Poster Presentation Abstracts

Garrison Shin (Mentor: Tina Bertrand) [Not Present]

Pakistan vs. India: A Comparative Analysis of Military Coups

The divergent political trajectories of India and Pakistan, particularly in the domain of civil-military relations, offer a compelling study of how foundational post-independence decisions influence long-term national stability. This research analyzes why Pakistan has experienced multiple military coups while India has not. Employing a Most Similar Systems (MSS) design, this study scrutinizes the influence of civil-military relations and political institutional development on the incidence of military coups. India and Pakistan, nations carved from the same colonial legacy, embarked on distinct political paths since their independence in 1947. India established a democratic framework with civilian control over the military, fostering a political culture resilient to military intervention. In contrast, Pakistan's unstable political history, characterized by frequent leadership changes and delayed constitutional establishment, created conditions conducive to military coups. This analysis draws upon comparative historical analysis and content analysis of legal documents, military communiqués, and governmental records to trace the evolution of civil-military relations and political institutions in each country. Preliminary data suggest that India's emphasis on economic liberalization and political stability underpins its democratic resilience, while Pakistan's political instability and external pressures have facilitated recurrent military interventions. This study posits that robust, inclusive political institutions and strong civilian control over the military are crucial for democratic stability and are potential buffers against military coups. The findings underscore the significance of economic stability and external security environments in shaping civil-military dynamics, offering insights into the conditions that either prevent or precipitate military interventions. This comparative analysis not only deepens our understanding of South Asian political systems but also contributes to the broader discourse on civil-military relations and democratic resilience in post-colonial states.

Zachary Rivera (Mentor: Tina Bertrand) P1

Argentina & Brazil: A Comparative Analysis of Educational Reform and Resulting Outcomes

This paper explores the varying outcomes of educational reforms in Brazil and Argentina, analyzing how similar reforms have led to different educational outcomes in terms of quality and accessibility. By examining a range of socio-economic, political, and historical factors, this

study provides a comparative analysis of the two countries' approaches to educational reform and their respective successes and challenges. In Brazil, educational reforms have predominantly focused on expanding access, motivated by the goal to democratize education and address the needs of a rapidly growing population. However, these reforms have often been hampered by political instability and economic challenges, which have resulted in inconsistent implementation and persistent disparities in educational quality and accessibility. This inconsistency is evident through continued struggles with funding, quality of teacher training, and infrastructural deficiencies, leading to an educational system where access does not always equate to quality. Conversely, Argentina's educational reforms have shown a stronger emphasis on enhancing quality alongside increasing access. With a history of more stable governance in terms of educational policy, Argentina has made significant investments in teacher training and curriculum development. These efforts have generally translated into improved educational outcomes, marked by better academic achievements and infrastructure compared to Brazil. Yet, socio-economic disparities, especially in rural areas, remain a challenge, impacting the universal applicability of these improvements. The comparative study highlights the influence of external factors such as economic stability, policy continuity, and government investment in shaping the effectiveness of educational reforms. It underscores the complex interplay between these factors and educational outcomes, suggesting that the success of similar reforms in different settings depends significantly on tailored approaches that consider unique national contexts. This analysis draws upon various scholarly sources, including assessments of educational reforms in Latin America, which collectively suggest that while both countries face similar educational challenges, the outcomes of their reforms are distinctly shaped by their respective historical, socio-economic, and political contexts. This study contributes to the broader understanding of educational reform impacts and may guide future policy decisions in similarly diverse educational landscapes.

Darian Neff (Mentor: Tina Bertrand) P2

Comparative Analysis of Thailand and Viet Nam

Thailand and Viet Nam, despite having vastly different histories, are remarkably similar in terms of their current regimes. To understand these regimes, an analysis of both regime type and stability will be conducted using a variety of quantitative data. Evaluating the historical development of these regimes involves analyzing literature on the presence of colonial legacies throughout their histories and geopolitical influences during the Cold War Era. The significance of this era is underscored by the concept of state-making through conflict theory and its intersection with colonialism, particularly evident in the Vietnam War. Additionally, it aims to discern how Western interventions during the Cold War Era, despite differing forms, contributed to the development of authoritarian regimes in both Thailand and Viet Nam. This analysis will utilize the research approach of the most different systems and apply concepts such as postcolonial authoritarianism, neocolonialism, historical institutionalism, and conflict theory.

Neikol Cruz (Mentor: Tina Bertrand) P3

Comparativist View Between Guatemala and Costa Rica

Why does genocide occur in some countries but not in others? When we are referring to Latin America the number one marginalized group is the indigenous population. The United Nations (UN) mentions that indigenous people participate in the Permanent Forum of Indigenous Issues (PF) based on colonization, decolonization, victim, actor, traditional, modern, global, and local issues. Around 44% of Guatemala's population is indigenous. Costa Rica has a much smaller indigenous population of 2.4%. It is notable that there are differences between these correlations. It is also important to note that Guatemala had Marxist affiliations after World War II which happened to get the United States involved with their politics. The communist party was favored by the large indigenous population, but had been abolished by the United States which had turned Guatemala into a strict military dictatorship following the 1954 CIA invasion. This allowed for the mass amount of killings from 1970 to 1995 to be conducted (Guatemala Timeline, 2019).. In comparison to Costa Rica, it was not largely involved with communist affiliations. Therefore, the United States did not take the steps to prevent communist rule in Costa Rica. In identifying the major causes of genocide, it can be analyzed that external influence as well as the allowed military dictatorship can cause a country to unsuccessfully develop.

Caitlin Baker (Mentor: Tina Bertrand) P4
Women's Rights in Saudi Arabia and Türkiye

Much has been written about the struggles of female empowerment and gender equality. Employing a comparative analysis approach, this research investigates the influence of legal structures and Islamic interpretations on women's rights in Saudi Arabia and Turkey, two countries with predominantly Sunni Muslim populations. Saudi Arabia's adherence to conservative interpretations of Sharia law and its social and governmental adherence to conservative Islam have contributed to entrenched gender disparities and limited progress in advancing women's rights. In contrast, Turkey's historical commitment to European legal interpretations supported by social and governmental secularism has facilitated greater gender equality, although challenges are reemerging due to the resurgence of conservative ideologies. Through a comprehensive examination of these factors, the paper sheds light on the complex interplay between religion, law, and societal norms in shaping women's rights, providing valuable insights into the dynamics of gender inequality in Islamic societies.

James Behrens (Mentor: Tina Bertrand) P5

China vs. Japan: The Post WW2 Transformations of China and Japan under U.S. Influence.

The post-World War Two era saw a significant transformation in the countries of China and Japan. These changes that the two countries underwent were heavily influenced by the United States of America. This research seeks to explore some of the main reasons as to why these countries, both having outside influence from the United States, took completely different paths following the Second World War. By using the Most Similar Systems design, this study looks at all the contributing factors such as government, history prior to post-World War Two, and several other factors. Following the Second World War, both Japan and China were completely changed from that they were before the end of the war. Once of the first differences between the two countries was how they were influenced by the United States. Japan was occupied by the US, which gave them complete control in rewriting laws and rebuilding the war-torn country. China on the other hand, was not physically occupied, but the US still tried to incorporate themselves into the government. The issue was that China had two separate parties fighting for political power, and the Chinese Communist Party took control. This completely erased the possibility that the United States could influence them any longer. During occupation of Japan, the United States was able to rebuild Japan into a powerful democracy and helped it become the successful nation that it is today. China, however, became controlled by a communist party and turned into a global superpower as well.

Lydianna Biggs (Mentor: Tina Bertrand) P6

Ecotourism in Kenya, and Tanzania

Majority of the literature provides substantial evidence as to why ecotourism is not improving the quality of life for the majority of citizens in Kenya, nor Tanzania, despite Kenya having a larger scale of tourism. Ecotourism has been popular for a while, but it really started to grow in popularity in the late 20th century. Ecotourism became something Kenya, and Tanzania are wanting to utilize as a tool to grow as a country, and hopefully foster more sustainable development within Kenya, and Tanzania. Both Kenya, and Tanzania have developed different laws, and rules to help conserve and regulate a responsible ecotourism. In Kenya they have a well-established reputation for ecotourism. They have done so by having excellent marketing. Kenya promotes there ecotourism more than Tanzania, and they pursue opportunities to entice travelers to come visit Kenya. Tanzania has steadily been trying to improve their marketing, and to establish tourism within the country more. Both, Kenya, and Tanzania are, and have been structuring tourism activities that stay within the guidelines of being a part of the responsible ecotourism industry. Kenya, and Tanzania like many countries in Africa struggle with waste, water usage, hosting tourists, and overall facilitating the ecotourism within their countries. Both, Kenya, and Tanzania are struggling to distribute the benefits of ecotourism across all populations, and demographics. I conclude that Kenya, and Tanzania will continue to struggle with disturbing the ecotourism industry income, and benefits throughout their country because they lack the ability to facilitate distribution among the citizens, tribes, and communities.

Noah Biggs (Mentor: Tina Betrand) P7

The Christian Democratic Parties of Germany and Italy

Much of the literature on the Christian Democratic parties of Italy and Germany attributes the differing focuses of the parties to several factors. These include authoritarianism in both countries, suppression of churches, both country's participation in WWII, and religion. Both parties emerged directly after WWII with the similar goal of stabilizing their country in the aftermath of the war although they both would go about their goal quite differently. Both parties had Catholic influences but the Italian party was directly related to the catholic church and backed by the Vatican. The German party, on the other hand, was a mix of Protestants and Catholics. The Italian Party was an instrument of the Vatican to keep Catholics in power and keep communism at bay, while the German party focused on promoting federalism and having a strong relationship with the West. Churches were suppressed in Germany during WWII so when it ended there was a wide resurgence of churches and this helped boost the Christian Democratic Party of Germany. However, there was no suppression of churches in Italy under Mussolini because the Catholic church retained quite a bit of power under his rule. In this paper, I examine the roles religion, authoritarianism, and WWII played in influencing and cementing the differing views held by the Italian and German Christian Democratic parties.

Alexander Lasserre (Mentor: Tina Bertrand) P8

Belarus and Ukraine How did the fall of the USSR affect thier economies.

After the fall of the Untied Soviet Socialist Republic (USSR) in 1991 many of the different states when though economic changes I will be looking at 2 of these counties Belarus and Ukraine between the years of 1991 and 2014 and using the Most Different Systems (MDS) as the research design model which will lead to the following questions. How did the economies of Belarus and Ukraine recover after the collapse of the USSR? Did the collapse of the USSR curve poverty. What were the food supplies like for each of them and were they self-sustaining? Did they make any market reform and if so, it how severe and in what ways? And, how was there relationship with Russia after the collapse was it good or bad and way.

Victor Leos (Mentor: Tina Bertrand) P9

Exploring the Economic Trajectories Between Iran and Iraq

This paper aims to analyze the economic trajectories and development of Iraq and Iran, and it will focus on their dependency on oil and the impacts of geopolitical and economic pressures. Both nations have heavily relied on oil, which has significantly shaped their economic landscapes. Since the 1970s oil boom, Iraq has faced economic challenges, including heavy reliance on oil exports, leading to an enclave economy with low employment and insufficient non-oil revenue sources. When we turn to Iran, which peaked economically in 1976, it has also

faced challenges from global market shifts, political upheaval, and sanctions, impacting its oil revenue and overall economy. The study utilizes a Mixed-Strategy Study (MSS) approach, combining quantitative and qualitative data to examine how oil dependency, geopolitical tensions, internal conflicts, and international sanctions have influenced Iraq and Iran's economic development. The findings highlight Iraq's vulnerability to oil market fluctuations and Iran's efforts toward economic diversification despite facing geopolitical tensions and sanctions.

Kendrick Hoster (Mentor: Tina Bertrand) P10

Colombia and Venezuela

Colombia and Venezuela are two very similar countries but are also very different. Venezuela is struggling with the economy, political corruption, and poor management of their energy sector. These problems are holding Venezuela back from developing into a stronger nation. Colombia on the other hand is handling the problems that are holding Venezuela back, very well. They have developed their energy sectors by producing higher numbers of natural gas and oil than Venezuela even though they have far less deposits. Colombia has even solved the problem of political opposition from within its countries by signing peace deals with the FARC group and making strides to end that conflict peacefully. It is no surprise as to why Venezuela is so low on the fragile state index since they have poor governance and are not utilizing the vast oil deposits that are at their disposal. In this paper, I examine how two very similar countries have different forms of development. I will go into depth about what has caused the decline of Venezuela and the rise of Colombia.

Brooke Boyer, Abigail Barzyk, Lorin Mow, Morgan Mehaffey (Mentor: Bradley Blackwell) P11

How Infidelity of Female and Male Birds Influences Fitness

The fitness of birds and how they interact via mating was simulated by students, half being male and half being female. The males each possessed 20 beads, which acted as their "gametes" and a female chose a random male to mate with each turn. When a male had given out their 20 beads, the mating ended. The number and color of beads that each female had were counted and the sum and fitness were calculated. This process was repeated 3 times, each time changing slightly. The first trial had no specific pattern or rules. In the second trial, the females became more focused on obtaining the most beads possible but still did not have a specific pattern for choosing a mate. The final and third trial is when cheating was introduced. Females had to turn, back to the males each go around. If the female with the specific-colored bead of a male caught the males giving their bead to another female, they were able to call to them. This resulted in the bead being taken out completely. The results from the final trial proved the hypothesis that infidelity reduces the fitness of the male and female birds.

Robert Albin, Bryana Corral, John Michael Angeles, Ken Hancock (Mentor: Bradley Blackwell) P12

Fitness Among Birds

For this year's research project, we conducted an experiment to show the fitness of the mate's choice over the female. Throughout the trials, the bird's fitness was determined by the likelihood of reproduction via the number of "eggs" each female bird would produce per trial. The overall purpose of this experiment was to measure the fitness of female and male birds. The hypothesis put forth was the idea that infidelity would lead to a decrease in fitness through the "cheater" rule implemented in the third trial. The males would start at the feeding grounds after determining their nest. The females would approach and choose the male they wished to mate with. After the egg was created the female would enter a simulated incubation period of 1 minute before returning to the feeding grounds. There were 3 trials, the first being an introductory one where the simulation's general rules were identified. The second trial consisted of strategizing for the most efficient mating cycles. The third trial introduced a new rule regarding infidelity. This was called the "cheater rule". In completion of the experiment the fitness of each male and female would be calculated based on the most to least successful in mating.

Chloe Valenzuela, Dianney Ortiz, Emilee Dominguez, Marleen Vega Guerrero (Mentor: Bradley Blackwell) P13

The Reproductive Relationship Between Birds

In this experiment, it involves the findings of males and females interacting in a specific way to simulate a reproductive scenario. Within the experiment nesting grounds were constructed with male birds being chosen by female partners due to attractive characteristics such as the distance from the feeding grounds, whether the male was remaining monogamous, or based off just chance in being able to successfully reproduce.

Tioluwalope Abdul, Khi Bruce, Ashley Smith, Anthony Oglesbee (Mentor: Bradley Blackwell) P14

Bird Reproduction and Fitness

Fitness is a relative value comparing the reproductive output of the most successful individual to the other individuals in a group. To measure fitness and sexual selection among birds, we ran an experiment with three (3) different trials; we changed some activities in each. The class was divided into equal halves, with the first half males and the second half females. In this experiment, the males had to compete for their nest and attract females with various behaviors to mate with them. Our hypothesis was that females would most likely choose their mate based

on the distance of the male's nest from the mating ground. Because the nature of the experiment was for each female to select a male from the nesting ground and receive a bead, "an egg," when both birds get to the male's nest, most females chose the males very close to the nesting ground because of distance. This experiment went on until the male ran out of the twenty (20) beads, "eggs", allocated to them initially. In the last two trials new rules to the mating process were added. In the second trial the males now know that the males with the closest nest to the mating ground will be most successful to take one female bird eggs completely. So, the male birds that were nested closer to the mating grounds received more of the female eggs than the male birds farther from the mating grounds. Once the third trial began a new rule was added; stating that other males could steal and mate with more than one female, but they could not get caught or the egg trying to be stolen would be eradicated from the trial. So, in the end the results of the last trial concluded in the male bird that remained loyal mated all eggs - producing more of their offspring, than the male birds who cheated with other birds.

Melinda Siebert, Reese Stephens, Davidpaul Salazar, Dude West, Jordan Katende (Mentor: Bradley Blackwell) P15

Reproduction and Fitness in Birds

In Biol. 1107, we experimented to determine the effect of selective mating between female and male birds. Our hypothesis we constructed was that the closer the male was to his nest to the mating ground, the more often he would be selected. During the trials, the female would walk around the courtyard, pretending to search for a mate. The male would try to attract the female with the rattling of beads. Those who got picked would take the female back to their nest and give them a bead. After the female received a bead, they would walk over to the other side of the mating ground and wait 30 seconds, then be allowed to be released again. Once one male ran out of beads, the trial was stopped. We conducted this 3 separate times. The first trial was more of a practice trial, the results went haywire, and in the end, multiple people emptied their bead holders.Iin the second round, the females created a stronger strategy of choosing the male closest to the nest. Few males emptied their bead holders. During the final trial, we added the infidelity rule where you cannot cheat, and if you do, you lose your bead. Females and males still were being cheated, but our director informed us that we couldn't watch the males while waiting to be released. In conclusion, depending where the nest was, the determining factor of the infidelity and competition, and the loyalty of the female birds, each trial ended differently; but our hypothesis was correct.

Robert Albin (Mentor: Bradley Blackwell) P16

Evaluating Crayfish as a Bio-indicator of Mercury Contamination

This project examined mercury bioaccumulation in crayfish and evaluated using crayfish as bioindicators of environmental mercury contamination. Crayfish were trapped and collected from Cedar Creek at Kirby Park in Abilene. Crayfish were measured before the tail muscle was extracted and analyzed for mercury. Data were examined to establish a relationship between crayfish size and mercury concentrations with the hypothesis that the larger crayfish will have greater concentrations of mercury. By examining the relationship of crayfish size to mercury concentration, future studies can use crayfish to assess mercury contamination in aquatic ecosystems.

Jacob Wooten (Mentor: Terrence Boyle) P17

Arachnid diversity at Firebase Libby

The purpose of this study is to acquire an identification of the diversity of arachnids at Firebase Libby. Pit-fall traps, flip traps, and opportunistic catches were used at different times of the day in order to find and collect specimens for identification. Literatures searches indicate there are an estimated 70 different species of arachnid present. So far only 9 species have been identified from Firebase Libby. This study will continue as more collections are needed.

Samantha Hamilton (Mentor: Terrence Boyle) P18

Exploring the Impact of Salinity Levels on Food Consumption in the invasive carb species, Rhithropanopeus harrisii

The invasive crab species *Rhithropanopeus harrisii* has been found in various locations with diverse temperatures and salinities. Given the species' invasiveness, understanding how different habitats and their characteristics affect the food consumption of *R. harrisii* is critical. This research aims to investigate the possible relationship between habitat salinity and food consumption. Approximately 100 crabs will be collected from Hubbard Creek Lake and transported to our laboratory, where they will be distributed into six tanks: three containing only male specimens, three containing only female specimens, with one tank allocated for each sex used as a control. After each of the twelve salinity adjustments consisting of six different salinity acclimation and feeding periods, the crabs will be weighed collectively and compared to their initial and previous weights. I hypothesize that as salinity increases, there will be a decrease in food consumption.

Caleb Dale (Mentor: Joel Brant) P19

Small Mammal Populations at Firebase Libby

Understanding biodiversity in a region is an important aspect of ecological studies. Firebase Libby is a property owned by McMurry University where we have the ability to sample the local fauna to answer ecological questions. Since 2019 we have been sampling rodents at Firebase Libby using two 160-trap arrays sampled two nights each month for a total of 7680 trap nights per year. Results have shown *Peromyscus attwateri* to be most abundant within the forest, with *Peromyscus leucopus* following behind. The grassland biome showed a denser population of *Reithrodontomys montanus*, with *Reithrodontomys fulvenscens* having a less dense, but still present population. This season we have an outlier, as in just a handful of weeks we have caught and released three specimens of *Chaetodipus hispidus* which in the past have been a much rarer occurrence.

Sunshyne Gwinn (Mentor: Joel Brant) P20

Herptile Survey of Firebase Libby in Callahan County, Texas

Herptiles, comprising reptiles and amphibians, play integral roles in ecosystem dynamics. Utilizing a combination of visual encounter surveys and trapping methods, we assessed species richness, abundance, and habitat preferences of herptiles in 2023. Our results revealed a diverse herptile community consisting of 12 species across the population of Firebase Libby in Callahan County, TX. Commonly encountered species included *Acris blanchardi* and *Sceloporus consobrinus*, while less frequently observed species included *Scincella lateralis*. Future research should focus on long-term monitoring to assess population trends and responses to environmental changes, thereby aiding in understanding the property's ecological makeup.

Glenda Parra (Mentor: Joel Brant) P21

Using Fluorescence Tracking to Determine the Preferred Micro-Habitat to Rodents

The study took place in three different areas of the Southern Rolling Plains of Texas. Using the method of fluorescent pigment tracking allows us to observe how the individual travels within its micro-habitat. Knowing the habitat selection of a rodent species is a crucial component of understanding the ecology of the area. Our results concluded that a total of 26 individually captured and tracked rodents, with a diversity of 8 different species. It was strongly inferred that *Peromyscus maniculates* preferred dense cactus vegetation, while the rest of the species tended to prefer grassy vegetation.

Julia McClung (Mentor: Ryan Dalton) P22

The effects of core strength training on lower body velocity compared to traditional lower body velocity exercise.

For many years core strength benefited people's physical health, and fitness. Studies have shown that care strength and stiffness has a positive correlation with dynamic postural control, coordination, and balance. This is seen specifically in sports like gymnastics. Studies have also found a strong relationship between core strength and upper body velocity that can be seen in sports like baseball, and softball. The purpose of this study is to determine if core strength will affect lower body velocity compared to traditional lower body velocity exercises. A significant gap exists in the research regarding exercises that will increase lower body power and force production. There is also a shortage of research to explain the best ways to implement core training to maximize athletic performance This study will attempt to determine if core strength will positively impact lower body velocity. METHODS: In order to compare core strength training to traditional lower body velocity exercise, the research team will recruit approximately 20 participants between the ages of 18 and 40 who are apparently healthy to perform 3 repetitions of a vertical jump, squat jump, back squat jump, and a power step up. A PUSH velocity tracker and a muscle contact grid will be used to measure the movements velocity, power and height. Once all the data is gathered the team will be randomly assigned to either group 1 or group 2. Group 1 will perform the core strength training exercises and group 2 will perform the traditional lower body velocity exercise. The groups will perform their respective 15 minute exercise routines 4 times a week, for 4 weeks before returning for the last testing session. In the last testing session the groups will perform the same exercise and measure them with the same instruments. The results will be analyzed to compare differences between vertical jump height, velocity and power for the four different movements.

Emma Nance (Mentor: Ryan Dalton) P23

Does Calisthenic Exercise Increase Math and Memory Performance and Decreased Reaction Time in Young People?

Exercise has often been associated with increased cognitive functioning and decreased reaction times. Primarily, it has been aerobic and strength training exercises that have been studied for cognitive functioning and reaction times. The effects of calisthenics on cognitive functioning and reaction time is rarely studied, but the studies that have been conducted were on the elderly population. The purpose of this study is to determine if there is an effect on cognitive function and reaction time in young people who complete calisthenic exercises. Methods: Each participant will complete a rest trial, exercise trial, and maximal testing session. The rest trial and exercise trial will be randomly assigned as to which will be first and which will be second. The exercise trial contain a warm-up and a calisthenic exercise, while the rest trial will be complete rest. Before both trials, we will measure height, weight, blood pressure, heart rate, O2 saturation and conduct pre-trial testing. After both trials, we will measure blood pressure, heart rate, O2 saturation and conduct post-trial testing. The testing will include a math test, memory test, and reaction time test. The trials will be conducted on different days so that there will not be any overlap from the reaction of the other trial. We will compare the pre-testing and post-testing scores for both the exercise trial and the rest trial. The math and memory tests will be scored based on the time it takes to complete the test, along with how many mistakes were made while completing the test. After both trials have been conducted, maximal testing of

pushups, squats, and a plank will be conducted in order to determine the fitness level of the individuals. We will use the fitness levels to determine if there is a difference in the testing due to the calisthenic workout. After all tests have been completed, the data will be analyzed using an ANOVA with repeated measures.

William Edwards (Mentor: Ryan Dalton) P24

The effects of unilateral training vs. combining unilateral and bilateral training on athletic performance and power output by measuring vertical jump and repeated sprint tests.

Previous research indicates that unilateral training demonstrates superiority over bilateral training specifically in terms of single-leg movements and running performance. There are only a few studies conducted that measured unilateral training and hybrid training. The results of that study concluded that hybrid training was better or equal to unilateral training in most parameters such as sprinting and jumping. By comparing these different training modalities, I aim to find the optimal training method for enhancing athletic performance. My intention in this study is to see if these findings are consistent, and I aim to see if bilateral deficit or facilitation has any effect on either training method since no current study has measured these parameters beforehand. The methods include measuring baseline and post-intervention for vertical jump and sprint performances for both groups. This study is a randomized control trial so participants will be randomly assigned to groups. There will be around 10 participants in the 18-40 years of age. I will measure if the participants are bilaterally deficient or facilitated by measuring their one rep max on leg extensions. They will perform their one rep max on leg extensions bilaterally and then unilaterally. The standardized tests such as the squat jump will be employed to measure vertical jump and a 40-yard sprint to measure sprinting. Participants have two attempts at running 40 yards and two attempts for vertical jump. Vertical jump measurements will be conducted on an RSI grid. The unilateral training group will undergo a structured training program focusing on unilateral exercises such as single-leg exercises. The experimental group will engage in both unilateral and bilateral exercises. The participants will undergo these exercises three times a week for two weeks.

Morgan Mehaffey, Lorin Mow (Mentor: Ryan Dalton) P25

Athletic Movements and Their Correlation with Agility Performance

Athletic ability is measured in many different movements, and athletes who compete in different sports are more experienced with the movements that they use within their sport. Agility is a skill that is needed in many sports and will help an athlete improve their overall athletic ability. When observing data collected from athletic movements, strength, speed, and power movements correlate with overall agility. The purpose of this study is to examine the performance tests that were run for strength, speed, and power, and compare them to agility tests that were run to see which test correlates the most. We hypothesize that speed will have

the most correlation with agility, followed by power and then strength. Methods: Using a randomized cross-over design, 8 healthy men and women (4 men and 4 women) were tested over many days. One-rep-max was found for squat and deadlift to be used as the strength tests, a 60-meter and 100-meter sprint test was used as the speed test, and a vertical jump test using a Vertec jump trainer and Contact Grid were used for the power test. The tests that had many different trials/attempts, the best attempt was used for each person. A correlation test was run between each of the tests back to two agility tests (CODAT test and 5-10-5).

William Edwards, Trey Castillo (Mentor: Ryan Dalton) P26

The Influence of Strength on Power and Speed for Athletic Performance

The purpose of this study is to determine how physical strength can influence other parameters in athletic performance, such as power and speed. Previous studies have shown the correlation that strength is a key factor in producing more power output and increasing speed. For example, many studies have shown that stronger athletes are faster sprinters and have a higher power output. Research also shows that faster sprinters need strength for speed. The more strength a person has, the higher the power output, which enables them to run faster. Methods: For this research project, we had four males and four females put through a combination of strength, speed, and power tests. They were tested on their one rep max for barbell back squat and conventional deadlift. We measured each participant's length at the hip so everyone would squat the same amount of distance. For measuring speed, they were timed on 60 and 100-meter sprints. Every 20 yards their time was measured to see any changes in acceleration or velocity during the sprints. Each participant ran 60-meter and 100-meter sprints twice. The standardized tests we used to measure power consisted of a countermovement jump and a drop jump. The countermovement jump was performed by each participant performing a brief countermovement by flexing the knees and hips and then jumping as high as possible. The drop jump was performed by each participant stepping off a platform of a predetermined height and immediately jumping once they landed. As a class, we used an RSI contact grid to measure vertical jump. Each participant had three trials for the counter movement and drop jumps.

Chloe McLellan, McKenna Standifer (Mentor: Ryan Dalton) P27

Body Composition Effects on Power Output in Vertical Jump and Short-Distance Sprints

There is evidence that power output is strong in jumping and short-distance sprints. Power, which requires both velocity and force, is necessary for peak performance in sports. Body composition, the percentage of bone, fat, and muscle in your body, can affect daily life. Multiple studies have documented that power is a key factor in a higher vertical jump. Other studies have shown that power is important in faster short-distance sprint times. This study consists of a body composition test, multiple trials of a 60-meter short-distance sprint, and

multiple trials of a vertical jump test. This study aims to measure how body composition affects power output in a vertical jump and a 60-meter sprint. It is known that body composition can affect how high one may get in a vertical jump or how fast one can be in a short-distance sprint, for our purpose, we want to examine how body composition affects the power output when participating in a vertical jump or short-distance sprint.

Methods: In this study, 8 apparently healthy participants (4 men, and 4 women, ranging from 19-40) had the circumference of their ankles, wrists, neck, waist, and hip taken Then, the same 8 participants completed a 60-meter sprint where the times were recorded every 20 meters. After every participant had completed the test, another trial was done. Then, a vertical jump test was completed, and the jump at the highest point was recorded. After each participant had gone, two more trials were completed. Data was analyzed by a One-Way ANOVA.

Caleb Kwiatkowski, Christopher Baker (Mentor: Ryan Dalton) P28

Does the FMS test/show athleticism and improve power output/correlate to acceleration?

Functional movement screens are used by examiners from various backgrounds such as athletics and Clinical uses. The use of FMS is a way to determine the risk of injuries in patients and allows the practitioners to determine what exercises to use. The FMS includes seven test such as Overhead squat, Inline lunge, Hurdle step, shoulder mobility, straight leg raise, push up and rotary. All these tests are scored from 0- 3 with the highest score being a 21. In our research we only decided to use four tests out of the seven and the test where OH squat, Inline lunge, Rotary, and Hurdle step. The reason why those four were selected was because the majority of athletes have some type of movement similar to those four tests. In the end the purpose of this study is to correlate if the four-test selected from the FMS can also test athleticism in athletes like an agility test and the vertical jump test. Methods: Within our class pool, 8 healthy students (4 males, 4 females; Ages 19-23, and 40) performed a function movement screen (FMS), CODAT, 5.10.5, SEMO, and T-test along with several power output tests such as counter-movement jumps (CMJ), vertical, and drop jump, after the completion of a dynamic warm up before the agility test. The functional Movement Screen Test Kit was used to perform and record the FMS, including measuring device, hurdle and stick, and cones were set at specific measurements using measuring tape for each agility test. The overhead squat, inline lunge, rotary, and hurdle step were the selected screens used to see if the is a correlation in these tests. Times were tracked and recorded during each agility test, and the FMS was screened and scored by members of the class and power output was tracked and recorded during our CMJs. Each student preformed each agility test twice, with rest times being as other students performed their trail. Males' vs females will be compared for the FMS, and for each agility or CMJ test as it relates to the FMS.

Danielle Armstrong, Chase Burke, Aiyana Collins, Braydon Durst, Jorge Garcia, Khoen Gregory, Mateo Herrera, Abigail Huffhines, Michael Ramis, Kalce Richardson, Eric Rios, Albany

Rodriguez, Hailey Soto, Abigayle Stubby-Kern, Isabella thames, Lainey Townsley, Alondra Vargas, Kaylee Worth (Mentor: Matt Draud) P29

'Rules of Monogamy' influence reproductive success in a lek simulation.

This study investigates the effects of mating system rules on reproductive success in a simulated lekking system of birds. Lekking is a social structure where males congregate to compete for female attention, leading to a skewed mating success with few males dominating the majority of matings. Females, on the other hand, have a more even distribution of mating opportunities. The study simulates a polygynous system, where males compete for nest sites at varying distances from the lek, influencing female choice based on the proximity of the nest to the lek, which allows for quicker egg deposition and return to the lek. Two hypotheses were tested: (1) variability in reproductive success would be less among females than males in polygynous simulations, but more similar under monogamy rules; (2) males with nests closer to the lek would accumulate more eggs than those with distant nests in polygynous simulations, with this effect diminishing under monogamy rules. Three simulations were conducted. The first two simulations, under polygyny, showed significant variation in male reproductive success and a preference for males with nests closer to the lek. The third simulation introduced a penalty for "cheating" (switching mates), simulating monogamy. Results indicated no significant difference in reproductive success variability between males and females, and nest site distance was not a determinant of female mate choice under monogamy. The study concludes that the introduction of monogamy rules can alter female mate selection criteria and reduce the reproductive success disparity between males. It also suggests that monogamy rules can diminish the advantage of having a nest close to the lek, leading to a more even reproductive success distribution among males.

Kiya Oleru, James Bell, Jade Dickens, Sarah Fry, Madilyn Guess, Kayla Hicks, Jadyn Martin, Breonna McCarthy-Reese, Jessica Shaffer, Beth Welshimer (Mentor: Yelena Kosheleva) P30

Cognitive and Emotional Functioning as a function of Sleep

Participants recorded their amount of sleep and activities that they were doing before going to bed over the course of about six and a half weeks. They were instructed to record data no more than two times a week and to be as accurate as possible. Subjects were also instructed to report how the amount of sleep, put into two categories; not enough sleep and enough sleep, affected the subjects attention span, mood, difficulty concentrating, and if they found themselves falling asleep during this time. The correlation between each of the subjects were highly similar in just about every recollection. The quantity and the quality of sleep was a high correlation that affected how the next day on these categories was altered.

Jennika Willis, Travis Alonge, Angel Alonso, Gabriel Aragon, Destinee Daniels, Joshua Dyer, Kathleen Hale, Richard Hernandez, Leo Hernandezgarza, Caleb Kwiatkowski,

Jordan McDaniel, Roman Perez, McKenna Standifer, Hunter Thompson, Adam Trevino, Kole Verdadero, Grayson Winter (Mentor: Janet McMurray) P31

A Comparison of Diaphragmatic Breathing and Rolling Patterns on FMS Scores

Functional movement is the ability to produce and maintain an adequate balance of mobility and stability along the kinetic chain while integrating fundamental movement patterns with accuracy and efficiency. Diaphragmatic breathing assists with posture and spinal stabilization, allowing for controlling dysfunctional movements caused by abnormal breathing habits. Rolling is a movement pattern which combines the use of the upper extremities, core, and lower extremities in a coordinated manner. Rolling is a basic demonstration of motor control and segmental sequencing. Rolling may be utilized to assess bilateral symmetry while affecting dysfunction of the upper quarter, core, and lower quarter. Functional Movement Screening (FMS) is a valuable tool for assessing movement patterns and identifying potential asymmetries or limitations in functional movement. Theoretically, rolling will improve the participants mobility and stability thereby improving FMS scores. Incorporating diaphragmatic breathing and rolling patterns to improve functional movement has gained attention for their potential to enhance movement quality and stability. This study aims to evaluate the effects of diaphragmatic breathing and rolling patterns on FMS scores, shedding light on their efficacy in optimizing movement performance. Methods: The FMS includes the overhead squat, hurdle step, in-line lunge, shoulder mobility reach, active straight leg raise, trunk stability pushup, and rotary stability patterns. Each student was screened and scored for the listed seven movement patterns. The second FMS screen was performed following diaphragmatic breathing for two minutes. The third FMS screen will take place after rolling patterns are completed. One group will perform a supine-to-prone movement (start face up), and another will perform a prone-to-supine movement (start face down). Each of the two groups will perform five reps on the left and right side of the upper extremity-focused rolling patterns and five reps on the left and right side of lower extremity-focused rolling patterns. Participants will choose the left or right and complete upper and lower extremity rolling. After the participants complete the upper extremity rolls, they will complete the lower extremity rolls. The FMS scores will be used to accurately assess the rolling patterns' effectiveness. The scores from the first (controlled) FMS were compared to the second (diaphragmatic breathing) and third (rolling patterns) FMS scores.

Yordanos Ayelework (Mentor: Aravind Mohan) P53

Health Informatics Platform to Understand the Impact of Insulin to Control Diabetes Using an Object-Oriented Approach

Insulin Dependent Diabetes Mellitus (IDDM), commonly known as Type 1 Diabetes, is a chronic and critical condition that occurs when the pancreas produces little to no insulin, resulting in elevated blood glucose levels (hyperglycemia), which can in turn cause blindness, kidney failure, heart disease, and even death. Consequently, the treatment of IDDM is mainly concerned with administering insulin to lower the blood glucose level to as close as possible to normal. The goal of this research is to identify the level of impact that the administration of different types of insulin and the dosage units has on blood glucose levels and how it can help manage diabetes. This research extracts real-world Multivariate, Time-Series Diabetes patients' dataset from the publicly available UC Irvine Machine Learning Repository. We implemented our data model and algorithm using Java programming language in an object-oriented approach and grouped the blood glucose levels into different impact groups such as low, normal, and high, assuming typical meal ingestion and exercise levels. The preliminary experiments conducted using our tool is helpful to understand the impact of insulin types and dosage units to control diabetes.

Shannon Baldwin (Mentor: Aravind Mohan) P54

Finding User Sentiments Using Youtube Comments

In the big data era, social media platforms like YouTube have emerged as massive repositories of information and opinions, reflecting the diverse voices and perspectives of users worldwide. Amidst this wealth of data, understanding user sentiment becomes paramount for organizations and individuals alike, serving as a compass for navigating the digital landscape and informing strategic decision making processes. By discerning the prevailing sentiments expressed within the vast array of social media content, stakeholders can refine content strategies, tailor marketing approaches, and anticipate trends with greater accuracy. Addressing the challenge of extracting valuable insights from public opinions shared through social media platforms presents a multifaceted research endeavor. At the forefront of this inquiry lies the critical question of how to effectively harness the power of social media data to gain actionable insights. One promising avenue for exploration involves connecting topics to YouTube videos and conducting sentiment analysis on the accompanying comments. By categorizing sentiments as positive and negative, researchers can capture the prevailing public opinion on distinct topics and themes discussed in YouTube videos, providing a better understanding of audience perceptions and preferences. This entails extracting specific comments on topics of interest, ensuring a targeted and focused analysis. Using advanced natural language processing (NLP) techniques implemented in the Java programming language. By advancing our understanding of user sentiment on social media platforms like YouTube, this research aims to empower individuals and organizations with actionable insights for informed decision-making and strategic planning. We can unlock the full potential of social media data as a valuable resource for understanding human behavior, societal trends, and consumer preferences in the digital age.

Logan Schneider (Mentor: Aravind Mohan) P55

A Scheduling Platform for Computing Big Data in the Cloud

The era of big data has started. Over the past decade, the digital revolution has resulted in three major challenges that define big data. The large volume, variety of types, and velocity of data generation make an arbitrary dataset be classified as big data. On the other side, computing big data is presented with the grand challenge of transforming billions of bits and bytes into insights in a timeeffective manner. One solution to this problem is to represent computation as a directed acyclic graph called workflow and use the cloud for allocating tasks in the graph to a computational resource that is more suited to the task. This solution allows the effective use of computational resources through scheduling and provides a framework for data to be processed more quickly. In this research, a popular scheduling algorithm known as Heterogenous Earliest-Finish-Time (HEFT) algorithm was implemented to solve the issue of computing big data in a usable and scalable manner using the Java programming language in an object-oriented approach. An important part of this algorithm is to rank the tasks in the workflow based on their computational and data transfer time. The HEFT algorithm prioritizes the task with the highest upward rank value at each computational step and applies a series of rules to identify the best processor for the task based on their computational and transfer time. The preliminary experiments conducted in this research are instrumental in understanding existing research and thinking of new ways to solve the important problem of computing big data effectively in the future.

Nathaniel Pyenta, Jessica Gribble, Ofeh-oseh Uzumefume (Mentor: Paul Pyenta) P32

Extraction and evaluation of gaillardin as an HDAC inhibitor in A375 and MDA-MB-231 cancer cell lines.

Histone deacetylase (HDAC) inhibitors are widely used in cancer treatment; they target HDAC proteins, which are over-expressed in cancer cells. Gaillardin, a compound extracted from the flower Gaillardia pulchella, has been observed to be a naturally occurring HDAC inhibitor. In this project, we wish to identify which part(s) of the plant express gaillardin and demonstrate efficient methods to best isolate gaillardin. Once isolated and characterized, the efficiency of gaillardin as an anti-cancer agent will be measured as an EC50 value and compared to that of suberoylanilide hydroxamic acid (SAHA), a known and FDA-approved HDAC inhibitor. We collected Gaillardia pulchella, which grows well in west Texas, dried the samples, and separated the different parts of the plants. Compounds were extracted from each group and introduced to cultures of growing cancer cells; cell lines used include MDA-MB231 and A-375, which are breast and skin cancers, respectively. Cell viability after incubation was tested with water-soluble tetrazolium salt (WST1) assays. Crude extracts of compounds that exhibited induced cell apoptosis were further separated using column chromatography to further isolate gaillardin in preparation for characterization and additional testing with cancer cells. Initial results show production of gaillardin within the leaf, flower heads with petals, and flower heads with fruit. Thin layer chromatography indicated that gaillardin is more highly polar than initially predicted

in comparison to other compounds present in the extracts. Further testing is needed to determine best methods of separation. Future work will characterize the purified compound and measure EC50 values in various cancer cell lines.

Matthew Pyle (Mentor: Timothy Renfro) P33

Weather Detector Device

A unique design has been proposed and a prototype has been built for a device that allows for easy detection of electrostatic potential differences in the atmosphere. The device has four points in the shape of four pronged forks, which detect charge on the rotating cylinder and pinwheel. Depending on the shape, the pinwheel fans, or a side of the cylindrical shape act as capacitors, and when high angular velocity is achieved charge dissociation occurs. This provides a pulsing electric potential to the device. To test this device, discharges created with a Van De Graph Generator were used. Once an alteration of electric potential occurs in the atmosphere, the device detects this discharge and voltage is plotted using an Elvis II National Instruments data acquisition computer interface and an oscilloscope for verifying the relationships on the "NI LabView 64 Bit" voltage readings. The resulting graph indicates a square wave function. Once the cylindrical capacitors have changed, the graphical representation changes to a "sawtooth graph". The device is quite sensitive and may serve as a detector to observe potential storms and electric discharges in the environment, whether man made, or natural. As a result, this device, because of these findings, is properly named a "Weather Detector."

Elijah Gregory, Jaumarian Barnett, Zarius Garcia, Victor Huerta (Mentor: Timothy Renfro) P34

Detecting Radioactive Uranium Traces in Oil Drilling Equipment

The investigation of gamma ray spectrum of different elements and the detection intensity relationship to distance and mediation was completed utilizing gamma ray spectroscopy with Spectrum Techniques Equipment. Additionally, a supplementary analysis was conducted on a radioactive west Texas drilling pipe. The examination of the pipe material unveiled the presence of radioactive isotopes of uranium elements. This can be used in shedding light on potential environmental and health implications on drilling sights.

Christiana Perez, Dylan Abbott (Mentor: Greg Schneller) P35

Assessing for Classically Conditioned Responsiveness to Social Media Notification Tones

This study was aimed at assessing whether individuals learn to have a subtle nervous system response to the Snapchat notification tone. Previous research establishes that cell phone over-usage correlates with nervous system activity and that complexity of auditory stimuli elicits

varying magnitudes of autonomic response. We hypothesized that there will be a stronger response to the Snapchat notification tone rather than the neutral notification tone (telegraph) regardless of sex/gender. We measured subject responsiveness using Galvanic Skin Response, a device that detects small changes in the skin's sweat gland activity. Results will be analyzed using change scores which represent the duration of the participant's autonomic response.

Abby Barzyk, Angelica Abila, Sunshyne Gwinn, Bandar Alanizi (Mentor: Hyunshun Shin) P36

Properties Found During the Synthesis of Ethyl-3, 5-Dichloro-4-((6-Ethoxy-6-oxohexyl) oxy) Benzoate, Histone Deacetylase 1 Inhibitors

A new histone deacetylase 1 (HDAC 1) will be created in the lab and tested on cancer cells to see if the new HDAC 1 will be effective in deteriorating cancer cells. Enzyme inhibitors reduce the rate of enzyme-catalyzed reactions within the body while preventing enzymes to work in a normal manner such as blocking or slowing enzymatic functions. The objectives of this experiment are to synthesize ethyl-3, 5-dichloro-4-((6-ethoxy-6-oxohexyl) oxy) benzoate as a target enzyme inhibitor and ovarian cancer. Ovarian cancer is one of the deadliest resulting diseases in gynecological cancers. This is because the signs and symptoms are not caught until it is too late and the cancer has spread throughout the body. Histone modification can impact or completely halt the processes of transcription and translation. Histone regulatory enzymes are capable of manipulating gene expression. This study will examine HDAC1 and the risks it may pose in cancer cases, specifically ovarian cancer, while also studying the potential it has in treatment plan. In preparation for both approaches, a phenoxide ion was formed by mixing ethyl3,5-dichloro-4-hydroxybenzoate with acetone and potassium carbonate. The approaches differed when ethyl-6-bromohexanoate was added. In the traditional approach, two cycles of stirring were performed, with one including a hot bath. The microwave assisted approach utilized a vessel, which led to higher yields within shorter reaction times. IR spectra can be used to compare products, and NMR can be implemented to evaluate the extent of reaction or purity of the inhibitor product. The synthesized compound will help provide the insights to develop new histone deacetylase 1 as a target in ovarian cancer.

Brooke Boyer, Isabella Sanchez, Eduardo Garcia, Ofeh-Oseh Uzumefune (Mentor: Hyunshun Shin) P37

Synthesis of the Histone Deacetylase 2 Inhibitor for Oncogenes

This research will consist of synthetization of the histone deacetylase 2 inhibitor, also known as HDAC-2 inhibitor. The work done will allow for the analyzation of the uses and effects of the HDAC-2 in the expression and activation of oncogenes and tumor-suppressing genes in the human body. Positive effects of HDAC-2 inhibitors include acting as a general anticancer agent and playing a role in T-cell development and differentiation, which underlies the effectiveness of HDAC inhibitors in T-cell lymphoma. It is also shown to be necessary for DNA replication and

initiating the immune control of T-helper cells and CD4+ T-cell activation. One of the major negative effects of HDAC-2 is the overexpression of the enzyme leading to cervical and gastric cancers. Mutations of the HDAC-2 in sporadic tumors have begun leading to the loss of HDAC-2 expression and activity, which in turn, results in the increase of oncogenes. In this experiment, the reactants of 2-chloro-5-hydroxypyridine and ethyl-6-bromohexanote will be synthesized to form the HDAC-2 inhibitor via a microwave synthesis and a conventional synthesis. The reactants stated above will then be analyzed via TLC plates for both the microwave and traditional method in three different eluting solutions. The same reactants will then be analyzed via IR and H-NMR spectrums. This same process will be repeated for the product, ethyl-6-((6-chloropyridin-3-yl) oxy) hexanoate, that is synthesized, which will then be purified via automated flash column chromatography. These results will be recorded and will provide insight into the development of the new HDAC-2 inhibitors as a oncogene suppressor, as well as identifying the best way to synthesize the product.

Jose Pena, Nathaniel Pyenta, Ansynn Franklin, Samantha Hamilton, Trista Brown (Mentor: Hyunshun Shin) P38

Synthesis and Bonding Affinity of ethyl 3,5-dichloro-4-((7-ethoxy-7-oxoheptyl)oxy) benzoate with Metallo Beta-Lactamases as an inhibitor.

Certain bacteria have evolved to use a compound known as Beta-Lactamase, which inhibits beta-lactam antibiotics. This creates a problem when trying to eliminate a bacterial infection. Metallo beta-lactamases (MBLs) possess a Zinc ion that serves as a potential target bonding site for an inhibitor with a polar negative end. By bonding to this site, the enzyme would be unable to perform its function. Typically, suberoylanilide hydroxamic acid (SAHA) is used as this inhibitor, however the compound also has ill effects on human health. In this project, a new compound, ethyl 3,5-dichloro-4-((7-ethoxy-7-oxoheptyl) oxy) benzoate, was synthesized by both a traditional method using reflux conditions and by microwave-assisted synthesis. The products were isolated and characterized using IR and HNMR spectra. The bonding affinity of the compound and SAHA with MBLs (PDB Code: 7AYJ) was predicted using Chimera and Autodock Vera, showing that the synthesized compound had a higher bonding affinity.

Robert May, Reagan Owen, Mason Scott, Olivia Valdovinos, Jerry Sullivan (Mentor: Hyunshun Shin) P39

Synthesis of Beta-Lactamase Inhibitor: Synthesizing the unique Inhibitor Ethyl7(6-chloropyridin-3-ol) oxy) Heptanoate.

Modern medicine practices that intend to attack bacteria-based infections have become far more difficult to combat. Medicines that are directed to fight bacterial infections specifically target the Metallo beta-lactamase enzyme in the bacterial walls to eliminate cellular growth. Over the past few decades, common bacterial infections have become

more resistant to predominant antibiotics due to the mutations of the Metallo beta-lactamase enzyme. The formation of a new inhibitor must be determined to combat the mutated bacterial cells. The following experiment includes the synthesis of a Beta-Lactamase inhibitor between the molecular reactants 6-chloropyridin-3-ol and ethyl 7-bromoheptanoate to form the inhibitor, ethyl7(6-chloropyridin-3-ol) oxy) heptanoate. There were two methods that took place to obtain the product, using a conventional method and the microwave-assisted synthesis method. The formation of the product with the reactants was conducted followed by a TLC analysis to illustrate the presence of a new compound. The HNMR and the IR spectrums of the product were analyzed to confirm the possibilities that a new molecule was synthesized.

The total crude and pure theoretical yields were 0.833g of the Beta-lactamase inhibitor. The actual yield for the microwave analysis was calculated to be 0.436g giving a percent yield of 50.34%. Therefore, the most efficient technique used in this experiment was the microwave-assisted synthesis method.

Jordan Flores (Mentor: David Upshaw) P40

Reverse Engineering and 3D Solid Modeling of a Wind Turbine

Using SolidWorks CAD software package, I generated a solid model of a wind turbine. Utilizing existing wind turbine designs, I was able to reverse engineer and incorporate a complex blade design geometry for use in my own wind turbine design. The next step in my project will be to rapid prototype a scaled down model of my wind turbine. I will then test the design in a controlled environment (wind tunnel), refining and reiterating the design based on the results.

Samantha Ford (Mentor: David Upshaw) P41

Reverse Engineering and Solid Modeling of a Surfboard

I generated a 3D solid model of a surfboard in SolidWorks CAD software using image references from existing products on the market. The type of surfboard I modeled is referred to as a "gun." It is called this because these types of boards are used to "hunt" the big waves. I followed engineering design methodology as the structure for my project. Future work includes modeling the fins, leash, leash plug, and traction plate. Then, I will rapid prototype a scaled-down model of the surfboard, followed by test and evaluation of the design for structural integrity and aesthetics to aid in further design development.

Celdon Gooch (Mentor: David Upshaw) P42

Reverse Engineering and 3D Solid Modeling of an Analog Wall Clock

In this project, I created a solid model in SolidWorks CAD software using reverse engineering methodology. I started by researching and comparing various analog clocks to find a suitable design. Then, I took precise measurements of a clock in our classroom using digital calipers and modeled each of the individual components that comprise the clock assembly. Future work includes rapid prototyping for testing and evaluation of fit, form, function, and aesthetic appeal.

Jackson Harris (Mentor: David Upshaw) P43

Engineering Design and 3D Solid Modeling of a Family Crown

Using SolidWorks CAD software, I designed and generated a 3D solid model of a family crown. To generate ideas for this project, I researched various crown design worn by kings and queens throughout history. I took measurements of my head to drive the design for my custom fitted crown. The assembly consists of multiple parts including the shell, headpiece, and precious gems. The next step in this project will be to rapid prototype a wearable model of my family crown. Rapid prototyping will allow for quick and cost-effective test fitting and size customization.

Daniel Mora (Mentor: David Upshaw) P44

Reverse Engineering and 3D Solid Modeling of a Collegiate Discus

I reverse engineered a collegiate discus and generated a 3D solid model in Solidworks CAD software. To accomplish this, measurements were taken of the disassembled discus using digital calipers. A solid model of each part was generated in SolidWorks and combined into an assembly model. Future work includes rapid prototyping of the assembly, followed by testing to ensure that the 3D-printed discus will withstand the impact and force exerted on it during normal operating conditions in competition and practice.

Alex Smith (Mentor: David Upshaw) P45

3D Solid Modeling and Rapid Prototyping of The Project Requiem Decapitator

Using the SolidWorks CAD software, I designed, modeled, and rapid prototyped my conceptual mechanized military vehicle "The Project Requiem Decapitator". The design is self-standing and fully articulating. I rapid prototyped my design and intend on testing the assembly to assess structural rigidity and mobility, upon which further design improvements can be made. Future work includes design and development of hardpoints, to which weapons and auxiliary equipment can be mounted.

Dustin Volk (Mentor: David Upshaw) P46

Design and Development of a 3D-Printed Protective Case for Wine Bottle Storage and Transportation

Have you ever had an incident of wine-bottle-breakage? My design of a wine bottle carrier is to facilitate bottle protection during transport and storage. This idea came about from an unfortunate incident where a bottle of wine fell over in my trunk and broke, spilling its contents. After this unfortunate incident, I began researching for some way to safely transport wine and the only thing available was an "egg crate" style container that was both not appealing visually and offered very minimal protection. I designed and modeled the case using SolidWorks computer-aided design (CAD) software. This design is in the early stage and will require further testing to identify possible product improvements.

Corbin Stulir (Mentor: Brooke Wright) P47

Review of Cancerous Agents in Firefighting

Firefighting is a job that demands a large amount of risk and demands both physically and mentally. There are many dangers that firefighters face in their daily work. But what about the long-term effects of their job? Cancer caused 66 percent of the career firefighter line-of-duty deaths from 2002 to 2019, according to data from the International Association of Fire Fighters (IAFF). And in 2016 only, cancer caused 70 percent of the line-of-duty deaths for career firefighters. There are a wide variety of cancerous agents found in the line of firefighting. Firefighters have a 9 percent higher risk of being diagnosed with cancer and a 14 percent higher risk of dying from cancer than the general U.S. population, according to research by the CDC/National Institute for Occupational Health and Safety (NIOSH). With this information, cancer is the most dangerous threat to firefighter health and safety today. Although there is a wide range of research on the topic of cancer as well as firefighting, the possible solutions for the risk of cancer in firefighting are lacking and limited. This paper analyzes the reported research on the cancerous agents found in firefighting and presents possible solutions to decrease the risk of cancer in firefighters.

Gerald Porter (Mentor: Brooke Wright) P48

Tracking fecal contamination patterns in Urban Parks: A look at Abilene, TX

Urban parks and green spaces are vital recreational areas within cities that offer opportunities for leisure activities and safe places to play for children. However, the fast pace of urbanization

often alters natural landscapes into impermeable surfaces such as concrete sidewalks and parking lots that naturally disrupt water flow and degrade water quality in urban ecosystems. This study investigates the presence and distribution of Escherichia coli (E. coli) bacteria as an indicator of fecal contamination in standing water collected from various locations within two local parks in Abilene, TX. The samples were taken from different parts, including grass, sidewalks, street gutters, and parking lots, utilizing IDEXX Quanti-Tray/2000 with the Colilert Reagent method from several ground puddle sites on Rose Park and Redbud Park. E. coli and coliform bacteria were found through an incubation process involving fluorescence detection methods. The objective was to examine how E. coli is distributed across different surfaces and evaluate its probable threat to children's playground equipment or other types of surfaces they come into contact with. All the samples tested positive for coliform bacteria, which showed fluctuation levels for E. coli across sites. In Rose Park, Grass samples exhibited significantly higher levels of E.coli, which exceeded 35 cfu/100mL, the EPA standard value. Also, some areas, like Parking Lot 2 in Rose Park or Sidewalk 2 in Redbud Park, surpassed the EPA standard for E.coli contamination. Surprisingly, temperature fluctuations during daytime did not correlate with changes observed in E.coli levels but could have affected numbers belonging to this group. These findings highlight the need to control fecal pollution within urban environments to protect public health, especially among kids who are most susceptible to infections due to their low immune system development. Understanding contamination dynamics and identifying high-risk zones can contribute to targeted management approaches for mitigating waterborne disease risks in urban parks.

Abby Barzyk, Brooke Boyer (Mentor: Brooke Wright) P49

What Effects Does the Gut Microbiome Have on Human Health?

The gut microbiome is essential to a person's health and well-being. It provides immune function and nutrients to the gut which help it retain its homeostatic balance. The human gut microbiome plays a huge role in providing healthy bacteria to support overall wellness. The gut microbiota in humans evolved throughout life and appears to play a pivotal role in both health and disease. "A dysbiosis state of the gut microbiota is becoming recognized as an environmental factor that interacts with a host's metabolism and has a role in pathological conditions, both systemic—obesity, diabetes, and atopy—and gut-related IBS and IBD" (Bull and Plummer, 2014). The gut microbiome is affected by irritable bowel syndrome (IBS) and in patients that have an appendectomy. This study will go in depth about the microbiome and how it works, as well as how it is affected by certain things. It will tell people the best way to take care of their gut microbiome to keep it happy and healthy.

Daniel Morey (Mentor: Brooke Wright) P50

Presence of Coliform Bacteria in Rainwater Puddles in Hospital Parking Lots

This study investigates the presence of Escherichia coli (E. coli) in rainwater puddles within hospital parking lots, which could potentially be environmental contamination risks in healthcare settings. Utilizing the IDEXX Quanti-Tray/2000 method with Colilert Reagent, samples were collected from various locations around McMurry and Abilene hospitals, including hospital parking lots and emergency bays, to detect E. coli and coliform bacteria. The results indicated that all sampled locations were positive for coliform bacteria, with varying levels of E. coli. The study found no significant effect of daytime temperature on bacterial presence. The presence of coliform bacteria, often linked to fecal contamination, suggests potential health risks, particularly in areas frequented by hospital staff, patients, and visitors. This underscores the importance of including external areas in hospital hygiene protocols to mitigate the risk of hospital-acquired infections. The variability in E. coli levels across different locations points to differences in environmental or human factors influencing water quality. The study recommends further investigation into specific causes of contamination and highlights the need for environmental hygiene practices in healthcare settings.

Ofeh-oseh Uzumefune (Mentor: Brooke Wright) P51

The Bite That Kills: Understanding Sleeping Sickness and Its Impact on Human Health.

Human African Trypanosomiasis (HAT), also known as African Sleeping Sickness, is a vector-borne parasitic disease primarily affecting rural communities with limited access to healthcare and resources in Sub-Saharan Africa. There are two clinical variants of HAT, the West African form caused by Trypanosoma brucei gambiense (abbreviated to T. b. gambiense) and the East African form caused by T. b. rhodesiense parasites. In Humans, it is caused by the protozoan parasite Trypanosoma brucei gambiense and transmitted by the bite from an infected tsetse fly species Glossina palpalis. Humans are the most important reservoir of infection, although the parasite can sometimes be found in domestic animals. African trypanosomiasis is fatal due to the absence of both a vaccine and a suggested treatment for prevention. This disease in humans induces a fatal sleep disorder and is characterized by episodes of nocturnal insomnia and daytime somnolence; Hence, the name "Sleeping Sickness." This research aims to provide insights into the epidemiology, pathogenesis, and control measures of African sleeping sickness.

Taya Bridges (Mentor: Brooke Wright) P52

Why are women more prone to ACL tears than men?

Anterior Cruciate Ligament (ACL) injuries have been seen in millions of people around the world, but there is a significant difference in how much more women are prone to tearing their ACL than men. Even though you can perform the same movement why it that women get injured more? There are multifactorial causes that deal with biomechanical differences as well as hormonal differences. In this research it has been found that there is not just one answer to why, such as having wider pelvises, estrogen fluctuations that may cause ligament laxity, and many more factors that can play a role in why.