



Tarleton Student Research and Creative Activities Symposium

October 11-12, 2018

**Thompson Student Center
& Fine Arts Theater**

Symposium Committee

Dr. Amber Harris-Bozer (chair)	Department of Psychological Sciences
Dr. Scott Cook	Department of Mathematics
Dr. John DeLeon	Department of Management
Dr. Tom Faulkenberry	Department of Psychological Sciences
Dr. Deneece Ferrales	Department of Social Work
Ms. Lacie Harris	Office of Research and Innovation
Dr. Heather Hawk	Department of Fine Arts
Dr. Sally Hoger	Department of Medical Laboratory Sciences
Dr. Barry Lambert	Office of Research and Innovation
Dr. Lesley Leach	Office of Research and Innovation
Dr. Juanita Reyes	Department of Educational Leadership & Technology
Ms. Linda Sanders	Office of Research and Innovation
Dr. W. Brandon Smith	Department of Animal Science and Veterinary Technology
Dr. Kartik Venkataraman	Department of Engineering and Computer Science
Dr. Brian Walker	Department of Fine Arts

Program Overview

		Ballrooms	TSC 27	TSC 219	FA Theater
Thursday	8:00–8:30 am	Registration and Poster Setup			
	8:30–9:30 am		Faculty Workshop 1		Creative Activities (9:00–11:00am)
	9:30–11:00 am	Graduate Poster Session			
	11:00am–12:00pm		Faculty Workshop 2		
	12:00–12:30 pm	Break			
	12:30–1:30 pm		Graduate Oral Presentations 1	Graduate Oral Presentations 2	
	1:30–1:45 pm	Break			
	1:45–3:00 pm		First Year Research Experiences (FYRE) Symposium	Undergraduate Oral Presentations 1	
Friday	8:00–8:30 am	Registration and Poster Setup			
	8:30–10:00 am	Undergraduate Poster Session	Faculty Workshop 3 (8:30–9:30 am)		
	10:00–11:00 am		Faculty Panel on Undergraduate Research		
	11:00am –12:00 pm			Undergraduate Oral Presentations 2	
	12:00–1:00pm	Keynote Address: Dr. Frank Morgan			
	1:00–1:30 pm	Break			
	1:30–2:30 pm		Undergraduate Oral Presentations 3		
	2:30–3:00 pm	Break			
	3:00–3:30 pm	Awards Ceremony			

8:00–8:30am	Registration and Poster Setup	<i>Ballrooms</i>
8:30–9:30am	Faculty Workshop 1	<i>TSC 27</i>
	<ul style="list-style-type: none">• A hands-on introduction to Bayesian modeling in the social and behavioral sciences <i>Dr. Tom Faulkenberry</i>	
9:00–11:00am	Creative Activities Exhibition	<i>Fine Arts Theater</i>
	<ol style="list-style-type: none">1. Photography Research <i>Presented by Case Galbraith</i> <i>Faculty mentor: Chris Ireland</i>2. Distortion <i>Presented by Katie Hendricks</i> <i>Faculty mentor: Chris Ireland</i>3. ??? <i>Presented by Julia Young</i> <i>Faculty mentor: Chris Ireland</i>4. Abandoned Memories <i>Presented by Alex Huerta</i> <i>Faculty mentor: Chris Ireland</i>5. The Art of Cinematic Comedy <i>Presented by Daniel Adame</i> <i>Faculty mentor: Megan Ehrhart</i>6. Fantasy Pieces for Clarinet and Piano by Rober Schumann <i>Presented by Ashley Davenport & Mackenzie Moore</i> <i>Faculty mentor: Dmitry Perevertailenko</i>7. Too late <i>Presented by Tori Vilches & Alan P. Lyles</i> <i>Faculty mentor: Douglas Tejada</i>8. Day Drive <i>Presented by Michael Bradley Ballenger</i> <i>Faculty mentor: Douglas Tejada</i>9. Civil Conflict <i>Presented by Ethan Caldwell</i> <i>Faculty mentor: Andrew Stonerock</i>10. TSU Street Beat <i>Presented by Justin Bartlett</i> <i>Faculty mentor: ???</i>	
9:30–11:00am	Graduate Poster Sesssion	<i>Ballrooms</i>
11:00am–12:00pm	Faculty Workshop 2	<i>TSC 27</i>
	<ul style="list-style-type: none">• Best practices in collaborative idea-generation and selection <i>Dr. Jonali Baruah</i>	
12:00–12:30	Break	

12:30–1:30pm Graduate Oral Presentations 1 TSC 27

1. **Reduce Reuse ReRumen: Variability in nutritive value of paunch manure**
T. J. Garcia, J. P. Muir, K. A. Guay, J. A. Brady, & W. B. Smith
Presented by Taylor Garcia
Faculty mentor: Dr. W. Brandon Smith
2. **Patterns of Soil Preference and Regional Genetic Diversity of the Texas Endemic Plant, *Dalea reverchonii* (Fabaceae)**
Seth Hamby, Russell Pfau, Darrel Murray, Allan Nelson, & Jeffrey Brady
Presented by Seth Hamby
Faculty mentor: Dr. Darrel Murray
3. **The Role of Angiotensin II During Stepwise Hemorrhage in a Freshwater Channel Catfish (*Ictalurus punctatus*)**
Kenneth A. Davis & Max G. Sanderford
Presented by Kenneth Davis
Faculty mentor: Dr. Max Sanderford

12:30–1:30pm Graduate Oral Presentations 2 TSC 219

1. **Circadian Rhythm Of Intraocular Pressure In Minipigs: First Time Mapping Of Rhythmicity and IOP response to light/dark cycle reversal**
Abigail Christie, Kimberly Guay, Amber Harris Bozer, Jolena Waddell, & Ryan Ridges
Presented by Abigail Christie
Faculty mentor: Dr. Kimberly Guay
2. **Phosphorus Sorption in Sediments of the Upper North Bosque Watershed Impacted by Changes in Effluent Discharges and Nonpoint Source Contributions**
Kendall Adair & Rajani Srinivasan
Presented by Kendall Adair
Faculty mentor: Dr. Rajani Srinivasan
3. **The effects of semantic relatedness and word type on lexical decisions**
Kristen A. Bowman & Thomas J. Faulkenberry
Presented by Kristen Bowman
Faculty mentor: Dr. Tom Faulkenberry

1:30–1:45pm Break

1:45–3:00pm Undergraduate Oral Presentations 1 TSC 219

1. **Competing International Relations Theories: Which Works Better? A Germany/EU Case Study**
Bronte Yardley
Presented by Bronte Yardley
Faculty mentor: Dr. Anne Egelston
2. **The Extent of Community Knowledge about Cancer Treatment Resources**
Miranda Baker & Charles Mongare
Presented by Miranda Baker
Faculty mentor: Dr. Ebony Hall
3. **From Natural Law to Positive Law**
Clifford Curry
Presented by Clifford Curry
Faculty mentor: Dr. Anne Egelston

4. **Foster Care Incentives**

Alyssa Bottlinger, Becca Heavner, Liz Hetrick, Clare McNiel
Presented by Alyssa Bottlinger
Faculty mentor: Dr. Ebony Hall

5. **Strengthening Project**

Kathy Bynum, Madison Loewe, Jade Patton
Presented by Kathy Bynum
Faculty mentor: Dr. Ebony Hall

1:45–3:00pm

First Year Research Experiences (FYRE) Symposium

TSC 27

1. **Adaptive Multiplex Quantitative PCR for Identification and Quantification of Reticuloendotheliosis Virus**

Faith Cox, Melissa Hopkins, Jeff Brady, & Dustin Edwards
Presented by Faith Cox
Faculty mentor: Dr. Dustin Edwards

2. **Masonry Insects at the Tarleton Permaculture Site**

John Garcia & Barbara Bellows
Presented by John Garcia
Faculty mentor: Dr. Barbara Bellows

3. **Do Mississippi map turtles live in the Bosque River?**

Megan Lawless & Victoria Chraibi
Presented by Megan Lawless
Faculty mentor: Dr. Victoria Chraibi

4. **Livestock Literacy: An evaluation of newspaper as an inexpensive and renewable fiber source for ruminant animals**

Natalie Finn & W. Brandon Smith
Presented by Natalie Finn
Faculty mentor: Dr. W. Brandon Smith

5. **Light Curve Analysis of Asteroids 2026 and 3017**

Arthur Alverez & Mike Hibbs
Presented by Arthur Alverez
Faculty mentor: Dr. Mike Hibbs

8:00–8:30am	Registration and Poster Setup	<i>Ballrooms</i>
8:30–9:30am	Faculty Workshop 3	<i>TSC 27</i>
	<ul style="list-style-type: none"> • Research in the Digital Age: Recruiting Participants through Social Media <i>Dr. Heather Labansat & Dr. Kristina Higgins</i> 	
8:30–10:00am	Undergraduate Poster Session	<i>Ballrooms</i>
10:00–11:00am	Faculty Panel on Undergraduate Research	<i>TSC 27</i>
	<ul style="list-style-type: none"> • Panelists: <i>Dr. Frank Morgan (Williams College), Dr. Kimberly Guay, Dr. Dustin Edwards, Dr. Kristin Herrmann, Dr. Ebony Hall, & Dr. Lynal Albert</i> 	
11:00am–12:00pm	Undergraduate Oral Presentations 2	<i>TSC 219</i>
	<ol style="list-style-type: none"> 1. The California Carbon Cap-&-Trade Market <i>Scott Hardaway</i> <i>Presented by Scott Hardaway</i> <i>Faculty mentor: Dr. Barbara Bellows</i> 2. How Do Students Use Mathematics in the Science Classroom <i>Jesse Dale & Kathy Smith</i> <i>Presented by Jesse Dale</i> <i>Faculty mentor: Dr. Kathy Smith</i> 3. Use of Social Networking Sites for Recruiting and Selecting in the Hiring Process <i>Marysol Villeda & Randy McCamey</i> <i>Presented by Marysol Villeda</i> <i>Faculty mentor: Dr. Randy McCamey</i> 4. Middle School ELL Students Understanding of Mathematics Vocabulary <i>Susy Tovar & Kathy Smith</i> <i>Presented by Susy Tovar</i> <i>Faculty mentor: Dr. Kathy Smith</i> 	
12:00–1:00pm	Keynote Address	<i>Ballrooms</i>
	<ul style="list-style-type: none"> • Double Soap Bubbles <i>Dr. Frank Morgan (Williams College)</i> 	
1:00–1:30pm	Break	
1:30–2:30pm	Undergraduate Oral Presentations 3	<i>TSC 27</i>
	<ol style="list-style-type: none"> 1. (REV)ised: a New Search for Reticuloendotheliosis Virus <i>Camille Trautman, Brittany Stewart, Faith Cox, Heidi Spann, Melissa Hopkins, Josh Katuri, and Dustin Edwards</i> <i>Presented by Camille Trautman</i> <i>Faculty mentor: Dr. Dustin Edwards</i> 2. Photometry of RR Lyrae stars in the Globular Clusters NGC6341 <i>Jonah Ferris</i> <i>Presented by Jonah Ferris</i> <i>Faculty mentor: Dr. Shaukat Goderya</i> 3. Classifying the Architecture of Numerical Cognition Using Systems Factorial Technology: An Investigation with Mathematica <i>Sabrina Hetzel & Thomas J. Faulkenberry</i> <i>Presented by Sabrina Hetzel</i> <i>Faculty mentor: Dr. Tom Faulkenberry</i> 	
2:30–3:00pm	Break	
3:00–3:30pm	Awards Ceremony	<i>Ballrooms</i>

Double Soap Bubbles

Dr. Frank Morgan (Williams College)

Friday, October 12, 12:00–1:00pm



Photo credit: Jeff Bauer

Soap bubbles continue to fascinate and puzzle us, while providing lots of applications. A round soap bubble is the least-area way to enclose a given volume of air, as was proved by Schwarz in 1884. The familiar double bubble that forms when two soap bubbles come together is the least-area way to enclose and separate two given volumes of air, as collaborators and I proved in 2002. In other spaces, there are many open problems and results, some by undergraduates. The show will include a little guessing contest with demonstrations, explanations, and prizes.

Biography

Dr. Frank Morgan is a mathematician who works in minimal surfaces and studies the behavior and structure of minimizers in various dimensions and settings. His proof with colleagues and students of the Double Bubble Conjecture is featured at the NSF Discoveries site. He has six books: *Geometric Measure Theory: a Beginners Guide* (5th ed. 2016); *Calculus Lite* (2001), republished as *Calculus* (2012); *Riemannian Geometry: a Beginners Guide* (1998); *The Math Chat Book* (2000), based on his live, call-in Math Chat TV show and Math Chat column; *Real Analysis* (2005); and *Real Analysis and Applications* (2005). He also has a personal blog and a blog at the Huffington Post.

Dr. Morgan studied at MIT and Princeton, where his thesis advisor, Fred Almgren, introduced him to minimal surfaces. He then taught for ten years at MIT, where he served for three years as Undergraduate Mathematics Chairman, received the Everett Moore Baker Award for excellence in undergraduate teaching, and held the Cecil and Ida Green Career Development Chair. He spent leave years at Rice, Stanford, the Institute for Advanced Study, Princeton, and Berkshire Community College. He served on the NSF Math Advisory Committee from 1994-97, and as chair of the Hudson River Undergraduate Mathematics Conference in 1997. In January, 1993, he received an inaugural MAA (Mathematical Association of America) national award for distinguished teaching. In 1995 he represented mathematics research at the exhibition for Congress by the Coalition for National Science Funding. He received the Allen High School Distinguished Alumni Award and an honorary doctorate from Cedar Crest College. For 1997-98 he held the first Visiting Professorship for Distinguished Teaching at Princeton University. From 2000-2002 he served as Second Vice-President of the Mathematical Association of America, from 2009-2012 as Vice-President of the American Mathematical Society, when he launched the AMS Graduate Student Blog, by and for mathematics graduate students.

Dr. Morgan served at Williams College as Mathematics Department Chair and founding director of an NSF undergraduate research project. He is currently Webster Atwell 21 Professor of Mathematics, Emeritus, and Editor-in-Chief of Notices of the American Mathematical Society.

Faculty Workshop 1

Thursday, October 11, 8:30–9:30am, TSC 27

- **A hands-on introduction to Bayesian modeling in the social and behavioral sciences**

Dr. Tom Faulkenberry

Recent proposals to improve measurement in the social and behavioral sciences have resulted in the adoption of many new techniques for inference. One of these techniques is Bayesian modeling, which allows the researcher to make inferences that combine both prior knowledge and new data in a way that is mathematically coherent and based on simple rules of probability. However, adoption of Bayesian modeling has been slow, possibly due to factors such as (1) unfamiliarity with the basic ideas of Bayesian modeling, and (2) lack of knowledge of the tools for Bayesian modeling. In this workshop, I will introduce Bayesian modeling, and through discussions and demonstrations, I will address the questions of “what” and “how”. Using the free software package JASP (www.jasp-stats.org), participants will be guided through building Bayesian models for common designs in the social and behavioral sciences, including *t*-tests and analysis of variance. Finally, I will give examples of how to report Bayesian analyses for the researcher who wishes to begin applying these models to his or her own work.

Faculty Workshop 2

Thursday, October 11, 11:00am–12:00pm, TSC 27

- **Best practices in collaborative idea-generation and selection**

Dr. Jonali Baruah

Research often suggests that teams left on their own never perform better than a group of individuals working alone on the same problem (Mullen, Johnson & Salas, 1981). This productivity loss in group setting is often attributed to cognitive and social processes such as production blocking (inability to express ideas), apprehensions of evaluation of ideas by other group members and downward social comparison which may lead to lowered group performance (Paulus & Dzindolet, 1993). Even though these factors inhibit group performance, group level brainstorming is often necessary to design a new product, concept or make decisions. Hence it is important to overcome various inhibitory factors at group level to tap the creative potentials in such groups. The proposed workshop is particularly focused on sensitizing the participants about the creative potentials in groups and to offer best practices in group creativity context. The workshop will incorporate videos, lectures and multiple team exercises to promote critical thinking in the area of team innovation. The workshop will include speculations on facilitating creative idea generation and selection in groups and individuals from practical and theoretical perspective. The objectives of the proposed workshop are to sensitize groups about the pros and cons of collaborative creativity, biases in decision-making, various techniques/procedures to provide ways to tap the collective intelligence in groups, synergistic efforts in enhancing creativity and productivity in groups.

Faculty Workshop 3

Friday, October 12, 8:30–9:30am, TSC 27

- **Research in the Digital Age: Recruiting Participants through Social Media**

Dr. Heather Labansat & Dr. Kristina Higgins

Given that one of the primary challenges of research is recruitment, social media provides a unique platform for distributing studies and obtaining a wide data pool. Designing online survey research specifically for social media dissemination is necessary to enhance the potential of the research study to reach the necessary audience. This presentation will cover various social media platforms and unique techniques to maximize a study’s reach. The presenters will discuss a specific study that recruited 306 participants with a wide range of demographic variables to complete a 162-item survey. Unique challenges for conducting research through social media will be covered as well.

Graduate Oral Presentations 1

Thursday, October 11, 12:30–1:30pm, TSC 27

1. Reduce Reuse ReRumen: Variability in nutritive value of paunch manure

T. J. Garcia, J. P. Muir, K. A. Guay, J. A. Brady, & W. B. Smith

Faculty mentor: Dr. W. Brandon Smith

Ruminant animals develop a diverse and complex microbial ecosystem for digesting fibrous feedstuffs. To assess viability of this material as a potential feed source, twelve paunch samples were collected at the Tarleton State University Meat Laboratory. Samples were dried under forced air at 55 degrees C to a constant weight and ground using a Wiley mill to pass through 2-mm screen. A subsample was assayed for dry matter (DM), crude protein (CP) and sequential neutral detergent fiber (NDF) and acid detergent fiber (ADF). Physically-effective fiber (peNDF) was calculated using the manually-operated Penn State Particle Separator. Samples were subjected to batch culture in vitro digestibility assays for determination of digestibility coefficients. Data were analysed as a random effects model. Contribution to variance of individual animal for NDF, ADF, ADL, CP, and peNDF were 97.2, 97.9, 95.4, 19.1 and 97.5%, respectively. In vitro true digestibility and in vitro neutral detergent fiber digestibility were 46.2% and 21.6%, respectively. Results indicate that rumen waste may be beneficial, while reducing environmental threats posed by disposal, but viability is highly dependent on the source animal. For viability of application in a sustainable system, a centralized receiving and compositing system may be useful for development of a consistent product.

2. Patterns of Soil Preference and Regional Genetic Diversity of the Texas Endemic Plant, *Dalea reverchonii* (Fabaceae)

Seth Hamby, Russel Pfau, Darrel Murray, Allan Nelson, & Jeffrey Brady

Faculty mentor: Dr. Darrel Murray

Dalea reverchonii (S. Watson) Shinners, known as Comanche Peak prairie clover, is a globally and state imperiled endemic plant with a conservation rank of G2S2, having a high-risk of extinction due to a small number of populations, a narrow range, marked declines, and habitat loss. Because of its conservation designation, *D. reverchonii* is a prime candidate for ecological and molecular population studies. The purpose of this study is to inform conservation and restoration of the species. A double digest restriction site associated DNA sequencing (ddRADseq) was performed to measure levels of regional genetic diversity of *D. reverchonii* at the population and species level and to measure population sub-structuring (divergence). In an effort to determine which soil physiochemical properties are most important for presence, growth, and abundance of *D. reverchonii* in 4 distinct sub-populations, a comparison of physiochemical properties of soil with morphological characteristics of plants was conducted.

3. The Role of Angiotensin II During Stepwise Hemorrhage in a Freshwater Channel Catfish (*Ictalurus punctatus*)

Kenneth A. Davis & Max G. Sanderford

Faculty mentor: Dr. Max G. Sanderford

The Renin-Angiotensin System (RAS) is an important regulator of blood volume and blood pressure in most vertebrates and may compensate for osmotic or hemorrhagic reduction of blood volume in fish. Numerous studies on teleosts have shown that vascular volume acts as a physiologic regulator of the RAS in marine and euryhaline fish. In freshwater (FW) stenohalines, the RAS is functionally present, and angiotensin II (ANG II), a humoral factor synthesized by the RAS, acutely affects blood pressure. Therefore, the purpose of the present study sought to determine if physiologically regulated ANG II contributes to the maintenance of blood pressure following a stepwise hemorrhage in the freshwater, stenohaline catfish (*Ictalurus punctatus*). The magnitude of dorsal aortic pressure and heart rate change in response to Captopril following a 20% hemorrhage was significantly greater than that of non-hemorrhage fish. Measurement of plasma angiotensin II before hemorrhage and after hemorrhage may further support the notion that ANG II supports blood pressure during volume depletion or acute reductions in blood pressure.

Graduate Oral Presentations 2

Thursday, October 11, 12:30–1:30pm, TSC 219

1. Circadian Rhythm Of Intraocular Pressure In Minipigs: First Time Mapping Of Rhythmicity and IOP response to light/dark cycle reversal

Abigail Christie, Kimberly Guay, Amber Harris Bozer, Jolena Waddell, & Ryan Ridges

Faculty mentor: Dr. Kimberly Guay

The daily circadian rhythm of intraocular pressure (IOP) in pigs has not been previously investigated. This study was to determine if there is rhythmicity to minipig IOP under regular light/dark cycle and investigate the effect of reversing light dark cycles on IOP. Four baseline IOP collections were taken at least 10 days

apart. Data collections were 24 hours, with IOP taken from both eyes every two hours. Light/dark cycles were flipped 10 days prior to reversed data collection. Baseline data was analyzed by repeated measures ANOVA and there was a significant effect of time, $F(11, 77) = 10.16$, $p < 0.001$. Bonferroni post hoc tests revealed a significant difference between hour 0 and 6 ($p = 0.01$), 6 and 10 ($p = 0.004$), 10 and 14, ($p < 0.001$) and between 14 and 0 ($p = 0.008$). Intraocular pressure peaked at hours 6 and 14, and troughed at hour 10 and 0, supporting that minipigs have an daily rhythmicity to their IOP. Reversed light/dark data were analyzed by repeated measures ANOVA and there was an effect of time, ($p < 0.001$) but a difference was noted between the established IOP baseline timepoints and reversed IOP timepoints ($p < 0.05$), suggesting a disruption from the regular light/dark cycle.

2. Phosphorus Sorption in Sediments of the Upper North Bosque Watershed Impacted by Changes in Effluent Discharges and Nonpoint Source Contributions

Kendall Adair

Faculty mentor: Dr. Rajani Srinivasan

Stream sediments may dictate the uptake, storage and release of phosphorus (P) to and from the water column. Phosphorus is a limiting nutrient in streams, and the ability to retain P is key to determining downstream water quality. Over-enrichment in P can lead to eutrophication, inducing algal or cyanobacterial blooms, anoxia and fish kills. It is therefore imperative to study the interaction between streambed sediments and the water column. This project is a follow-up to a 2004 study in the Upper North Bosque watershed to compare the EPC0 at five of the previously sampled sites more than a decade following phosphorus control practices. The results of this project will broaden the scope of TIAER research to include the environmental fate of P in the North Bosque River sediments, specifically whether sediments act as a source or sink for P. The combination of P control practices in the WWTP and implementation of several BMPs has resulted in less phosphorus in the water column. This should reduce phosphorus accumulation in sediments. However, there is a chance of legacy P. More P may enter the water column because the concentrations are now less even though less phosphorus in the river sediments is expected.

3. The effects of semantic relatedness and word type on lexical decisions

Kristen A. Bowman & Thomas J. Faulkenberry

Faculty mentor: Dr. Tom Faulkenberry

In a classic study, Meyer and Schvaneveldt (1971) found that when words shared a similar meaning, participants were faster to make surface-level decisions about these words, demonstrating that word meaning can prime lexical decisions, even if meaning is unrelated to the task. The present study was an extension of Meyer and Schvaneveldt. Participants were presented two strings and asked to respond yes only if both strings represented words. We manipulated semantic relationship (related, unrelated) and word type (abstract, concrete). Similar to Meyer and Schvaneveldt, we found that participants responded yes faster when words were semantically related. Also, participants responded faster to concrete words than to abstract words. Surprisingly, participants responded no slower when words were related, showing a reverse priming effect. This could have been because participants were primed to access the correct spelling of the misspelled word, inducing a decision penalty due to the mismatch with the presented nonword.

First Year Research Experiences (FYRE) Symposium

Thursday, October 11, 2:00–3:30pm, TSC 27

1. Adaptive Multiplex Quantitative PCR for Identification and Quantification of Reticuloendotheliosis Virus*Faith Cox, Melissa Hopkins, Jeff Brady, & Dustin Edwards**Faculty mentor: Dr. Dustin Edwards*

Reticuloendotheliosis virus (REV) is an immunosuppressive avian retrovirus affecting Galliformes, Anseriformes, and Passeriformes. Modern testing for REV utilizes a duplex quantitative polymerase chain reaction (qPCR) technique developed by Texas Veterinary Medical Diagnostic Laboratory. Here, we modified their technique to a multiplex qPCR reaction that can be adapted to simultaneously test for multiple infections. We designed an amplification for the pan-avian GAPDH gene as an internal control in testing for DNA or cDNA from RNA viral genomes. Plasmids were constructed by TA cloning, and confirmed by DNA sequencing, to contain the target REV LTR, REV Env, and GAPDH genes. After DNA extraction, DNA molecule copy number was determined and diluted for the purpose of forming a standard curve of 110^8 to 110^1 molecules/ μ L. TaqMan probes for the three target genes were redesigned to contain different fluorescent dyes to increase the number of probes that could be used simultaneously and with double nonfluorescent quenchers to decrease false positives. Reactions were performed in triplicate to establish the standard curve, with slopes of the log concentration measured for REV LTR and Env at -3.077 and -3.013, respectively, allowing for precise determination of the identity and quantity of virus in a sample.

2. Masonry Insects at the Tarleton Permaculture Site*John Garcia**Faculty mentor: Dr. Barbara Bellows*

Thousands of Hymenoptera nest in hollow plant stems and piping. Each of these actively choose where to nest. The purpose of the research conducted was to determine what insects were present, what diameter of hole they chose to nest, and if the location of the motels influenced where they nested. The locations for the bee motels were the Pollinator Garden, the Native Grass field, and the Fruit Forest. The diameter of holes tested were 7/64, 7/32, 15/64, 1/4, 19/64, and 3/8. 3 motels of a kind were created each with 6 holes drilled into them of the same diameter. Once the holes in the bee motel were capped or once a capped hole had an insect emerge the motel was taken down and stored. 41 of the holes were capped with 11 of the emerged captured. The insects captured were; 9 mason wasps, 1 cuckoo wasp and 1 metallic blue wasp. The Pollinator Garden and Native Grass field had results with the 7/32, 1/4, 19/64, and 3/8 diameter holes while the Fruit Forest had results with the 7/32, 1/4, and 3/8 diameter holes. There was no notable difference between what insects were attracted and the location of the bee motels.

3. Do Mississippi map turtles live in the Bosque River?*Megan Lawless**Faculty mentor: Dr. Victoria Chraibi*

This study is surveying the Bosque River to see if the Mississippi map turtle (*Graptemys pseudogeographica kohni*) lives in the river in Stephenville, Texas. This is important for understanding the habitat range of this turtle. Although the Bosque River is included in the turtle's range in Texas, no one has ever formally recorded that the Mississippi map turtle lives in the Bosque River. After identifying potential habitat areas, we deploy up to six traps baited with clams. We are currently surveying in the Stephenville City Park at five locations and will continue to move further along the river. To date, we have not caught or sighted the Mississippi map turtle yet. This may be because they are small (12-25 cm) and skiddish, so we can test new tactics such as adding different bait or leaving the traps out longer in the morning. Another possibility is that their preferred food source, snails and certain clams, are not present in the Bosque. We can expand this project to conduct a freshwater mussel survey in the Bosque. Over time we will also move our trapping locations out along the Bosque into different parts of Stephenville.

4. Livestock Literacy: An evaluation of newspaper as an inexpensive and renewable fiber source for ruminant animals*Natalie Finn & W. Brandon Smith**Faculty mentor: Dr. W. Brandon Smith*

Fiber is an essential unit of a ruminant animal's diet. Fibrous feedstuffs are also one of the more expensive aspects of feeding livestock. One method to combat this cost is by feeding byproducts. The objective of this project was to evaluate the suitability of waste newspaper, either raw or ensiled, as a feed product for livestock. In the first experiment, ground newspaper samples were subjected to chemical analysis and statistically analyzed as a random effects model to determine the variability among source. In the second experiment, newspaper waste was combined with titrated mixtures of sorghum-sudangrass and allowed to

ensile in laboratory silos for 35 d. Ensiled samples were assayed for dry matter, particle size, and silage acids. Results indicated that source had a minimal effect in the nutritive value of waste paper. There was no ensiling in 100% newspaper samples, but some level of ensiling was detected when mixed with grass. From these results, we conclude that newspaper may represent a viable feedstuff, economically and sustainably, in the formulation of ruminant rations.

5. **Light Curve Analysis of Asteroids 2026 and 3017**

Arthur Alvez

Faculty mentor: Dr. Mike Hibbs

The spin rate, shape and size of two faint asteroids were determined. Using Tarleton's 0.81 m telescope to collect the light intensity changes over time, detailed light curves were constructed and analyzed for asteroids 2026 and 3017. Data was collected during the few weeks in August/September 2018, in which the two asteroids passed the Earth at the closest point in their orbits (opposition). This data then was compared and combined with similar data collected at Tarleton when these two asteroids were last in opposition with Earth, February, 2016 for asteroid 2026 and July 2014 for asteroid 3017.

Undergraduate Oral Presentations 1

Thursday, October 11, 2:00–3:00pm, TSC 219

1. Competing International Relations Theories: Which Works Better? A Germany/EU Case Study

Bronte Yardley

Faculty mentor: Dr. Anne Egelston

What are the characteristics of a good international relations theory? What makes one competing theory better than another? This paper will take a theoretical approach to analyzing competing international relations theories, Realism and Liberalism, in regards to the general definition of what makes a “good theory” a good theory. The research will explore how the characteristics of a good theory affect the extent each of the competing theories works to answer the simple question: Which theory is better? Germany’s status within the European Union has been described by many as a reluctant hegemony. Under the Realism school of thought, Germany’s position is an indication of Hegemonic Stability Theory; in regards to Liberalism, it fits better within Neoliberalism Industrialization. This paper will attempt to answer which school of thought fits better and why through a select comparison of the characteristics of international relations theory outlined by Mingst and Arreguin-Toft.

2. The Extent of Community Knowledge about Cancer Treatment Resources

Miranda Baker & Charles Mongare

Faculty mentor: Dr. Ebony Hall

In 2018, more than 1.7 million new cancer cases will be diagnosed and nearly 609,640 of those new cases will result in death for many Americans within the same year, which translates to nearly 1,670 deaths per day (Siege, 2018). Anyone can be diagnosed with any type of cancer regardless of the population, demographic, or age. Many people are not aware of the different resources and programs available to them. In order to gain an understanding of people’s knowledge cancer treatment resources such as the American Cancer Society (ACS), the student researchers gather and analyze data collected from adults within a rural community. This quantitative study helps the researchers understand whether or not the community needs more information about different services provided by ACS and if cancer patients and their families are satisfied with the care and assistance they have received from the organization. Student researchers identified the Crisis Theory (Dustin & McDonald, 2016) as an applicable theory because it explains how a person is faced with a crisis, such as being diagnosed with a terminal illness, and the person’s plans to overcome the crisis. Another theory researchers identified is the Social Learning Theory (Staff, 2014); Albert Bandura’s idea that people learn new information through social behaviors and observations. Student researchers developed a quantitative survey consisting of 20 questions to be answered by 50 participants within a rural community. The data from the study is important to the social work profession because it presents how people process new information.

3. From Natural Law to Positive Law

Clifford Curry

Faculty mentor: Dr. Anne Egelston

Overall, there are two categories of law. Natural law is based on the commonality of humans as a whole, and positive law is based on the selfish nature of humans as a whole. Most states have their foundations with natural law, but gradually transition to positive law over time. This research strives to answer which is more influential to a state’s transition to positive law: population or diversity? The standards of natural law are more difficult to enforce as a state’s population grows and diversifies. It is my theory that as the population of a state grows, the state will begin to transition away from natural law towards laxer positive law. The independent variables for this research are the populations and diversity of the states of the U.S, U.K, Canada, Australia, and New Zealand. The dependent variable is the highest court’s ruling on landmark cases. By analyzing this data I hope to determine if there is a causal link between population growth and the viewpoint of law held by the state. If this research is successful, then the government of the state will be able to more effectively legislate and regulate their people.

4. Foster Care Incentives

Alyssa Bottlinger, Becca Heavner, Liz Hetrick, & Clare McNiel

Faculty mentor: Dr. Ebony Hall

Employers report there is an overabundance of children who need foster care but not enough foster homes. This mixed methodological study places an emphasis on the knowledge about foster care and the interest in becoming a foster parent. The study is centered on a specific region in southern Texas. Currently there are 1,349 placements needed in the studied region but there are only 652 current homes. The lack of homes in this county has led to 790 children being placed in a different county than where they previously resided (Foster’s Home for Children, 2017). The student researchers survey 100 participants using purposive

sampling. A pre-developed survey is used consisting of demographic, short answer, yes or no, and Likert scale questions. The survey contains 27 questions of which 16 are quantitative and 11 are qualitative. Broffebrenner's Ecological Systems Theory (1917) is an applicable theory because a child's development is affected by his/her environment. The student researchers test the following hypotheses; 1) Majority of female participants report a desire to becoming a foster parent, 2) Majority of participants who are knowledgeable of the requirements are less likely to become a foster parent, and 3) Participants who have a fear of the child background are less likely to foster. Participants identified for the survey are agencies who work with children, former and current foster parents, and faith-based organizations. Being aware of the process of becoming a foster parent and the need for more foster parents enhances the importance of human relationships. This study allows professionals to increase an understanding of what incentives there are for people who are interested in becoming a foster parent.

5. **Strengthening Project**

Kathy Bynum, Madison Loewe, & Jade Patton

Faculty mentor: Dr. Ebony Hall

Since the late 1980s the training program of Title IV-E of the Social Security Act was created as part of the Child Welfare and Adoption Assistance Act. This project has been a major funding source for staff training and has offered more opportunities for individuals to earn a Bachelors of Social Work (BSW) degree. Currently, the Title IV-E Project's problem consists of the lack of data in regard to the impact of the stipend received by recipients. This mixed methodological study has an emphasis on comprehension of Title IV-E. The researchers use a pre-developed survey of demographic and multiple-choice questions. Bloom's Taxonomy (1956) is an appropriate theory because it informs students to gain apprehension, and apply that awareness for potentially serving in child welfare. Researchers identified three hypotheses that focus on the statistics, knowledge, and completion rates of participants about the Title IV-E Project. The study includes participants who are currently social work majors at a major university in Central Texas, Title IV-E participants, and the Texas Department of Family Protective Services (DFPS). The results serve as information for Title IV-E directors as well as future students in a undergraduate or graduate social work program with the intention of increasing the overall number of students who participate the Title IV-E Project. Students awareness of the Title IV-E Project at Tarleton State University will assist with increasing the participation number.

Undergraduate Oral Presentations 2

Friday, October 12, 11:00am-12:00pm, TSC 219

1. **The California Carbon Cap-&-Trade Market**

Scott Hardaway

Faculty mentor: Dr. Barbara Bellows

This presentation entails a three-part description of the California Carbon Cap-and-Trade Compliance system. The three parts are (1) History, (2) Program Structure and Interaction, and (3) Impact and Future. The first part details how and why the California Cap-and-Trade system came to exist through the California Cap-and-Trade Regulation, a direct product of the California Global Warming Solutions Act (AB-32) of 2005. The second part details how both the Compliance Market and the Compliance Offset Market are structured as well as how they are connected, along with a visual model of the market system. The third and final part is an overview of the effectiveness of the program and also how it has become involved with non-regulated volunteer offset markets, and what possibilities it presents for the economic incentive of future climate change mitigation programs.

2. **How Do Students Use Mathematics in the Science Classroom**

Jesse Dale & Kathy Smith

Faculty mentor: Dr. Kathy Smith

This research project was conducted during the summer of 2018 at Texas Christian University during a Fort Worth ISD summer school program called Math Science Language, or MSL for short to 28 completing 7th and 8th grade English Language Learners. The classes were composed of students from two schools, World Language Institute and International Newcomers Academy. During this program, the students went to math class and science class and learned about forensic investigations while performing many labs to solve the crime of the missing t-shirts. This research study, how do students use mathematics in the science classroom, emerged from this program. The lens in which data were analyzed was through the Next Generation Science Standards (NGSS). These standards encourage the use of mathematics in the science classroom by analyzing and interpreting data and using mathematical and computational thinking (<http://www.nextgenscience.org/search-standards>). Data were collected through observations of classrooms and teacher instruction and student's daily journals. After analyzing the data and using the Next Generation

Science Standards, several patterns emerged. This presentation will expound on the patterns that were found.

3. Use of Social Networking Sites for Recruiting and Selecting in the Hiring Process

Marysol Villeda & Dr. Randy McCamey

Faculty mentor: Dr. Randy McCamey

Global competition continues to demand creativity in terms of how human capital is acquired thus leading to the question, "How can employers take advantage of technology in the hiring process?" Social networking sites (SNS) are being explored as an additional tool for recruiting and selecting the best-suited candidates. Although different types of businesses are attempting to integrate SNS into their hiring process, many still lack understanding on how the candidate experience influences employer brand image as well as the actual benefits and risks. By analyzing peer-reviewed journals and other reliable sources the author found many benefits in the recruiting process while finding significant challenges when used in selecting process. Lower cost and time per hired employee, ability to reach a high number of younger possible applicants, attraction of passive job applicants, and the inclusion of a supplementary method for employee performance predictions are the most important benefits. Legal issues, the inability to attract a diverse pool of candidates, and reliability and validity of such platforms are some of the risks of this process. After examination, the author concludes that SNS should be used in recruiting and selecting of employees but cautions that employers should not rely solely on such platforms.

4. Middle School ELL Students' Understanding of Mathematics Vocabulary

Susy Tovar & Kathy Smith

Faculty mentor: Dr. Kathy Smith

During the Math Science Language (MSL) program at Texas Christian University, we observed how the use and understanding of mathematics vocabulary affected students' understanding of mathematics. There was a total of 25 participants in this study, whose academic level ranged from seventh to eighth grade. These participants were attending either the World Language Institute or International New Comers Academy. A pretest was administered to assess their understanding of mathematics vocabulary with no academic intervention. Then we used word wall activities as vocabulary intervention to increase their understanding of mathematics vocabulary. We determined the effect the vocabulary intervention had on the participants understanding by administering a posttest and determining if there was a significant change in their grades. Results of our findings will be shared.

Undergraduate Oral Presentations 3

Friday, October 12, 1:30pm–2:30pm, TSC 27

1. (REV)ised: a New Search for Reticuloendotheliosis Virus

Camille Trautman, Brittany Stewart, Faith Cox, Heidi Spann, Melissa Hopkins, Josh Katuri, & Dustin Edwards

Faculty mentor: Dr. Dustin Edwards

Reticuloendotheliosis virus (REV) is an avian retrovirus that infects B-cells in galliform birds, such as turkeys and the endangered Attwater's prairie chicken (APC). REV mode of transmission and prevalence in nature is relatively unknown. Previous studies have demonstrated that REV can integrate into the fowlpox (FWPV) viral genome. We hypothesize that wild turkeys in Texas are reservoirs for transmission of REV by insects, perhaps integrated within FWPV, to other birds such as APCs. To determine the prevalence of REV infection in wild turkeys in Texas, blood samples from 331 native wild Rio Grande turkeys and 88 imported Eastern wild turkeys were collected between January 2016 and April 2017. REV was detected by proviral PCR amplification in six counties at prevalence rates of 5% to 10% and in one individual transported from West Virginia. We also detected FWPV-REV integration in an additional pox tissue sample. To survey for REV in uninfected bird species in remote locations, we developed a dried blood spot antibody elution method for enzyme-linked immunosorbent assays (ELISAs), which could better inform wildlife biologists of the geographical range of REV. By understanding viral reservoirs and transmission, additional measures could be implemented to protect at-risk populations.

2. Photometry of RR Lyrae stars in the Globular Clusters NGC6341

Jonah Ferris

Faculty mentor: Dr. Shaukat Goderya

The Tarleton telescope was used to obtain photometry data on an eclipsing binary star V798Her in globular cluster NGC6341 found in the Hercules constellation. However, because the field of the image was 0.4 degrees in the sky the archive data contains time series data on other type of variable stars besides V798Her. The goal of this FYRE is to derive the light curves and the period of several RR Lyrae stars from the photometric data available on globular cluster NGC6341 and do comparative study as to what has been published before on these RR Lyrae Stars.

3. Classifying the Architecture of Numerical Cognition Using Systems Factorial Technology: An Investigation with Mathematica

Sabrina Hetzel

Faculty mentor: Dr. Tom Faulkenberry

The way a cognitive processing system handles multiple information sources can be classified in two ways. The first is the system's architecture. There are two main types of architecture: serial, where information is processed sequentially, and parallel, where information is processed simultaneously. The second classification type is stopping rule, which asks whether the system stops after sufficient information is processed, or whether the system processed all sources of information until completion. The first of these is called self-terminating whereas the second is called exhaustive. Systems Factorial Technology (SFT) is a mathematical technique for classifying architecture and stopping rule from response time data in human cognitive tasks. We apply SFT to analyze how people process numerical information from the numerator and denominator when doing tasks with fractions. Using Mathematica, we compute two processing signatures for 7 different observers: the survivor interaction contrast and capacity curve. These curves both point to a serial self-terminating system, implying two things. First, people process fraction components one at a time, and second, people process only the necessary parts of the fraction that are needed for the task.

Creative Activities Exhibition

Thursday, October 11, 9:00–11:00am, Fine Arts Theater

1. **Photography Research**

Case Galbraith

Faculty mentor: Chris Ireland

I am studying digital media and graphic design. For my presentation I want to focus on the photography aspect of my major. I like to create characters and also objects. I tend to research different photographers and directors for inspiration.

2. **Distortion**

Katie Hendricks

Faculty mentor: Chris Ireland

For my senior show I have been researching the methods behind distorting images. Right now I have been working with acrylic overlaying images to form a displacement feeling between art and viewer. There has been a lot of research to figure out the process to use. There is a lot of trial and error.

3. **???**

Julia Young

Faculty mentor: Chris Ireland

For my Senior Show I am researching photographic overlays of multiple images in black and white photos.

4. **Abandoned Memories**

Alex Huerta

Faculty mentor: Chris Ireland

I will be doing a presentation of my current work and what I plan to do for my senior art show. I will partly be doing research over landscape photography and a process of cutting acrylic glass.

5. **The Art of Cinematic Comedy**

Daniel Adame

Faculty mentor: Megan Ehrhart

An overview of Comedy in Cinema. Studying the evolution of the genre in different cinematic elements including screenwriting, Acting, and Culture. The development of the comedy genre and it's integration into film.

6. **Fantasy Pieces for Clarinet and Piano by Rober Schumann**

Ashley Davenport & Mackenzie Moore

Faculty mentor: Dmitry Perevertailenko

Music performance - clarinet (Ashley) and piano (Mackenzie)

7. **Too late**

Tori Vilches & Alan P. Lyles

Faculty mentor: Douglas Tejada

Original solo vocal piece written, sung, and notated by Tori Vilches. Electronically mixed by Alan P. Lyles. The lyrics tell the story of a heartbroken girl who is singing to the one who broke her heart. The song portrays how by the time the other realizes that what the two had was special, it is too late, and the other will have already moved on. I think many listeners can connect with the lyrics in some way, as many have felt feelings such as the ones I portray in the words I used.

8. **Day Drive**

Michael Bradley Ballenger

Faculty mentor: Douglas Tejada

Whenever I first came back to college, me and my friends took one of our first days just to ride around Stephenville and take everything back in. The environment, the memories, the potential fun we were going to have, etc. After the day had ended, I was in a creative mood, and from that, I created an instrumental that just encapsulated, to me, that feeling of just having a good, carefree time with my friends, driving around.

9. **Civil Conflict**

Ethan Caldwell

Faculty mentor: Andrew Stonerock

Civil Conflict is a piece I composed for saxophone choir. It features many different contrasting musical elements, such as soft and loud dynamics, short and long articulations, low and high voices, etc. Through the use of these conflicting motives, as well prolific use of rhythm and dissonance, I intended to inspire ideas of arguments. This idea of argument could be reminiscent of simple domestic disputes, or as philosophical as

having one's ideas of morality conflict with each other. Overall, this piece for 8 saxophones incorporates intricate harmonies and contemporary melodic ideas in order to create a very enjoyable listening experience.

10. **TSU Street Beat**

Justin Bartlett

Faculty mentor: ???

I have spent the last four summers working with small high school percussion groups across the state of Texas. I take great pride in helping improve percussion education in small school band programs and a major part of that is writing pieces that allow them to improve and showcase their skills without being so overwhelming for them to play. A lot of marching percussion music is either written really complex and requires a lot of instrumentation or it is extremely watered down to basic middle school rhythms and just played fast. For the Symposium I decided to write something that really showcases my writing skills for percussion. In this piece I have incorporated a lot of grooves while working on rhythm and rudimental training. The goal of my pieces is to showcase small percussion programs on high level. My works have been performed in front of DCI legends Scott Johnson and Brett Kuhn.

Graduate Poster Session

Thursday, October 11, 9:30–11:00am, Ballrooms

1. Reduce Reuse ReRumen: Effect of preservation method of rumen fluid collected from slaughtered cattle on in vitro true digestibility*T. J. Garcia, J. P. Muir, K. A. Guay, J. A. Brady, & W. B. Smith**Faculty mentor: Dr. W. Brandon Smith*

Microbes and chemical constituents in the rumen fluid play an important role in re-establishing the rumen microbial population. To assess preservation of this fluid, twelve paunch samples were collected from the Tarleton State University Meat Laboratory. Liquid samples were divided into five 500-mL aliquots and randomly allocated to one of five preservation methods (freezing or lyophilisation) and preservative (glycerol; yes or no). A fresh control was maintained from each sample. Three reference feeds and two roughage sources were subjected to batch culture in vitro true digestibility (IVTD) assays using each of the four ruminal fluids (plus the control). Original samples and incubated residues were assayed for DM, CP, NDF, and ADF. Data were analyzed in a 2 x 2 + 1 augmented factorial design. There were no differences observed in IVTD for soybean meal and cracked corn among any of the treatments; however, there were differences in IVTD for all treatments for rice bran and grass hay. All treatments except frozen without glycerol were different for alfalfa hay IVTD. Despite lower degradation of reference feed, results suggest that, in the absence of fresh inoculum, preserved rumen fluid may be a viable option for research and veterinary applications.

2. Feeding Better Biochar to Bermuda Grass*Lauren E. Selph, Donald G. McGahan, Eunsung Kan, & James P. Muir**Faculty mentor: Dr. Donald G. McGahan*

Biochar physical and chemical properties are advertised to enhance soil properties and plant growth. Enriching biochar can further enhance its benefits. We utilized biochar from cellulosic (woody) and manure (dairy) feedstocks produced at similar pyrolysis temperatures. Biochar was added at 2% and 4% by weight of the soil. Soil analysis included pH, electrical conductivity, available water holding capacity, cation exchange capacity, extractable cations, and nutrient availability. Giant Bermuda grass [*Cynodon dactylon*] growth was tracked by number of nodes, plant height, leaf count and tiller count, as well as final biomass. We hypothesized a forage growth increase with biochar amendment and further improvement with enrichment. Manure biochar treatments produced significantly greater forage biomass than cellulosic treatments. Interval-enriching soil with biochar is a value-added treatment, enhancing nutrient exchange in the soil and increasing forage growth. Manure biochar has definitive advantages over cellulosic biochar when applied as a soil amendment.

3. Heritage forest landscape: A model of bird conservation and preservation of bio-cultural heritage in Bhutan*Rinchen Wangchuk, Hemanta Kafley, Thomas W. Schwertner, Sherub, Heather Mathewson, & Ugyen Tenzin**Faculty mentor: Dr. Hemanta Kafley*

The management of heritage forest as a paradigm of bio-cultural conservation landscape has immensely contributed towards environmental preservation across the globe. These bio-cultural forests served as wildlife reservoirs and provided various ecological services to the local inhabitants. Species diversity and richness are reported significantly higher supporting a range of key species. However, rapid developmental changes accelerated habitat degradation and fragmentation. Degeneration of socio-cultural values was also reported in many cases. Here we sought to determine the bird species diversity and richness to understand the overall conservation significance of the heritage forest landscapes. We surveyed three selected heritage forests and three state reserved forests during the months of June through August 2018. Trail transect survey was used applying the MacKinnon List to standardize survey effort within the sub-alpine coniferous ecosystem. Species richness and diversity of birds were determined by the condition of the heritage forest structure and human interferences. The locally protected heritage forest of Phabtan in Shingnyer showed higher species diversity that included some of the unique and threatened pheasant species compared to the other sites.

4. Assessing Arthropod Communities Under Native Prairie Restoration*Leo A. Herzberger & James P. Muir**Faculty mentor: Dr. James P. Muir*

Norther bobwhite (*Colinus virginianus*) decline has been attributed to reduced habitat quality and quantity. Reduction of quality grassland habitat, especially grasslands seeded to dense, sod-forming grasses like bermudagrass (*Cynodon dactylon*), may be linked to low bobwhite populations in some areas. Sod-forming grasses may not allow successful quail escape, nesting, or brooding habitat because they lack the proper vegetation structure, composition, and sufficient food. Many grasslands bird species, including bobwhite quail, become largely insectivorous during the breeding season and the nestlings are fed a protein-rich diet of

arthropods. Gamebird chick survival is dependent on invertebrate availability, and the ability to access insect prey is an important characteristic defining brood habitat quality. Vegetation characteristics such as bare ground cover and plant diversity appear to have a significant effect on insect selection and availability for quail. My project will test native seed mixes under post management methods to see how insect communities are affected. I measured arthropod abundance and diversity, using sweep nets and pitfall traps during the fall of 2017 and 2018. The objective was to determine arthropod diversity and abundance as effected by vegetative composition and grazing management.

5. **Prospective Epidemiological Study in Collegiate Rodeo Athletes**

Andrianna Forester & Tiffany Green

Faculty mentor: Dr. Jennifer Lancaster

This study is an epidemiological study with collegiate rodeo athletes. A search through current existing literature resulted in very limited or no injury data being reported for timed events in rodeo at any competitive level. However, some evidence is reported for rough stock, but is limited. One study indicated that 79.7% of all reported rodeo injuries were in rough-stock events (Meyers, et al., 1990). Most literature is outdated or does not exist. This study is expected to spot light these athletes and the athletic training healthcare they need. The purpose of this study is to better determine injury rates for both rough stock and timed collegiate rodeo events. The project will consist of a survey given via qualtrics. The first survey will obtain participant waiver and demographic information. Then surveys will be issued once per week to study participants and will collect information on the volume of practice and competition rides as well as injury data. Analysis of data will occur at the end of the fall semester. Injury rates for each event will be calculated as the number of injuries per exposure. The participants in our study include collegiate rodeo athletes. The teams included in this study all compete in the Southwest Region in Texas. The participants include both male and females, competing both collegiately and professionally. The age ranges from 18-25. The researchers are currently in the process of gathering data. A high number of injuries per athletic exposure are anticipated. If data demonstrates a high injury rate per exposure with limited to no medical coverage, this will demonstrate the need for athletic training healthcare coverage for collegiate teams. Researchers will also consider the differences in teams that currently have athletic training healthcare versus teams that do not.

6. **Use of Evidence-Based Practice Among High school Athletic Trainers: Attitudes, Beliefs, Accessibility and Barriers**

Madison McBride & Jennifer Lancaster

Faculty mentor: Dr. Jennifer Lancaster

Evidence based practice allows the athletic training profession and its clinicians to make the best decision for patients based on the clinical research, patient values and clinical expertise. Research was conducted to determine evidence-based practice among high school athletic trainers; specifically the effects on their attitudes, beliefs, accessibility and barriers. This study was previously done sampling athletic training educators, clinicians, and students. There is limited research; 8 known studies examining evidence based practice: Attitudes, Beliefs, Accessibility, Barriers, Knowledge, implementation prediction. The last known study was done in 2013. This data will allow researchers to understand if there is a correlation between what high school athletic trainers know and how they feel towards EBP. It is important to know what data has change and or developed in the last 5 years and it will be interesting to look at the smaller population of high school athletic trainers. The purpose of this study is to assess the attitudes, beliefs, accessibility and barriers amongst high school athletic trainers. This data collected will allow researchers to understand if there is a correlation between what high school athletic trainers know and how they feel towards EBP. An online survey will be randomly sent to high school athletic trainers identified through the National Athletic Trainers Association membership database. The 25 question survey will use a 4-point likert-scale and include a demographic survey. The data will be analyzed to detect differences for the ordinal data in the attitudes and beliefs and perceived barriers sections. By detecting the differences in the high school athletic trainers licence and number of years practicing, we will compare it to attitudes and beliefs and perceived barriers. These findings can then lead to suggestions that improve and or adjust the approach of high school athletic trainers' views of evidence based practice.

7. Education Over the Lelli Physical Examination and Insights in Clinical Use

Nathalie de la Torre, Eduardo Escobar, & Stephanie Nelson

Faculty mentor: Dr. Jennifer Lancaster

The purpose of this study was to: review the literature over the Lelli test (a clinical exam used to determine ACL rupture) understand how it is used by medical professionals in different clinical settings, identify how diagnostic accuracy of the examination compares to other trusted exams, provide exact instructions on the proper methods to perform the exam, and share the thoughts of several medical professionals over the evidence-based research supporting the exam to help educate the public and promote future research.

8. The Integration of Pre-Habilitation into Resistance Training Routines

Nikki Granath, Kenzie Donaldson, & Andrew Wolfe

Faculty mentor: Dr. Andrew Wolfe

Research suggests musculoskeletal pain in athletics is currently more common compared to 40 years ago (Harkness, Macfarlane, Silman, & McBeth, 2005). Youth athletes account for more than 2 million injuries, 500,000 doctor visits, and 30,000 hospitalizations (National Federation of State High School Associations Handbook, 1996). Research has developed a well-defined “return to play” protocol, involving a consistent systematic employment of therapeutic exercise, which is linked to timely injury recovery (Managing Return to Activities, 2016). While the effectiveness of therapeutic exercise as a rehabilitation mode is well-documented, limited literature outlines the utilization of therapeutic exercise as a preventative measure. Therefore, the following research review articulates the process of selecting appropriate corrective exercises, and presents the methods of integrating corrective therapeutic exercises into strength and conditioning training routines. The application of corrective therapeutic exercise as a preventative solution can be recognized as pre-habilitation (What Is Prehabilitation, 2016). Pre-habilitation involves three phases: 1) pre-activity movement assessment, 2) analysis of common sport specific risks, and 3) consideration of athletic position (What Is Prehabilitation, 2016). The three phase pre-habilitation screening exposes postural, muscular, and movement deficiencies, potentially associated with future injury. Incorporating sport and athlete specific corrective exercises in resistance training routines creates an optimal injury prevention scenario. Programmed within resistance training are rest interval that follow bouts of strenuous exercise. The rest component of resistance training routines provides an ideal platform for the integration of pre-habilitation. Corrective exercises that progressively resolve postural, muscular, and movement deficiencies can be assigned to active rest periods of resistance training routines. This coupling of strength, power, and endurance training with injury prevention enhances athletic development efficiency and theoretically, decreases the overwhelming injury rate of athletes.

9. Ergonomic Sit-Stand Desk at Tarleton

Micah Broughton

Faculty mentor: Amy McKay

This is a proposal of the importance and the benefit of ergonomic sit-stand desk across all four Tarleton State University campuses. Ergonomics is the science of fitting the task to the worker to maximize productivity while reducing discomfort, fatigue and injury. Sit-stand desk have been shown to increase energy, improve overall health, increase work productivity, decrease stress and improve mood. Sitting for long periods of time affects the feeling of the overall body, research shows standing for twenty minutes of every hour can decrease the risk of getting a musculoskeletal disorder. The number of insurance claims due to musculoskeletal disorders is increasing drastically. They are linked to the way people sit in their desk for long periods of time, sit-stand desk allows people to stand when wanted at the correct timing.

10. Tarleton State MSAT initiative for the prevention of Anterior cruciate Ligament injuries for female high school athletes

Jaelan Burns

Faculty mentor: Dr. Jennifer Lancaster

Female athletes have the highest risk of Anterior Cruciate Ligament injuries especially those involved in sports that require a sudden change in direction such as basketball and soccer. Female athletes are 4 to 6 times more likely to sustain non-contact ACL injuries (Myer, 2007). There are an estimated 38,000 ACL injuries in female athletes per year (Gilchrist, 2008), and the cost of ACL surgeries is \$17,000 and rehabilitative costs \$646,000,000 annually. This project is a designed initiative for the prevention of ACL injuries in female high school athletes. Three key factors affect young females predisposing them to this particular injury. These include ligament dominance (Myer, 2004), which happens when an athlete allows the knee ligaments to absorb the force rather than the lower extremity (Myer, 2004) and lack of muscular control of the lower extremity. The second factor is the quadriceps dominance (Myer, 2004): females have increased quad dominance compared to males (Myer, 2004), which may lead to the inability to maintain deep knee

flexion stance. The third and final factor is leg dominance (Myer, 2004): a difference in strength or power of 20% or more between limbs indicates neuromuscular imbalance (Myer, 2004), and another indicator of bilateral imbalance is an athlete's ability to perform a single leg balanced stance on an unstable surface (Myer, 2004). We will perform a best practices preventive protocol. The target group includes female high school athletes. An ACL preventive protocol will be created based on the literature of preventive exercises for ACL. A 6 week program that is to be completed 3 times a week during pre-season (Hewett, 1999) and once a week during the competition season. The protocol will include neuromuscular, plyometric, strength, and balance training.

11. **Marijuana use and chronic pain contribute to a decrease of theta band activity in the brain**

Tracy Brown, Kathryn Seymour, Cristian Botello, Kayli Colpitts, & Amber Harris Bozer

Faculty mentor: Dr. Amber Harris-Bozer

About 81% of chronic pain participants believed that using cannabis is more effective in treating pain than using opioids. The effects of cannabis and chronic pain have been heavily researched, but little is known about chronic pain sufferers that use cannabis for pain treatment. Pain sufferers are subject to inhibition within the frontal lobe of the brain, while cannabis users display decreased power in theta brain waves. The hypothesis was chronic pain sufferers and cannabis users will display more inhibition in the frontal theta band (4-7 Hz) compared to healthy controls. Twenty-one participants (aged 18-30, right-handed) were administered a survey to assess cannabis use and chronic pain (> 6 months). An electroencephalogram was used to record 5 minutes of resting brain activity. Independent samples *t*-tests using 2 frontal lobe sensors indicated no significant differences between the pain and no pain groups ($F_{p1}, p = .864$; $F_{p2}, p = .358$), and a significant decrease of theta activity among cannabis users in 1 sensor ($F_{p1}, p = .029$; $F_{p2}, p = .082$). We conclude that cannabis use causes a decrease of left frontal lobe theta activity, possibly by a top-down inhibitory network. Data collection is ongoing.

12. **Neural Mechanisms of Pain Approach-Avoidance Using an Electroencephalogram**

Cristian Botello, Tracy Brown, & Amber Harris Bozer

Faculty mentor: Dr. Amber Harris Bozer

Chronic pain sufferers do not have the choice to avoid or relieve pain and may experience decision-making conflicts consisting of approaching pain to achieve a reward. This research was designed to elucidate the neural mechanisms that accompany approach-avoidance behaviors among chronic pain sufferers. We hypothesized that a pain group would demonstrate increased prefrontal asymmetry. Participants included 31 right-handed people that reported chronic pain or no pain. An EEG (10 electrodes) was attached to the scalp during a hypothetical approach-avoidance task. Participants chose to approach varying levels of pain (low-moderate-high) to receive varying levels of a monetary reward (low-moderate-high). Prefrontal asymmetry was calculated in Microsoft Excel as the natural log of right-side alpha (F4) minus the natural log of left side alpha (F3). SPSS was used to compute independent samples *t*-tests and the pain group did not demonstrate increased avoidance or prefrontal asymmetry ($p > .05$). This makes sense because current literature states that increased prefrontal asymmetry is associated with avoidance. The chronic pain group approached painful stimuli more than the control group, therefore the chronic pain group would not show an increase in prefrontal symmetry.

13. **Teeing off Back Pain**

William Gibbs

Faculty mentor: Dr. Jennifer Lancaster

Many recreational golfers today experience low back pain. Whether this pain is caused from golf or from other activities of daily living, low back pain is still a factor that affects hundreds of golfers everyday. A variety of different exercises and stretches can help alleviate this pain. If they continually do these stretches and exercises daily, golfers can reduce their low back pain in their daily lives as well. The purpose of this project is to create a research based prevention program for reducing low back pain in golfers. I will discuss some different causes of low back pain in golf and demonstrate some stretches and exercises to help with low back pain. An evidence-based low back pain prevention protocol will be taught at various country clubs. I will give examples of what could be causing low back pain. I will also demonstrate various stretches and exercises that will help golfers' low back pain. Some of the stretches include knee to chest, windshield wipers, and cobra stretch. Some of the exercises include planks, bridges, and Supermans. After the demonstration, golfers should know causes for their pain as well as various ways to help relieve the pain.

14. **Best Practices: Why a Small School District Can Afford an Athletic Trainer**

Katie Gibson & Jennifer Lancaster

Faculty mentor: Dr. Jennifer Lancaster

There are 154 1A high schools in Texas and the research tells us that only 5% of them have a full time athletic trainer. This means 146 schools (95%) averaging approximately 100 students at each who do not

have immediate accessible health care. This is an alarming 14,600 students in all that are not getting the proper medical attention they deserve and need. Something needs to be done. The purpose of this study is to inform 1A high schools in Texas about how important and necessary an athletic trainer is. As well as to inform them of injury rates, competencies of the Certified Athletic Trainer, difference between contract and full time athletic trainers, and lastly how much they would benefit having a full time athletic trainer at their school. This project will encompass everything from injury rates and the cost of doctor visits to differences between larger schools and 1A schools. Also information will be given on what an athletic trainer can do for a school and how to employ one. Hopefully this project will influence schools to hire a full time athletic trainer for their upcoming year.

15. **The Relative Influences of Turtle Ecology and Ambient Water Quality on Determining the Community Composition of Epizooic Diatoms**

Natalee Williams, Victoria Chraibi, & Shelby Galyon

Faculty mentor: Dr. Victoria Chraibi

Algae form the backbone of aquatic ecosystems as the base of the food web. Diatoms (Bacillariophyceae), a group of golden-brown algae, are abundant and important members of aquatic communities. These algae often attach themselves to the carapaces of aquatic turtles. Studies conducted in Oklahoma suggest that some species of diatom specifically live on turtles; they do not live on other substrates within their environment (Wu and Bergey, 2017). However, no studies of this kind have been conducted in Texas. This study is sampling at least 10 individuals each from live specimens of 5 different aquatic turtle species for the presence of epizooic diatoms. Turtles are caught by live-trapping in central Texas rivers and ponds of varying water quality. Three scutes on the carapace are scrubbed with a brush to collect samples before releasing the turtle. Basic water quality metrics are taken on site, and rocks are sampled for epilithic diatoms for comparison. Diatoms are identified to species. Statistical analysis will consider the relative importance of water quality, substrate availability, and aspects of turtle ecology and behavior on the diatom community assemblage. This poster will present preliminary findings.

16. **Novel Application of CRISPR-Cas12a DETECTR System to Water Quality Monitoring along the Texas Gulf Coast: An Improved, Rapid Method for the Early Detection of Harmful Algal Blooms in Aquatic Samples**

Carrie Maryak

Faculty mentor: Dr. Jeff Brady & Dr. Janice Speshock

Harmful Algal Blooms (HAB) are an increasingly frequent phenomenon in salt and fresh waters. Current detection of HABs relies on quantitative Polymerase Chain Reaction (qPCR), but often occurs following an ichthyotoxic event and is susceptible to waterborne inhibitors. Recently developed Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) systems provide alternate monitoring options to established qPCR methods. A system established in 2018, termed DNA Endonuclease Targeted CRISPR TransReporter (DETECTR) utilizes *Lachnospiraceae* bacterium CRISPR-associated protein 12a (LbCas12a) and activating CRISPR RNA (crRNA), coupled with a DNA reporter molecule, to detect the presence of a specific target within an environmental sample. Through redesign of specific crRNA sequences, DETECTR can be quickly adapted to indicate the presence of a common HAB forming species, *Microcystis*. DETECTR is capable of distinguishing strain variants, which is beneficial since nontoxic and toxic *Microcystis* strains are present in the environment. This study will compare detection of *Microcystis* in Texas waters via DETECTR and qPCR using standards, spiked samples, and environmental unknown samples.

17. **Nurture vs. Avoidance: Shifting Water Relief Paradigms From Short-term Symptom Management to Sustainable Creation Stewardship**

Lisa Akinoyemi & David Pendergrass

Faculty mentor: Dr. Barbara Bellows

This presentation outlines current methods to provide short term water supplies and proposes a sustainable alternative for watershed development. The current paradigm is driven by crisis management and often leans on foreign resources that require upkeep and can foster dependency cycles. Sweetwater C.A.R.E.s. Sweetwater establishes communication (C) with influential community members who are seeking long term solutions. Sweetwater then ascertains (A) resources and local tools available for nurturing abundant, clean water and to address identified obstacles to water access. Sweetwater researches (R) solutions that are biblically informed and scientifically sound. Sweetwater educates (E) local community leaders to train their own people. Results are also disseminated to the global scientific and relief communities. Sweetwater intends to demonstrate the effectiveness of a biblical, long term, watershed-scale approach and help initiate a paradigm shift from solutions that operate in small spatiotemporal scales (e.g., digging wells and providing bottled water) to large scale solutions for sustainable water resource management. This proposed paradigm is currently being tested with projects in Texas and Ethiopia. Expected long term outcomes include

community-driven, sustainable, best management practices for nurturing water resources. This research is a prime opportunity for student researchers to connect their skills with real-world problem solving.

18. Impact of Land Use Practices on Fisheries Ecology of Two Rivers in North Central Texas

Farron Fiedler Jr. & Barbara Bellows

Faculty mentor: Dr. Barbara Bellows

Land use, habitat quality index (HQI), fish index of biotic integrity (IBI), and water quality measures were made at four equidistant sites along each of two rivers in North Central Texas. The North Bosque River (NBR) has numerous Concentrated Animal Feeding Operations (CAFOs), several wastewater outfalls, and two golf courses, mainly concentrated within the upper reach. These land uses are associated with significantly higher levels of orthophosphate in the water. The Paluxy River (PR) has only four CAFOs and no wastewater outfalls within the study area. Indicators of better fish quality, including fish IBI measures of intolerant fish species, benthic invertivores, presence of piscivores, and HQI score were consistently higher in the PR compared to the NBR. However, the percentage of piscivore fish in the NBR increased with the distance from the area of high orthophosphate concentration in the water. At the upper two sampling sites of the NBR, where the orthophosphate levels were the greatest, the HQI score was lower for the NBR compared to the PR. Despite the environmental impacts to the upper reach of NBR watershed, the HQI was the same for both rivers at the lower two sites.

19. Systems thinking analysis of farmer adoption of conservation practices

Lisa Akinyemi & Barbara Bellows

Faculty mentor: Dr. Barbara Bellows

A national consortium of researchers, farm support personnel, businesses, and farmers are developing a Soil Ecosystem Services program (SES). After several decades of slow adoption of conservation farming practices, this consortium seeks to enhance the overall economic benefit for adopters of agriculture best management practices (BMPs). By working with the private sector, they seek to provide farmers who enhance soil health with economic incentives while the participating private companies gain “sustainability” credentials. Currently, farmers in Texas are receiving mixed and often contradictory messages about conservation practices from various farm support personnel, which impede the adoption process. This poster includes a brief description of soil ecosystem services BMPs, their environmental benefits, and a qualitative “mind-map” causal loop diagram, and a discussion of research methods that will quantify interactions illustrated in the diagram. These methods will include socio-economic surveys of farmers and farm support personnel and secondary research. The diagram will focus on interactions among factors such as economic incentives, educational messaging, interactions with farm support personnel, farm tenancy, and farm demographics that influence farmer adoption of BMPs. It will also address factors that influence the price point of incentives required to stimulate BMP adoption.

20. Analyzing Multivariable Water Chemistry to Assess Water Quality of Reference Sites in Texas In Compliance With the National Rivers and Streams Assessment

Gabriel Wechter Nejad

Faculty mentor: Dr. Victoria Chraibi

Of the many streams and rivers in Texas, only a few have been previously included in the National Rivers and Streams Assessment, a national water quality survey that recurs every five years. The purpose of this research is to sample a subset of potential reference sites identified by NRSA but never sampled. The study will collect water chemistry data using field and laboratory methods in compliance with NRSA protocols. Each site will be sampled in spring, summer, and fall in order to compare seasonal differences in water quality. Statistical analyses will employ temporal and spatial comparisons of water quality among different streams by season, ecoregion, and watershed land use. Doing so will bridge data gaps in the national assessment to include rural Texas ecoregions, helping to determine the extent to which rivers and streams support healthy biological conditions and to identify their major stressors to inform management.

21. **Identifying the Influential: Using the PD4SDG database as a proxy for regime formation**

Tu Nguyen, Scott Cook, & Anne Egelston

Faculty mentor: Dr. Scott Cook

This project examines the geospatial coverage and network connectivity of entities that have registered voluntary commitments to the United Nations Sustainable Development Goals as published in the Partnership Data for the Sustainable Development Goals (PD4SDGs) database prior to 2018. We seek to measure support for the sustainable development paradigm. We assume that the projects registered in PD4SDGs represent good faith efforts to support the values, norms, and beliefs of sustainable development. However, merely registering a project in a database is not sufficient for regime formation. We will present mathematical models that attempt to quantify the efficacy of these projects toward regime formation and identify factors that inhibit it. We first look at the geographical coverage of the projects and the entities conducting them. We then perform a network analysis of the topology of the network where two nodes are connected by an edge if they are partners on the same PD4SDGs project. We identify connected components of entities connected (directly or indirectly) through such collaboration. Then, we apply mathematical connectivity metrics such as degree rank, betweenness centrality, cut degree, and pagerank to identify the most important entities in the network. We observe that the network has one main giant component containing a majority of entities and a corona of smaller clusters with no connection to the giant component. We are specifically looking to identify characteristics of the corona that inhibit network growth and block regime formation.

22. **Get the Most (Big) Bang for your Buck**

Clayton Boone, Pedro Romero, & Tu Nguyen

Faculty mentor: Dr. Scott Cook

We want a model that will optimally distribute limited scientific funding among its constituent fields in a way that produces the most science. Our dynamical systems approach is based on author productivities derived from their papers on the ArXiv. An author is funded by a field in proportion to their contributions to that field. The author then uses this funding to produce more science (not limited to that field), which will update the funding distribution for the next cycle. We will find the stable, optimal distribution based a rough estimate of current real-world funding levels.

23. **Enigma: Breaking Down the German Encryption Machine**

Edward Smith & Sabrina Hetzel

Faculty mentor: Dr. Scott Cook

In times of war, one of the most vital abilities is being able to securely send and receive encrypted messages. In World War II, the infamous Enigma Machine was the key to the initial stages of the war for the Germans. While the Enigma Machine was a marvel for its time, it was by no means a perfect encryption machine. We will cover the inner workings of the Enigma and how the Polish Cipher Bureau was able to reverse engineer their own Enigma Machine using mathematics and help from the Allied Forces. Moreover, we will demonstrate an Enigma emulator we wrote in Python using Jupyter notebooks. This project was part of the summer 2018 study abroad course in math history called “Math in Time of War.”

24. **Hadoop Computing Cluster**

Edward Smith, & Tu Nguyen

Faculty mentor: Dr. Scott Cook

The ability to deal with massive amounts of data is essential for many modern businesses and researchers. Companies like Microsoft rely on a technology called Hadoop to connect a cluster of storage nodes into a big data warehouse. This architecture allows the cluster to easily scale to fit growing needs by simply adding more nodes. Moreover, data is stored redundantly; when a node fails, its data can be rebuilt using data from the remaining nodes. In summer 2018, we created a working Hadoop cluster in the Department of Mathematics using old computers that were set to be decommissioned. This cluster could serve the growing data storage needs of researchers around campus. If you have a big data set that needs a place to live, we are eager to collaborate with you.

Undergraduate Poster Session

Friday, October 12, 8:30–10:00am, Ballrooms

1. Moo-vie Popcorn*L. Paige Bielamowicz, Taylor Garcia, Nichole Cherry, Jim Muir, & W. Brandon Smith**Faculty mentor: Dr. W. Brandon Smith*

Animals with multi-compartmented stomachs, also known as ruminants, are designed for the digestion of cellulosic materials, which is an expensive undertaking. Oftentimes, byproducts of other industries are repurposed for use in livestock diets to decrease these costs. However, with increased use of these byproducts, costs increase and viability is lessened. Therefore, finding alternative feedstuffs will benefit the cost of the livestock production. Our objective was to evaluate the viability of waste popcorn as a feedstuff in ruminant diets. The first experiment in this project evaluated the storage potential of popcorn discarded from a local cinema. The design of this experiment was a completely randomized design with repeated measurements. Popcorn was collected on consecutive weekdays in two wk. Samples were stored at room temperature for 0, 1, 2, 3, 7, 35, 70, 105, and 140 d. Samples were subjected to a batch-culture in vitro assay for digestibility estimates. Original samples and incubated residues were assayed for dry matter, neutral detergent fiber, acid detergent fiber, and crude protein concentrations. Results indicated that popcorn could be viably stored without a decrease in nutritive value, leading us to conclude that popcorn may represent a viable feedstuff to add to the arsenal in ration formulation.

2. Effects of commercial probiotic on bees exposed to insecticide*Julianna Hicks & Kimberly Guay**Faculty mentor: Dr. Kimberly Guay*

Recently, hive productivity and honey bee health have been declining due to a variety of stress factors. Hive treatments have involved chemicals. Because of this, beekeepers need natural hive treatments to facilitate bee health. This study evaluates the effects a commercial probiotic has on bee health. There were two phases of this project. During Phase 1, three colonies of bees (n=150) were raised in the laboratory. Bees were exposed to one of three treatment groups, 1) sugar water (CON), 2) probiotic and sugar water, and 3) insecticide with sugar water and probiotic. Data (mortality, intake, and wax production) were collected every eight hours for ten days. In Phase 2 of this project, ten bees were placed in one of two treatments 1) probiotic with sugar water 2) sugar water (CON). Foraging time was recorded via video camera and data (mortality, intake) were collected at 24 hours for ten repetitions. Results from Phase 1 found XX % and XX % mortality for CON and probiotic treatments respectively. Currently, this research indicates that probiotics did not alleviate the effects insecticide. However, bees fed probiotic displayed an increase in overall bee health as seen by increased wax production and lower mortality rate.

3. Fish surveys in north-central Texas in compliance with the National River and Streams Assessment*Charles Armstrong & Lauren Halbert**Faculty mentor: Dr. Victoria Chraibi*

The species living in an area can provide information about the health of the area; this is particularly true in an aquatic habitat, for which fish serve as reliable water quality indicators. Following the data collection protocols from the Environmental Protection Agency's National Rivers and Streams Assessment (NRSA), fish were surveyed to help determine the water quality for eight streams in north-central Texas. Field collections used seine nets and an electrofishing backpack to collect a target sample size of 500 fish over a 100 m stretch of river. Fish were collected while wading in the stream and kept in a live well. Once all fish were collected, they were identified, weighed and measured, and enumerated. During the early stages of the project certain streams were unattainable due to the streams being dry. Moreover, heavy rains during early September inhibited access to some of the streams due to high waters and flash flooding. These difficulties highlight some challenges of applying protocols created for large rivers to smaller streams in arid regions. Even so, the data provided by fish towards the creation of an index of biotic integrity (IBI) tailored for specific streams helps to monitor water quality in water sources of any size.

4. Native Bees and Associated Forage Plants of Parker County, Texas*Camille Carey, John Montoya, & David Kattes**Faculty mentor: Dr. John Montoya & Dr. David Kattes*

Little data has been collected about bees in Parker County, Texas. The purpose of this research was to collect and identify bees, and the plants they were collected from, in Parker County, Texas. This collection will provide a baseline dataset of bee species, and the plants they feed on, in north central Texas. These collections took place from February through August, 2018. GPS coordinates were recorded for each bee-plant collected. Over 1,800 bees were collected and keyed to the genera. Each plant was identified at the

family level. The plant family Asteraceae attracted the most diverse bees out of all the plants collected from. Plant families such as Fabaceae seemed to attract mostly bees from the Halictidae family. Peponapis bees seemed to be predominantly attracted to plant family Cucurbita.

5. **Coring versus Compliant Cavity to Determine Bulk Density**

Parker E. McCoy & Donald G. McGahan

Faculty mentor: Dr. Donald G. McGahan

Soil health coincides with lower soil bulk density. Increased bulk density can inhibit root elongation, decrease infiltration, and reduce soil aeration. Conversely, engineers seek increased bulk density for higher strength. Either perspective entails reliable measurements for bulk density. The coring method is common and is generally considered cost effective. When coring there is a potential for mechanical alteration of the sampled soil while driving the cylinder into the soil. The conventional tilling practice is preparing well-disked 'clean till' fields to facilitate seedling establishment. This approach results in soils that can behave as single grain, or structureless, making core extraction difficult when the soils are dry. The compliant cavity method is considered time consuming but works reasonably well in rocky or massive structureless horizons. This project evaluates four sampling sites across a field. Each site consists of a central sampling location with four proximal satellite locations. From each location three cores and five compliant cavity samples were taken. Do the two methods return similar values, and how do they compare under statistical analyses?

6. **The Use of a Standardized vs. Perceptually Regulated Work-to-Rest Ratio during Resistance Training: Effect on Training Volume and Lift Quality**

Blake George, Jordan Sanford, Andrew Wolfe, & Matt Laurent

Faculty mentor: Dr. Andrew Wolfe & Dr. Matt Laurent

Recovery is an increasingly important training variable that has garnered increased attention in the scientific literature. Indeed, optimizing recovery is established as an important training consideration and serves as an informative guide in terms of tailoring workloads in subsequent bouts of training. While the importance of assessing and augmenting recovery on a day-to-day basis has been established, what is less known is that process of optimizing work-to-rest periods within a resistance training session. Currently, there are guiding recommendations that establish a window of time to rest after the completion of a set of work from the National Strength and Conditioning Association during strength training (two to five minutes long). However, it is problematic that, in many cases, an arbitrary selection of a static recovery time is usually selected before the session and little consideration is given to titrating recovery time; potentially blunting the training response. There is growing evidence, though, that perceptual measures can be used as expeditious and effective means of non-invasively guiding recovery periods. While the use of perceptual measures to monitor within-session recovery has typically been used in repeated sprinting, it stands to reason that this strategy would be effective during resistance training as well. Therefore, the purpose of research is to determine the effect of self-selecting vs. standardized work-to-rest periods impact on work volume or power output in bench and squat. Resistance trained men and women that are asymptomatic will serve as participants in this study. Each participant will complete three experimental sessions. Session one will consist of obtaining each individual's one-repetition maximum (1RM) in both bench press (BP) and back squat (SQ). A standardized procedure established by the National Strength and Conditioning Association will be employed in order to maintain validity in measurement. Following a minimum of 48 hours of recovery, the individual will report back to the laboratory to complete a training session that will consist of a load for both BP and SQ of 85% of their 1RM. Each participant will be asked to complete six repetitions per set with a total of five sets of work. During the repetitions, lift quality will be assessed utilizing a Tendo unit that will measure bar velocity (m/s) and power (watts). Immediately following the set of work, each individual will report their rating of perceived exertion (RPE) using the OMNI RPE scale for resistance training. After reporting their RPE, participants will either sit passively for the designated recovery period or will utilize a Perceived Recovery Status (PRS) scale to guide their recovery. In the case of a standardized recovery, participants will be informed of the final 15-s of recovery to prepare for their next set. When utilizing the PRS, when an individual reports a 7 (out of 10) they will be asked to begin their next set. Participants will always complete the SQ exercises first followed by a 15 minute recovery period before performing the exact same procedures but performing BP. The order in which participants employ a perceptually regulated vs. standardized recovery session will be counterbalanced. The training sessions will be separated by a minimum of 48 hours. Data acquired from the trials will be analyzed using a 2 (trial) x 2 (lift; BP or SQ) x 5 (set of work) repeated measures ANOVA to identify any significant main effect of recovery strategy on RPE, volume, or lift quality (i.e., power or velocity) during the session. If main effects are identified, post-hoc measures including Fisher's LSD will be employed to identify significant differences. In addition to formal statistical tests, measures of effect size will be calculated to determine magnitude of difference using Cohen's *d* calculation in which a 0.2 is considered a small effect, 0.5 moderate and 0.8 a large effect.

7. Maximal and Submaximal Resistance Training Load Recommendations

Jared Shields, Ty Hill, & Andrew Wolfe

Faculty mentor: Dr. Andrew Wolfe

Research has identified a positive relationship between physical activity and human performance benefits, both mentally and physically (Ekblom-Bak, Ekblom, Andersson, Wallin, & Ekblom, 2018). One mode of physical activity is exercise (Nieman, 1998). Any physical activity that is planned, structured, and repetitive, with a purpose of improving or maintenance one or more compounds of physical fitness is defined as exercise (Caspersen, Powell, & Christenson, 1985). Various forms of exercise are utilized to enhance physical performance. Among these forms, resistance training has recently gained great popularity (Lopes, Aoki, Crisp, de Mattos, Lins, da Mota, & Marchetti, 2017). Strength and conditioning specialists employ a multitude of resistance training tactics that involve maximal and submaximal loading to achieve optimal performance. However, the ideal selection of training load (maximal or submaximal) is frequently debated. The following research review outlines the benefits associated with maximal and submaximal loading, and presents the optimal exercise program integration of each loading method. Maximal training is the use of heavy loads, or high percentages of the individual's one rep max performed for few repetitions (Barrett-O'Keefe, Helgerud, Wagner, & Richardson, 2012). Submaximal training is the use of moderate loads, at lower percentages of the individual's one rep max performed for higher repetitions (Grosicki, Miller, & Marsh, 2014). Maximal training causes a larger increase in serum testosterone than submaximal training, and has also been associated with the greatest metabolic adaptations (Innamo, Pakarinen, Komi, Kraemer, & Hkkinen, 2005). Additionally, submaximal training is related to increased aerobic working capacity and the promotion of muscle recovery (Boyadjiev, 2004). As highlighted, improvements in performance are obtainable when strength and conditioning professionals employ either maximal or submaximal training protocol. Therefore, the researchers recommend strength and conditioning professionals design and prescribe training programs with varying load emphasis depending on the athletic season. Within post-season mesocycles, submaximal training loads are the primary selection and should align with rest and recovery recommendations. Off-season programming initially involves submaximal loading and progresses to maximal loading as the athlete approaches pre-season training. Preseason mesocycles utilize maximal training with limited submaximal supplemental loading. Finally, in-season training alternates maximal loading with submaximal loading to continually achieve enhanced fitness adaptations and avoid overtraining/injury. Furthermore, the considerations regarding the ideal selection of maximal or submaximal loading is ultimately dependent on seasonal program design.

8. Alpha Band Brain Activity in Chronic Pain and No Pain Groups

Kayli Colpitts, Tracy Brown, Cristian Botello, Kathryn Seymour, & Amber Harris Bozer

Faculty mentor: Dr. Amber Harris Bozer

Chronic pain sufferers don't typically have the option to avoid their pain, instead they are forced to approach their pain to complete daily tasks. A previous study has shown a decrease in alpha band brain activity for individuals in chronic pain, and we hypothesized that this may be powered by frontal lobe changes. A 24 electrode wireless EEG was used to record brain activity. Participants were presented with 75 approach-avoidance scenarios comprised of a meter for money (low-medium-high) as well as a meter for pain (low-medium-high), then they had to decide whether to approach or avoid each hypothetical stimulus in hopes of gaining a corresponding reward. Each participant must decide whether to "experience" the given amount of pain to "receive" the related amount of money. One-way ANOVA analyses revealed that there were no significant differences between frontal alpha band activity in chronic pain and control groups ($p > .05$). This study is ongoing, and it is likely that we were underpowered to detect any significant differences between the groups. Continued research will focus on the effects of opioids on alpha band inhibition during chronic pain.

9. Decreased alpha band frequency in left frontal lobe in cannabis users with chronic pain measured by encephalogram

Kathryn Seymour, Tracy Brown, Cristian Botello, & Amber Harris Bozer

Faculty mentor: Dr. Amber Harris Bozer

Cannabis is often used as an analgesic by chronic pain sufferers. Legalizing marijuana has been controversial, and more research is required to elucidate the efficacy of cannabis for chronic pain. Studies have shown that both chronic pain and cannabis use independently result in an inhibition of activity in the alpha frequency band. We hypothesized that pain and marijuana will create a combinatorial decrease of alpha frequency band activity in the frontal lobe. Five minutes of resting encephalogram activity was recorded from 21 participants. Data were exported, filtered, and artifact rejected in Matlab and imported into Notepad++ and Cartool to complete a Fast Fourier Transform. Microsoft Excel was used to compute prefrontal asymmetry as the natural log of right side alpha (F4) - natural log of left side alpha (F3). SPSS was used to

run ANOVAs. Cannabis and pain produced a decrease in alpha frequency activity in the left frontal lobe ($p = .04$). There was a significant interaction between pain and cannabis on prefrontal asymmetry ($p = .03$). Pain and cannabis result in meaningful changes in brain activity in the left frontal lobe that should be taken into account when making decisions about cannabis for analgesia.

10. Internal vs. External Causal Attributions: How one's Locus of Control Perspective Relates to Psychological Well-Being

Sara Maganzini, Bethany Isaacs, Holden Childress & Heather A. Labansat

Faculty mentor: Dr. Heather A. Labansat

The present study explored the relationship between participant's Locus of Control scores (Internal vs. External) and their Psychological Well-Being (PWB). 267 participants completed an online questionnaire using Qualtrics. Participants were recruited using Social Media (Facebook, Instagram, and Twitter), and were not compensated for participating. Rotter's Locus of Control scale (Rotter, 1966), and Ryff's Psychological Well-Being scale (Ryff, C.D., 1995) were used as measures. Correlational analysis showed there was a significant negative correlation between Locus of Control (Internal, External) and Psychological well-being ($p < .000$), where participants with an Internal LOC had significantly higher psychological well-being scores. Ryff's Psychological Well-Being scale has a total PWB score as well as 6 variables that contribute to the overall PWB. 5 out of 6 variables had significant negative correlations as well. This poster will discuss future analysis using Structural Equation Modeling, as well as future directions for our research.

11. Exploring Compassion: The Relationship Between Perspective Taking, Empathic Concern and Compassion for Self and Others

Holden Childress, Bethany Isaacs, Sara Maganzini & Heather A. Labansat

Faculty mentor: Dr. Heather A. Labansat

The present study used correlational analysis to determine if a person's perspective taking ability and empathic concern was correlated to having compassion towards oneself and/or other people. A 162 item questionnaire was completed by participants using Qualtrics. Participants were recruited from social media (Facebook, Twitter, Instagram) and were not compensated for participating in the survey. Results showed a significant positive relationship between Perspective taking and Self-Compassion ($p < .001$), and Compassion for Others ($p < .001$). Empathic concern was not correlated with Self-compassion (n.s.), but had a significant positive correlation with compassion for others ($p < .001$). This was the first step of this exploration and future analysis using Structural Equation Modeling will be discussed, as well as future directions for research.

12. A Review of Patterns of Energy Drink Consumption among Undergraduate Students and the Associated Health Consequences

Kellyne Nakitare & Subi Gandhi

Faculty mentor: Dr. Subi Gandhi

There is a rising trend of energy drink consumption in the United States, especially among the youth. These drinks have high amounts of stimulants and caffeine, and are among the popular choice of beverages among college students for various reasons. However, many of them are not aware of the adverse health outcomes associated with this behavior. In the recent years, there has been a sharp increase in the number of emergency department visits due to the consumption of energy drinks by the youth. A current rising trend has been mixing of energy drinks with alcohol which increases binge drinking capacity. Drinking of energy drinks habitually could be a screening medium of potential alcohol and substance abuse. Knowing this could help us in starting early discussions and interventions to prevent alcoholism and drug abuse in a non-confrontational means among students. This review will highlight some of the recent trends of energy drink consumption in the United States by the undergraduate students, some key risk factors for its usage, and the adverse effects associated with the behavior.

13. Intermittent Hypoxic Conditioning: Potential Treatment for Ischemic Stroke

Genell Tantingco

Faculty mentor: Dr. Myoung-Gwi Ryou

Intermittent, normobaric hypoxia (IH) conditioning increases cerebral resistance to subsequent ischemia-reperfusion, resulting in near prevention of cerebral infarct after ischemic stroke. The cerebroprotective mechanisms of IH are unknown. Cerebral ischemia-reperfusion triggers activation of microglia might contribute to injuring cells by over-activating proinflammatory cytokines and chemokine. The regulation of the phenotype of microglia will provide a pivotal clue in developing an effective treatment for the ischemic stroke. Furthermore, it will help to develop an intervention the victims of ischemic stroke. Currently, FDA-approved treatment for the ischemic stroke is only rtPA. This study examined a mechanism how IH-derived phenotype switches of microglia occur in the in vitro OGD-reoxygenation model. EOC 20 microglia cells ($n=30$) were conditioned by a three days IH program consisting of 5-8 daily, 5-10 min cycles of

hypoxia with intervening 4 min reoxygenation, previously shown to produce robust cardioprotection [Exp Biol Med 2004; 229:806-812; Basic Res Cardiol 2006; 101:436-446]. 24 h after the last IH, Microglia was harvested to perform a series of experiment; content changes of a series of proteins and cytokine (immunoblot and ELISA), ROS generation (DCFDA assays), phagocytic activity (FITC conjugated particle phagocytosis assay), and cell phenotype (immunocytochemistry, CD68 (M1) and CD206 (M2)). Immunocytochemistry and western blot indicates that IH shifts the microglial phenotype relatively toward anti-inflammatory type (vs. control). Phagocytic activity of EOC 20 was significantly enhanced vs. control group. EGF alpha and IL-10 content were elevated in the IH group. Microscopic examination and flow cytometry quantification showed IH enhanced phagocytic activity (vs. non-IHT groups), Last, ROS generation in the OGD groups was significantly increased, but IH was able to dampen the ROS generation. IH shifts the microglia to the anti-inflammatory phenotype. A possible mechanism of IH-induced phenotype change of microglia could be related to the regulating ROS and anti-inflammatory cytokine.

14. **Increase in ROS in microglial cells**

Sara Iadarola, Genell Tantingco, Josiah Steele

Faculty mentor: Dr. Myoung-Gwi Ryou

Stroke is one of the leading causes of disability and death in America. According to recent statistics, stroke kills about 140,000 Americans each year. 87% of all strokes were diagnosed as ischemic strokes. The microglial cells play a key role in the brain and function as the resident phagocytic cells. The Reactive Oxygen Species, ROS, can affect the phagocytic activity of the microglial cells. The increase in ROS can overwhelm the cells' natural antioxidant defenses and activate the microglial cells. While the mechanism of the ischemic stroke disease process is complex and have not been researched fully, the serious effects that it has on microglia cells can be used to further understand the disease process. This makes them an ideal candidate for research. The main purpose of this research is to investigate the effects that an increase in ROS has on microglial cells due to an ischemic stroke. The two specific aims were to see if ischemic stroke decreases the mitochondria function and if it decreases the superoxide concentration of the microglia cells. The microglial cells, taken from a mouse, were grown and tested for their viability. Although there was a decrease in viability, other viable cells that were provided were used. They were then exposed to an oxygen glucose deprived, OGD, environment for a 90 minutes. The cells were then reoxygenated for 24-hours and prepared for staining. Dichlorodihydrofluorescein Diacetate, DCFDA, was used to stain the microglial cells. This stain directly measures the redox state of the cells and measures the ROS that is produced by the cell.(2) The stain produces a green fluorescent pigment when bound to the ROS. The results showed an increase in ROS after the cells were exposed to OGD. There was an increase in production of green pigment from the OGD exposed cells compared to the normal cells. The green pigment is directly proportional to the ROS. The simulated ischemic environment also increased the amount of proinflammatory produced as well as the phagocytic activity. A simulation of ischemic stroke, OGD, did increase ROS. The cells were damaged in the OGD thus increasing the production of ROS. In order to help the cells recover, there is an increase in both the proinflammatory and phagocytic activity. This can help with regeneration of the cells and overall stroke recovery.

15. **Cholesterol Synthesis and Cell Migration in the presence of Glucose and Statins**

Jamie Damon, Christopher Daniell, Puja Naran, Gregory Smith, & Dale Telgenhoff

Faculty mentor: Dr. Dale Telgenhoff

The need for cellular cholesterol is enhanced during wound healing due to the need for increased cell membrane synthesis. Elevated blood glucose levels are implicated in various pathologies associated with diabetes such as neuropathy, blindness, and impaired wound healing. Presumably, high blood glucose levels increase glycosylation of proteins necessary for cell migration, a process that is essential for robust wound healing. The purpose of this study was to examine cholesterol levels in cell culture assays following treatment with either high glucose or statins, both in normal and wound-healing models. Adult keratinocytes were cultured to confluence and treated with either glucose or Pitivistatin. After 24 hours wounds were made by scratching the surface of the monolayer. Total cholesterol levels were determined using a colorimetric kit (Biovision). Cholesterol levels were elevated in all wounded samples compared to unwounded controls. The glucose treatment showed the largest increase in total cholesterol, while the Pitivistatin treatment showed the largest decrease. Measurements of wound size indicated that while glucose and no treatment wounds decreased over time, Pitivistatin wounds increased. The results of this study indicate the need for cholesterol synthesis during the cell migration process.

16. **Disparities in Incidence and Mortality rates of Breast Cancer in North Texas Counties**

Mackenzie Greer & Subi Gandhi

Faculty mentor: Dr. Subi Gandhi

Breast cancer is the most commonly diagnosed cancer and second leading cause of death among women in

Texas. This study was conducted to identify breast cancer disparities in 16 North Texas Counties. This study utilized various secondary data sources from governmental and nonprofit agencies to obtain the breast cancer incidence and mortality rates of 16 North Texas Counties (Collin, Cooke, Dallas, Denton, Ellis, Erath, Grayson, Hood, Hunt, Johnson, Kaufman, Navarro, Parker, Rockwall, Somervell, Tarrant and Wise). Our study revealed that Erath County had the highest age-adjusted incidence rate of breast cancer compared to other North Texas Counties for 2011-2014. For the same study period, Parker County had the highest age-adjusted breast cancer mortality rate of breast cancer. The increase in breast cancer incidence and mortality in some North Texas Counties could be due to lack of early education on modifiable risk factors and mammography referrals, as well as poor health care access.

17. Phagocytic Activity of Microglia Cells after OGD

Gong Song, Mahnoor Sohail, Thu Kieu, Karis Kim

Faculty mentor: Dr. Myoung-Gwi Ryou

Microglia cells in the brain are normally in resting form and is composed of a cell body with long branching arms that moves and survey the surrounding area for any physiological change in the environment. In healthy conditions, there are many inhibitory protein and interactions with the neuronal cells preventing microglia to go into active form. In ischemic stroke there is reduced amount of oxygen and nutrients flowing to the brain causing neuronal cell death which removes the inhibitory signaling and causes microglial activation. After activation of microglia cells changes shape by retracting the branching arms which allows the cell to migrate to the site of damage to clear out the cell debris. The activated microglial cells have increased phagocytic activity and switches to the M1 phenotype which is pro-inflammatory and the secreted pro inflammatory factors can then activate more microglia cells. Microglia cells from phase two EOC20 cell were washed with 4.5 mL of NaCl and 0.9 saline. The cells were incubated for 5 minutes at 37 C after adding 1.5 mL of Trypsin to eliminate the remaining fetal bovine serum (FBS). A 3.5 mL of 10% FBS and 10% of Dulbecco's modified eagle's medium (DMEM) utilized to wash cells up to three times to remove the dead cells. Less than 80% grown confluent cells subculture on the two plates and incubated in the two different conditions; the anoxia condition, and the normal condition respectively. After 24 hours of incubation, Cayman's Phagocytosis Assay Kit employed to evaluate the activity, the size, and the number of cells. A latex beads-rabbit IgG-FITC complex with a fluorescence-labeled directly on the pre-warmed culture media to a final dilution of 1:300. Following an hour of incubation at 37 C, the cells on the two media were examined under the fluorescence microscopy. On two successive hours, every 30 minutes, both anoxia and the normal condition phagocytosis activities were monitored and measured. The Oxygen and Glucose Deprivation (OGD) cause the changes in phagocytic activity of microglia. While the CD206 which is stained with red fluorescence, is almost the same after the sample is processed with OGD, the CD68 which is stained green, is increased (region 1). It means the phagocytic activity of microglia is promoted. The counter-stain (DAPI) also indicates the presence of cell's nucleus before and after OGD processing. There was also an increase in green fluorescence from the phagocytic activity assay in the OGD sample. The results from group 6 also showed that after OGD there is an increase in M1 phenotype which is the pro-inflammatory. After the microglia cells have been placed under OGD conditions there was an increase in CD68 expression, which are expressed in macrophage like cells. This could mean that the microglia cells have switched over to activated forms and combined with the increase in green fluorescence in OGD from the phagocytic activity assay compared to the normal condition the test shows that there has been an increased in phagocytic activity due to OGD conditions. There was also an increase in M1 phenotype microglia cells which is proinflammatory and can secreted factors that can activate other microglia cells.

18. Prevalence of Sexual Offenses and Victimization on School Property

Mark Aston, Kayla Azua, Valerie Baccus, & Jensey Calvino

Faculty mentor: Dr. Ebony Hall

Parents do not expect their children to become victims of child sexual abuse; however, there has been an increase in reported incidents of peer-on-peer sexual offenses occurring on school property. Between fall 2011 and spring 2015, approximately 17,000 official reports of peer-on-peer sexual assaults occurred on school campuses in the United States and the schools ranked as the second highest location for the prevalence of juvenile peer-on-peer sexual victimization. (McDowell, Dunkin, Schmall, & Pritchard, 2017). This quantitative study assesses the correlation between the frequency, locations and gender-bias in victimization of sexual offenses on school property. An estimated total of 100 participants are identified to survey using convenience sampling. Participants identified are between 18 and 21 years of age. The student researchers use a pre-developed survey of demographic questions and six quantitative questions that focus on the prevalence of sexual offenses and victimization on school property. The student researchers use Bandura's (1977) Social Learning Theory as an applicable theory because it demonstrates observational learning within one's environment affects one's behavior. Student researchers test three hypotheses related to reporting and

victimization of sexual offenses on school property. Being aware of the circumstances of peer-on-peer sexual offenses occurring on school property allows for current and future social workers to advocate for adapting current laws to educate and protect children against peer-on-peer sexual offenses at school.

19. **2-1-1 Texas**

Marisella Cavazos, Danielle Jones, Tarissa Klander, Yvette Campbell, & Julie Stanton
Faculty mentor: Dr. Darla Beaty

2-1-1 Texas is a part of the Texas Health and Human Services Commission that provides resources to those in need throughout Texas. They offer assistance in following: housing/shelter, employment, food/nutrition, veterans, crisis/emergency, income/expenses, legal aid/victims, criminal justice, aging/disability, medical, mental health, and child care/education. Yet, while working with the community it became clear that those we were encountering did not have much information about who or what 2-1-1 consisted of. This disconnect serves as a major problem to truly serve the community in ways that are needed. Thus, a policy analysis was conducted on the basis of how inclusion and exclusion play a part within this agency. 2-1-1 Texas is only allowed to give information of resources that are funded on a non-profit spectrum, and this can lead to turning down clients in areas of necessity. The convenience sampling will be conducted through IRB approved surveys that community citizens will complete to allow us to analyze through SPSS. The quantitative data that will be obtained will provide the upmost information to best assist those within the community. This generalization of data will also assist in generating knowledge to other locations in how to best serve members of their communities.

20. **Higher Education: from Optional to Accessible, Refugees in America**

Jessica Watkins, Rachel Presley, Melissa Branish, & Lindsey Meyers
Faculty mentor: Dr. Nathalie Jones

This mixed methodology study explains the importance of breaking down barriers to higher education for refugee and immigrant students. The purpose of this study is to close a gap in information for college-aged students in the areas of: financial (scholarships/grants/sponsorship), linguistic (ESL course) and naturalization (citizenship) processes accessible. Evidence shows U.S. schools and policies are failing displaced students. Research has identified that refugees and immigrants fall behind in classwork and have higher dropout rates (Moinolnolki & Han, 2017). Furthermore, Texas' decision to close the Office of Refugee Resettlement has significantly decreased the availability of resources. In New York, school findings prove that removing barriers to success, like standardized testing, improved student's graduation rates a great deal (Mendenhall, Bartlett & Ghaffar-Kucher, 2017). Creating a single multi-language website detailing the funding available, elimination of standardized testing, and specialized training for advisors of the unique needs of immigrant and refugee students within institutions of higher learning; would change the frontier of previously undeveloped resources available to social workers (Miller et al, 2017). The resources gained to immigrants and refugees provide a significant reduction of dependence on social assistance and greater opportunity for client's self-efficacy (Miller et al, 2017).

21. **Redefining Parenting Student Resources**

Erika Schat
Faculty mentor: Dr. Edward Randle

With the growth in online college courses and night classes, the appearance of non-traditional students has also grown. As non-traditional students they may be parents of young children living in their households. Parenting students have responsibilities outside those of traditional students which affect the academic performance of students. Student researchers identified lack of parenting students knowledge about resources available to them. Researchers developed a question that focused on the knowledge base about parenting student resources among faculty. The objectives identified were to assess the knowledge of faculty as it relates to parenting student resources, number of parenting students, and compare the knowledge of student to faculty knowledge. The hypotheses developed pertained to the extent of knowledge about parenting resources and the student rights under Title IX. A Research Plan outlines necessary steps to capture data using a pre-developed survey for faculty to complete. The research plan is based on review of 15 journal articles related to student safety and incorporates policy advocacy for Title XI to include mandatory education about student safety resources for parenting students. This poster presentation provides a detailed overview of the process of understanding and developing plan of action for advocating for parenting students based on student and faculty knowledge of parenting resources.

22. **Effectiveness and Areas of Growth in Resources for the LGBTQ Homeless Population in Tarrant County**

Franshesca Garza, Adrienna Barron, Lavender Collins, Iliana Montoya, & Lilibeth Arroyo

Faculty mentor: Dr. Edward Randle

This research reviews and analyzes the effectiveness and areas of growth for a non-profit agency that serves the lesbian, gay, bisexual, transgender, and queer (LGBTQ) youth population in large metropolitan area. Student researchers have partnered with an agency to help foster the well-being of LGBTQ students in public schools by promoting safe, egalitarian, and supportive environments and policies. Any youth who identifies their gender with lesbian, gay, bisexual, or transgender and is at risk for homelessness or experiencing homelessness at present time. Students and their families need resources related to LGBTQ issues as well as safe spaces for social and personal development. Student researchers developed objectives and hypotheses to assess experiences and needs of the youth population. Student researchers plan to survey 50 LGBTQ youth and provide the results internally to the partnering agency. They will present their research on the process of reviewing various journal articles related to the LGBTQ population and importance of advocating for services and safety resources. If there was federal funding made available, there would be more shelters and resources to potentially lower the rates of victimization and hate crimes towards LGBT homeless youth. Social workers have a shared commitment to promoting laws, policies and programming that affirm, support, and value LGBT individuals, families, and communities (NASW, 2018).

23. **Mosaic**

Emily Gilbreath, Fallyn Gutierrez, Cheriton Shepherd, & Karen Cosio

Faculty mentor: Dr. Darla Beaty

Mosaic is a national, faith-based organization that provides services and a voice to individuals with intellectual and developmental disabilities. Our goal while working with Mosaic is to increase availability and accessibility of the resources needed by this community to live a fulfilling life. To reach our goal we are collecting data through surveys to gain knowledge of what services Individuals with Intellectual and Developmental Disabilities have access to before receiving support from Medicaid's, Home and Community Based Services, waiver program. At this time, we have researched the organization and the resources they offer as well as other resources in the community. By conducting research to learn what services the targeted individuals have previously or are currently using, we hope to raise awareness of the need for more resources and an increase in funding to support the population in receiving these additional resources. This research is still on going and will be finished in May of 2019.

24. **Adolescents, Family, and Substance Abuse in Rural Areas**

Aline Mbonwanayo, Trinity Davis, Alyssa Franqui, & Abigail Torres-Perez

Faculty mentor: Dr. Ebony Hall

The Substance Abuse and Mental Health Services Administration (SAMHSA) predicts that by the year 2020, substance use will surpass all physical diseases as the major cause of disability (2017 b, para.3). Individuals who participate in substance use are not only affecting their health, but also the health of their families and communities (SAMHSA, 2017, b, para. 2). This mixed methodological study assesses potential factors that lead individuals to engage in substance use activities. Researchers survey a total of 100 participants using purposive sampling. Researchers use a pre-developed survey containing demographic, dichotomous, and multiple-choice questions. The Family Systems Theory (Bowen, 1950) states families affect emotions, actions, and thoughts of their members (The Bowen Center, 2018). Two hypotheses focus on individuals who have negative stressors present in their family and the other hypothesis focuses on male participants who have a likelihood to engage in substance use. Participants identified are children 12-17 years of age who are currently students in rural communities. Results from the study inform the relationship between adolescents and their participation in substance use. Experts can understand adolescents who engage in substance use by becoming aware of the influence of family systems and how a family's history affects the adolescent's decision to abuse substances. Social workers advocate to assist clients who may be affected by substance abuse through efforts of awareness.

25. **Faculty Knowledge of Parenting Students**

Brittany Shelton, Itzel Valdez

Faculty mentor: Dr. Ebony Hall

Awareness of the resources and needs of pregnant and parenting students among faculty on college campuses are limited. Due to the limited number of students who disclose they are pregnant or parenting it is estimated that roughly 26 percent of undergraduate's are among that population according to a 2014 study conducted by the Institute for Women's Research and Policy. The research is a mixed methodological study with an emphasis on faculty's knowledge of resources and needs of pregnant and parenting students on campus. The researchers survey 50 faculty participants. The researchers use a pre-developed survey with

both qualitative and quantitative questions. The hypotheses was developed by the researchers to predict the impact the survey would have on student and faculty knowledge of pregnant and parenting student resources on their campus. The survey serves to expand awareness towards the rights of pregnant and parenting students and to educate regarding resources afforded to them. Researchers identified the Ecological Systems Theory as a theoretical framework for their research (Bronfenbrenner, 2014). The Ecological Systems Theory explains the impact systems can have on an individual's success and well-being, assisting the researchers to understand the needs of pregnant and parenting students. The survey expresses the need of resources and lack of education the survey population possess. The study is important to the social work profession, because it serves as a way of spreading awareness to faculty about the needs of pregnant and parenting students on campus. The study also serves as an advocate for this population by educating faculty on the needs as well as resources provided by the university.

26. **Parenting Student Support in Higher Education**

Courtney Brite, Brittany Kuzniar, Lateaka Buchanan, & Tanya Black

Faculty mentor: Dr. Nathalie Jones

Pregnant and parenting students are a rapidly growing demographic in universities across the United States. Statistics indicate as many as one in four students are parenting school-age children during their attendance at university (Noll, 2017). Despite the rising numbers, pregnant and parenting students are an overlooked population with unique needs and few available resources or legal protections. Though areas of concern for pregnant and parenting students have been identified in previous research, the research is limited regarding desired support services as articulated by the pregnant and parenting student population. This mixed methods survey is conducted to determine the needs of and support desired by the pregnant and parenting student population, with a sample size of 50 participants. The results inform the social work field of the continued need for support and advocacy on behalf of the pregnant and parenting student population at the micro, mezzo, and macro levels.

27. **Cyberbullying awareness**

Fernanda Valadez, Lester Lawler, & Benney Peoples

Faculty mentor: Dr. Nathalie Jones

The purpose of this mixed methodology study is to bring awareness to David's Law 2017 and connecting it within the Lesbian, Gay, Bisexual, Transgender, and Questioning (LGBTQ) community by conducting an anonymous survey. The student researchers formulated a total of 10 qualitative and quantitative questions survey for parents or guardians of school-aged children at an Independent School District in a small rural community in Fort Worth, TX. The student researchers will collect data and gather information on how David's Law is being implemented in Texas public schools. The purpose of conducting this research is to gather data on who is being affected by bullying on school campus, how it is being reported, and parents and guardians understanding of the David's Law. Goals include provisions for students and families to facilitate the connection of the resources of which legislation will protect students. The sample size will be 25 adults answering 10 questions about the experiences they have had regarding their students being bullied.

28. **Immigrant and Refugee Families in Transition**

VanNessa Motley, Whitney Allen, Taylor Keller, & Lorenzo Perez

Faculty mentor: Dr. Nathalie Jones

The student researchers tested for the effectiveness of adding an information pamphlet for the parents of the refugee students who enter schools. There is estimated to be 672 students, whose families can benefit from this research. This informational pamphlet provides information on graduation requirements. The sample size will consist of 40 teachers and staff to identify the need for student-parent success. The questionnaire will consist of 10 qualitative questions. By the school giving resources, students and family members are more competent in areas of test scores, access to available resources, expectations and graduation requirements. This reduces the chances of students and families needing social work intervention.

29. **Awareness of Christian Women's Job Corps and Available Business Resources**

Latisha Melton, Jenifer Wilkes, & Alejandra Moreno

Faculty mentor: Dr. Ebony Hall

Unemployment has a pronounced effect on women who are sole income providers for their families under the poverty level. Christian Women's Job Corps, also known as CWJC, focuses on women in Texas whose economic status may be depressed, and their families may be impoverished. The Bureau of Labor and Statistics report that four percent of Texans were unemployed (Unemployment Rates for States, 2018). Some of the women attending CWJC have at one time obtained a criminal record, hindering their ability to gain employment. With limited research on CWJC, the researchers hypothesize there are businesses who are not aware that women are qualified resources for employment. This study uses a mixed methodology with an emphasis on quantitative data. A sample size of 75 businesses are identified using judgmental sampling. The

researchers have created a survey with four qualitative and five quantitative questions. Maslow's (1943) Hierarchy of Needs is an applicable theory because rest, warmth, food, and water are basic human needs (McLeod, 2017, para 9). This theory allows the researchers to understand the basic needs of the women who are seeking services. The researchers hypothesize most businesses are less likely to be aware of services provided by the CWJC agency. Results from the study allow researchers to obtain the level of knowledge of available employment resources for women.

30. **Alleviating Barriers to Justice for Sexual Violence Survivors**

Jamie Pytlik

Faculty mentor: Dr. Ebony Hall

Sexual violence refers to sexual acts committed without a person's consent and often include force, coercion, or other means compel the person into the act (Centers for Disease Control and Prevention, 2018). For every 1000 sexual assaults, only 6 offenders serve time in prison (RAINN, 2018). Survivors of sexual violence are often failed by the criminal justice system and those who come forward are often retraumatized (Spencer, Dodge, Ricciardelli, & Ballucci, 2018). Although sexual assault has low instances of false reports, survivors of this crime often have their credibility discounted, thus imposing a barrier on their access to justice (Tuerkheimer, 2017). This reality is magnified for survivors of sex trafficking, as they are often mistaken for offenders of other crimes and arrested, or their reports are dismissed (Polaris Project, 2015). Also, thousands of rape kits are never submitted to crime labs for testing, and the ones that are submitted are often not tested within a reasonable amount of time (Joyful Heart Foundation, 2018). This study uses a systematic review process of documentaries, organizations, and journal articles. The student researcher examined a total of thirteen sources. The backlog of rape kits and lack of support from law enforcement for many sex trafficking and other sexual violence survivors demonstrates ineffectiveness of the justice system and its inefficiency to provide support or access to justice for survivors to heal. The Ecological Systems Theory depicts how various systems affect individuals, such as the survivor's journey in dealing with his or her trauma (Bronfenbrenner, 1977). By understanding obstacles faced by sexual violence survivors, social workers can better advocate for survivor needs at the micro, mezzo, and macro level. The student researcher uses the process of systematic review to inform future research in addressing sexual violence within the criminal justice system.

31. **Taxonomic Description of a Rare Diatom**

Cristine Mccubbins & Victoria Chraibi

Faculty mentor: Dr. Victoria Chraibi

Diatoms are algae that can be found in almost every aquatic habitat imaginable. They are unicellular organisms that build hard silica cell walls. As they asexually reproduce they build the new silica cell wall inside the original causing them to uniquely decrease as the population. They form the base of food webs in aquatic ecosystems. They also tend to be specialized within their environments, which due to their high biodiversity makes them good indicators of water quality. However, they are not well described within Texas. In this study, benthic diatoms were sampled from the Bosque River in October 2017. A species of *Diploneis* was spotted in algae mats and was not found to be present on the taxonomic database Diatoms of North America (DONA), so it was chosen to be described. Images were taken of multiple individuals using light microscopy and SEM, and their striae were counted, measured, and recorded. Individuals were subsampled from wild populations and cultured to capture the size diminution over generations. A formal description of this species will be submitted to be published on DONA. Identifying species in Texas streams is an important first step towards using diatoms to monitor water quality in a region.

32. **Diatom Assemblages in Artificial Stream Cultures**

Shelby Galyon, Esperanza Sandoval, & Victoria Chraibi

Faculty mentor: Dr. Victoria Chraibi

Diatoms are golden-brown algae that are important in aquatic habitats because they make up the base of the food web and produce oxygen. Many species of diatom are sensitive to environmental conditions, which makes them good indicators of water quality. In this study, we cultured diatom communities from a variety of microhabitats collected from the Bosque River and the Paluxy River in conditions of increasing nutrients. As an undergraduate research assistant in the summer of 2018, I prepared 300 samples of diatom assemblages collected weekly from eight artificial streams. The samples were digested with 35% hydrogen peroxide, rinsed with DI water, and plated onto microscope slides. Using light microscopy, diatoms were identified to species and counted to track community change over time in response to nutrient concentrations.

33. **Mesocosm Water Quality Experiments Using Artificial Streams**

Esperanza Sandoval, Shelby Galyon, & Victoria Chraibi

Faculty mentor: Dr. Victoria Chraibi

Diatoms are golden-brown algae that are good water quality indicators because they are sensitive to changes in water conditions. In this study, we established an artificial stream lab that contains eight tubs that

circulate water continuously to simulate natural stream conditions. Two experiments cultured samples taken from the Bosque, Paluxy, Colorado, and Brazos Rivers to track changes in diatom assemblage in correlation with changes in water conditions. The first experiment cultured samples water, rock, soil, and wood microhabitats taken from the Bosque and Paluxy Rivers under constant water level but consistently increasing nutrient conditions. The second experiment cultured water and rock samples taken from the Colorado and Brazos Rivers to track changes in diatom assemblage in correlation with changes in nutrient conditions, while also manipulating water level to simulate compounding effects of drought conditions. Each experimental set consisted of two control streams and two treatment streams. Each experiment ran for 10 weeks; weekly, I subsampled diatoms from microhabitats in each stream, and measured water chemistry data for nitrite, ammonia, phosphorus, silica, chlorophyll a, and other parameters. This poster presents preliminary results on the correlations of diatoms with nutrient conditions, water level, and microhabitat.

34. **Benthic macroinvertebrate surveys in north-central Texas in compliance with the National Rivers and Streams Assessment**

Lauren Halbert & Victoria Chraibi

Faculty mentor: Dr. Victoria Chraibi

As the human population continues to grow, so do the anthropogenic impacts on the environment. It is becoming increasingly important to monitor our natural resources, especially our water sources. This project, following sampling protocols set forth by the National Rivers and Stream Assessment (NRSA), evaluated benthic macroinvertebrate assemblages at seven sites to assess general stream health in north-central Texas. At each stream, fine mesh kick-nets were used to collect benthic macroinvertebrates (such as insect larvae and snails) along eleven transects while wading across the stream in cross-sections. Benthic macroinvertebrates were identified to genus or family, enumerated, and photographed for voucher purposes. Using data collected through these samples, we determined species richness, relative abundance, and community composition, which, alongside other metrics, were used to calculate an index of biological integrity (IBI) for each site. Developing stream-specific IBI matrices help to gauge general stream health and pinpoint areas of concern.

35. **Trypsin Inhibitor Isolation in *Sesbania vesicaria***

Schnell Rodgers

Faculty mentor: Dr. Harold Rathburn

Trypsin is a serine protease that is essential to the breakdown of proteins in the digestive system. Legumes can be a major source of protein in the diet. The digestion of proteins in humans and animals can be prevented by the presence of inhibitors. Trypsin Inhibitors are anti-nutritional factors that reduce the enzymatic activity of Trypsin. The inhibition of Trypsin results in reduced food and nutrient consumption in herbivores. *Sesbania vesicaria* is a legume found in the Southern region of the United States that synthesizes Trypsin Inhibitor. The beans of *S. vesicaria* are being used for the characterization of its Trypsin Inhibitor. *Sesbania vesicaria* legumes were soaked in water to diffuse the inhibitor out of the seed. Twenty soakings were prepared (Kayla Bryant) but only a few are being used in the following research. The chosen soakings, containing protein and inhibitor, were applied to an affinity column to purify the Trypsin Inhibitor. Then spectrophotometric enzymatic assay and Bicinchoninic Acid assays (BCA) were performed on the fractions collected from the column to determine percent inhibition and protein concentration. By analyzing the protein concentration and percent inhibition we can determine if the isolation of trypsin inhibitor was successful.

36. ***Sesbania* bean soaking analysis**

Monica Villalpando

Faculty mentor: Dr. Harold Rathburn

Trypsin is an enzyme released by the pancreas. This particular enzyme helps break down food proteins that are not broken down by pepsin. However, there are some plants that produce a trypsin inhibitor, which binds to trypsin and prevents the enzyme from breaking down proteins. Legumes are an example of these plants. Legumes produce a trypsin inhibitor as a protection mechanism. When consumed, a trypsin inhibitor is released into the gut of the consumer where it binds to trypsin, thus rendering the enzyme inactive. This prevents the plant from being fully digested. The native legume Texas plant, *Sesbania vesicaria*, bears this type of defense mechanism. In this study, our findings will provide more information how a trypsin inhibitor works and if there are different types of inhibitors expressed. Our findings will help raise awareness of native Texas legumes and find ways to benefit other crop plants from this defense mechanism against common pests. If our experiment goes as planned, our results will give us information that will contribute to the understandings of plant defense mechanisms. For this study, seed soakings from *Sesbania vesicaria*, were analyzed for the protein concentration of each soaking. Twenty soakings were previously obtained and some soakings purified using affinity chromatography. The fractions collected from the purifying step were used to detect trypsin inhibition through a spectrophotometric enzymatic assay. Fractions that provided good result

were kept for further analysis. Methodology for this experiment was based on Durnati et al. (2003).

37. **The purification of a Trypsin Tnhibitor from the Sesbania vesicana**

Jackson Roye

Faculty mentor: Dr. Harold Rathburn

The seeds from the *Sesbania vesicana* were observed to have a trypsin inhibitor that could be of importance for agriculture. The trypsin inhibitor helps repel pests by stopping their ability to digest and absorb protein. The protein responsible for this effect is easily extracted from the legume by soaking them in hot water for approximately 90 minutes. The legume soakings were centrifuged and eluted through an affinity chromatography column to purify the desired protein. To do this a portion of some soakings were eluted through a column prepared according to Duranti et. al. (2003). A increasing stepwise salt solution (KCL) is alternated with DI water to elute proteins bound to the column. The final wash is of dilute HCL to remove any other non-specific bound proteins or debris from the column. The fractions are then analyzed in spectroscopy assays for enzymatic activity and protein content. The overall goal is to determine if these proteins would be satisfactory to be considered for a plant defense option.

38. **Application of biochemical polymers in sorption of crude oils**

Micheal Cain Meadows & Rajani Srinivasan

Faculty mentor: Dr. Rajani Srinivasan

The properties of plant based polymers were observed and compared to the properties of polyacrylamide, a synthetic polymer, by means of experimentation. When polyacrylamide degrades in the environment it turns into acrylamide, a substance linked to birth defects, cancer in animals, and nerve damage. The purpose of these experiments was to discover the maximum crude oil removal of several biopolymers and compare the result with polyacrylamide to estimate the practical application of biopolymers removing crude oil from ocean surface water. Crude oil was injected into several different containers of water and each treated with a different polymer (polyacrylamide, fenugreek, or psyllium) or used as a control group then the percent oil removal was calculated. The biopolymers, fenugreek and psyllium, were able to surpass the crude oil sorption of polyacrylamide but the maximum efficiency of each polymer was not discovered in the experiments conducted. Psyllium has the highest percent oil removal of the biopolymers observed in previous experiments, thus more polymers with similar functionality will be explored. Further experimentation utilizing mixtures of polymers may increase percent absorption.

39. **Laser Speckle Contrast Imaging: Increasing Efficiency**

Jace A. Willis & Vladislav V. Yakovlev (Texas A&M University)

Faculty mentor: Dr. Daniel Marble

The technique of laser speckle contrast imaging (LSCI) is used to view and record flow in biological tissue for medical and research use. Often used for brain imaging, increasing depth of view and efficiency could lead to a more cost-effective and superior method than other options. This research aims to reduce computation time by combining previously published methods and improving for maximum resolution. Given future depth improvements, this could play a major part in making LSCI capable of widespread use in medical applications. Overall, tests showed expected correlations between samples. Initial calculation time by brute force methods measured in minutes whereas final calculation at maximum resolution averaged 1.25 seconds. Lowering resolution granted greatly improved calculation time as expected. This success is a vital one, as computation techniques are not often properly compiled and adapted to the methods used.

40. **Modelling Arsenic Occurrence in the Gulf Coast Aquifer of Texas**

J.W. Lozano & K. Venkataraman

Faculty mentor: Dr. Kartik Venkataraman

Arsenic occurs at elevated levels, well in excess of the drinking-water standard, in several aquifers that underlie rural communities in Texas. Earlier studies have suggested geogenic origins of groundwater arsenic but also do not rule out the effect of agricultural inputs on arsenic enhancement in the subsurface. In this study, we have applied logistic regression (LR) techniques to model arsenic exceedance of the drinking-water standard of 10 ppb using relevant explanatory variables that are both continuous, like geochemical constituents of the water, and categorical, like land use. The LR models were evaluated using Receiver Operator Characteristic (ROC) curves. Overall, the LR models perform well in the region, with an accuracy of 75%, albeit with a high rate of false negatives. The model variables that displayed statistical significance at $p < 0.05$ were vanadium and fluoride – their significance in reducing model deviance was also evident from likelihood ratio tests. As such, the significance of other volcanically-derived, co-occurring minerals like vanadium and fluoride suggests a common geogenic source of arsenic in the region. It also appears that land use is not a significant variable in the LR models, suggesting that the effects, if any, of past anthropogenic inputs may no longer be important.

41. Development of Low Cost MR Fluid for Rehabilitation Applications

Nathan R. Wall, Casey Cockburn, Jacob Fletcher, Mason Murphy, & Audrey Ortega

Faculty mentor: Dr. Neil Petroff

Quality of life is inextricably tied to hand function. When one loses the ability to properly, grasp objects as a result of stroke or other medical conditions, adequate rehabilitation is paramount. Most hand-strengthening devices used during rehabilitation do not have the ability to provide varying levels of resistance required to match progress through the rehabilitation process. Magnetorheological (MR) fluids possess the unique characteristic of changing viscosity based on a changing magnetic field. By changing the viscosity of the fluid, the compressional properties of the fluid change. A device built using MR fluid would function as a progressive rehabilitation device. In addition, an adjustable, fluidic device would offer weight reduction and space savings. Commercially-available MR fluids are very expensive due in part to the economic volatility of the raw materials. This work resulted in two low-cost MR fluids for incorporation into a hand rehabilitation device. Two 8-ounce prototypes, consisting of black iron oxide and olive oil and atomized iron and olive oil, cost \$7.31 and \$6.15, respectively. It was observed that both fluids had similar consistency in the absence of a magnetic field. While in the presence of an electromagnetic field, both samples became nearly solid.

42. Math Vs. Gerrymandering

Preston Ward & Maria Tovar

Faculty mentor: Dr. Scott Cook

Courts at all levels are struggling with the increasingly pressing and complex issue of political gerrymandering. Deadlines for the post-2020 census redistricting are quickly approaching. At the heart of our difficulties to fairly divide ourselves in voting district lies a math problem – how do we measure fairness? How can we use that measure to draw fair district boundaries? Our project is part of nationwide collaboration of mathematicians, demographers, lawyers, mapmakers, political leaders, and citizens attempting to develop tools for this purpose. We will survey Markov Chain Monte Carlo methods used in the PA Supreme Court case and our recent work to improve and apply it to more states. We will discuss several commonly used compactness metrics and present a new idea called transit time compactness that aims to use the Google Maps API to measure cohesiveness of people, not just land. This talk derives from participation in the Voting Right Data Institute at MIT, Harvard, and Tufts University in Summer 2018 under Dr. Moon Duchin.

43. Evolutionary Algorithm Optimization of Lattice Towers

Jason Pipal, Ethan Keene, Hakiem Grant, & Wyatt Young

Faculty mentor: Dr. Bryant Wyatt

We will develop an evolutionary algorithm for the structural changes of galvanized steel beams over time under external forces. These beams will be used to construct lattice tower models. These models will treat the galvanized steel beams as ideal springs with limits in both tensile and compressive forces. We will apply an evolutionary algorithm to optimize the tensile and compressive strengths of the beams. By modeling structures in this way, we can create a stable collection of beams that are optimized to withstand specified external forces, without the cost of over-engineering. Because of the large number of calculations and the need for multiple trials to determine success, we plan to use parallel processing on high end graphics cards to execute these simulations. This method will allow us to rapidly design more efficient structures.

44. Autogyro Descent Control Using Reinforcement Learning

Michael Osei

Faculty mentor: Steve Merwin

Descent control is rapidly becoming a key part of space craft design and aeronautics. With the advances and proliferation of companies like SpaceX, descent control is now an important part of cutting down costs of future aerospace missions. We have developed a machine learning model for automatically landing an autogyro paired with inertial measurement units using active reinforcement learning. The result is an easily extendable and flexible system for future descent control systems.