braid shows tricolorability then both braids will show tricolorability.

Cooperative research and the development of new ideas between students and faculty is a key tenant of higher education. Andrew was able to develop a strong working relationship and gained much guidance from his faculty advisor, Dr. Norwood. The spring semester of 2018 has been particularly insightful and informative for Andrew, because he has been able to work on questions and mathematical problems associated with his work, and then Dr. Norwood would edit and make notes, which aided in the interpretation and extrapolation of his results from his project. Dr. Norwood believes that Andrew has made exceptional progress during his time at ETSU, considering Andrew knew little to nothing about knot theory prior to his thesis.

Andrew successfully defended his thesis in March of 2018 and then plans to graduate with an M.S. in Mathematical Sciences in May of the same year. As he nears the end of his time in the Department of Mathematics at ETSU, Andrew pondered over his next steps post-graduation. He was ultimately inspired by his graduate assistantship. Andrew's assistantship consisted of teaching a probability and statistics course for undergraduates. In this position he found a passion for educating. Andrew now plans on applying for lecturer positions, so he can pass on the knowledge he has gained during his time at ETSU.

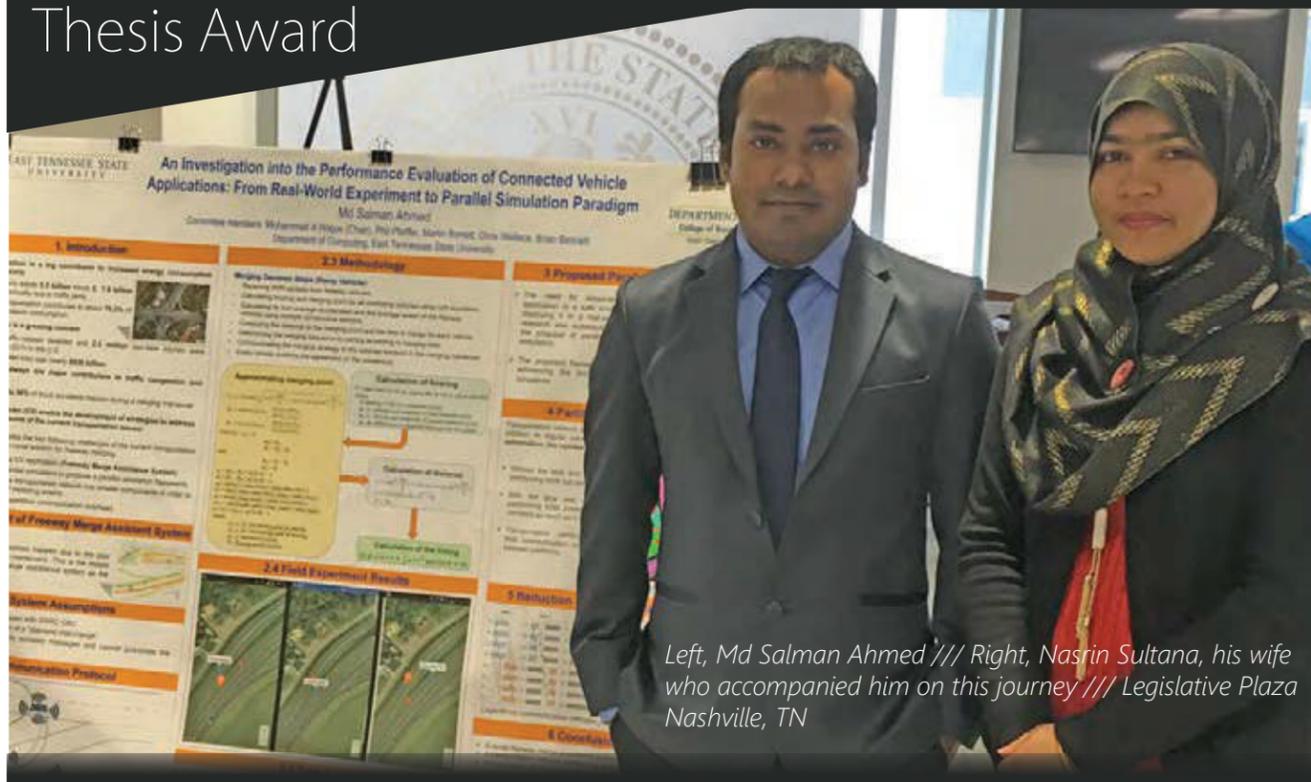
Andrew has learned much during his time at ETSU both inside and outside of the classroom. He has this advice to offer future and current graduate students; do not take your time for granted, make study time a priority. In some ways more importantly, network with your fellow graduate students. They can be a valuable resource to help your understanding of coursework, and also serve as outlets that help reduce the stress and burdens one may feel as a graduate student. //



Andrew Sweeney and Dr. Rick Norwood animatedly discuss some notes for Andrew's thesis.



# ETSU Alumnus receives Tennessee Council of Graduate Schools Graduate Student Thesis Award



Left, Md Salman Ahmed /// Right, Nasrin Sultana, his wife who accompanied him on this journey /// Legislative Plaza Nashville, TN

**Md Salman Ahmed**, a 2017 graduate of the ETSU Department of Computing, received the Tennessee Council of Graduate Schools (TCGS) Graduate Student Thesis Award for his thesis, “An Investigation into the Performance Evaluation of Connected Vehicle Applications: From Real-World Experiment to Parallel Simulation Paradigm.” This award recognizes the exceptional work of one Tennessee graduate student each year who has made significant and original contributions to his/her chosen field.

While at ETSU, Md authored 13 peer-reviewed papers and served as co-primary investigator for a research grant. His work was supervised by Computing Professor Dr. Mohammad (Asad) Hoque who stated, “Salman is the kind of student every professor dreams to have, but rarely gets. He solved a problem within two weeks, which an entire team of researchers could not solve in two years.”

The TCGS Thesis Award is selected from all TCGS member universities, and carries a stipend of \$500 and travel expenses. Md presented his research at the Legislative Plaza during Graduate Education Week and at the spring TCGS meeting in Nashville, Tennessee. Salman is currently pursuing a Ph.D. at Virginia Tech University. //



Left, Dr. Donald Thomason, TCGS President /// Right, Md Salman Ahmed /// TCGS Meeting, Nashville, TN

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