



Posters at the Capitol

Undergraduate Student Research

Austin Peay State University

East Tennessee State University

Middle Tennessee State University

Tennessee State University

Tennessee Technological University

University of Memphis

University of Tennessee–Chattanooga

University of Tennessee–Knoxville

University of Tennessee–Martin

February 20, 2018



Posters at the Capitol 2018
Cordell Hull Building
425 5th Avenue
Nashville, Tennessee 37243

Goals:

On February 1, 2006, Tennessee joined a dozen other states by exposing state legislators to undergraduate research from across the state through the first-ever Tennessee Posters at the Capitol. Sixty-three undergraduate students from six Tennessee Board of Regents (TBR) universities and three University of Tennessee campuses will present their research through posters at the Tennessee State Capitol in Nashville. Legislators will be encouraged to meet students from their districts and see first-hand the outstanding research being conducted by undergraduates across the state. The Posters at the Capitol project, sponsored by the Tennessee Board of Regents and the University of Tennessee system, and hosted by Middle Tennessee State University, has two goals—to expose legislators to undergraduate researchers and to expose undergraduates to their legislators. The state of Tennessee is the beneficiary of this exciting effort.

Participating Universities

Austin Peay State University (APSU), Dr. Alisa White, President
East Tennessee State University (ETSU), Dr. Brian E. Noland, President
Middle Tennessee State University (MTSU), Dr. Sidney A. McPhee, President
Tennessee State University (TSU), Dr. Glenda Glover, President
Tennessee Technological University (TTU), Dr. Philip B. Oldham, President
University of Memphis (U of M), Dr. M. David Rudd, President
The University of Tennessee at Chattanooga (UTC), Dr. Steven R. Angle, Chancellor
The University of Tennessee, Knoxville (UTK), Dr. Beverly J. Davenport, Chancellor
The University of Tennessee, Martin (UTM), Dr. Keith Carver, Chancellor

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WELCOME *from the* GOVERNOR

Dear Friends:

I am honored to welcome students from all across the University of Tennessee and the Board of Regents systems to the Capitol for the annual "Posters at the State Capitol" event.

This event is a great opportunity for some of our brightest young minds to present their research to lawmakers. I hope that your participation in "Posters at the State Capitol" is an enriching experience that inspires you to further academic achievement. Working together we will make Tennessee an even better place to live, work and raise a family.

Again, I welcome you to the annual "Posters at the State Capitol" event, and wish you well in all your future endeavors.

Warmest regards,

A handwritten signature in black ink, which appears to read "Bill Haslam".

Bill Haslam

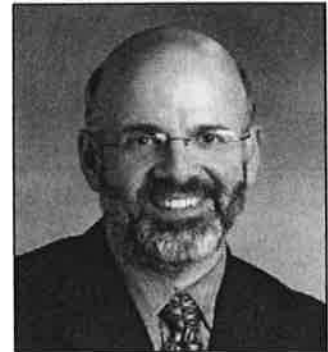
UT
THE UNIVERSITY of TENNESSEE
KNOXVILLE, CHATTANOOGA, MARTIN, TULLAHOMA, MEMPHIS

PRESIDENT'S OFFICE

Welcome to Posters at the Capitol:

This worthy program offers an opportunity to share a celebration of research, scholarship, and creative activity of our faculty and students. These projects, presented by undergraduate research students, represent significant discovery and achievements that build new knowledge, solve emerging problems, and expand the creative thinking that is essential to healthy, productive society.

Our undergraduates' areas of expertise reflect world-class research and creative activity that elevate our students and advance the frontiers of knowledge. As researchers and scholars, these students pursue the "how's" and "why's" in their various disciplines. Their discoveries impact how we live, work, and understand our world. These students benefit greatly from the University of Tennessee's world-renowned partnerships with Oak Ridge National Laboratory, which provide unique capabilities and contribute to Tennessee's emerging global prominence in alternative energy.



As the state's flagship public research institution, The University of Tennessee takes its commitment to research at all levels very seriously. Students from our Knoxville, Chattanooga, and Martin campuses, mentored by dedicated faculty mentors, are pleased to share their scholarship with our state's leaders and the public. We are delighted to showcase their work, providing a small window to the excellence going on within our classrooms and laboratories every day.

Sincerely,

A handwritten signature in dark ink, reading "Joseph A. DiPietro". The signature is fluid and cursive, with the first name "Joseph" being the most prominent.

Joseph A. DiPietro
President

Welcome from Austin Peay State University

Alisa White, President



Austin Peay State University (APSU) is committed to promoting undergraduate research and recognizes that undergraduate research initiatives provide a transformative learning experience for undergraduate students and an opportunity to interest them in pursuing innovative research activities beyond their undergraduate careers. During the Posters at the Capitol event, you will have the opportunity to meet some of Austin Peay's outstanding student researchers and learn about the impressive research projects they completed in collaboration with dedicated and talented faculty members. The APSU Office of Undergraduate Research (OUR) is dedicated to working with undergraduate students and faculty to inform students about research opportunities and funding sources, identify

partnerships, and provide opportunities for students to present their completed research. Financial support for undergraduate students who are conducting and presenting research is provided through collaborations between academic affairs and student affairs in order to make this opportunity available to as many students as possible.

Welcome from East Tennessee State University

Brian E. Noland, President



East Tennessee State University is committed to the value of research and creative experiences as essential, both to a strong, effective undergraduate education and to preparing students for success in graduate or professional schools and entry into a competitive workforce. We are pleased to collaborate with our sister institutions to feature the accomplishments of our undergraduate research students in the annual Posters-at-the-State Capitol event. Each year, we strive to showcase the diversity of research endeavors at ETSU. This year, we continue this tradition by representing undergraduate research in the musical and theater arts. The strength of our Undergraduate Research Program and the dedicated spirit and commitment of our faculty is reflected in the quality and diversity of the work

of these students. I am proud of the efforts made across our campus to introduce students to the vitality, rigor, and excitement of exploration and discovery, and of the many faculty scholars who mentor these students. The ETSU community is pleased and greatly appreciates the response of our State Legislators and Governor to the original and unique achievements of undergraduate researchers across the State of Tennessee.

Welcome from Middle Tennessee State University

Sidney A. McPhee, President



The second goal of our university's Academic Master Plan is to promote individual student success and responsibility for accomplishments through fostering a student-centered learning culture. Creating a culture of research and inquiry for undergraduates through a campus-wide initiative that engages students in a journey of discovery through exploration of real-world research problems is a strategic direction that supports this goal. Our Undergraduate Research Center coordinates students' research efforts across the campus by encouraging participation through initiatives such as the Honors College, FirstSTEP, TLSAMP, URSCA, and other student research experiences. Posters at the Capitol, an event that has been awarded TBR's Academic Excellence Award, is an exciting forum

to share our students' work with state legislators.

Our commitment to undergraduate students participating in research is unwavering. I think the quality of the abstracts in this booklet and the posters exhibited at the Capitol will convince you that our resources and efforts are not misplaced. MTSU is delighted to participate in the Posters at the Capitol event.

Welcome from Tennessee State University

Glenda Glover, President



It is my pleasure to welcome you to the Posters at the Capitol event. Undergraduate research is an integral component of our students' educational experience at Tennessee State University and we are honored to be here. Engaging students in the process of science assures the achievement of the highest level of learning. The posters on display by our undergraduate students represent the larger body of research work performed by students across the University's eight colleges/schools.

This level of illustration demonstrated here today, could not have been made possible if not for the dedicated faculty involved. These educators devote an extraordinary amount of time to the research enterprise and to serving as research mentors for our students. Again, welcome and thank you for your continuous support of Tennessee State University.

Welcome from Tennessee Technological University

Philip B. Oldham, President



Welcome to the Posters at the Capitol. Congratulations to all the participating students and thank you to all those supporting their efforts. Discipline-based, independent creative scholarship and research is the heart and soul of any modern education. To actively learn by doing is the ultimate educational experience and often the real differentiator for employment in this highly competitive global economy. From my personal experiences participating in research as an undergraduate and supervising many student research projects in my career, the challenge of original research provides significant and lasting personal benefits regardless of the initial results or project outcome.

As Tennessee's Technological University, TTU is proud of its long history in research and creative scholarship. Undergraduate research is an integral part of the educational experience provided to our students regardless of their academic major. One of the most rewarding parts of the research experience is the chance to share your discoveries with your peers and other colleagues at events like this. Best wishes to all the outstanding apprentice scholars participating.

Welcome from University of Memphis

M. David Rudd, President



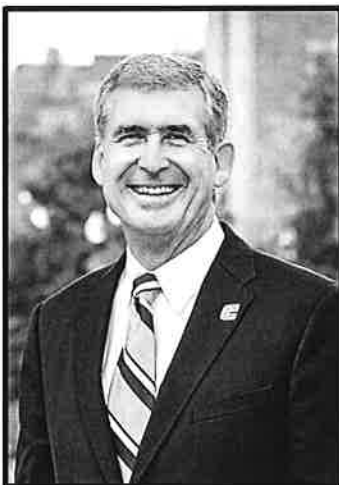
Congratulations and best wishes to all of the students participating in this year's Posters at the Capitol event. We recognize the tremendous commitment you have made not only to your individual project, but to the challenge of creating original research within your area of study.

As an urban metropolitan research university, the University of Memphis celebrates undergraduate research as an integral part of our educational mission. We are particularly proud of the work of the outstanding students we sponsor for this event. The intellect, creativity and ingenuity expressed in their collective body of research increases our capacity to change lives in our community.

Thank you to our legislative representatives of the State of Tennessee for hosting this important gathering of scholars so they may share their important discoveries with their colleagues, and with us.

Welcome from University of Tennessee at Chattanooga

Steven R. Angle, Chancellor



Welcome to Posters at the Capitol. The University of Tennessee at Chattanooga is proud to feature the accomplishments of our undergraduate students. UTC considers undergraduate research to be an integral part of the educational experience.

UTC's Office of Undergraduate Research and Creative Activity, located within the Honors College, communicates and facilitates undergraduate research and creative opportunities and highlights the accomplishments of our students and faculty. We have an annual research day showcase for faculty and students from all colleges and departments to prepare a poster, display, or platform presentation and share their discoveries with peers and colleagues. Our Provost Student Research

Awards are designed to provide UTC students with a special opportunity to participate in original research with faculty members.

We appreciate the opportunity to showcase the work of our students. Best wishes to all of the apprentice scholars participating.

Welcome from University of Tennessee at Knoxville

Beverly J. Davenport, Chancellor



Welcome to Posters at the Capitol, and congratulations to all the students whose work is featured in this event. As a major public research institution, the University of Tennessee, Knoxville, has an impressive legacy of academic excellence, service, and innovation. This is embodied by the dedication to research and creative achievement of our students.

The partnerships we have cultivated with organizations and agencies like Oak Ridge National Laboratory, Y-12, and the Tennessee Valley Authority offer our students a unique opportunity to work alongside and learn from top faculty. We sponsor summer internship programs that offer undergraduates unique opportunities to pursue research and creative projects. Our commitment to this hands on experience is what helps our

students excel in the classroom and beyond.

We hold ourselves to the highest standards when it comes to enhancing research, scholarship, and outreach – all vital components of our role as the state's flagship research university. I am proud to present the outstanding research projects conducted by undergraduate students at UT.

Welcome from the University of Tennessee at Martin

Keith Carver, Chancellor



As a top-tier institution, ranked 47th among southern master's universities in the 2017 edition of *America's Best Colleges* as compiled by *U.S. News & World Report*, we value and promote undergraduate student research. We make it a productive component within many of our programs so that students graduate with hands-on, real-world experience in programs as diverse as agriculture, business, behavioral sciences, humanities and numerous science disciplines. The highly selective UT Martin Honors Programs requires all of its students to conduct research. Undergraduate participation in research projects and funded activities have increased during the past several years, and that investment continues to pay off as a number of our students have received recognition for their research in the state, region, and nation.

Our professors often couple student research with real-world experiences such as the TVA Investment Challenge, summer internship opportunities at the Oak Ridge National Laboratory, and various other opportunities within grants and governmental programs at the local, state, and national levels.

We are proud to present these selected research projects to represent a cross section of ongoing undergraduate research at UT Martin.

Posters by Poster Number

Poster Number	Student	University	Poster Title	Page No.
1	Alexius Dingle	Tennessee State University	Analyses of Sweet Sorghum Booting Stage Development to Harvest Early Uninucleate Microspores without Cell Wall	20
2	Morgan Hartgrove	University of Tennessee, Knoxville	Treating Infants with NAS: An Examination of Three Protocols	20
3	Maia Council	Middle Tennessee State University	Recovering Nashville's Past	21
4	Jeff Banks	East Tennessee State University	Quilting in Appalachia: A Vanishing Art?	21
5	Jessica Bearse	University of Tennessee, Martin	Nutrient Dynamics in Soils under a Mixed cover Crop	22
6	Blaine Gundersen	Austin Peay State University	Love, Hate. Love.	22
7	Soomin Choi	Tennessee Technological University	Low-cost and high-speed surface roughness measurement by using a capacitive sensor	23
8	Alexander Forgey	University of Tennessee, Chattanooga	Student Opinion and Effects of Tennessee's Faculty Carry Law	23
9	Jasric Bland	University of Memphis	Examining the Effect of Diet on Mesolimbic Dopamine Release and Psychostimulant Addiction	24
10	Farah Ismail	Tennessee State University	Exposure of Human Immune Cells to Triclosan Alters the Secretion of Interferon gamma	24
11	Elle Johnson	University of Tennessee, Knoxville	The Role of Social Support on College Freshmen	25
12	Brooke Fitzwater	Middle Tennessee State University	Habitat Selection by two Chilean subtidal blennies under predation pressure in a Chilean coastal ecosystem	25
13	Jessica Chambers	East Tennessee State University	Internalizing symptoms associated with emotional abuse: An examination of religious social support as a moderating variable	26
14	Lane Brown	University of Tennessee, Martin	Multistep Organic Synthesis in Introductory Undergraduate Organic Chemistry Laboratory	26
15	Jordan Miller	Austin Peay State University	Accurate Localization for Small Scale Mobile Robots	27
16	Seth Crum	Tennessee Technological University	Synthesis and characterization of pyruvic aldehyde-1-oxime thiosemicarbazones and their complex formation with Cu(II)	27
17	Kirsten Hein	University of Tennessee, Chattanooga	Implementing Early Screening Methods to Detect Resistance to <i>Thytophthora cinnamomi</i> in First-Backcross Chinese-American Chestnut Hybrids	28
18	Nic Bradley	University of Memphis	Political Police Project	28
19	Nafisa Hamza	Tennessee State University	Tributyltin Effects on Akt/Protein Kinase B and Ribosomal S6 Protein Phosphorylation	29
20	Valerie Lick	University of Tennessee, Knoxville	The Cold War at Home: Impact of Anti-Communist Government on Women's Activism	29
21	Natalie Foulks	Middle Tennessee State University	Narrative Discourse Performance in Older Adults	30
22	Dustin Gilmer	East Tennessee State University	Novel Binder Development in Binder Jet Additive Manufacturing to Improve Green Part Strength	30
23	Kaleb Byars	University of Tennessee, Martin	Unclaimed Property; Uncertainty with Tennessee's Adoption of the Revised Uniform Unclaimed Property Act and Related Income Tax Liability	31
24	Ronnie Roberts	Austin Peay State University	Becoming more prepared: How to create change in college students by focusing on reading abilities	31
25	Madison Fulmer	Tennessee Technological University	Screening method development for identification of nontargeted designer drugs by GC-MS ⁿ and LC-MS/MS	32
26	Hannah Rose Margavio	University of Tennessee, Chattanooga	Radiative Properties of Silica Aerogel	32

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28	Sara Jamal	Tennessee State University	Triclosan alters the secretion of Tumor Necrosis Factor alpha from human immune cells	33
29	Gayatri Nandwani	University of Tennessee, Knoxville	Archaeometric Approaches to the Roman Near East	34
30	Lauren Hennessee	Middle Tennessee State University	Why Do Some States in the Middle East Have a Higher Level of Democratization than Others?	34
31	Holdon Guy	East Tennessee State University	Tobacco policies at higher education institutions in TN	35
32	Stephen Harris	University of Tennessee, Martin	Solid Propellant Rocket: A Student Researched and Designed High Power Solid Rocket Motor and Flight Vehicle	35
33	Sarah Grossarth	Tennessee Technological University	Human topoisomerase II α inhibition by new palladium (II) and platinum (II) complexes of a 2-acetylpyrazine tert-butylthiosemicarbazone ligand	36
34	Rachel Peters	University of Tennessee, Chattanooga	Sound of Photoacoustics: Making Music with Light	36
35	Kenya Ector	University of Memphis	The Effect of Diet on Locomotor Activity and Anxiety Using Open Field Testing	37
36	Danielle Solomon	Tennessee State University	Sulfide-rich Groundwater Enhanced Seedling Growth and Photosynthesis	37
37	Jessica Ossyra	University of Tennessee, Knoxville	Fabrication of Dense UO ₃ Pellets for Neutron Detection Applications	38
38	Janie Kullmar	Middle Tennessee State University	Word Learning in Authentic Versus Explicit Conditions	38
39	Luke Hiester	East Tennessee State University	File Fragment Classification using Neural Networks	39
40	Amanda Mayo	University of Tennessee, Martin	Mechanosensory sensitivity in <i>Manduca sexta</i>	39
41	Parker Lusk	Tennessee Technological University	Detection of Lead Contamination in Water using Fluorescence of Functionalized Gold Nanoparticles	40
42	Kathryn Rouse	University of Tennessee, Chattanooga	The Effect of Dietary Restriction on <i>Saccharomyces cerevisiae</i> Lifespan	40
43	Alexis Nelson	University of Memphis	Ankle bracing is associated with increased ankle and hip joint torques during a landing task	41
44	Hitesh Vaishnav	Tennessee State University	Metastatic Prostate Tumors in Bone	41
45	Summer Smith	University of Tennessee, Knoxville	Pyruvate Kinase M2 Deficiency Promotes a Brown Fat-Like Phenotype in White Adipocytes	42
46	Salman Rahmani	Middle Tennessee State University	Flow Control of 3-Dimensional Bodies Utilizing CFD	42
47	JP Mitra	East Tennessee State University	The Analysis of Different Methods of Construction Estimation: A Case Study of the ETSU Football Stadium	43
48	Nathaniel Newlin	University of Tennessee, Martin	Preliminary Observations of organism-substrate relationships in <i>Astraeospongia</i> , <i>Astylospongia</i> , <i>Hindia</i> , and <i>Palaeomanon</i> from the Brownsport Formation (Silurian), Western Tennessee	43
49	Anna Webb	Tennessee Technological University	Bat Genome Sequencing	44
50	Keith Wachter	University of Tennessee, Chattanooga	Solution Scholars	44
51	Nick Paige	University of Memphis	Examining autoreceptor functioning in the nucleus accumbens	45
52	Kierra Ware	Tennessee State University	The Combined Effect of Canagliflozin and Metformin in Human Prostate Cancer Cells	45
53	Peyton Terry	University of Tennessee, Knoxville	3D Genome Organization During Neutrophil Migration	46

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55	Rebekah Pearson	East Tennessee State University	What influences fan perception on the National Pastime	47
56	Allison Wittmer	Tennessee Technological University	The Forgotten: Minorities' Role in Industrial Britain	47
57	Thomas Wiegand	University of Tennessee, Chattanooga	Effects of Micro-climate and Human Activity on Building Energy Use at Oak Ridge National Laboratory	48
58	Sonia Hopkins	University of Memphis	Life satisfaction, self-regulation, motivation to change, and family history as predictors of young adult alcohol misuse	48

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39	Luke Hiester	Jay Jarman	39
47	JP Mitra	Jeremy Ross	43
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1. Alexius Dingle

Tennessee State University

Faculty Mentor: Ahmed N. Aziz & Aron Felts

Analyses of Sweet Sorghum Booting Stage Development to Harvest Early Uninucleate Microspores without Cell Wall

Microsporogenesis and cytokinesis occurs simultaneously during meiosis of pollen cells, and there is a stage after the tetrad separation and cytokinesis, where cell wall is not formed. Thus microspores can be captured immediately after the tetrad separation and before endomitosis when there is only cell membrane to lyse. Such microspores can be lysed by reagents to extract their DNA for further molecular analyses. The objective of this project was to identify the development of sweet sorghum microspore stages. Four varieties of *Sorghum bicolor* L. ('Achi Turi', 'Dale', 'Dasht' and 'Topper 76-6') were grown in a greenhouse to closely monitor plant height, flag-leaf width, diameter of the leaf sheaths (stem) around developing panicle for capturing microspores immediately after the tetrad stage. To isolate microspores, the individual sessile spikelets measuring 3.3-3.7 mm in length were dissected under a microscope to retrieve the anthers. The absence of the cell wall around microspores was confirmed. The microspores were then individually isolated into PCR tubes using a micro-injector mounted on a micromanipulator. Whole genome DNA amplifications were confirmed by UV-Vis Spectrophotometer. This research provides a crucial step in the molecular analyses and manipulation of sweet sorghum.



2. Morgan Hartgrove

University of Tennessee, Knoxville

Faculty Mentor: Laurie Meschke

Treating Infants with NAS: An Examination of Three Protocols

Neonatal abstinence syndrome (NAS) is an infant withdrawal disorder associated with prenatal opioid exposure. On average, newborns with NAS stay in the hospital 800% longer (16.9 days) than infants without NAS (2.1 days). Nationally, NAS accounts for \$1.5 billion in hospital charges, with the majority of these costs paid by state Medicaid programs. Treatment protocols vary, but can shorten hospitalization time; however, research on which protocols most effectively treat NAS is limited.



To address this gap, we examined health record data of East Tennessee infants diagnosed with NAS across three distinct treatment protocols: (1) no rescue dose, (2) doctor driven protocol with rescue dosing, and (3) nurse driven protocol with rescue dosing. Preliminary findings indicate that the use of a rescue dose, regardless of the medical administrator, significantly reduced opioid weaning and hospitalization time. The fiscal impact of NAS protocol calls for the attention of professional organizations and legislators to promote evidence-based best practices in treating opioid withdrawal of infants with NAS.

3. Maia Council

Middle Tennessee State University

Faculty Mentor: Molly Poleskey

Recovering Nashville's Past

Research projects conducted both with the help of Dr. Molly Taylor-Poleskey and Dr. Mark Doyle provided several opportunities to use artwork as a means of communicating historical information to the public. In Dr. Taylor-Poleskey's class, sketches were used to communicate design ideas for rack cards produced to advertise Bygone Nashville, a walking tour and accompanying Curatescape site created by a digital history class. Artwork and imagery were incorporated into the website design in order to bring life to the stories and add visual interest.



Research for an honors thesis conducted under the supervision of Dr. Mark Doyle also afforded several opportunities for the union of historical research and artistry. The thesis, a historical fiction novel, is a marriage of historical research and creative writing, and the process of designing and producing illustrations for the book afforded an opportunity to research historical costumes and photography in order to create accurate illustrations.

4. Jeff Banks

East Tennessee State University

Faculty Mentor: Rebecca Fletcher

Quilting in Appalachia: A Vanishing Art?

Quilting, an American folk art tradition, is a quintessential symbol of Appalachia. Quilting, brought to America by Europeans was seen as "folk art" as opposed to "high art," primarily because of the utilitarian purpose of quilts to keep people warm. In the 1970s, some folks began to class certain quilts as "high" and "fine" because they were made for show. My objective in this research was to explore the status of quilting in Appalachia today. To do this, I drew on connections with the Boone's Creek Historic Trust and conducted interviews and participant-observation with The Quilting Ladies at the Boones Creek Christian Church in Washington County, TN. Through these conversations, I linked the activities of The Quilting Ladies with literary sources to investigate the history of quilting; the art and craft of quilting; how quilting groups support communities, and how communities may or may not support the groups themselves; and, finally, the stories of quilting. While quilting traditions may appear to be declining, every quilt has a story if we take the time to listen. Ultimately, I discovered how quilting remains an important aspect of community service that fosters the continuation of an important folk art.



5. Jessica Bearse

University of Tennessee, Martin

Faculty Mentor: Paula Gale



Nutrient Dynamics in Soils under s Mixed cover Crop

The NRCS as well as other agencies are recommending that farmers incorporate mixed species cover crops into their farming practices. The purpose of our experiment was to monitor the levels of various parameters including, pH, N, P and K, in the soil where a mixed cover crop was planted. The cover crop was planted at four different rates, $\frac{1}{2}$, 1, $1\frac{1}{2}$, and 2 times the NRCS recommendation of mixed species cover crops. Management of the cover included planting, rolling, and chemical burndown. Soil samples were collected during active growth and following each of the termination steps as well as after a soybean crop was planted. pH decreased significantly as the recommended cover crop seeding rate increased. Potassium also showed distinct differences based on the cover crop planting rate. There was limited variation amongst the other nutrients based on the cover crop planting rate. In order to fully understand the benefits of mixed species cover cropping, more research should be done. However, it is our belief that mixed species cover crops can help to keep soil healthy by providing diverse cover and organic matter.

6. Blaine Gundersen

Austin Peay State University

Faculty Mentor: B. Renkyl



Love. Hate. Love.

This exploration through the human body combined with art making creates a unique and unparalleled experience for the viewer. Often there is no bridge between science and art; this projects satiates this wan. The show will help promote the lifestyle that we should choose by showcasing the damage that is done to our bodies when we engage in certain behaviors. The actions we take on our bodies now can affects us negatively long-term such as drinking excessively, taking recreational drugs, and smoking. These affect our organs even if we do not noticeable immediately. The focus of organs include the liver, heart, and lungs. There will be a set of these organs as pristine sculptural pieces of artwork by using traditional paper cutting techniques as the original state of our own bodies. The second set of these organs will include the “destroyed” versions by using the objects that render organs useless. It adds a sign of warning to the viewer. It will create a new form of expression while using organs as a means of communicating the harsh reality of one’s actions over time. It will create an intimacy, originality, and individual aesthetic for each piece within the body of work.

7. Soomin Choi

Tennessee Technological University

Faculty Mentor: ChaBum Lee



Low-cost and high speed surface roughness measurement by using a capacitive sensor

Manufacturing and automotive engineering sector led to how accurate and fast current development has become. It has directed a new method for measuring an affordable way rather than traditional methods. The objective of this term project is to test a novel surface roughness measurement method by sensing changes in capacitance between the sensor facet and the measurement target. Our hypothesis is that the capacitance between the sensor facet and the measurement target is proportional to the effective surface area that it increases as the measurement surface becomes rough. In order to test our hypothesis, we will relate capacitance change with surface roughness by using the capacitance sensor and surface finish scale.

Area averaging techniques such as optical, ultrasonic and laser scanning methods are useful alternatives compared to the more traditional profiling methods for specifying the surface parameter. The instrument readings are based on a limited number of line samplings such as C9, a texture scale, which may not represent the real characteristics of the surface under investigation. It is also limited to a sampling length which may not represent the overall surface. Due to these drawbacks, these types of instruments are not suitable for high-speed and low-cost automated inspections.

8. Alexander Forgey

University of Tennessee, Chattanooga

Faculty Mentor: Amanda Wintersiek



Student Opinion and Effects of Tennessee's Faculty Carry Law

Recently, Tennessee passed a campus carry law that allows faculty to carry on campus. Sixteen months after the law was passed I surveyed students at UT Chattanooga to determine opinions on the law and feelings of safety (N=297). In addition, I looked at variables such as major, sex, race, gun ownership, and ideology to see how they influence opinion formation. Finally, I contacted UTC police to see how many faculty/staff had registered to carry since the law took place. I found that less than 5% of faculty/staff have registered, 56% of students reported favoring the law, and outside variables do influence opinions on gun laws.

9. Jasric Bland

University of Memphis

Faculty Mentor: Deranda Lester

Examining the Effect of Diet on Mesolimbic Dopamine Release and Psychostimulant Addiction

Dopamine transmission in the mesolimbic dopamine system is associated with reward and reinforcement behaviors. Natural rewards in our environment, such as food, can increase dopamine levels in the nucleus accumbens. Drugs of abuse also act on this reward pathway, driving behaviors related to addiction. Previous animal studies have shown that high fat diets can lower behavioral responses to psychostimulants. The current study compared the effect of a high fat diet (Western diet), vegan diet (Daniel Fast diet), and standard lab chow (control diet) on dopamine release in mice before and after administration of a psychostimulant (the dopamine reuptake blocker nomifensine). Fixed potential amperometry was used to record real-time dopamine release in the nucleus accumbens of anesthetized mice. The mice on the Western diet had decreased dopamine release compared to Daniel Fast and control diet mice. Additionally, Western diet mice had a decreased dopaminergic response to the psychostimulant compared to Daniel Fast and control diet mice. These data indicate diet can alter neurotransmission. Thus, diet may be a therapeutic target for people dealing with dopamine-related disorders (such as ADHD, addiction, and schizophrenia). Furthermore, dopaminergic drugs, which are commonly used medically and recreationally, may affect individuals differently based on diet.



10. Farah Ismail (Wendy Wilburn)

Tennessee State University

Faculty Mentors: Margaret Whalen

Exposure of Human Immune Cells to Triclosan Alters the Secretion of Interferon gamma

Triclosan (TCS) is used as an antifungal and antibacterial agent in many products such as: toothpaste, soaps, detergents and cosmetics. It is found in human blood and tissue samples. Interferon gamma (IFN γ) is important for immunity against intracellular pathogens and for tumor control. As a pro-inflammatory cytokine, inappropriately elevated levels of IFN γ can cause chronic inflammation, which has been shown to enhance the development and progression of certain cancers as well as other diseases. Accurate regulation of IFN γ levels is important to avoid the loss of immune capability or the occurrence of chronic inflammation. The aim of this study is to investigate whether TCS alters the secretion of IFN γ from human immune cells. Human peripheral blood mononuclear cells (PBMCs) were treated with 0 - 5 μ M TCS for 24 h, 48 h, and 6 days. After a 24 h exposure to TCS there were significant increases in IFN γ secretion. Increases in IFN γ secretion were also seen after 48 h and 6 day exposure to TCS at certain concentrations. Thus, it appears that TCS is capable of disrupting secretion of this important immune system regulating cytokine which could have the potential to increase the potential for chronic inflammation.



11. Elle Johnson

University of Tennessee, Knoxville

Faculty Mentor: Laura Miller

The Role of Social Support on College Freshmen Eating and Nutrition Habits

Evidenced by the trope of the “freshman 15,” college student nutritional habits can have both a short term and life-long impact on health and well-being. Social support has been well documented to encourage healthy eating. However, little is known of social support’s role in the context of college student nutrition. Therefore, the following research question was posed: What role does social support play in helping college freshmen maintain healthy eating habits? This qualitative study uses in-depth interviews to explore what types of social support college freshmen receive, perceive they could receive and wish they were receiving in regards to healthy eating and nutrition. First-year students living on-campus with a meal plan at the University of Tennessee, Knoxville are interviewed about the frequency and types of conversations had about healthy eating with peers and family. The interviews also explore the role of university support in encouraging student nutrition. A thematic analysis of interview transcripts using a constant comparative method will provide qualitative data to organize and identify emerging themes. The results of this study will address the social support needs of college freshmen and set the foundation for proposed university policies and initiatives to support student nutrition on a social level.



12. Brooke Fitzwater (Alejandro Perez-Matus, Evie Wieters)

Middle Tennessee State University

Faculty Member: Dennis Mullen

*Effects of predation risk on habitat selection by two cryptobenthic blennies (*Helcogrammoides* spp.) in a central Chilean coastal ecosystem*

Prey fish species have been shown to alter their behavior in the presence of predators, and predation has been shown to alter habitat selection in fish as well. Two species of cryptobenthic marine blennies, *Helcogrammoides chilensis* and *Helcogrammoides cunninghami* (Family Tripterygiidae), are found on the productive shallow coasts of Chile which are dominated by heterogeneous habitats containing *L. trabeculata* and rocky reef beds. The objective of this research was to determine if the presence of a predatory fish (*Sebastes oculatus*) affected habitat selection by these two triplefin blennies. *Helcogrammoides* specimens were placed individually in a large circular pool and were allowed to select between three habitats (“*L. trabeculata*,” “rocks,” or “no choice”) for a duration of ten minutes. Two adjacent, translucent compartments were on either side of the habitat choices, and a singular *S. oculatus* specimen was either present or absent from one of these compartments during the trial. Trials were filmed and video footage was later analyzed to determine *Helcogrammoides* habitat choices. Preliminary results showed that predator influence on habitat selection by *Helcogrammoides* spp. is likely, and the research is ongoing.



13. Jessica Chambers
East Tennessee State University
Faculty Mentor: Diana Morelen



*Internalizing Symptoms Associated With Emotional Abuse:
An Examination of Religious Social Support as a
Moderating Variable*

Emotional abuse in childhood is linked to an increased risk for internalizing symptoms such as depression and anxiety in adulthood. Religious social support offers a promising defense in maintaining mental well-being in the face of trauma. This study aims to investigate if religious social support in childhood will moderate the impact of negative outcomes associated with emotional abuse. Further, this study will examine whether and how gender and ethnicity impact this relationship. The sample includes undergraduate students attending East Tennessee State University (ETSU), located in the southeastern United States. Participants completed an online survey that asked about childhood experiences (e.g., emotional abuse, emotion socialization, religious social support) as well as current mental health (e.g., anxiety, depression). Data will be evaluated utilizing multiple-regression analysis to determine whether anxiety and depression associated with childhood emotional abuse decreases in the presence of religious social support in childhood. Further, participant gender and ethnicity will be considered as moderators of the proposed model.

14. Lane Brown
University of Tennessee, Martin
Faculty Mentor: Jozsef Devenyi



*Multistep Organic Synthesis in Introductory
Undergraduate Organic Chemistry*

A multistep synthesis requires special planning since each step of is inherently linked to the next: the product of the first step serves as the starting material of the second step, and the latter is carried on to be used as the starting material of the third step, *etc.* A multistep organic reaction scheme suitable for introductory organic chemistry labs was successfully developed as well as introduced into the Fall 2017 laboratory curriculum. Students are especially appreciative of laboratory experiments in which their “book knowledge” is reinforced and in which they see the progression of their experimental results toward the final target compound. The sequence of reactions includes a Diels-Alder reaction, hydrolysis of the Diels-Alder product, esterification of the obtained diacid and, finally, the bromination of ester. Analysis by IR, ^1H and ^{13}C NMR confirmed each intended product except the dibromo substance. Each reaction step of the sequence was repeated multiple times to ensure excellent reproducibility.

15. Jordan Miller

Austin Peay State University
Faculty Mentor: J. Nicholson



Accurate Localization for Small Scale Mobile Robots

The poster will discuss the design and implementation of an autonomous table-top robot that will be used to develop and test vision-based algorithms. The goal is to accurately move the robot based on the input of a single camera attached to the top of the robot. The robot was designed using off-the-shelf hardware and is built using a layered design. The robot is driven using two continuous servos and is controlled using a Raspberry Pi with a HAT. We are currently working on developing the control software to control the servos and camera using a custom python library. Once that is completed, we will begin developing the localization algorithm, which will be a proportional-integral-derivate controller (PID controller). The algorithm will use visual clues of target sizes to accurately control the continuous servos for precise positioning.

16. Seth Crum (Sarah Bowman, Xiaohua Jiang)

Tennessee Technological University
Faculty Mentors: Edward Lisic



Synthesis and characterization of pyruvic aldehyde 1 oxime thiosemicarbazones and their complex formation with Cu(II)

Thiosemicarbazone ligands and their metal complexes have been seen to inhibit Topoisomerase II- α , a popular target of chemotherapy, as has been described in the literature. The new thiosemicarbazone ligands, pyruvic aldehyde-1-oxime [x]-thiosemicarbazone (PAO-xTSC's) and their metal complexes with Cu(II) have been synthesized. The ligands were characterized and analyzed by ^1H Nuclear Magnetic Resonance spectrometry (NMR), ^{13}C NMR, $^1\text{H}^{13}\text{C}$ HSQC, and $^1\text{H}^{15}\text{N}$ HSQC. The compounds were then tested in a Topoisomerase II- α relaxation assay, and this poster will present our findings.

17. Kirsten Hein

University of Tennessee, Chattanooga
Faculty Mentor: J Hill Craddock

*Implementing Early Screening Methods to Detect Resistance to *Thytophthora Cinnamomi* in First-Backcross Chinese-American Chestnut Hybrids*

The objective of our research is to implement early screening methods for PRR resistance in Chinese-American chestnut hybrids. Individuals were inoculated with *P. cinnamomi* prepared on V8 agar medium and a rice-grain inoculum, during the midsummer months, and later screened at the end of the growing season. Survival quotients of the American-Chinese backcross families ranged from 8% to 39%, while the survival quotients of the American and Chinese controls were 20% and 58%, respectively. Higher survival quotients of several backcross families relative to the American chestnut control group suggests that PRR resistance was inherited by a large portion of backcross progeny in these families. The 58% survival quotient observed in the Chinese chestnut control group implies that high disease pressure existed in our greenhouse screening conditions. Higher survival quotients of several backcross families relative to the American chestnut control group suggests that PRR resistance was inherited by a large portion of backcross progeny in these families.



18. Nic Bradley

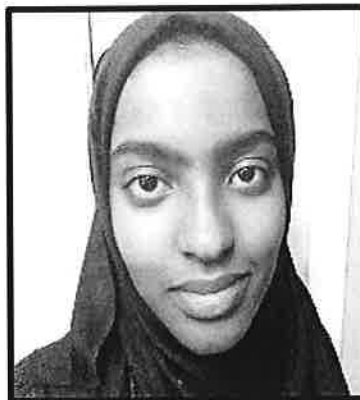
University of Memphis
Faculty Mentor: Antonio de Velasco

Political Police Project

The goal of the Political Police Project is to create a resource for citizens, journalists, and historians, which documents and catalogues the history of the Memphis Police Department and its use of surveillance, specifically of political opponents, activists, and actions. The City of Memphis is bound by a 1978 Consent Decree which specifies, amongst other things, that “the City of Memphis shall not engage in political intelligence.” Memphis is in breach of that contract. Through an ethnographic study, this research has sought to answer the questions: To what extent does the City of Memphis engage in political surveillance? How does the administration communicatively and bureaucratically navigate legal obstacles? What rhetorical strategies do activists utilize to oppose administrative practices? To answer these questions, an ever-growing evidence of surveillance and the narratives surrounding issues of surveillance has been and continues to be gathered. This is reported through a maintained website, which features an interactive timeline dating back to 1827 and is updated concurrently as new developments arise. The history of MPD surveillance is told through newspaper articles, official documents, Freedom of Information Act requests, corroborated testimonies, firsthand researcher accounts, and audiovisual and photographic resources.



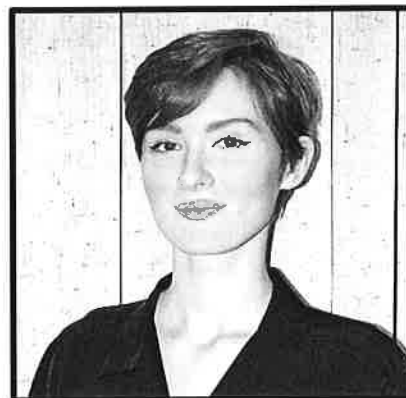
19. Nafisa Hamza (Mariam Boules)
Tennessee State University
Faculty Mentor: Margaret Whalen



Tributyltin Effects on Akt/Protein Kinase B and Ribosomal S6 Protein Phosphorylation

ERK1/2 and p38 mitogen activated protein kinase (MAPK) pathways are activated by exposure to the environmental contaminant tributyltin (TBT). TBT is found to contaminate a number of food products that humans consume resulting in measureable levels in human blood (as high as 261 nM) as well as other tissues. Recent studies have shown that TBT at certain concentrations increases the production of the pro-inflammatory cytokine interleukin 1 beta (IL-1 β) from human lymphocytes without increasing the mRNA for IL-1 β . TBT-induced production of IL-1 β appears to require the ERK1/2 and p38 pathways. TBT may be activating other pathways such as Akt/protein kinase B (PKB) which could also contribute to its ability to increase IL-1 β production. Additionally, downstream substrates of both ERK1/2 and Akt/PKB can lead to the activation of protein synthesis in part by stimulating phosphorylation of the ribosomal S6 protein. The current study examines whether TBT is able to activate Akt/PKB and S6 phosphorylation as possible mechanisms for TBT-induced increases in IL-1 β production. Initial results indicate that exposure to TBT increases the activation of Akt/PKB and S6. Thus, it is possible that TBT is stimulating IL-1 β production by activating both MAPK and Akt/PKB signaling pathways leading to increased translation of IL-1 β .

20. Valerie Lick
University of Tennessee, Knoxville
Faculty Mentor: Samantha Murphy



The Cold War at Home: Impact of Anti-Communist Government on Women's Activism

The early Cold War, defined as the years from roughly 1945 to 1965, was a period of social unrest and political suspicion for the United States. The branches of the government tasked with investigating potential Communists, such as the HUAC, viewed many political and economic organizations as potential hotbeds of Communist activity. Interactions between the anti-Communist government and citizen organizations during this era are extensively studied. However, much of the body of research does not address the way that gender expectations informed the government's anti-Communist efforts against organizations led by or comprised of women. This project examines various women-led campaigns of the era and government action against them in terms of gender and family dynamics in order to show the importance of these dynamics in analyses of Cold War government. It also analyzes the social and political reasons for the government to suspect women's organizations of Communist activity or ideology, as well as the successful strategies used by women's organizations to avoid or survive government action. The government's anti-Communist actions disproportionately targeted American women's campaigns for social, economic, and political change during the early Cold War because of the threat they presented to gender.

21. Natalie Foulks

Middle Tennessee State University

Faculty Mentor: Kathryn Blankenship

Narrative Discourse in Older Adults

This study examined the narrative performance in elderly individuals on two narrative tasks using personal and pictorial stimuli. The quality of narratives produced by typically and atypically (i.e. a stroke or Parkinson's disease) aging elderly were compared as well as the quality of narratives produced by the personal stimulus and the pictorial stimulus. The narratives were examined on the total number of T-units used, use of cohesive ties, narrative relevancy, total dysfluencies, and lexical diversity. This study found that there were significant differences in the quality of narratives when produced from different stimuli and from elderly individuals of different ages. Also, this study showed that there are significant differences in narrative discourse performance in atypically aging adults compared to typically aging adult. The findings of this study provide information regarding the characteristics of narratives produced by individuals at different stages of the aging process on two narrative tasks.



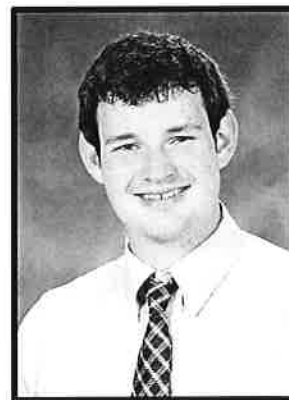
22. Dustin Gilmer (Eunice Hong, Derek Siddel, Abbey Merriman, Alexander Kisliuk, Shiwang Cheng, Amelia Elliott)

East Tennessee State University

**Faculty Mentor: Tomonori Saito (ORNL) &
Richard Ignace (ETSU)**

Novel Binder Development in Binder Jet Additive Manufacturing to Improve Green Part Strength

Additive Manufacturing (AM) of metals is a potentially disruptive technology that could significantly change the value chain in industries such as aerospace, automotive, tool-manufacturing, and medical industry. A few AM methods can create metal parts, mainly utilizing powder bed fusion such as (Selective Laser Sintering, SLS, Selective laser Melting, SLM, and Electron Beam Melting, EBM). Many challenges though exist in the powder bed fusion processes, due to thermal stresses within the printed parts, operator burden in completing the build process, and overall cost of the equipment. Binder Jet 3D printing utilizes inkjet technology to selectively deposit binder into a powder bed and it exhibits significant potential for metal AM. One challenge that limits binder jetting technology is its green part strength, which limits application of the process due to broken parts and geometric inflexibility. The research presented here introduces a new binder system utilizing a difunctional monomer binder. This monomer when heated polymerizes and holds the structure of the printed green part before sintering. The novel binder successfully increases the strength of the green part and allows more flexibility in geometric design. This presentation summarizes efforts on optimizing various parameters including viscosity, surface tension, solution composition, drop size, curing temperature and time with respect to the new binder system.



23. Kaleb Byars

University of Tennessee, Martin

Faculty Mentor: Patrick Baker & Paula Moore

Unclaimed Property: Uncertainty with Tennessee's Adoption of the Revised Uniform Unclaimed Property Act and Related Income Tax Liability



The Uniform Law Commission proposed several versions of the Uniform Unclaimed Property Act since 1954. In 2016, the ULC proposed the most recent version, the Revised Uniform Unclaimed Property Act (RUUPA). Tennessee, along with three other states, adopted RUUPA. While Tennessee's adoption of RUUPA addresses many issues that arose from past iterations of the Act, several unanswered questions remain. This paper will address three ambiguities associated with RUUPA and the income unclaimed property generates: the potential for an unconstitutional claim by Tennessee for interest accruing on unclaimed property, a derivative rights issue, and income tax liabilities associated with unclaimed property.

24. Ronnie Roberts

Austin Peay State University

Faculty Mentor: L. Wells

Becoming more prepared: How to create change in college students by focusing on reading abilities



Tennessee universities and community colleges are exploring ways to increase retention and graduation of an increasing number of students. It is important to identify and implement strategies that will favorably impact student learning. History classes are naturally reading and writing intensive, thus providing an appropriate context for additional reading comprehension support as well as support in expository writing.

The purpose of this study is to determine if direct instruction of proficient reader strategies, identified by Keene and Zimmerman (1997), enhance student reading comprehension and writing proficiency. These strategies will be taught through reading and analyzing 18th century primary source documents. Students will then rewrite the documents in 21st century language. The question to be addressed in this research study is: "To what extent does analyzing, reconstructing, and modernizing historical 18th century documents enhance students' reading comprehension and writing proficiency?" The research hypothesis for this study is that analyzing, reconstructing, and modernizing historical 18th century documents will improve reading comprehension and writing competency.

25. Madison Fulmer

Tennessee Technological University

Faculty Mentor: Tammy Boles

Screening method development for identification of nontargeted designer drugs by GC-MSⁿ and LC-MS/MS

Recreational use of synthetic drugs is a problem in Tennessee and nationwide. Cannabinoids (synthetic marijuana) and cathinones (bath salts) are among the biggest problems. The criminal justice system has a difficult time keeping up with the detection of nontargeted drugs that are constantly being altered, creating new drugs that are technically not illegal. Laboratory personnel need published analytical methods for compounds in for forensic application purposes, and we have been given a list of unidentifiable nontargeted compounds that require published methods. This research focuses on developing easier, faster methods for detecting nontargeted drugs using instrumentation available in forensic chemistry labs. Identification of nontargeted unknowns will turn them into targeted knowns and allow feedback of information to spectral libraries to benefit the forensic analytical community. Published GC-MS methods were analyzed and reproduced using our instrumentation. We created new methods using GC-MSⁿ and LC-MS/MS to be able to separate different compounds. We validated the methods using known standards of various concentrations and analyzed unknown samples provided by the Tennessee Bureau of Investigation using our methods.



26. Hannah Rose Margavio

University of Tennessee, Chattanooga

Faculty Mentor: Sungwoo Yang

Radiative Properties of Silica Aerogel

A way to decrease energy consumption for large buildings with many glass windows is to bind silica aerogel to the glass. With its high porosity, low density, low refractive index, high transparency, and low thermal conductivity silica aerogel makes an excellent medium for scattering and reflecting light. The less light that penetrates the glass, the less the room will heat up, and the less energy is consumed to cool it down to a comfortable temperature. The purpose of my research is to quantify and model the radiative properties from measured transmittance and reflectance spectra of the aerogel sample as a function of the optical depth of the sample and intensity of light by solving the inverse problem of the 1-D Radiative Transfer Equation for intensity.



27. Johnny Carter

University of Memphis

Faculty Mentor: Leah Windsor



The Effects of US Economic Hegemony on Cultural Values

Why do countries with strong economic ties to the United States align their cultural values with Western preferences or priorities? The United States is, and historically has been, a global economic hegemony. This hegemony does, in turn, create a global cultural hegemony. Through the interconnectedness of economic globalization, there is a diffusion of western cultural values. Therefore, in this paper I intend to explain the effects of US economic hegemony on cultural values of individualism. To explain this, I plan to explore the process of cultural alignment over the past 30 years in its correlation to the US hegemony. I will be using the world values survey as a data source to reflect the values of each country; while also using dependency on United States trade, the amount of United States companies within the country, and the amount of marketing by those companies to show the amount of financial investment. The amount of United States financial investment within a country should cause their values to begin to align with American values over time. This study is important in order to explain and observe the possibility of financial influence as a facilitator of social and political influence over values.

28. Sara Jamal (Wendy Wilburn)

Tennessee State University

Faculty Mentors: Margaret Whalen



Triclosan alters the secretion of Tumor Necrosis Factor alpha from human immune cells

Triclosan (TCS) is an environmental contaminant added as an antibacterial agent to many products including mouthwashes, soaps, toothpastes, and deodorants. TCS can be absorbed through skin and mouth and has been found in human blood and other tissues. Tumor Necrosis Factor Alpha (TNF α) is an essential pro-inflammatory cytokine produced by immune cells. Increased levels of TNF α cause production of additional inflammatory cytokines. Inappropriate elevation of TNF α can lead to chronic inflammation which contributes to a number of disease states including cancer. The current study investigates the effect of TCS exposure on TNF α secretion from immune cells. Peripheral blood mononuclear cells (PBMCs) were treated with TCS at concentration of 0.05-5 μ M for 24 h, 48h, and 6 days. Result showed that 24 h exposures to TCS caused significant increases in TNF α secretion at 5 μ M in cells from 4 separate donors. This increase maintained at 48 h and 6 days of exposure. These data show that exposure of (PBMCs) to TCS alters the secretion of TNF α . TCS has the capacity to increase this important master regulator of inflammation, which would have the potential to lead to development or exacerbation of several disease states.

29. Gayatri Nandwani
University of Tennessee, Knoxville
Faculty Mentor: Erin Darby



Archaeometric Approaches to the Roman Near East

The purpose of my research this summer has been to participate in a full suite of archaeometric and geoarchaeological analyses, particularly as they are applied to sedimentology. The first section of my research focused on an introduction to these procedures at the UT Archaeological Research Laboratory (ARL), including laboratory safety procedures, proper sample collection and processing methods, and introduction to methods and purposes for a variety of laboratory analyses including grain size distribution analysis, organic matter and inorganic carbon analysis, and microartifact analysis. Preliminary geoarchaeological field investigations were carried out by Howard J. Cyr, the project geoarchaeologist (University of Tennessee Archaeological Research Laboratory) during the 2015 and 2017 seasons at 'Ayn Gharandal in Jordan and these data were analyzed by Cyr and myself. The primary research goal was to test the applicability and feasibility of geoarchaeological methods at the site and measure natural change and anthropogenic impact. The preliminary results clarify natural environmental change over time at the site, indicate the nature of anthropogenic impact, and suggest that the natural landscape as it appeared in the Roman period continued for some time and differed significantly from the landscape as it appears today.

30. Lauren Hennessee
Middle Tennessee State University
Faculty Mentor: David Carleton



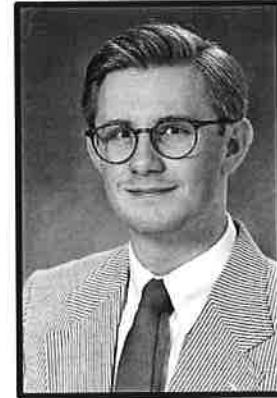
Why Do Some States in the Middle East Have a Higher Level of Democratization than Others?

Democratic principles have rarely flourished in the Middle East throughout the region's history. This project considers three independent variables that are possibly predictive of levels of democratization. Gross domestic product figures, attained levels of education, and the economy's level of dependency on natural resources were all evaluated for potential effects on measured levels of democracy. This project compares findings on these variables in four states in the Middle East: Israel, Turkey, Syria, and Uzbekistan. I hypothesized that the variables of GDP and education have a positive relationship to democratization levels, and that the dependency of natural resources in the economy would have a negative relationship to levels of democratization. When evaluating the level of democracy for each of the four states, I consulted the Freedom House Democratization scores. Israel and Turkey were two higher scoring states in this region, while Syria and Uzbekistan were two of the lowest scoring states in the Middle East. When considered the variable of GDP, I referred to the World Factbook statistics for the percentage growth of GDP and GDP per capita for each of the four states. To look into education's effect of democratization I relied on the United Nations' Human Development Reports for data on the average number of years spent in school. I also consulted literacy rate statistics from the World Factbook provided by the Central Intelligence Agency. To further evaluate education's effect on democracy, I evaluated the percentage of the relevant aged population that completes primary, secondary, and tertiary levels of schooling provided by the reports from the World Bank. To determine the possible effects of natural resources in a state's economy, I looked into the World Factbook's data on oil, petroleum, and natural gas exports, as well as their reports on the total percentage of GDP derived from natural resource rents. After concluding my research, I was able to accept all three parts of my hypothesis when defined on specific terms. The conclusions made from this research can be used to better understand what factors contribute to why some states in the Middle East experience greater levels of democracy than others, and having such insight might be beneficial when considering political dilemmas involving related matters.

31. Holdon Guy

East Tennessee State University

Faculty Mentor: Hadii Mamudu



Diffusion of 100% Tobacco Free Policies in Higher Education Institutions in Tennessee

Annually, tobacco use in Tennessee (TN) causes over 11,000 premature deaths and \$5 billion in economic costs. Cigarette and smokeless tobacco use among adults age 18-24 in TN is higher than national averages (18.5% vs. 16.8% and 8.9% vs. 8.0% in 2015). As 99% of smokers start by age 26, it is crucial that higher educational institutions (HEIs) act to reduce usage of tobacco and alternative tobacco products (ATPs) such as e-cigarettes among students with school tobacco policies (STPs). The objective is to analyze previous STP rating systems, discuss obstacles to STPs in TN, rate the STPs in TN, and encourage HEIs to adopt 100% Tobacco-Free Policies (TFPs). This project method is a five-phase mixed-methods approach with qualitative and quantitative assessments. This involves literature reviews of previous efforts, ten focus group discussions with students to discuss obstacles to STPs, developing a rating system to compare STPs, assessing the 108 STPs in TN, and publishing results. Of the STPs from the 49 public institutions in TN published online, 11 lack coverage for ATPs, and 6 only limit smoking within certain building radii. Currently, no best practice TN policy instrument exists to guide HEIs in developing policy; hence, developing one is necessary.

32. Stephen Harris

University of Tennessee, Martin

Faculty Mentor: Robert LeMaster/Doug Sterrett



Solid Propellant Rocket: A Student Researched and Designed High Power Solid Rocket Motor and Flight Vehicle

It has been almost half a century since humans last set foot on the moon. Manned deep space exploration has stagnated and the excitement that the Apollo missions created in the fields of science and engineering has been lost. Several engineering students have decided to channel their enthusiasm about space towards the design and fabrication of a high power solid rocket motor and flight vehicle for their senior design project with the goal of flying to 10,000 feet and landing safely. The project includes propellant design and characterization, static testing of rocket motors and the analysis of the flight regime to design the optimal airframe. The rocket will be entered into the Spaceport America Cup in June 2018. It is with the hope that the project will do its part to engender excitement about science and engineering in current and future students.

33. Sarah Grossarth (Sarah Bowman, Jessica Hill,
Xiaohua Jiang)
Tennessee Technological University
Faculty Mentor: Edward Lisic



*Human topoisomerase II α inhibition by new palladium (II)
and platinum (II) complexes of a 2-acetylpyrazine tert-
butylthiosemicarbazone ligand*

The new ligand, 2-acetylpyrazine- tert-butylthiosemicarbazone (APT-tBTSC) and its palladium (II) complex, and its platinum (II) complex have been synthesized. After the synthesis process, the ligand and metal complexes were characterized and analyzed by ^1H Nuclear Magnetic Resonance spectrometry (NMR), ^{13}C NMR, ^1H - ^{13}C HSQC, and ^1H - ^{15}N HSQC. The acronym HSQC stands for Heteronuclear Single Quantum Coherence. We have determined that this thiosemicarbazone compound ligates to Pd and Pt in a tridentate monoanionic fashion forming a metal complex with the formulas $[\text{Pd}(\text{APZ-tBTSC})\text{Cl}]$ and $[\text{Pt}(\text{APZ-tBTSC})\text{Cl}]$. The metal complexes were tested for biological behavior with a panel of seven microbes. The palladium complex is found to be highly active against Gram positive bacteria. The results of the human topoisomerase II α inhibition will be presented.

34. Rachel Peters
University of Tennessee, Chattanooga
Faculty Mentor: Han Park



Sound of Photoacoustics: Making Music With Light

Methods of photoacoustic spectroscopy were applied to observe the properties of light and demonstrate unique tones produced by ethylene gas as it was modulated at specific frequencies for the sake of creating a stimulating and educational demonstration that was aimed at explaining fundamental principles of the photoacoustic effect. To display the audible phenomenon that occurs as laser radiation gets absorbed by ethylene gas, the frequency of a mechanical chopper was altered according to specific frequencies correlating to musical notes, ranging from 262 Hz to 4186 Hz. Multiple variables were then adjusted to determine their effect on the photoacoustic signal and to replicate factors influencing the tones produced by musical instruments. Data was recorded at the fundamental frequency of each variable, and then compiled into demonstrative videos for the sake of comparison. It was observed that for each change in variable, changes in sound occurred. This is the first experimental study of the photoacoustic effect to produce music using only a laser and gas.

35. Kenya Ector

University of Memphis

Faculty Mentors: Deranda Lester

The Effect of Diet on Locomotor Activity and Anxiety Using Open Field Testing

Research shows one is at risk for developing cardiovascular disease if consuming foods high in saturated fats. There is not as much research that shows how different diets effect psychological functioning. The research conducted shows that animals and humans who consume a high fat diet experience anxiety but are not susceptible to developing drug addiction. This experiment compares a high fat diet (Western diet) to a low fat diet (Daniel Fast diet) and a control diet measuring their behavioral functioning related to addiction and anxiety using open field testing. The Daniel Fast and control diet mice had similar weights and behavioral activity, but the Western diet mice weighed significantly more and displayed more anxiety behavior and less addiction behavior. The Western diet mice experienced less locomotor activity and rearing one time during testing and less percentage of time spent in the center of the open field during another testing period compared to the Daniel Fast and control diet groups. This shows that a high-fat diet can have varying effects on mental functioning of individuals leading to how altering a diet can be a source of treatment for those with anxiety and substance use disorders.



36. Danelle Solomon

Tennessee State University

Faculty Mentor: Tom Byl & De'Etra Young

Sulfide-rich Groundwater Enhanced Seedling Growth and Photosynthesis

Previous research found water artificially enriched in sulfide stimulated plant growth and biomass. This study's objective was to determine if groundwater from Tennessee State University's farm wells, naturally rich in sulfide, stimulated plant growth. Lettuce, radish and oats seedlings raised using waters from a well containing high sulfide (65-115 mg/L) were compared to seedlings raised in control water where the sulfide had been oxidized into sulfate. Seeds were germinated using the experimental waters and raised in a growth chamber at 20°C. After 4 weeks, the oatseedlings raised in sulfide-water had 3x more lateral roots and 18% greater biomass than plants raised in control-water. Lettuce and radish seedlings raised in sulfide-water were significantly taller than those raised in control water. Plants raised in sulfide-water had a 40% increase in cell wall peroxidase activity, leading to stronger cell walls. Sulfide plants were 3-times more efficient at CO₂ uptake during photosynthesis. TSU's sulfide-water prompted faster growth, stronger plants and enhanced photosynthesis.



37. Jessica Ossyra (Aaron Crigger)
University of Tennessee, Knoxville
Faculty Mentor: Thomas Meek



Fabrication of Dense UO₃ Pellets for Neutron Detection Applications

High-efficiency detection of neutrons is fundamental to societal safety and the advancement of a variety of fields including nuclear medicine, high-energy physics, nuclear energy, and radiochemistry. Helium-3 and boron trifluoride currently provide the vital capability of direct conversion neutron detection, but each present difficulties due to cost, rarity, and toxicity. While previous research on uranium oxides has focused on their use as nuclear fuels, recent research has shown these uranium compounds exhibit semi-conducting characteristics with a broad range of electrical properties. These properties make them potential candidates for use as direct conversion neutron detectors.

UO₃ discovered to not densify through traditional sintering methods (i.e. solid state sintering). Additionally, UO₃ when left at atmospheric conditions, was found to form hydrates. These were visible through a color change over time.

This project determined a procedure for fabricating uranyl oxide pellets and verified validity through preliminary characterizations including density, resistivity, microstructure and PXRD.

38. Janie Kullmar
Middle Tennessee State University
Faculty Mentors: Kathryn G. Blankenship



Word Learning in Authentic Versus Explicit Conditions

This study compared the effectiveness of a vocabulary list (i.e., explicit environment) to a textbook passage (i.e., authentic environment) for the initial exposure of domain-specific vocabulary from an anatomy textbook. This was posited as a superior form of introduction to complex material for students who struggle with the complex language of textbooks. The participants were college students majoring in speech-language pathology and audiology. The gain scores between groups were similar, and this was true of students with both high and low reading abilities, as measured by the reading score from the American College Testing (ACT). Student performance was highly variable, and many students performed poorly. This poor performance may be related to research design or student reading habits in general.

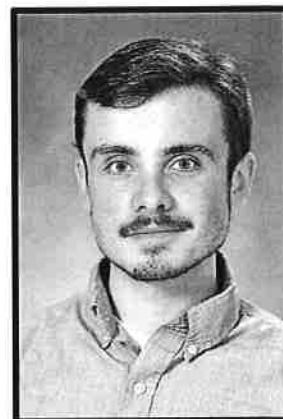
39. Luke Hiester

East Tennessee State University

Faculty Mentor: Jay Jarman

File Fragment Classification with Neural Networks: A Generalized Approach

This study investigated the application of neural networks to file fragment classification, which is the task of identifying the type of a small isolated segment from a digital file, as might be found when analyzing network traffic or the contents of storage devices. This problem is highly relevant to digital forensics, but despite the potential utility, at present no methods have been published which perform well universally. In this study, neural network models were tested due to their strength and history of success in the recognition of arbitrary patterns. Feedforward, recurrent, and convolutional networks were used in order to empirically determine the best type of model; however, each type of model itself has many parameters to select, on which the performance depends heavily. The results show that this approach has good potential, but models have not yet been found with sufficient accuracy to function as large-scale universal file fragment classifiers.



40. Amanda Mayo (Johnathan Travis)

University of Tennessee, Martin

Faculty Mentor: Joaquin Goyret

Mechanosensory sensitivity in Manduca sexta

Adult *Manduca sexta* are large, crepuscular/nocturnal hawkmoths that feed nectar. While hovering in front of a target flower, they extend their long proboscis and inspect the floral surface in search of a nectar reservoir. This inspection behavior has been shown to use mechanosensory (tactile) information, and proceeds using two stereotyped motor patterns. While on a smooth, flat surface, moths use a “tapping” behavior, which quickly switches to a back-and-forth “diving” behavior upon contact of grooved surfaces. Here, we set to use these distinct behaviors to better understand the spatial sensitivity of the tactile sense of the proboscis. As a first approach, we are offering moths 3D-printed artificial flowers of three different kinds: smooth, with grooves of 1 mm or with grooves of 0.1 mm. Evaluating the probabilities of triggering the diving behavior of the different flower models will allow us to begin to estimate the spatial sensitivity of the proboscis.



41. Parker Lusk

Tennessee Technological University

Faculty Mentor: Holly Stretz, Martha Wells

Detection of Lead Contamination in Water using Fluorescence of Functionalized Gold Nanoparticles

The goal of this research was to determine whether functionalized gold nanoparticles can be useful as a sensitive residential fluorescent sensor for lead contamination in drinking water. In the future, such nanoparticles could be dispersed into a membrane visible through a window inside a household tap filter. A large body of work exists in the literature concerning use of gold nanoparticles to detect lead. Almost all of these depend on a visible color shift, which is less sensitive compared to fluorescence and can confuse the consumer. The 5 nm diameter gold nanoparticles (GNPs) were functionalized with 11-mercaptopundecanoic (MUA) acid. Controls and MUA-GNPs were exposed to lead ion/water concentrations as low as the EPA drinking water limit, 15 ppb. The fluorescent response was tested using excitation/emission matrix spectroscopy (EEMS). Corrections were performed on the data for inner filtering and Raman and Rayleigh scattering of water. The GNPs were shown to detect lead at varying concentrations, enhancing the fluorescent intensities of fluorophores at some concentrations and quenching at others. This result is possible if the lead ion was changing the state of aggregation of the colloidal solution in a concentration-dependent manner for the ranges tested and concentration therefore affected the distance at which the ion was adsorbed/spaced from the GNP surface.



42. Kathryn Rouse

University of Tennessee, Chattanooga

Faculty Mentor: Hong Qin

The Effect of Dietary Restriction on Saccharomyces cerevisiae Lifespan

Dietary restriction (DR) increases lifespan in many organisms; however, its effect on individuals in genetically heterogeneous populations is unclear. Here, we are determining the effect of DR on lifespan for 4842 gene deletion strains in *Saccharomyces cerevisiae* with sample sizes greater than 30 cells. These genetic backgrounds have been used to describe association factor in yeast cells between 2% glucose (YPD) and 0.05 glucose (a form of DR) conditions. Here we present an overview of yeast lifespan data as a model to study aging and describe an approach by fitting yeast lifespan data with Gompertz aging model. We compare both mortality rate parameter (G) using genotype backgrounds and increase in mortality rate parameter (R) between YPD and DR conditions. Data-mining approaches are performed to find association factors with yeast aging to be used for generating predictive models of underlying lifespan, genotype-dependent responses to dietary restriction.



43. Alexis Nelson

University of Memphis

Faculty Mentors: Douglas Powell



Ankle bracing is associated with increased ankle and hip joint torques during a landing task

Ankle bracing is common in athletics for prevention and treatment of ankle ligament injuries. Little is known of the effects of ankle bracing on joint torques at the knee and hip. The purpose of this study was to quantify changes in ankle, knee and hip joint torques during a landing task in response to an ankle brace. Ten healthy recreational athletes performed a landing task off a box of 16 inches high with the ankle brace on the dominant limb. Three-dimensional kinematics and the ground reaction forces were collected simultaneously. Visual 3D was used to calculate joint moments at the ankle, knee and hip during 100 ms after initial contact. Data from the braced limb were compared to the unbraced limb. Analyses revealed that ankle ($p = 0.001$) and hip joint torques ($p = 0.022$) were significantly greater in the braced compared to unbraced limbs. No differences were observed at the knee ($p = 0.558$). Current findings show greater ankle and hip joint torques in the braced condition suggesting that ankle bracing may protect the ankle against frontal plane motion, but also increases joint loading throughout the lower extremity.

44. Hitesh Vaishnav (Kristin A. Kwakwa)

Tennessee State University &

Vanderbilt University

Faculty Mentor: Julie A. Sterling



Metastatic Prostate Tumors in Bone

Prostate cancer frequently metastasizes to the skeleton. The growth of prostate cancer cells in bone causes bone destruction known as tumor-induced bone disease, which can lead to life-threatening conditions such as bone pain, nerve pain, stiffness, and even bone fractures. Our lab has previously shown that PC3 cells (metastatic prostate cancer) cultured on rigid 2D films express higher levels of genes that promote the metastatic and bone-destructive phenotype, particularly the transcription factor Gli2 and parathyroid hormone-related protein (PTHrP). In order to study the expression of these genes in a more physiologically relevant environment, we created novel 3D scaffolds that mimic the trabecular structure of human bone at different sites including the femur, tibia, and vertebrae. In this study, we will culture PC3 cells on these scaffolds along with growth factors (TGF- β) and measure expression of Gli2, PTHrP, and ITGB3 via qRT-PCR and western blot. We hypothesize that the trabecular structure of bone can modulate the expression of Gli2, PTHrP, and ITGB3 in prostate cancer cells to promote the metastatic and bone-destructive phenotype. A better understanding of tumor cell behavior in the bone microenvironment can help researchers develop new therapies to treat tumor-induced bone disease.

45. Summer Smith

University of Tennessee, Knoxville

Faculty Mentor: Ahmed Bettaieb

Pyruvate Kinase M2 Deficiency Promotes a Brown Fat Like Phenotype in White Adipocytes

Obesity is a growing epidemic that presents a major health problem worldwide. The past decade has seen advances in the identification of specific factors that contribute to this condition. However, despite these strides, there is still much to be learned about the underlying mechanisms. A better understanding of these biochemical mechanisms will enhance our ability to prevent and treat obesity. The conversion of white adipocytes that store fat into brown adipocytes, which burn fat, represents an anti-obesity therapeutic strategy. This study demonstrates that knockdown of pyruvate kinase M2 (PKM2) changes white adipocytes into behaving like brown adipocytes. PKM2 is an enzyme that functions in glycolysis to catalyze the transfer of a phosphate from phosphoenolpyruvate to ADP resulting in the formation of pyruvate and ATP. The role of PKM2 in adipocytes is unexplored. In the present study, we focused on investigating the impact of PKM2 on white adipocyte cell fate or differentiation. We demonstrate that PKM2 is indeed expressed in both brown and white adipocytes. shRNA-mediated depletion of PKM2 in white adipocytes promotes the development of a brown fat-like thermogenic program. These novel findings demonstrate that PKM2 suppression in white adipocytes could constitute a potential strategy to prevent obesity.



46. Salman Rahmani

Middle Tennessee State University

Faculty Mentor: Nate Callender

Flow Control of 3-Dimensional Bodies Utilizing CFD

In aerodynamics, there is a classical, 2-Dimensional geometry which has been heavily examined due to various applications in real-world situations. This geometry is known as the Rearward-Facing Step (RFS). As a fluid flow travels over the edge of the step, the fluid is no longer “attached” to the step and begins to rotate, causing a low pressure recirculation region which produces drag. After numerous studies, it was determined that the recirculation region on the 2-Dimensional Step could be reduced by various methods such as rounding off the edge or by creating a slight taper at the trailing edge of the geometry.

This project, which was conducted by Salman Rahmani and overseen by Dr. Nate Callender, attempted to examine whether the same modifications on the 2-Dimensional RFS that produced drag-reducing results, would yield the same outcomes on a 3-Dimensional representation. In addition to testing the already-studied modifications, extensive observations were also conducted on a theoretical design which included rotating cylinders whose surface was tangential to the trailing edge of the 3-D geometry. The tested rotational speed ranged from zero rotational speed to twice the speed of the flow. The results of these examinations will be the focus of the presentation.

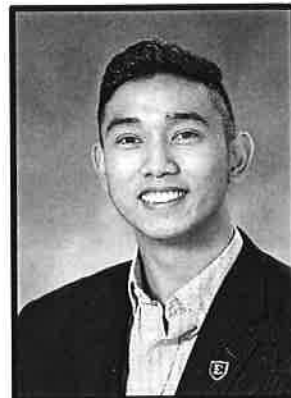


47. J.P. Mitra

East Tennessee State University

Faculty Mentor: Jeremy Ross

The Analysis of Different Methods of Construction Estimation: A Case Study of the ETSU Football Stadium and the ETSU Fine Arts Center



Considering the competitiveness of the construction industry, it is an important aspect of a project to be able to predict costs ahead of time accurately throughout the entire estimation process and add profits along the way. However, different factors (i.e. overhead, delays, cost variation) play significant roles in determining whether or not a project will be profitable. Thus, it is important to learn about what makes construction estimation so variable even among expert estimators within the same company. This study will look at the estimation methods used by BurWil Construction Company and Denark Construction, Inc. for the ETSU Football Stadium and the ETSU Fine Arts Center, respectively, as case studies for both post- and in-development construction projects. To analyze, the estimates used in different phases of the projects will be pitted against the most current cost of the project, being the final cost for the Football Stadium and the most up-to-date costs for the Fine Arts Center. Also, the different sections and their corresponding estimates will be inspected. As an ending discussion of the study, optimization efforts will be conducted to assess how current estimation methods can be improved.

48 Nathaniel Newlin

University of Tennessee, Martin

Faculty Mentor: Michael A. Gibson

*Preliminary Observations of organism-substrate relationships in *Astraeospongia*, *Astylospongia*, *Hindia*, and *Palaeomanon* from the Brownsport Formation (Silurian), Western Tennessee*



The Brownsport Formation (Middle Silurian) of West Tennessee contains abundant well-preserved *Astraeospongia*, *Astylospongia*, *Hindia*, and *Palaeomanon* sponges. Organism-sediment relationships and taphonomic characteristics of 102 sponges were studied in both the field and laboratory settings to elucidate paleosynecological biotic interactions (primarily with associated brachiopods, pelmatozoans, and corals) and sponge-substrate paleoecology. The sponges are in situ, of low-profile on the sediment floor to slightly semi-infaunal. Brownsport sponges occur between thinly-laminated mudstone to packstone interlaminated with thin shale. Sponge occurrence within fine-grained sediment is anomalous given that the mud would clog sponge ostia. These sponges do not occur as sclerobionts (epi- or endobionts), and have indistinct attachment points. Bedding contact occurrence, fine-grained infill of the sponge's concave atrium, shale drapes, overturned sponges, and their low profile indicate preservation resulted from episodes of rapid burial during turbid water kill-events (obruption?) that occurred during otherwise time-averaged clear-water Brownsport deposition. Secondary mineralization (chertification) has occurred exclusively within some sponge-rich horizons.

49. Anna Webb

Tennessee Technological University
Faculty Mentor: Brian Carver



Bat Genome Sequencing

Population genetic structure can provide pertinent and essential information for the conservation and management of rare species. *Corynorhinus rafinesquii*, or Rafinesque's Big-eared Bat, and *Myotis austroriparius*, or Southeastern Myotis, are two such bat species with overlapping ranges across much of the southeastern United States. At the state level, both species are regarded as threatened, endangered, or of greatest conservation need across nearly all of their range. As urbanization, fragmentation, and habitat loss continue, it is of the utmost importance to understand the population genetic structure and population connectivity of these two species in order to properly manage and conserve their populations. The overall objective of this study will be to understand the population genetic structure of *C. rafinesquii* and *M. austroriparius* in order to determine population connectivity and determine if there is sufficient gene flow to maintain a high level of genetic diversity within and among populations. Some of the sampled populations are disjunct, and it may be beneficial to create wildlife forest corridors to reconnect these populations for proper mixing of the gene pool and for maintaining genetic diversity. It may also be beneficial to construct artificial roosts across the range to support and better connect these populations.

50. Keith Wachter

University of Tennessee, Chattanooga
Faculty Mentor: Liza Soydan



Solution Scholars

Solutions Scholars gives UTC students the opportunity to provide low cost consulting solutions to local businesses in the Chattanooga area, in partnership with the TN Small Business Development Center (TSBDC). This semester, Solutions Scholars answered questions like "Who are my customers and how do I reach them?" or "How can I expand my business in the local, current market trends?". Using U.S. market data like MRI and IBIS reports, we provided a detailed layout of current consumers, trends and provided future opportunities. We're able to extrapolate precise data of what the businesses customers look like and what they're willing to spend their money on, helping focus the business's marketing needs.

51. Nick Paige

University of Memphis

Faculty Mentor: Deranda Lester

Examining Autoreceptor Functioning in the Nucleus Accumbens

The mesolimbic dopamine pathway consists of dopamine cell bodies in the ventral tegmental area (VTA) that project to the nucleus accumbens (NAc). Dopaminergic dysfunction in the mesolimbic pathway has been linked to conditions such as addiction, ADHD, autism, and depression. Dopamine autoreceptors sit on the presynaptic terminal and regulate dopamine release. Faulty autoreceptors, therefore, are a prime suspect for dopamine imbalances leading to conditions aforementioned. D2 receptors have a well-established role as autoreceptors, but the role of D3 receptors is less understood. The present study aimed to distinguish the regulatory role of D2 and D3 receptors on NAc dopamine release using in vivo fixed potential amperometry in anesthetized mice. Autoreceptor-mediated inhibition of dopamine release was measured before and after intra-NAc infusions of a D2 receptor antagonist, D3 receptor antagonist, or vehicle (control). Infusing a D2 receptor antagonist significantly decreased autoreceptor functioning compared to vehicle infusions ($p = 0.042$), whereas D3 infusions did not alter autoreceptor functioning relative to vehicle infusions ($p = 0.181$). Thus, results indicated D2 receptors function as autoreceptors, while D3 receptors do not. Autoreceptors may be a therapeutic target for dopamine-related disorders; therefore, determining these specifics regarding dopamine autoreceptor functioning has critical clinical relevance.



52. Kierra Ware

Tennessee State University & Meharry

Medical College

Faculty Mentor: LaMonica Stewart

The Combined Effect of Canagliflozin and Metformin in Human Prostate Cancer Cells

Recent studies have shown that two drugs used to treat type 2 diabetes, metformin and canagliflozin, may be effective treatments for castration-resistant prostate cancer. However, it is not known if combined treatment with metformin and canagliflozin suppresses the growth of prostate cancer cells better than each drug alone. The goal of this study was to determine the effectiveness of the combination of canagliflozin and metformin as an alternative treatment for prostate cancer. Canagliflozin produced a significant decrease in the proliferation of PC3 and 22Rv1 cells. While metformin showed no significant decrease in proliferation of PC3 cells, metformin did significantly decrease 22Rv1 cell proliferation. The effect of the combination of canagliflozin and metformin on cell proliferation was no greater than canagliflozin alone. However, the combination of metformin and canagliflozin was the most effective in reducing androgen receptor (AR) levels within castration-resistant prostate cancer cells. These data suggest that combination treatments involving metformin and canagliflozin could be used to decrease tumor growth and AR expression in prostate cancer patients who have developed castration-resistant prostate cancer.



53. Peyton Terry

University of Tennessee, Knoxville

Faculty Mentors: Rachel Patton McCord



3D Genome Organization During Neutrophil Migration

The human genome is more than a mere code—it is a dynamic three-dimensional (3D) structure. To examine the 3D genome's physical role in cell migration, we used a human cell line (HL-60) that can differentiate into neutrophil-like cells (HL-60d), notable for their distinct lobular nuclei. In vivo, neutrophils must extravasate, or squeeze through tight junctions of blood vessels. We hypothesized that 3D genome structure is integral to successful extravasation. To mimic extravasation in vitro, we performed Transwell migration assays in which HL-60d cells must constrict their nuclei to migrate through small pores. After migration, however, we found no significant change in the distribution of heterochromatin and euchromatin as examined by immunofluorescence. We then altered the 3D genome with the histone deacetylase inhibitor (HDACi) drug trichostatin A (TSA). HDACi drugs increase histone acetylation, decondensing the chromatin within the nucleus. Preliminary results show a significant decrease in HL-60d migration after TSA treatment. Because neutrophils have low levels of endogenous transcription, decreased migration likely results from the physical impact of 3D genome decondensation rather than differential gene transcription. Moving forward, we will examine the post-migration changes in global genome accessibility and organization of HL-60d cells via the ATAC-seq and Hi-C techniques, respectively.

54. Benjamin Yost

Middle Tennessee State University

Faculty Mentor: David Carleton



Understanding the Modern Stage of International Adoption

The number of children adopted out to US households varies drastically from country to country, and within any given country over the past several decades. The most drastic game changer for international adoption was The Hague Convention of 1993, which regulates adoption practices to ensure they are non-exploitive and done in the best interest of the child. Countries that ratified the Convention saw overall sharp decreases in children sent out of the country. This poster examines four case countries—two which have ratified the Convention, China and Thailand, and two which have not, Ethiopia and Japan—by measuring four independent variables: recent history of domestically significant military conflict, poverty, record of political corruption, and fertility rate. These variables were expected to have a positive relation to international adoption to US households except for political corruption, which was predicted to have a negative relation due to The Hague Convention's evident success at spreading awareness about corrupt governments attempting to send out high numbers of children for profit, and the subsequent backlash towards this behavior on the part of receiving countries like the US. The results of this research could not conclude the correctness of the first hypothesis, due to insufficient data drawn from the case countries—namely, only Ethiopia had experienced military conflict fitting the criteria. Poverty and a high fertility rate were both confirmed to be positively linked to more children being adopted out to the US. The hypothesis concerning political corruption, however, had to be rejected since the two non-Hague Convention member countries contradicted the model. Much of the consulted research for this poster was conducted prior to 2015, and some as far back as the mid-90s—an essentially different era for adoption processes—which could be one reason the hypothesis concerning corruption was disproven under the contemporary lens contrary to the assumptions of previous researchers. This proves that international adoption to the US is as fluid an issue as the international political context surrounding it. Future research looking at more case countries should take this evolving nature into account.

55. Rebekah Pearson

East Tennessee State University
Faculty Mentors: Natalie Smith



A Shift from Baseball? What Influences the Perception of the National Pastime?

Baseball has often been seen as America's Pastime, etched into the cultural landscape of the United States for over 100 years. However, recent shifts both in cultural landscape and the sport industry puts this moniker into question. Whether Americans consider baseball the national pastime is currently up for debate. The crux of that debate for individuals may be influenced by their emotional attachment to the sport or an emotional attachment to competing sports. The data suggests that baseball is being surpassed for the title of America's Pastime by American football. Nearly 34% of respondents say that football is their favorite sport and almost 43% of the total respondents saying it is the sport they spend most time watching. There is a lack of scholarly research on the continuance of baseball as the national pastime. This project has assisted in bringing to light the interaction between what variables aid in the development of emotional attachment and the factors that cause a shift in that attachment. From an industry perspective, a shift from baseball as America's National Pastime could impact baseball's financial future, or more broadly reflect cultural changes in our American psyche.

56. Allison Wittmer (Emily Thomas)

Tennessee Technological University
Faculty Mentor: Allen Driggers



The Forgotten: Minorities' Role in Industrial Britain

In this original research project, we will look at the role that minorities, such as Jews, Asians, and Blacks, played in the Industrial Revolution (1760-1840) in Britain. In order to do this, we will search in the National Archives, the Jewish Museum, the London Metropolitan Archives, and the British Library. During our trip, which we plan to be June 6th through June 20th, we will take information from original documents, only available in these archives. The information collected will provide us with examples of different minorities' role and experiences. Through comparison, we will see how each minorities' experience was different, and the impact those differences made on the development of technology and the movement of social, political, and economic change. As co-investigators, we will be able to research this large project faster, more efficiently, and with two unique perspectives. This project will bring a light to those who are often forgotten in a time period when there was constant social, political, economic, and technological change.

57. Thomas Wiegand

University of Tennessee, Chattanooga

Faculty Mentor: Melissa Allen

Effects of Micro-climate and Human Activity on Building Energy Use at Oak Ridge National Laboratory

There is no doubt that weather and building occupancy directly affect the amount of energy used in our buildings and how that energy is produced and distributed. This study will use statistical analysis to understand the complex relationship between building energy use, climate, and human activity at Oak Ridge National Lab in an effort to understand needed sustainable development and ways to maximize energy efficiency of buildings in the future.



58. Sonia Hopkins

University of Memphis

Faculty Mentor: James Murphy

Life satisfaction, self-regulation, motivation to change, and family history as predictors of young adult alcohol misuse

Alcohol misuse is the cause of physical, social, and emotional health problems and is an economic and global burden. 58% of college students drank alcohol and 37.9% reported binge drinking in the past month (SAMHSA, 2015). Life satisfaction, self-regulation, and motivation to change predict alcohol misuse. It is necessary to test moderators to determine predictive utility across groups. The goal of this study is to examine the interaction between these variables and family history of problematic alcohol use. We hypothesize that lower life satisfaction, self-regulation, and motivation to change will be associated with greater alcohol misuse and moderated by positive family history of problematic alcohol use. Baseline data from a large multisite clinical trial for a brief intervention intended to reduce alcohol misuse, conducted by Dr. James G. Murphy was used for this study (N = 393). Results of six multiple linear regressions showed that the relationship between life satisfaction, self-regulation, motivation to change and alcohol problems don't appear to be influenced by parental alcohol misuse. Although, when family history and self-regulation are considered in the same model, family history is no longer significant, but self-regulation is, suggesting it is a unique predictor of alcohol problems.



Posters at the Capitol Organizing Committee

Ginger Holmes Rowell, Chair, Middle Tennessee State University
Interim Director, Tennessee STEM Education Center at MTSU

Linda Barnes, Austin Peay State University
Professor, American Literature

Erin Lynch-Alexander, Austin Peay State University
Director, Office of Undergraduate Research

Richard (Rico) Ignace, East Tennessee State University
Director of Undergraduate Research & Creative Activities, & Professor of Physics

Jeffrey Porter, Middle Tennessee State University
Director, Office of Research Services

Margaret Whalen, Tennessee State University
Professor, Chemistry

Tom Byl, Tennessee State University
Assistant Professor, Civil and Architectural Engineering

Edward Lisic, Tennessee Technological University
Professor, Chemistry

Melinda Jones, University of Memphis
Director, The Helen Hardin Honors College

Angela Robinson, University of Memphis
Assistant Director, The Helen Hardin Honors College

Joanne Romagni, University of Tennessee, Chattanooga
Vice Chancellor for Research

Bengt Carlson, University of Tennessee, Chattanooga
Experiential Learning Coordinator & Interim Director of Undergraduate Research & Creative Endeavors

Meredith Perry, University of Tennessee, Chattanooga
Director of Sponsored Research

Marisa Moazen, University of Tennessee, Knoxville
Executive Director, Undergraduate Research

Jennifer Greenwood, University of Tennessee, Martin
Dean, College of Engineering and Natural Sciences

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