McMURRY UNIVERSITY

Year	Student	Advisor	Topic	Description	After Graduation
2013	Heather Rawls	Dr. Gary Wilson	Influence of Entomocidal Protein Gene on Germination of *Bacillus thuringiensis* and *Bacillus cereus* Spores	The focus of this investigation was to determine whether the removal or insertion of the crystal toxin protein gene modifies the activation and germination of spores of *Bacillus thuringiensis* (Bt) and its close relative, *Bacillus cereus* (Bc), which does not produce the toxic protein crystal. Spores of the wild type Bt and Bc, and genetic strains where crystal-production genes were either deleted or inserted, were tested for their response to spore activation using sublethal heating and to exposure to alkaline pH (a method for activating spores unique for Bt) to determine how presence or absence of crystal protein impacts germination response. The results from this investigation suggest that the movement of crystal genes did not result in any improved spores. Adding crystal genes to a spore former is more likely to negatively alter spore properties than eliminating crystal genes from a spore former.	I completed the Physician Assistant program at Texas Tech - Midland. Now PA-C practicing in Midland.
2014	Mitchell Crittenden	Dr. Joel G. Brant	Clarification of the Distribution of the Eastern Mole (*Scalopus aquaticus*, Talpidae) on the Southern Rolling Plains Region of Texas	The eastern mole, *Scalopus* aquaticus, occurs throughout the panhandle and eastern portion of Texas. Until recently, a gap in this distribution could be found on the Southern Rolling Plains Region of the state (Callahan, Coke, Coleman, Fisher, Jones, Nolan, Runnels, Shackelford, and Taylor counties). We compared recent collections of the eastern mole on the Southern Rolling Plains to a soil map to determine the preferred habitat of this fossorial species. We then visited these potential habitats in search of signs of mole activity. Victor Harpoon traps were placed along observed runs throughout the region in attempts to obtain new voucher specimens. Mole runs were observed in seven new habitat patches in Callahan, Fisher, and Jones counties. A voucher specimen was obtained from Fisher County for the first time. This study increases our knowledge of the distribution of this often overlooked member of the mammalian fauna of Texas. Future efforts will investigate additional potential habitat patches on the Southern Rolling Plains and assess the genetic variation of these new populations relative to other populations in Texas and the Eastern United States.	M.S. in Animal Science at Angelo State University (2017)

2015	Sophie Southwell	Dr. Dana N. Lee	A Novel Screening Method for Coronaviruses in Texas Bats	Sophie developed a novel approach to screening bats for coronaviruses and tested it using intestinal samples obtained from frozen bats submitted by citizens to the Texas Department of State Health Services to determine whether this extensive resource might help track the prevalence of the virus in regional populations. Sophie also collected guano from live bats and tested for the virus's presence. Samples from 10 different species of bats were screened for coronaviruses using viral extraction, real-time polymerase chain reaction (RT-PCR), and gel electrophoresis. No coronaviruses were found in the live or frozen samples. This suggests that there were no active coronavirus infections in regional bat populations.	Master's program at Johns Hopkins University & is applying to Medical School.
2016	Payden Dompe	Dr. Dana N. Lee	Genetic Variation in *Scalopus aquaticus* Across the United States	*Scalopus aquaticus* is distributed over most of the eastern half of the United States. There have been 16 proposed subspecies based primarily on morphological characters. Payden tested these 16 proposed subspecies to determine whether they were genetically supported. Specimens from four counties in Texas where *S. aquaticus* is undocumented were included to determine to which subspecies these new unidentified specimens belong. Payden was unable to decide whether all subspecies are genetically supported successfully. However, data from specimens collected in Texas and Oklahoma suggest that the subspecies *S. a. aereus* and *S. a. nanus* appear identical. The new unidentified specimens were genetically similar to the subspecies *S. a. aereus*.	Enrolled in Hardin-Simmons Physician Assistant School
2017	Thomas Gilbreath	Dr. T. J. Boyle	Macroinvertebrate Survey of 3 Big Country Reservoirs	Thomas sorted and identified organisms from Hubbard Creek Reservoir, Lake Cisco, and Lake Leon. He also aided in trapping at three other reservoirs. He could not complete the identifications but did identify Rhithropanopeus harrisii in Hubbard Creek samples, and there was a lack of crabs in either of the other two reservoirs.	Left school to provide for the family.
2018	Adam Liuzza	Dr. T. J. Boyle	Macroinvertebrate Survey of 3 Big Country Reservoirs	Adam sorted and identified organisms from Hubbard Creek Reservoir, Lake Cisco, and Lake Leon. He also aided in trapping at three other reservoirs. He could not complete the identifications but did identify Rhithropanopeus harrisii in Hubbard Creek samples, and there was a lack of crabs in either of the other two reservoirs.	Graduated 2021; Hired at TCEQ

2019	Rebecca Harris	Dr. Joel G. Brant	Bat Diversity and the Impact of Wind Turbines on the Bat Communities in the Big Country	Wind turbines kill an estimated 600,000 bats annually in the US alone, and Texas is a leader in wind energy. Nine species of bats have been documented in the Big Country; only a handful of voucher specimens have been collected. The purpose of this study is to document the bat community in the Big Country and to determine what effect, if any, wind turbines have on this community. Two SM4BAT ultrasonic detectors were deployed in the study area, one was set 25 kilometers from wind turbines, and one was placed within 25 kilometers of a wind turbine. Sampling was conducted from May 2019 to December 2019. After applying a 30-minute window to the calls, 6,032 bat calls were recorded over 420 trap nights. All nine previously documented species were present, with *Lasiurus borealis* the most common bat at both locations. Diversity analyses were performed to test Margalef Richness, Berger-Parker Dominance, Simpson Evenness, and Shannon Diversity. All diversity measures were significant, which implies that the wind turbines are attracting some species of bats. These results represent only preliminary data in an ongoing research project.	Master of Biology program at Angelo State University
2020	Hunter Lynn	Dr. Joel G. Brant	Animal Diversity of Medium to Large Mammals at Firebase Libby (Callahan County, Texas) Using Camera Traps	This project aims to characterize the medium to large mammal communities in Callahan County using McMurry's research land at Firebase Libby. To do this, we will maintain 10 camera traps arranged in various locations on the property to ensure coverage. We will check the SD cards monthly to collect the data and organize thousands of captures to report the fauna in central Callahan County. I will be responsible for determining the best capture locations, checking the SD cards and batteries, and sorting through all the data we collect to attempt to calculate population numbers and gather species diversity. In addition to camera trap research, I will assist Dr. Brant in collecting data on herptiles and small rodent populations using live traps in 6 arrays across Firebase Libby.	Office Manager (non-science)

	Daniel Nunez	Dr. Malaney O'Connell	Development, Optimization, and Validation of a 3D Cell Growth Assay Using the MDA-MB-231 Breast Cancer Cell Line	Daniel has spent the last year developing a 3D culturing system that sandwiches cells between two collagen layers so that they can form multicellular tumor spheroids. Developing this 3D culture system has allowed our lab to visualize changes in the microenvironment of the cells we grow, and we hope to use this as a tool to understand better the role collagen X plays in modulating the extracellular matrix to promote invasion and metastasis. Using the 3D culturing system developed by Daniel, we are now working to understand the effects of collagen X when overexpressed. Daniel will grow cells in 2D monolayers and 3D spheroids to evaluate the changes in the invasive capability of these cells. To provide a more complete picture of the steps necessary to invade, Daniel will be evaluating genes involved in the epithelial-mesenchymal transition (EMT). The EMT has been described as a critical step before invasion and metastasis. Previous studies have demonstrated that when cells are grown in 2D monolayers, there are minimal changes to the EMT markers in response to collagen X overexpression. However, literature suggests that increasing the culture density in a 3D system provides the cells with the environment necessary to induce these changes. By evaluating the genes involved in EMT when cells are grown in 2D vs 3D, we hope better to understand the effects of collagen X on EMT. Daniel has already successfully developed the 3D assay. With the help of a stipend, Daniel will be able to spend the summer performing both 2D and 3D studies so that we can evaluate gene expression changes. Daniel will maintain all tissue cultures, perform growth assays, and generate gene expression data.	Pursuing a master's in public health at the University of Texas Health Science Center, San Antonio

	Ryan Rollins	Dr. Malaney O'Connell	Defining Collagen X's Potential Role in Breast Cancer Using MDA-MB-231 Metastatic Breast Cancer Cells	In recent studies, we evaluated the role of collagen X in breast cancer metastasis using the MDA-MB-231 breast cancer cell line. Stable cell lines were generated to express GFP only (MDA-VEC) or GFP-tagged COL10A1 (MDA-COL). GFP and COL10A1 transcript and protein levels were examined to confirm overexpression of collagen X, and transwell assays were used to determine changes in the invasive capability of the cells. Cells overexpressing collagen X demonstrated a higher invasion rate, suggesting that collagen X may enhance breast cancer cells' metastatic potential. Our current study aims to evaluate the mechanism by which collagen X augments the ability of these cells to invade and metastasize. To achieve this, biological replicates of MDA-VEC and MDA-COL have been sent for RNAseq analysis. RNAseq will allow us to determine differentially expressed genes between the two cell lines. Once we have generated a list of differentially expressed genes, we can explore the different pathways in which collagen X plays a role. Ryan will evaluate the list of differentially expressed genes to identify critical changes in possible mechanisms in which collagen X mediates invasive and metastatic processes. Using Ingenuity Pathway Analysis (or other equivalent software), Ryan will locate possible pathways disrupted (or enhanced) in response to collagen X overexpression. He will then evaluate each key player involved in the potential path. Results from this study will provide a more comprehensive understanding of the role collagen X plays in breast cancer metastasis. They may offer additional molecular targets involved in invasion and metastasis that can be used in diagnosis, prognosis, and treatment strategies.	UNT Health Science Center-TCOM

	Shawna Faucett	Dr. Malaney O'Connell	Propagating HSKMC Primary Cells to Evaluate Metabolic Activity of HSKMC Primary Skeletal Muscle Cells in Hypothermic and Hyperthermic Conditions	Shawna's project will focus on muscle cell adaptation regarding varying environmental conditions. Recent literature suggests hypothermic and hyperthermic conditions can influence both muscle performance and recovery. Shawna's study aims to evaluate the effects of hypothermic and hyperthermic conditions on the cellular behaviors of skeletal muscle cells. Using primary skeletal muscle cells obtained from ATCC, Shawna will expose the cells to hyperthermic and hypothermic conditions by increasing or decreasing their incubating temperature. Cell growth, apoptosis, and metabolic output (measured by ATP usage) will be evaluated at each condition. We hope to determine if hyper-/hypothermic conditions affect muscle performance by assessing these cellular behaviors. Time permitting, we also hope to evaluate muscle recovery at each condition by evaluating degeneration and inflammation via gene expression changes associated with each. In athletics and sports medicine, much effort has been dedicated to promoting muscle performance and recovery. We hope to shed light on both performance and recovery regarding environmental conditions. Shawna will spend the summer learning tissue culture techniques and skills in handling primary cultures. She will also gain expertise in measuring these various cellular outputs. We have already determined which assays should be used and are in the process of ordering the necessary reagents. We will optimize these protocols to run time course studies at the required temperatures as soon as possible. We hope to be able to use this summer to perform in-depth course studies and generate data regarding the cellular outputs.	Applied to multiple medical master's programs to prepare for medical school
2021	Kimber Boyles	Dr. Joel G. Brant	Biodiversity of Herptile Fauna in Callahan County, Texas	The purpose of the project is to get a baseline survey of the species of reptiles and amphibians in Callahan County. The project will be based out of Firebase Libby. Monthly trips include setting up the arrays, checking them daily, and closing them when unused. The other time is spent opportunistically searching for species during the day and evening. Data collection and analysis will be run to determine diversity measurements of the three habitats found on the property. Other responsibilities include cleaning and repairing the arrays, creating and building different ways to capture species, maintaining the property, and characterizing vegetation.	Enrolled in a graduate program in Ohio

	Corbin Whitsell	Dr. Malaney O'Connell	Determination of ATP1A1 gene status in the white-fingered mud crab, Rhithropanopeus harrisii, at low salinity conditions	The white-fingered mud crab, Rhithropanopeus harrisii, is an invasive crab species commonly found inhabiting coastal environments of the Western world. The crab has been introduced to habitats around the globe, but to our knowledge, it has only successfully invaded ten freshwater reservoirs found in Texas. To explore the differences in lower thresholds of salinity tolerance for larval development between inland and coastal populations, the ATP1A1 gene status will be determined. Na+/K+ ATPase pumps three Na+ out of animal cells in exchange for two K+ or NH4+ + per ATP hydrolyzed. Studies have shown that the enzymatic activity of the Na+/K+ ATPase in homogenates of ion-transporting gill tissue is enhanced when euryhaline crustaceans are subjected to osmoregulatory stress following transfer from seawater to dilute salinities. Several gravid female R. harrisii were collected from Hubbard Creek Reservoir. The females were brought back to the lab and placed in tanks at a salinity of 1 ppt. Once the crab eggs hatched, the planktonic zoeae were pulled from the tanks and put into separate vials. Total RNA will be isolated from a single crab zoea and reverse transcribed into cDNA. ATP1A1 gene-specific RT-PCR will be used to determine ATP1A1 gene status.	Tarleton State University - Master's in Medical Laboratory Sciences
2022	Daniel Ice	Dr. T. J. Boyle		The insect life of Firebase Libby has been poorly studied to date. This study aims to establish a baseline survey of the diversity of Lepidopteran (butterflies, moths, and skippers) at Firebase Libby. It would build on the last 9 months of collections that Daniel has been making. He has collected over 30 distinct species and successfully identified 29 of those. Identification of the species that make Firebase Libby home either permanently or along a migration path will open up future research projects for other undergraduate students here at McMurry who could do host plant preferences, niche modeling to determine if they prefer the grassland or wooded areas more, as well as morphometric studies across time.	High School Biology Teacher in the DFW area
	Luke Marshall	Dr. Joel G. Brant		This research aims to determine the diversity and density of species of Herpetofauna at Firebase Libby. Herpetofauna are reptiles (snakes, turtles, and lizards) and amphibians (frogs and toads). To determine the diversity, we will collect and trap specimens in different habitats, such as the pond, woods, and grass on Firebase Libby, and record which species inhabit those areas. The number of species at each location determines the density. Collecting will be done by trapping using herp-arrays, fences with buckets at the ends, and funnel traps along the middle of the traps. Turtle traps will be used at the pond, trapping the specimens in a cage. Active collecting will be conducted by searching under logs or flips, tin sheeting, and leaf debris. Frogs and toads are caught by hand or net. This will allow us to understand better what herpetofauna resides at Firebase Libby.	Enrolled in a graduate program at Tarleton State University

2023	Megan Keller	Dr. Joel G. Brant		The project aims to determine the coagulation factors of different animals' blood after being introduced to rattlesnake venom. Given that the average adult rattlesnake gives between 6mg and 140mg of venom on their first bite. I will take a patient's average blood volume and calculate the correct ratio of venom needed per test, which would correspond to a real-world interaction between snake and patient. Then I would run a negative control panel of tests with blood without venom, and a positive control that would have 3 times the amount of venom used in the test subjects. The test subjects mentioned will be donor horse, dog, and cat blood. The tests will be a coagulation panel consisting of a Complete Blood Count (CBC) and a Prothrombin time test (PT), which measures how long it takes for blood to clot: measures coagulation factors 1,5,7, and 10, and a fibrinogen test. From the gathered testing data, I would construct a comparative analysis to determine any differences in how each animal's blood coagulates post-envenomation. Creating charts, running calculations on differential variables, and putting together all acquired data for the Honors Thesis Paper	Enrolled in a Veterinary Program at Ross University
	Brandon Martin	Dr. T. J. Boyle		Recent studies have shown that sounds can alter the behaviors of decapods. The mud crab, *Rhithropanopeus harrisii*, has invaded freshwater lakes here in Texas. This study aims to determine how sounds from a novel environment may affect the crab's shelter-seeking response. Previous research has shown that this species can outcompete native crayfish for shelter. If novel sounds increase this behavior, it could further increase the impact this invasive species has on native species.	non-science job
2024	Sunshynne Gwinn	Dr. Joel G. Brant		This research aims to determine the diversity and density of species of Herpetofauna at Firebase Libby. Herpetofauna are reptiles (snakes, turtles, and lizards) and amphibians (frogs and toads). To determine the diversity, we will collect and trap specimens in different habitats, such as the pond, woods, and grass on Firebase Libby, and record which species inhabit those areas. The number of species at each location determines the density. Collecting will be done by trapping using herp-arrays, fences with buckets at the ends, and funnel traps along the middle of the traps. Turtle traps will be used at the pond, trapping the specimens in a cage. Active collecting will be conducted by searching under logs or flips, tin sheeting, and leaf debris. Frogs and toads are caught by hand or net. This will allow us to understand better what herpetofauna resides at Firebase Libby.	Current McM Student

	Caleb Dale	Dr. Joel G. Brant		This research aims to determine the diversity and density of rodent species at Firebase Libby. To assess diversity, we will sample specimens at different habitats (grassland & woodland) on Firebase Libby and mark individuals to determine recapture rate. Density will be estimated for each habitat and species using mark/recapture techniques. Collecting will be done by trapping Sherman Live traps set in 160 traps in each habitat type. In addition to the rodent sampling, I will assist Dr. Brant in sampling other fauna (amphibians, reptiles, birds, larger mammals, & bats) at Firebase Libby. This will allow us to understand the vertebrate fauna at Firebase Libby better.	Current McM Student
	Jacob "Suede" Wooten	Dr. T. J. Boyle		It is essential to know what arachnids are present in an area. Arachnids may be apex predators, making them crucial to the food web. When arachnids are present in an ecosystem, they will consume many prey and are often prey to other larger animals. Identifying which species are present can provide helpful information in building a complete food web, and having a complete food web would allow anyone to make accurate predictions of an area. This study will help to identify the diversity of arachnids at Firebase Libby. Firebase Libby, McMurry's university field research station, sits at the junction of two ecotypes (the Rolling Prairies and the Cross Timbers). A brief literature search suggests that there may be between 36 and 48 different species of arachnids here, but no study has been done to confirm that. The area I will be surveying has dense forest and thick leaf litter, a large field of wild grasses, and a small pond in the wooded area. These three primary areas provide excellent coverage of the diversity of arachnids in the area. --The study will be carried out over the course of this upcoming summer. Collecting will be done two days each week for 15 weeks. The first day will be carried out early in the morning, and the second will be during dusk/night. This is to get an accurate idea of when the arachnids are most commonly out and to catch any specific diurnal species. This will be done with pitfalls and flip traps. The traps are set in different locations throughout the various biomes of Firebase Libby: the pond, the forest, and the grass. The traps are already present on the property. Any specimen found at random while traversing the property will also be collected. More trapping methods may be introduced if I find the current methods inadequate for certain groups of arachnids. --Once captured, location and date will be noted, then the specimen will be moved into a kill jar. After fifteen minutes, the specimen will be moved to ethanol for preservation (or longer for larger individuals). After collection, all specimens will be identified under a microscope, noted with the name, date, and location, and then put into a preserved specimen jar.	Current McM Student

2025	Caleb Dale	Dr. T. J. Boyle		This research monitors urban and rural bird populations in Taylor and adjacent counties. Using Song Meter Mini bird detectors from Wildlife Acoustics, we measure bird populations in three metropolitan areas within Abilene and three rural ranches. Audio files received from the detectors are put through a program to determine the species of bird detected. We aim to observe the effects of urbanization on the bird populations in the Big Country, including shifts in species composition, abundance, and behavior. We hope our findings can lead to identifying strategies for balancing human development with effective bird conservation.	Current McM Student
	Jacob "Suede" Wooten	Dr. T. J. Boyle		The purpose of this project is to perform a survey of arachnid species in Callahan County, TX. The study will involve collecting from roadsides and several private properties from different parts of Callahan County. Collections will be made by hand and using pitfall traps. We will have one trap night each week with at least five traps per property for 10 weeks. Ideally, we will collect arachnids from all the primary habitat types of Callahan County. All specimens will be euthanized for identification back in the lab. --Responsibilities include the collection and identification of arachnids. From this, an overall diversity of arachnids in Callahan County can be estimated.	Current McM Student