Fall 2017

UNDERGRADUATE RESEARCH & CREATIVE ACTIVITY FORUM
MIDWESTERN STATE UNIVERSITY

Thursday, November 16
Clark Student Center
# 2017 Fall Undergraduate Research and Creative Activity Forum

**Thursday, November 16, 2017**  
**Clark Student Center**

## UGRCA Forum Sessions

### Oral Presentations

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## Poster Presentations

**Clark Student Center Atrium**  
9:00 AM – 4:00 PM

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*Students will be at the posters at indicated times for evaluation. Outside those times, students may come and go and/or be at their poster at any time for dissemination purposes.*
9:05-9:25 (O1)  *PLC Operated Pick and Place Pneumatic Robot*

**Kentzie Rhodes, Brady Burross, Denzel Kinyua, Michael Reynolds, Alan Peregrino**, McCoy School of Engineering, College of Science and Mathematics  
Mentor(s): Dr. Jan Brink  
The purpose of this project is to design and build a non-servo pick and place pneumatic robot. The robot will be controlled by using a programmable logic controller (PLC). The robot will be able to perform simple pick and place operations that would be applicable in the manufacturing industry. The authors plan on developing a Solidworks drawing and model for the robot and then having the required parts machined in the McCoy School of Engineering machine shop. We plan on calculating the required cubic feet per minute (ft³/min) CFM for the circuit and ordering the appropriate pneumatic parts such as cylinders, tubing, fittings, limited rotary actuators, and other pneumatic components. The result of this project will be a pick and place robot that can perform basic variable sequences. The robot will increase the productivity of a hypothetical assembly line in a manufacturing setting. The robot will interface with other manufacturing equipment. Robots, even very simple basic ones, can improve productivity and ultimately lower production costs when implemented into manufacturing settings. Robots can interface with different types of manufacturing equipment essentially allowing one robot to perform not only the task of one trained individual, but the tasks performed by many different individuals. Construction of the physical robot will begin next semester.

9:30: 9:50 (O2)  *Benford’s Law and its Application in Financial Statements to Detect Fraud*

**Hettyadura Shehan Karunaratne**, Accounting, Dillard College of Business Administration  
Mentor: Dr. Agim Kukeli  
Identifying fraud in financial statements is critical and quite complex in present days. As a result, it’s very expensive and time consuming for businesses to attempt and execute internal audits as well as external audits during their fiscal year. Benford’s law therefore can be useful in identifying frauds and manipulations in numbers in the financial statements. This paper discusses about the most effective use of digital analysis and Benford’s Law. The law is based on an observation where, certain digits in a number distribution shall appear more frequently than others. For example, in certain data sets, it has been observed that more than 30% of numbers begin with the digit one. We shall discuss the background of the law and development of its use in auditing, since it may not always give us accurate information if we fail to apply the correct digital analysis based on what type of data we are taking into consideration. We shall look at developing specific formulas and showing where digital analysis based on Benford’s Law can most effectively be used and where auditors should exercise caution. Specifically, we identify data sets which can be expected to follow Benford’s distribution, discuss the effectiveness of statistical tests, types of frauds that will and will not be detected by such analysis, as well as the potential problems that arise when an account contains too few observations. Furthermore, we anticipate seeing, to which extent the application of Benford’s Law in financial statements will help in identifying frauds.
Dual Planetary and Chain Based Car Transmission

James Ivey, Joshua Munoz, Juan Orozco, Seth Witherspoon, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Salim Azzouz
An ideal car transmission would be able to give the optimum torque or speed for any particular loading condition. The main task of this project is to make an advanced transmission by using two-planetary gear systems coupled by three driving chains and sprockets, and being controlled automatically with the use of a clutching and braking system. This new type of transmission has theoretically twenty distinct gear ratios that can be selected depending on the optimal needed torque. By utilizing the composite Willis formula, we can theoretically obtain the different formula related to the twenty gear ratios. Those gear ratios will be verified experimentally once the automation of the transmission is complete. Currently, the group is designing a clutching and braking system that will automatically drive and brake specific gears to obtain a desired gear ratio. This automation is realized by the use of a Programmable Logic Controller (PLC) which will engage or disengage the clutching system at will. A logic chart is being worked out as well as a visual panel displaying the transmission different gear combinations. The panel will display with colored LED’s all the possible gear ratio combinations pertaining to the new transmission. It is envisioned that the mechanical work on the transmission will be finished by the end of the Fall 2017 semester, while the automation will be achieved by the Spring 2017 semester.

Midwestern State University Echometer Slippage Research

Danielle Arrington, Brandon Allan, Eric Savage, Daryn Sims, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Sheldon Wang
The purpose of this research is to develop an analytical solution that represents accurately the slippage in a sucker rod pumping system. Slippage is a term used in the oil and gas industry that defines a column of oil and gas that passes between the clearances of a sucker rod pump assembly. A sucker rod pump is a positive displacement pump often used in the petroleum industry for artificial lift. The sucker rod pump uses mechanical leverage to move a sucker rod string up and down inside the well. At the bottom of the string a pump consisting of a barrel and plunger assembly is connected. As the rod moves up and down the pump assembly displaces fluid upward for recovery.

Slippage occurs in the pump assembly can be attributed to both the pressure difference and the plunger motion. The method of this research is twofold, with one part being a mathematical model, and the other a real world pump jack model apparatus. Mathematical solutions will be compared with the actual measurements of constructed apparatus. This research will focus on the first quarter of the full stroke of the pump jack system. At the moment, mathematical results have been derived and the corresponding experimental apparatus is being constructed.
9:05-9:25 (O5)  *Intelligent Robotics Using Computer Vision*

Ken Griffin and Mpathi Nzimao, McCoy School of Engineering, College of Science and Mathematics

Mentors: Drs. Yu Guo and Bingyang Wei

Vision based feedback is the process by which data can be obtained through the combination of a camera and distance sensor, and a decision algorithm can be designed to govern the motion of a robot. Our project was to enable vision based feedback on a Multi-DOF robot utilizing Bluetooth communication. To achieve this; a Raspberry Pi microcomputer coupled with an ultrasonic distance sensor and camera, were attached to the robot to allow for onboard processing of the visual and distance feedback. Through the establishment of a Bluetooth communication between the robot and the Raspberry Pi - as well as through the creation of various motions executable by the robot – we designed a decision making algorithm allowing for seamless motion of the robot. The successful execution of the algorithm, will allow for the robot to undergo object tracking and obstacle avoidance based on the visual data obtained through the combination of the Pi-camera (filtered directly on the Raspberry Pi using the OpenCV virtual interface), the ultrasonic sensor and the digital compass (to allow the robot to keep a constant heading).

9:30: 9:50 (O6)  *The Hound Drone*

Sean Egloff, Hunter May, Latham Moody, Tyler Parnell, Zeltzin Reyes, McCoy School of Engineering, College of Science and Mathematics

Mentor: Dr. Yu Guo

The purpose of the Hound Drone Group is to research and develop a fixed-wing drone system. The drone system should meet requirements identified as essential to fill the desired role. These requirements are long duration of flight (exceeding 90 minutes), low detectability, low cost (below $10,000), no dedicated pilot required, live standard and infrared video feed, laser designator, simple launch and recovery, rugged design, tablet controlled. The requirements specified to develop a drone that can meet specific municipal and agency requirements for a surveillance and observation drone system.

9:55 – 10:15 (O7)  *Hotter ‘N Hell Study: Quantitative Phase Final Results*

Matthew D. Matlock, Crystal Williams, Management and Marketing, Dillard College of Business Administration

Mentors: Dr. Niyati Kataria, Dr. Jeff Stambaugh

Previous literature has examined reasons for volunteer motivation especially in the arena of sports and sporting events (Reeser, Berg, Rhea & Willick, 2005). However, much of this literature focuses on sporting events like the Olympics, which do not recur annually in the same community and where the volunteers are being drawn from highly populated communities. We examined the case of Wichita Falls, Texas’ ‘Hotter ‘N Hell Hundred’ (HHH) organization which hosts America’s largest hot weather bike race and has managed to attract a volunteer base of over 3000 volunteers for decades. We want to understand what makes this organization so successful at attracting volunteers in a small community where other non-profits have failed. This study was conducted over two phases: qualitative and quantitative. The qualitative study was conducted with the leadership of HHH and uncovered 39 volunteer motivations. For the second phase
Quantitative) of this study, we incorporated the 39 volunteer motivations in developing and pilot testing a survey instrument. We adjusted the survey based on the results of the pilot study and then administered the final survey instrument to the entire volunteer population of Hotter ‘n Hell Hundred during their 2017 annual event. We received 1295 completed surveys back and we present the final results of the quantitative phase of this study. Triangulating findings over a multimethod (qualitative, quantitative) study allows a richer understanding of this organization’s volunteer success. The findings from this multimethod study can provide guidelines for other non-profits regarding volunteer motivation.

Forecasting Regional Output Level: Case of Wichita Falls MSA, TX
Kaushik Sunil Shah, Economics, Dillard College of Business Administration
Mentor: Dr. Agim Kukeli

The purpose of the research is to forecast the Gross Domestic Product (GDP) of Wichita Falls. GDP of Wichita Falls for a given year is released in the following year and not the same year. Therefore, forecasting GDP would help to study the economy of Wichita Falls. So, in this research, we will use and study two different ways of forecasting GDP. First method is studying the trend and moving averages of the past GDP data of Wichita Falls, and using it to forecast the GDP of current and upcoming year. In addition, the second method is to find a correlation between taxes and GDP, and then use this correlation to predict the GDP. Finally, we will compare two methods and conclude which one is a better method of predicting GDP. Furthermore, for the research we will use Hodrick-Prescott filters (HP filters), data from Bureau of Economic Analysis (BEA), and articles from Google Scholar and Midwestern State University’s databases. To sum up, in the research we will study the two methods mentioned above to effectively predict the GDP of Wichita Falls for the year 2017, and 2018.

Oral Presentations
Wichita I & II
Session 1C
9:00 – 10:40 am
Moderator: Lauren Jansen

Unnecessary Aggression
Nicole Longo, Psychology, Prothro-Yeager College of Humanities and Social Sciences
Mentor: Dr. Andrea Button

The purpose of my study was to take an in depth look at the law enforcement methods of the Metropolitan Police Force of London-as they are key players in the future of policing. The Metro implement a type of non-lethal policing known as de-escalation. My goal for my research was to examine the driving forces behind London’s success in maintaining officer safety as well as upholding a positive public image. My research was a review of literature as well as hands on observations conducted while I was studying abroad in London over the summer. After reading all the literature I found, the success of London’s policing van be traced to three main components: the gun laws of the United Kingdom, the attention that the Metro places on Officer Safety Training, and the positive relationship that is seen between officers and civilians. After conducting my research, the biggest influence on London’s ability to police non-lethally are the strict gun laws of the U.K. because the limited number of guns on the streets allows for officers to police unarmed. Public image, along with the gun laws, help the police to alleviate tensions between themselves and the citizens they protect-helping to bridge the ‘us versus them’ gap. The final factor, Officer Safety
Training, is the final influencing factor. By training their officers to be well-versed in disarming suspects, effective in communication, and successful in using non-lethal weapons to take down aggressive suspects, the Metro ensures that they have the most successful officers possible.

9:30: 9:50 (O10)  
**Gender Constraints in Business**  
**Gisselle Polius**, Management, Dillard College of Business Administration  
Mentor: Dr. Scott Manley  
Both men and women face constraints in business. Such constraints are raising capital, work-life balance; access to funding, gender issues such the inability to be as competent as a man to produce quality work and access to experience. Historically, women have had a harder time overcoming those challenges. Stereotypically, a woman’s role was mainly that of a wife and homemaker; there never seemed to be a place for her in business. Society’s pre-conceived notions have painted the picture that men are perceived as more fit to run a business because of their experience, vision and adaptability.

The main purpose of this research is to examine women entrepreneurs and the unique traits or factors that allow them to overcome constraints in business. Women are hitting up against the biases of conforming to a man’s leadership mentality to gain acceptance in the business world. Women are empowering themselves through support and other motivating factors. Women can’t change society’s stereotypes but they are exhibiting traits such as persistence, perseverance, passion and drive as some of the factors that have enabled them to succeed. The research focuses on diverse areas in business because difficulties occur within all industries. The researcher’s means of gathering information is by interviewing women within the local Wichita Falls community. The researcher has found that, some of the constraints women still face, while others have not been faced since the establishment of their business.

9:55 – 10:15 (O11)  
**Monetary Policy: A comparison between the Federal Reserve of the United States and the Eastern Caribbean Central Bank**  
**Avelyne Pinkey Prince**, Finance, Dillard College of Business Administration  
Mentor: Dr. Pablo A. Garcia-Fuentes  
Increasingly, modern accounts of suicide terrorism conceptualize such events as deliberate. A central bank manages the monetary policy of a country. Managing the monetary policy represents central bank’s actions that affect money supply and the interest rate while targeting macroeconomic policy objectives that aim to keep the economy healthy. The central bank is also a lender of last resort to commercial banks and regulates member banks. In general, each country has a central bank. The Federal Reserve is the central bank of the United States. However, the Eastern Caribbean Central Bank (ECCB) manages the monetary policy of eight island economies in the Caribbean. Thus, it is interesting to compare the ECCB’s managing of the monetary policy with that of the U.S. Fed. This research aims to compare the managing of monetary policy between the Federal Reserve of the United States and the Eastern Caribbean Central Bank (ECCB). Specifically, it describes the monetary policy targets of both central banks and the monetary policy actions these two central banks take to keep their respective economies healthy.

10:20 – 10:40 (O12)  
**Modeling Mobile Advertising Click Fraud Problem Using TensorFlow**  
**James Trevino**, Management Information Systems, Dillard College of Business Administration  
Mentor: Dr. Grace Zhang  
This study intends to detect mobile advertisement click fraud using the machine learning tools provided by Google’s TensorFlow. Click fraud cost digital advertisers well over $8.6 billion in 2015. Prior literature make research calls on analyzing click fraud data from a real world mobile advertising network, and encourage exploration of various machine learning
techniques to identify fraudulent mobile application publishers.
In this proposal, fraud detection will be conducted at the click level instead of publisher level. This approach allows better granularity for differentiating valid versus non-valid click based on pay-per-click revenue model. The proposal also introduces a new toolbox of machine learning called TensorFlow. TensorFlow enables deep learning research with a modular design. It is a highly flexible system and often outperforms traditional machine learning techniques for large data set with

Oral Presentations
Kiowa
Session 2A
11:15 am – 12:50 pm

MODERATOR: CHRIS VIVO

11:15 – 11:35 (O13)  Protest and Survive: The Sociology of British Hardcore Punk
Luke J. Saunders, Psychology, Prothro-Yeager College of Humanities and Social Sciences
Mentor: Dr. Andrea Button
This paper, written for the British Culture and Society course in London, studied the social patterns leading to the 1980s hardcore punk movement in the UK and, consequently, how social patterns changed the movement after it began. A reaction to the increasingly individualistic and capitalist British government, punk became a subversive and anti-capitalist force. Additionally, punk and hardcore would come to influence resistance music even today. Sociological applications included Simmel’s theory of sociability, Adorno’s “culture industry,” and Marx’s theory of alienation.

11:40 – 12:00 (O14)  Salt Ions Separation Study When Exposed to an Electric Field
Vongai Nyikayaramba and Kristen Moss, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Salim Azzouz
One-third of the world’s population does not have access to clean water. In fact, 289,000 children under 5 die each year due to diseases caused by poor water sanitation. Drought conditions brought on by arid conditions in areas like the African Sahara, Texas, and California have also created an urgent need for additional water resources. Considering that two-thirds of the earth's surface is water, desalting water is an answer to the endemic shortages. The purpose of this study is to find a new and inexpensive way to desalinate water by studying the behavior of sodium and chloride ions in saltwater when subjected to an electric field. In this project, the saltwater solution is held between two aluminum electrodes and subjected to an electric field while moving. This electric field causes the sodium ions to migrate towards the negative electrode whereas chloride ions are attracted towards the positive electrode. From a reservoir, salt water goes to the first module where sodium and chloride ions are separated from the brine solution. The highly concentrated brine solution goes to the waste tank while the low concentrated salt water is recycled through more ion separation modules. The sodium and chloride ion concentrations are measured using specific ion selective electrodes (ISE) as well as the conductivity of the solution. The changes in the concentration and conductivity are then graphed for trends study. An experiment set-up will be built after the optimization of the desalination module.

12:05 – 12:25 (O15)  Deep Sea Exploration using an Intelligent Unmanned Drone Fleet
Rojitha Goonesekere, Ryan Fidlar, Chiezda Tokonyai, Nicholas Jaramillo, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Yu Guo
According to the National Oceanic and Atmospheric Administration to date we have explored less than five percent of the ocean. It is the lifeblood of the earth and covers over 70 percent of the planet’s surface. We spend a significant amount of time and money taking our expeditions out of earth to planets like Mars, yet our own planet is still left unexplored. Our goal as humanity should not be to focus all our efforts on exploring another planet but explore our own to understand ocean dynamics, develop new technologies using this knowledge and unlocking secrets that have baffled the scientific community. This underlying thirst for exploration is how our project came into fruition. To address this need we will design and develop an intelligent unmanned underwater vehicle that could survive in the ocean for months collecting data and working together with a group of similar vehicles organically. Traditionally, UUV’s have been used for missions such as detecting and mapping submerged wrecks, rocks, and obstructions that pose a hazard to navigation for commercial and recreational vessels, but our applications have a more biological tone. We will collect data such as salinity, temperature, PH, mineral composition and map these areas of interest for further exploration. The goal is to complete a proof of concept for a single drone during senior design and move on to expanding this model into a fleet of drones working together using neural networking methods to collect mass data in the future.

12:30 – 12:50 (O16)  
**Educational Reach Gone Wrong**  
**Hailey Morris,** Curriculum and Learning, West College of Education  
Mentor: Dr. Dittika Gupta  
In America, citizens take great pride in the opportunity and freedom offered. For decades people have traveled here for more opportunities and a better life. The educational system is of no exception, for people have the chance to seek a higher education that will allow them to become more marketable. Educators not only emphasize educational psychology and learning theories, but also integrate differentiation and diversity, considerations that many countries do not make. As a result, we boast that our system is unique because an adequate education is accessible to all. However, if this were true, then we must ask why such a large educational gap exists between high and low socioeconomic students? A literature review study was conducted to examine and seek answer to the above research question. Literature analysis showed that due to factors that include but are not limited to poor habits during pregnancy such as drinking, smoking, and unhealthy dietary, as well as parental income and educational background, community environment, access to resources, teacher and testing bias, and government funding, students from an economically disadvantaged background are automatically set up for failure. Research shows that while education is obtainable for all students, the reach for achievement is far more difficult for low SES students. As a result, students lack background knowledge and skills that are vital to curriculum, testing, and ultimately success. Hence, there is a need to recognize that privilege and oppression do exist and that we all play a role in this injustice.

**Oral Presentations**  
**Comanche Suites**  
**Session 2B**  
**11:15 am – 12:50 pm**  
**M**ODERATOR: **JEFF BLACKLOCK**

11:15 – 11:35 (O17)  
**Design and Construction of a Wind Tunnel**  
**Bailey Kaufman and Christian Gregory,** McCoy School of Engineering  
College of Science and Mathematics  
Mentor: Dr. Sheldon Wang  
The purpose of this project is to design and build a supersonic wind tunnel with a moderate Mach number around 1.5 (1150 mph) that will be used for research and
educational purposes in the McCoy School of Engineering. The functionality of the wind tunnel is to pass air flow through a converging-diverging nozzle and to demonstrate the relationship among pressure, velocity, temperature, cross-sectional area, sonic speed, and Mach number. A powerful fan will suck the air through an intake, compress it through the converging-diverging nozzle and then send it through the exhaust. By injecting smoke into the system there will be a visual stream line of the air for visualization. Thermocouples, pressure sensors, and velocity sensors will be introduced in four different locations, which will allow future engineering students to compare theoretical values and measured values for this particular subject.

11:40 – 12:00 (O18) **Effect of Growth Conditions on Cell Surface Hydrophobicity of Candida albicans**  
**Melissa Rose**, Biology, College of Science and Mathematics  
Mentor: Dr. James Masuoka  
The opportunistic fungus *Candida albicans* colonizes roughly 20% of the human population. Typically, it lives commensally within the host, but under the correct conditions it can become pathogenic and cause disease, particularly in those that are immunocompromised. The first step to be able to colonize a host is to be able to adhere. Adherence is influenced by cell surface hydrophobicity (CSH). Previous work demonstrated that CSH can be affected by growth temperature. In this study, we investigate the effects of other growth conditions on the CSH, specifically the nutrient composition and pH. Three *C. albicans* strains (LGH1095, SC5314, ATCC90028) were used throughout this study. CSH was determined in four growth media, YNB2G, Sabouraud Dextrose (SAB), GYEP, and YEPD. The major difference among the media is the amount of yeast extract (YE). CSH is measured using a hydrophobic microsphere assay. All strains were hydrophobic (> 90%) in YNB2G at 23 °C. In GYEP, ATCC90028 only showed decreased CSH. In YPD and SAB, all strains demonstrated decreased CSH. In some cases, the extent of these decreases was strain dependent. All strains were equally hydrophilic at 37 °C with the exception of SC5314, which was 11% hydrophobic in YPD. Once the media trials are completed, the effects of pH on CSH will be determined. We cannot predict how a lower pH will affect the curve, but we have reason to believe that we will see an effect since CSH also changes during germination, which can be affected by pH.

12:05 – 12:25 (O19) **Co-Teaching Model: Making a Difference for Teaching and Learning**  
**Nikki Bussue**, Curriculum and Learning, West College of Education  
Mentors: Drs. Jeff Blacklock, Leann Curry, Kureethara Austin Manuel  
Clinical teaching should be the capstone experience to becoming a certified teacher. However, the methods used throughout this process have not changed for hundreds of years. Cooperative teaching is an instructional method where two or more teachers plan, instruct, and evaluate in one or more subject areas. New research suggests that there are innumerable academic and social benefits to co-teaching when consistently implemented. These benefits include combining the knowledge and strengths of both teachers, and modeling positive adult working relationships. The researchers purpose is to investigate the perception of Clinical teachers, their Cooperating teachers, and University Supervisors- before and after their experience with co-teaching. The researchers also aim to investigate the extent to which this model fosters differentiation and improves the classroom environment, using a mixed method design. The researchers anticipate that the outcomes of this study will improve the Clinical teaching programs throughout the nation and build and strengthen nation-wide learning communities.
Improving Plate Heat Exchanger Design to Increase the Pressure Tolerance Limit

Duli De Alwis, Brett Scheffe, and Jocelyn Brown, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Salim Azzouz

The purpose of this project is, through collaboration with a local manufacturer Tranter, to redesign a plate-type heat exchanger to withstand higher liquid pressures. A rubber gasket, held between two plates by machined nubs in the metal, ensures liquids stay inside the apparatus. However, the high pressure pushing the liquids through the apparatus can make the gasket deform and displace, causing leaks. In this project, we will first create a three-Dimensional model of the plate and gasket assembly, upon which finite elements analysis simulations can identify the weak points most likely responsible for gasket deformation and displacement. Based upon these results, the pitch, or distance between center points of adjacent nubs on the plate, and the width, or area of the top of the nubs, will be adjusted to improve the pressure the gasket can withstand before leaking. A coupled Plexiglas-Aluminum prototype of the final plate redesign will be manufactured and tested so that any further deformation or displacement and any leaks of the liquid would be visible on a high-speed camera. We expect that reducing the pitch of and increasing the width of the nubs will increase the amount of pressure the gasket can withstand before it deforms or displaces. The group has already run computer simulations for stress and displacement on the completed three-dimensional model of the original design. It is envisioned that a physical prototype of the redesigned plate will be built for use in a practical setting.

Oral Presentations
Wichita I & II
Session 2C
11:15 am – 12:50 pm

Moderator: Sally Henschel

Design and Implementation of a Heat Transfer System for the Pyrolysis of Synthetic Polymers

Will Statham, Brandy Fields, Caleb Acuna, Sheldon Walsh, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Mahmoud Elsharafi

Plastic trash has been building up for over a century in our landfills and our oceans. We produce 300 million tons of trash a year. To alleviate this burden pyrolysis of plastics is producing the petroleum oil from plastics by heating plastics to the boiling point. Our goal for this semester is to create a design for a reactor system that will optimize our oil yielding results. We have redesigned the furnace used in research previously to get a higher, more stable heat that will reach the boiling point of the plastic to create the vapor. The system will require thermocouples to measure the temperature and provide feedback through a closed loop to maintain proper temperatures within the furnace. In our design of experiment the gases released from boiling will travel through a pipe to a water bath condenser. There the gases will cool and condense to petroleum oil which will settle on top of the water in the cooling bath. There it will be condensed back into a liquid form to create petroleum oil, a solid wax, and gaseous byproducts. Variables for this research includes types of plastics, temperature magnitudes, and temperature stabilities. Optimally 1 kg of plastics will yield close to 1 liter of oil. If we estimate $58 a barrel for oil, we could make $99.5 billion a year from plastic trash. With this research we will aid in the creation of commercial/industrial sized pyrolysis systems that will make eco friendliness economical.
**Gender-Violence and Displacement: Assessing the Transit State Security Gaps for Women and Girls in the Northern Triangle and Syrian Refugee Crises**  
Herbert McCullough and Natalia Zamora Garcia, Political Science, Prothro-Yeager College of Humanities and Social Sciences  
Mentor: Linda Veazey

In large-scale displacements, gender-violence is a factor of displacement, as well as issue of security and protection in host countries. This paper focuses on the particular gender-violence and rights challenges of women and girls in transit states in the Global South during displacement. What are the challenges in transit states to the protection and security of displaced women and girls? In the Syrian crisis, the large influx of refugees exceeds transit states’ capacities to protect displaced women and girls from gender-violence. In the case of the Northern Triangle, the cause of displacement is rooted in gender-violence and transit state policies that attempt to return women and girls to countries of origin can further exacerbate gender-violence concerns. Using comparative case studies and development indicators, this paper seeks to identify the gaps in protection from gender-violence in transit states in both of these displacement contexts. In the Syrian crisis context, this research focuses on the transit states of Turkey and Lebanon. In the Northern Triangle of Central America, Mexico and Costa Rica will be the primary transit states examined in order to find linkages between gender-violence, development, and displacement.

**Utility of Religious Goods**  
Courtney Waldron, Ashley Baird, Chappell Whyms, Marketing, Dillard College of Business Administration  
Mentor: Dr. Thuy D. Nguyen

The study attempts to answer the following questions:
1. Do consumers see any contradiction of values between being religious and being materialistic?  
2. Is there any difference in life satisfaction between religious versus non-religious consumers?  
3. To what extent do consumptions of various religious products and services differ between religious versus non-religious consumers?  
4. To what extent do the roles of religious consumptions differ between religious versus non-religious consumers?

The results identified four groups of consumers of religious products/services. In addition, regression analyses revealed that religious services and purchase of functional religious goods have positive correlations with donations to charities and other non-profit organizations. Religious consumers prefer brands that have similar values as their compared to non-religious consumers. ANOVA results indicated that the Jews made more money on average than the Gentiles. This study delineates the differences between four groups of consumers of religious media, services, goods, and social participation. The findings shred lights on how to target consumers to increase donations and market share.

**Automated Pneumatic Stamping Cycle**  
Aaron Stewart, Colton Kowalick, Victor Juarez, Jason Hill. McCoy School of Engineering, College of Science and Mathematics  
Mentor: Dr. Jan Brink

Automation with pneumatics is widely used in the manufacturing industry. The group is designing and building an arrangement that feeds blocks through a series of positions where various functions are performed in order to improve efficiency. Using CAD drawings and design models, we will build the unit with accurate dimensions, then program the automation. Our primary goal in this project is to understand the basics of automated pneumatics through a unique
design collaborated by the group. We hope to experience an engineering design project that entails a wide variety of workloads that may be encountered in an industrial setting. Our third major goal is to discover creative and helpful designs that can be implemented in the manufacturing industry. We will create a system of pneumatics/PLC logic that works together so that we can simulate a process that is found in many factories worldwide. The pneumatic/PLC logic will also have safety and other considerations in its design such as an On/Off Switch, a counter for how many blocks we have stamped, a guard door, safety lights, and an emergency button to shut off the cycle in case of an emergency.

Oral Presentations
Kiowa
Session 3A
1:00 – 3:10 pm

MODERATOR: WHITNEY SNOW

Damian De Silva, Economics, Dillard College of Business Administration
Mentor(s): Drs. Pablo Garcia-Fuentes and Yoshi Fukasawa

Academics has been interested in explaining the relationship between the forward and spot exchange rates. The theory suggests that the forward exchange rate is an unbiased predictor of the spot exchange rate, which is called the forward rate unbiasedness hypothesis (FRUH). However, some empirical research has not confirmed this. Other research has focused on explaining why spot rates vary with respect to forward rate predictions, which is regarded as the forward premium anomaly. Given the role of the exchange rate on the macroeconomy, it is important to explain the forward premium anomaly and the differences between the forward and spot exchange rates. This research is a survey of the literature on the relationship between the forward and spot rates. It gives a description of the theory that supports the FRUH and the literature that finds contradictory results. Given this, it seems that the uncovered interest rate parity theory still has to do more on explaining the trend behavior in spot rates in the short- to medium term, though there is fairly strong empirical evidence that it is more consistent in the long run. The FRUH aims to explain deviations from the uncovered interest rate parity, which still leaves some issues unexplained. The forward premium anomaly is an indication that there is still much to learn regarding the forward rate being a predictor of the spot rate. Therefore, there are still unanswered questions for future research.

1:30 – 1:50 (O26) Flow Loop Systems with Heat Transfer and Compressible Air
Mitchell Henton, Corbin Matamoros, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Sheldon Wang

Fluid flow through a pipe system experiences different forces and exhibits behaviors depending on factors such as pipe length, and the fluid temperature, velocity, and pressure. When designing a fluid flow system, these factors must be taken into account to ensure a dependable and effective system. This project has two missions, firstly, to design and implement parallel and counter flow heat exchangers, and secondly, to create experiments and labs for future mechanical engineering students. In the design of the heat exchanger, its parameters depend on the speed and temperature of the water flowing
1:55 – 2:15 (O27)  

Friede sei mit dir: The Forgotten German-Catholic Colonies of North Texas  
Russell Bega, History/German, Prothro-Yeager College of Humanities and Social Sciences.  
Mentor: Dr. Yvonne Franke  
The German immigrant community in Texas is a beloved fixture of many towns, however many associate this group only with the Texas hill country and the mid-19th century. In North Texas there exist two communities of German speaking immigrants that left a lasting mark on the landscape and culture of North Texas. Windthorst and Rhineland, Texas were both founded exclusively as colonies for German speaking Catholics by the same priest in the late 18th and early 19th century. While these towns are more than one hundred miles apart they are forever linked in faith and history. Through original research including an in-depth examination of census data, interviews with descendants of the original settlers and seldom-seen primary sources, this project examines not only the history of these little-known communities but also the vast cultural impact these immigrants left on North Texas. In the current climate regarding immigration this work highlights North Texas’ immigrant past and the contribution of those immigrants that are still evident today.

2:20 – 2:40 (O28)  

Color and Pattern Associations, and Correlation with Individual Perception and Behavior  
Nathaniel Shawver, Biology, College of Science and Mathematics  
Mentor: Dr. Margaret Brown-Marsden  
In this project, I collected individual responses to different colors and imagery, in order to discern and explain patterns in individual perception. Colors studied in the survey include the primary colors red, yellow, and blue, as well as individual preferences in color combinations and clothing. Past research has shown that individuals operate on cultural associations in which color plays a part. The survey section contained questions to gauge color preference, how color influences perception of others, and subsequently how the individual responds to persuasion that may, perhaps, use color as a persuasive element. This study helps to classify commonly-held responses to color as well as observe patterns among outliers in the dataset. The study also followed up with interviews from local participants to more thoroughly assess their color associations. Trends from the data can project how significantly specific colors and color combinations can influence persuasion and appeal to individual's preferences. After collection, these results were analyzed with data from national and international populations, further comparing the trends in local culture to what is common in society. All of the knowledge gained by this project is important not only to understand why industries use the colors they do, but allows each person to understand more about themselves. Being aware of what they like and do not like, and why, allows people to make better decisions.

2:45-3:05 (O29)  

Combatting Antibiotic Resistance Through the Reversion of Chromosomal Erythromycin Resistance in Escherichia coli  
Bethany Russell, Biology, College of Science and Mathematics  
Mentors: Dr. James Masuoka and Dr. Jon Scales  
Bacterial antibiotic resistance is a significant clinical challenge. Resistance genes appear on...
both the chromosome and on plasmids, extrachromosomal segments of DNA that cells can be induced to lose. A study by Lacey et al. suggested that resistance in the bacterium *Staphylococcus aureus* due to chromosomal genes could be lost when bacteria are treated with a drug to which it is susceptible. We hypothesized a similar loss of resistance can occur in *Escherichia coli*. A strain of *E. coli* (QH020816-1.1, resistant to tetracycline and erythromycin) was previously isolated from gulls. Curing this strain of plasmids with acridine orange resulted in tetracycline susceptibility. The plasmid-cured strain was pressured with a sublethal dose of tetracycline for 10 days, with samples taken every 24 hours. Susceptibility to erythromycin was determined using the Kirby-Bauer disc test. Susceptibility to erythromycin increased linearly over the first 5 days, then plateaued at a diameter of ~20mm. Genome analysis showed that plasmid DNA was present in the parent strain, but not after acridine orange and tetracycline treatment. Comparison of the chromosomal DNA sequence before and after reversion to erythromycin susceptibility revealed a large insertion in the erythromycin resistance gene. We conclude that this insertion is responsible for reversion to erythromycin susceptibility. We are in the process of identifying the origin and function of this insertion. This information will provide insights as to how antibiotic susceptibility can be regained which may lead to strategies of antibiotic use that can be implemented to increase the lifespan of drugs.

3:10-3:25 (O30)

*Development of a Lizard PBT Data Collection Apparatus*

**Colton Dorion, William Hendrickson, Kennan Marino, Kevin Tracy**, McCoy School of Engineering, College of Science and Mathematics

Mentors: Drs. Salim Azzouz, Yu Guo, Charles Watson, and Jeong Tae Ok

Biologists endeavor to collect data on the Preferred Body Temperature (PBT) of lizard species in laboratory settings and are still searching for an effective apparatus. The objective of this research project is to provide biology researchers with an accurate, efficient, compact, and repeatable apparatus for PBT data collection. Review of numerous previous studies and articles revealed some pros and cons of other such apparatuses used in previous lizard PBT data collection campaigns. A survey of these studies was used to determine the optimal apparatus layout and materials. In addition, this survey yielded some heating, cooling, monitoring, and control solutions for the PBT apparatus.

The solution to keeping the apparatus compact was a serpentine layout, making it less cumbersome than a linear or circular layout. Individual temperature zones requiring cooling will be lowered to temperature by utilizing a thermoelectric-convection cooler. Zones needing an increase in temperature will be conductively heated by thermal heat tape under copper panels. All of this will be monitored and controlled with thermocouples and a Proportional-Integral-Derivative (PID) controller.

This solution will allow biologists to gather PBT data with ease, noting the temperature of the surface in the zone where the lizard decides to come to a rest. By simply noting the zone in which the lizard is located, the biologist will acquire the desired temperature data without disturbing the lizard or using external temperature measurement devices. Future works planned include preliminary experiments to verify the heating and cooling solutions reached to assemble, debug, and characterize a prototype apparatus.
(P1) **Glass Ceiling for Women: A Review of Legal Cases**  
**Jacqueline D’Ingianni**, Management and Marketing, Dillard College of Business Administration  
Mentor: Dr. Niyati Kataria  
The aim of this study was to examine how glass-ceiling issues (defined as promotion and wage gap), translated to litigation and legal outcomes in America. I reviewed relevant historic legal cases regarding gender gap in senior management (i.e. promotion gap) and wage gap between men and women in corporate America in order to study the legal precedent that has been established by these cases. Further, based on insights from these cases, I discuss a human resource management ‘best practices’ mandate to suggest organizational policies that could aid in improving gender equality at the work place. The goal is to help organizations in reducing the expenditure and necessity to legally defend against glass-ceiling related lawsuits while creating a gender inclusive and progressive organizational culture.

(P2) **Comparison of Perceived Stress Between International and National College Students**  
**Rebekah Bratton, Lorena Banda, Kaily Ashton**, Social Work, Gunn College of Health Sciences and Human Services  
Mentor: Dr. Packiaraj Arumugham  
The purpose of this study was to examine the perceived stress between national and international students of Midwestern State University. The study participants (n=50) were selected by following stratified random sampling procedure. Data was collected by administering a questionnaire consisting of socio-demographic items, and Cohen’s (1994) Perceived Stress Scale. The collected data was entered into SPSS 23.0 version. Preliminary data analysis reveals that there is no significant difference between the perceived stress of national and international students.

(P3) **Linking Executive Compensation to Firm Performance**  
**Yenifher Valenzuela**, Accounting, Dillard College of Business Administration  
Mentor: Dr. Paul A. San Miguel  
We analyze executive compensation and the firm performance to further explain the relationship between executive compensation and the financial performance of their firms. We use a sample of firms and executives listed in Compustat and Execucomp and rank executives and their compensation into groups based on cash compensation, equity compensation and overall compensation and compare the firm performance of the groups. We find that executives earning higher compensation relative to their peers exhibit lower firm performance and appear to be engaged in rent extracting activities when accruals and capital expenditures are examined. When we further partition the sample based on industry we find evidence of herding mentality suggesting that executives of specific industries attempt to match the compensation of their peers, not to the financial performance of the firm. This study contributes to the extant literature in executive compensation in several ways. First, it further examines executive herding mentality in that executives benchmark their compensation based on peer compensation rather than actual firm performance. Second, we gain insight into executive performance and find that executives earning above and below the median compensation appear to have little incentive to increase firm performance. Third, this research shows how even apparent gains in financial performance for the upper and lower ranges of paid executives are mitigated when accruals and capital expenditures are considered. Finally, the results are stronger when CFO compensation is examined supporting extant research which shows CFOs control non-operational earnings management.
From Margin to Center: Multicultural Picture Books for Math, Science, and Social Studies
Montserrath Garay, Frida Arredondo, Curriculum and Learning, West College of Education
Mentors: Dr. Dittika Gupta, Kelly Medellin
Due to changes in public school demographics, there is a need to examine the current representations of
diversity in children’s picture books to provide culturally responsive teaching in content areas. Subsequently, this project has two purposes, (a) to review and analyze the cultural authenticity of current picture books in elementary school curriculum; and (b) to enhance educational experiences for marginalized students by foregrounding counter-narratives in multicultural picture-books that give voice and agency to characters of color, giving children from diverse backgrounds messages of resiliency, creativity and strength. This study will be conducted in two stages. First, critical content analysis will be conducted to explore the representations of culturally and linguistically diverse characters in picture books included in Texas elementary school curriculums. The second stage will consist of collecting culturally authentic picture books related to science, math, and social studies content areas through the literature review, Pura Belpre and Coretta Scott King award winners, and multicultural book websites. These books will be used to create activities and lessons that preservice teachers can use in the classroom. A case study will be carried out to collect data and the experiences of the preservice teachers. This first stage of data analysis shows the lack of cultural diversity in currently adopted Texas elementary school curriculums, which exemplifies the need for the second stage of the research. This is critical because preservice teachers will serve increasingly diverse populations in their future classrooms and will need to supplement the existing curriculum with cultural relevant and authentic literature.

Perceptions of Bullying in Schools Among Teachers and Counselors
Melissa Pennington, Katie Luna, Kasie Morris, Amanda Morrow, Social Work, Gunn College of Health and Human Services
Mentor: Dr. Packiaraj Arumugham
The purpose of this study was to find out the perceptions of bullying in schools among school teachers and counselors. The study participants (n=50) were selected by following availability sampling method. Data was collected by administering a questionnaire consisting of socio-demographic items and statements pertaining to bullying in schools. The collected data was entered into SPSS 23.0 version. Preliminary data analysis reveals that the study participants have a good perception of bullying in schools. Implications of the study and directions for future research are discussed.

Continued Mineral and Textural Assessment of the Quanah Margin Granites in the Wichita Mountains, Oklahoma
Alexandria Weiskircher, Kimball School of Geoscience, College of Science and Mathematics
Mentor: Dr. Jonathan Price
The Wichita Mountains in southwestern Oklahoma expose approximately a dozen granite plutons, all part of magmatism within the Southern Oklahoma Aulacogen. At the margin of the Quanah Granite Pluton, we noted three facies. These are 1.) the typical coarse-grained facies (CF), 2.) fine-grained facies (FF), and 3.) porphyritic facies (PF). All are alkali feldspar granites dominated by intergrowth of feldspar and quartz; CF has 6mm alkali-feldspar and smaller quartz, FF has 2mm alkali-feldspar and quartz, and PF has 5mm alkali-feldspar phenocrysts with a sub-millimeter matrix. Additionally, the margin contains several pegmatite pods and dikes, and inclusions of rhyolite and granite. Mapping the FF and PF revealed these to have dike-like geometries that cut the CF, suggesting that both are late intrusions. To resolve relationships, we assessed the three facies through petrography, X-Ray Diffractometry (XRD), and Electron Probe Microanalysis (EPMA). Prior researchers noted CF’s sodic amphiboles (confirmed as arfvedsonite) that make the Quanah unique among the Wichita granite plutons. PF contains biotite and/or calcic amphibole. In our samples, FF contains only biotite. The pegmatitic bodies are quartz ± orthoclase ± biotite or arfvedsonite. The textures and mafic mineral assemblages of the different facies imply that the voluminous CF magma first intruded this area, followed by the magma(s) that gave rise to the FF and PF. The FF and PF facies may record one of the last gasps of felsic magmatism because the difference in texture suggests a change in the local thermal profile over the time interval.
Exposed Vesiculated Rhyolite Facies and the Relationship with Underlying Strata

Shadai John, Kimball School of Geosciences, College of Science and Mathematics
Mentor: Dr. Jonathan Price

The Mexican Highlands unit of the Basin-and-Range Province encloses fault-block mountain ranges which stand as mesas high above contiguous alluvium-filled basins. The mesas cover most of the northcentral Big Bend of Texas, terminating to the south at the Dalquest Desert Research Station (DDRS), 3,000 acres of rugged canyon lands that are home to MSU’s field research property. The Mitchell Mesa Rhyolite is a product of late Paleogene period volcanism and forms a Mexican Highlands volcanic plateau that is dissected at the DDRS. The rhyolitic rocks are typically orange-brown with pink-orange feldspars and clear quartz. They are moderately- to densely-welded pyroclastic flows. Peculiarly, some of the rhyolite is a blue-gray to white facies that is unusually porous (vesiculated). We postulate that this difference is due to water content present in the underlying strata during the eruption and emplacement of the Mitchell Mesa Rhyolite. Thus these vesiculated facies may contain a higher clay content due to hydration from ponds under these features.

To assess, we conducted a field survey of five sites at the DDRS. Two samples were gathered from each of the five sites and coordination points were recorded by a GPS-WAAS handheld unit and mapped. We also measured five profiles of the exposed Mitchell Mesa on and adjacent to the DDRS, including a previously unmapped exposure on the eastern end. Currently, we are preparing a series of thin sections for petrographic exploration. This is aimed to support and advance the concept of the development that molded the geology of West Texas.

Control of Asymmetric Periodic motions in a Duffing Oscillatory Circuit

Rojitha Goonesekere, Abigail Reyes, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Yu Guo

In nature, most systems tend to be nonlinear. These nonlinear dynamical systems appear chaotic, unpredictable and erratic. Chaotic means that the system’s initial conditions lead to arbitrarily large divergences as the system evolves over time, making it unpredictable. Therefore, also making the system impossible to reproduce the same initial conditions twice. These nonlinear systems are found everywhere in nature and in practice and are very useful in industries that deal with cars, heavy machinery, airplanes and all other systems whose motions are unpredictable and dependent on their initial conditions. Circuit design and computational methods were used to analytically predict and simulate the complex periodic motions. Stable and unstable periodic motions were obtained to better understand the nonlinear behavior. Subsequently bifurcations, symmetric and asymmetric motions of these behaviors were also obtained. Next is to explore ways in which these behaviors could be programmatically predicted.
(P9) **Stress Amongst Student Athletes**  
**Alishia Johnson-Early, Mallory LeDoux, Jennifer Joss, Kalyn Johnson, Social Work, Gunn College of Health Sciences and Human Services**  
Mentor: Dr. Packiaraj Arumugham  
The purpose of this study was to examine the stress level amongst student athletes of Midwestern State University. The study participants (n=50) were selected by following stratified random sampling procedure. Data was collected by administering a questionnaire consisting of socio-demographic items and Cohen’s (1994) Perceived Stress Scale. The collected data was entered into SPSS 23.0 version. The preliminary data analysis reveals that there is no significant difference among different types of sports played by the study participants and their perceived stress. Implications of the study and directions for future research are discussed.

(P10) **Occupational Burnout Between Social Workers and Nurses**  
**Brooke Shewmake, Rita Solomon, Angela Urista, Chris Smith, Social Work, Gunn College of Health Sciences and Human Services West College of Education**  
Mentor: Dr. Packiaraj Arumugham  
The purpose of this study was to examine occupational burnout between social workers and nurses employed in a hospital setting. The study participants (n=50) were selected by following a stratified random sampling procedure. Data were collected by administering a questionnaire consisting of socio-demographic items, items pertaining to occupational burnout, and Mashlach Burnout Inventory Scale (1996). The collected data was entered into SPSS 23.0 version. The preliminary analysis of the data reveals that there is no significant difference between study participants' occupation and their occupational burnout. Implications of the study and directions for future research are discussed.

(P11) **Perceptions of Sexual Assault Among College Students**  
**Linda Drake, Mireya Gonzalez, Brittney Huff, Glendonna Johnson, Social Work, Gunn College of Health Sciences and Human Services**  
Mentor: Dr. Packiaraj Arumugham  
The purpose of this exploratory study was to find out college students' perceptions of sexual assault. The study participants (n=50) were selected by following availability sampling. Data was collected by administering a questionnaire consisting of socio-demographic questions and statements pertaining to perceptions of sexual assault. The collected data was entered into SPSS 23.0 version. Preliminary data analysis reveals that the study participants have a fairly good perception of sexual assault. Implications of the study and directions for future research are discussed.

(P12) **Parents' Divorce and Fear of Intimacy Among College Students**  
**Breanna Dial, Kristi Bustamante, Sandra Contreras, Aspyn Derebery, Social Work, Gunn College of Health Sciences and Human Services**  
Mentor: Dr. Packiaraj Arumugham  
The purpose of this study was to find out the relationship between parents' divorce and fear of intimacy among college students. The study participants (n=50) were selected by following purposive sampling method. Data was collected by administering a questionnaire consisting of socio-demographic items, items pertaining to marriage and divorce and, Descutner and Thelen's (1991) Fear of Intimacy Scale. The collected data was entered into SPSS 23.0 version. Preliminary data analysis reveals that there is a significant difference between study participants’ race and ethnicity and their fear of intimacy. Implications of the study and directions for future research are discussed.
Bacterial Endophytic Diversity in Relation to Seed Melatonin Content: Metabolic Implications

Salvatore Capotosto, Mutandwa Machemedze, Meaghan Rose, Biology
College of Science and Mathematics
Mentors: Drs. Magaly Rincón-Zachary and James Masuoka

Melatonin (MEL) is synthesized in most organisms and may act as a growth regulator by promoting cellular growth and tissue repair. MEL is found in varying concentrations in plant organs, such as leaves, stems, flowers and seeds. Plants house endophytic organisms in every tissue type, but the endophytic diversity varies depending on its location in the plant. These organisms often produce beneficial compounds in return for sugars and a stable environment. In this study, we investigated the endophytic bacterial composition in seeds with different melatonin concentrations. Because MEL is a growth regulator, high levels of MEL may result in higher endophytic diversity. We successfully isolated a total of 32 isolates. So far, we have identified 12 bacterial species by amplifying the 16S rRNA gene using polymerase chain reaction (PCR). The 16S rRNA gene sequences were analyzed using the BLAST (Basic Local Alignment Search Tool) available on the National Center for Biotechnology Information (NCBI) website. Sequence analysis, in combination with the results from phenotypic and metabolic assays were used to identify the bacterial endophytes. *Bacillus pumilus*, which was isolated from *Silybum marianum* (milk thistle), is among the species identified in this analysis. *Bacillus pumilus* has been found to enhance root and shoot growth in grapes. We expect to complete the bacterial identification by the end of the semester.

Antibiotic Resistance Due to Changes in the Drug Target

Natalie Ragland and Anthony Quezada, Biology, College of Science and Mathematics
Mentor: Dr. Jon B. Scales

Research on antibiotic resistance is critical in the modern world due to the fear of antibiotics becoming obsolete as they are no longer able to kill certain bacteria. There are three ways that bacteria can adapt to become resistant antibiotics; the bacteria can: change enzymes to degrade the drug, pump the drug out of the cell, or mutate the target of the drug. The antibiotic erythromycin is toxic to bacteria because it binds to ribosomes and disrupts the normal protein synthesis function. The bacterium, *Escherichia coli*, mutates its ribosomal RNA (rRNA) to allow for resistance to the antibiotic, erythromycin. The *E. coli* genome contains seven separate copies of the rRNA gene. In order to identify any possible mutations, we first had to analyze each of the seven rRNA gene sequences (from both susceptible and resistant bacteria) so that primers could be developed to facilitate polymerase chain reaction (PCR). PCR will be used to amplify the genes so that their DNA sequences can be cloned, sequenced, and compared to identify alterations. Overall, with further research, we hope to be able to understand how and why *E. coli* mutates the specific location it does in order to become resistant to antibiotics and later, apply the knowledge on a larger scale with different bacteria and drugs to check for patterns and gain a greater understanding of antibiotic resistance, as a whole.

Understanding The Growth of A Cell through Entropy

Jedesh Chandrasegaran, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Preet Sharma

Cells undergo chemical reactions, which produce energy and go through a series of changes resulting in a final state. There is a change of energy in such a process due to its surroundings and how the cell interacts with the surroundings. We have considered systems, which are open and irreversible and treated the cell as a black box since it simplifies the analysis. We have tried to explain these energy changes of the process from an entropy approach and how the information from the system can be understood through the disorder in the system. This in turn will help us understand the system from a perspective of self-organization of the cells. Finally we would like to explain the behavior of more complex based systems based on this understanding.
Search and Rescue Drone Network Using Neural Networking Methods
Rojitha Goonesekere and Don Wijesinghe, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Yu Guo

Aerial drones have traditionally been used to push forward military objectives. In recent years though these machines of surveillance and destruction have transformed to be more versatile than ever. Beautiful aerial video and timely delivery of products are just the beginning for a whole list of applications that they could be used for. Our research on drones have more humanitarian application. There is a high failure rate when it comes to finding people in a large terrain full of obstacles. Finding someone on time could also be the difference between life and death in some situations. The objective of our project is to program a network of drones that will work as a single unit to perform specific tasks. Our main goal for this semester will be to use what we have learned over the past few semesters to facilitate search and rescue missions around the world. Imagine using a large network of drones that works together organically using neural networking to search for a specific missing person or multiple missing people fast and efficiently with little to no error. We don’t have to imagine anymore because it is possible with the results from our previous work. We could now combine the facial recognition software we have developed along with Google’s neural networking platform “TensorFlow” to make this possible. Our underlying objective is to push a positive message across and humanize these machines to lead to more humanitarian applications that have not yet been thought possible.

Enhanced Oil Recovery (EOR) Study Using Stiff Polymer Micro Porous Media Analogs
Carlyse Wallace and Juwel Williams, McCoy School of Engineering, College of Science and Mathematics
Mentor: Drs. Mahmoud Elsharafi and Jeong Tae Ok

The primary goal of this EURECA project is to effectively develop “reservoir on a chip” (ROC) models to simulate micro- and nanoscale features in the rock matrix and apply this knowledge to adapt field models or rock conditions and pore geometry to a laboratory microscale apparatus to cease direct drilling into wells which causes harm to the environment. Dr. Ok’s 2015-2016 senior design group developed an experimental apparatus to consistently test with compressed gas and characterize enhanced oil recovery by using Fiji ImageJ image processing tool. We are under progress to establish a fabrication procedure to produce stiff thermoplastic microscale porous media analogs (μPMAs) with periodic and random pore geometries by combining Computer Numerical Control (CNC) micromilling and hot embossing techniques. In an endeavor to achieve optimal results, we are determining the best fit geometric shape (dimensions and thickness) to find optimal thermal temperatures of fluidic material. We plan to determine the displacement efficiency in μPMAs with various pore geometries at different interfacial tensions. The development of this reservoir-on-a-chip has the potential to bring in new micro-techniques to the oil industry. Therefore, after completion, we are going to communicate with members of engineering’s Industry Advisory Panel with the intentions of generating an annual event to bring oil industry partners to MSU observe the micro milling instrument and the outcomes from studies of displacement efficiency.
Experiments in Digital Focal Stacking

Kurlon George Kimball School of Geosciences, College of Science and Mathematics
Mentor: Dr. Jesse Carlucci

Photography is an important observational tool in many areas in science. It provides insight on many micro features in paleobiology, such as details of the exoskeleton of a trilobite. It can capture also features that the human eye cannot see and provide additional insight on how organisms should be classified. Focal stacking is a method that increases depth of field by combining a series of images taken at either different focus settings or at a fixed focus, and plays a significant role in scientific photography. Additionally, focal stacking focuses at different camera-to-subject distances. The objective of this project was to identify which methods and variables would produce the best stacked images and 3D models for use in paleontology research. The variables - step length, whitening density, time value and duplicated images, were tested on four fossils – a trilobite, a gastropod and two brachiopods. Each variable set-up was evaluated using an image quality rubric that assessed clarity, reproducibility, accuracy of a 3D model, and the extent of image artifacts. The software used to make the stacked images and 3D models was Helicon Focus 6 and it used three methods to render the images – weighted average (Method A), depth map (Method B) and pyramid (Method C). This study determined that the highest quality images and 3D models can be created with moderate whitening density, non-duplicated images, even step length, a time value of 1/200 for small fossils and 1/160 for large fossils and Depth Map Rendering (method B).

Experimental Study of the Nonlinear Dynamics in a Duffing Oscillatory Circuit

Zeltzin Reyes and Abigail Reyes, McCoy School of Engineering, College of Science and Mathematics
Mentor: Dr. Yu Guo

This research project aims to assist Dr. Yu Guo in investigating the analytical solutions for nonlinear dynamical systems through discretization. Naturally, most systems tend to be nonlinear. Nonlinear dynamical systems appear chaotic, unpredictable or counterintuitive. Chaotic means that the system’s initial conditions, such as time and position, lead to arbitrarily large divergences as the system evolves over time, making it unpredictable. This also makes it impossible for the system to reproduce the same initial conditions twice. If we were to take two identical setups and set their initial conditions as close as possible, the system’s course of motion would look entirely different once the system was set in motion. Nonlinear dynamical systems like these are found everywhere in nature and are very important for many industries such as cars, heavy duty machines, airplanes, and other machinery whose course of motion is unpredictable and whose unpredictability is highly dependent on its initial conditions. Computational methods will be used to analytically predict the complex periodic motions. Complete stable and unstable solutions of periodic motions will be obtained for better understanding of the nonlinear behavior. Bifurcations, chaos, symmetric and asymmetric phenomenon will be investigated.

Antibacterial and Antifungal Activity produced by Symbiotic Bacteria from Grass-Feeding Termites

Paytan Stubbs, Biology, College of Science and Mathematics
Mentor: Dr. James Masuoka

Wood eating termites have protozoan symbionts in their gut that allow them to be able to digest cellulose. Grass-feeding termites such as Gnathamitermes perplexus, however, lack protozoan symbionts. Instead there are gut bacteria present that produce cellulose, which degrades cellulose. Several of these bacterial symbionts have characteristics of Streptomycetes, which are known to produce antibiotics. We hypothesized that the termite symbionts, in addition to producing cellulose, may also produce antibiotics. The cellulose-producing bacteria isolated from termites are maintained on tryptic soy agar plates (TSA) and as frozen stocks stored at -80°C. Isolates were characterized using standard microbiological morphologic and biochemical assays. Genomic DNA was extracted using a commercially available kit. Antibiotic production was tested using both an overlay method and a line streak method, testing several potentially pathogenic bacteria. The bacteria obtained were identified to be Gram positive bacteria, grew as hard, thick, white and powdery colonies on the agar plate. This and most biochemical tests completed support the conclusion that these are members of Streptomyces, which are known antibiotic producers. The commercially available kit didn’t produce
usable DNA, so alternative methods are being tested. No isolate has shown antibiotic production in either assay. We have used known antibiotic-producing Streptomyces kanamyceticus as a control to show the method works. The results of this project will help us better understand the symbiotic relationship between these bacteria and the termite host. In addition, should antibiotic production be shown, the produced compounds may be novel and increase our treatment options.

(P21) **Disparate Conditions and Perceptions in British Prisons Along Racial & Ethnic Lines**

*Aaron D. DeVaul*, Psychology, Prothro-Yeager College of Humanities and Social Sciences  
*Mentors: Drs. Teresa Tempelmeyer and Andrea Button*

The present literature review explores minority prisoners’, in the United Kingdom (UK), perceptions regarding their incarceration. Specifically, if minority prisoners are treated differently overall, in comparison to white prisoners, this may negatively affect their perception about their incarceration. This review suggests that there are differing perceptions of treatment from prison staff, other prisoners, and prison administration towards minorities and whites. The review also includes the works of Foucault as a theoretical framework to explore why institutional entities like the criminal justice system in the UK (The State) benefit from racially disparate prison conditions. Taking into account contributing factors like staff fluctuations, worsening sanitary conditions, overcrowding, prejudice, increasing violence, and disparate sentencing procedures, this review suggests minorities are disproportionately more vulnerable to these phenomena. The question then becomes, why are minorities in the criminal justice system more at-risk for these disparate conditions and their implications.

(P22) **Outcomes of Internet Mindfulness Training**

*Luke J. Saunders*, Psychology, Prothro-Yeager College of Humanities and Social Sciences  
*Mentor(s): Dr. Michael Vandehey*

Stress, anxiety, and depression are significant public health issues. Mindfulness was effective in treating various mental problems, and is being incorporated into cognitive behavioral therapy and acceptance and commitment therapy. Online mindfulness trainings (MTs) showed similar efficacy to in-person MTs in treating stress, anxiety, depression, and work-related fatigue. The feasibility and short-term benefits were supported in the literature, but the long-term effects need further research. This study intends to evaluate the effects of a mindfulness app in a college campus setting. **Conclusion/Hypothesis:** Mindfulness can be taught online and online MTs are able to reduce stress, anxiety, and depressive symptoms, as well as improve general well-being in participants. Data is currently being collected, compiled, and will be completed by Friday, October 20th. I will present the findings of this data at the forum.

(P23) **Karaoke and Its Effect on Reading Comprehension**

*Connie Ginnings*, Special Education, West College of Education  
*Mentor: Dr. Emily Rutherford*

The purpose of this study is to determine if repeated reading karaoke will increase reading comprehension in 4th and 5th grade students with learning disabilities. In addition to increasing reading comprehension, the goal is to give teachers a new tool to use in their classroom to help struggling readers. Research will be conducted in participating elementary special education class Monday, Wednesday, and Friday for 20 minutes each time, lasting 4 weeks. Participating students will take a pretest and posttest to analyze results. The expected goals are to increase reading comprehension among 4th and 5th graders with learning disabilities and provide a new tool for teachers to use in their classroom to help improve reading comprehension levels among struggling readers.
(P24) **Synthesis and Spectroscopic Studies of Dipyrromethene Complexes**  
**Hae Lee Han**, Chemistry, College of Science and Mathematics  
Mentors: Drs. Christopher A. Hansen and Jianguo Shao  
Dipyrromethene (dipyrrin) complexes have been investigated to be very useful with a wide range of applications, such as in solar cell devices, photosensitizers in Photodynamic Therapy of cancer, and as catalysts for many organic reactions, as they possess favorable spectroscopic properties. They exhibit intense absorption bands in the visible region of the spectrum due to their fully conjugated π-system. In this study, 5-(pentafluorophenyl) dipyrromethene was synthesized through a one-step oxidation in the presence of three equivalents of p-chloranil. The substituent effects of an electron-withdrawing group (Fluorine) in the dipyrromethene complex were then characterized as to its UV-Visible, IR, and NMR spectroscopic properties.

(P25) **Exploring the Medicinal Effects of Smooth Sumac**  
**Carson Barnard**, Biology, College of Science and Mathematics  
Mentor: Dr. James Masuoka  
The microbiome comprises microorganisms, such as bacteria and fungi, which reside within multicellular hosts or other habitats. The multicellular host provides protection and a favorable environment for growth while the microbiome often provides usable nutrients or performs other helpful functions. For example, the breast cancer drug Taxol, is produced by fungal symbionts within the Pacific Yew tree (*Taxus brevifolia*). Other native plants, such as Smooth Sumac (*Rhus glabra*), were used by several Native American tribes in the United States to treat diarrhea, dysentery, and mouth ulcers. We hypothesized that endophytic symbionts within the plant *Rhus glabra* are responsible for the observed medicinal effects. Leaflets from *Rhus glabra* were collected and cut into 5 mm² squares. The squares were surface sterilized then cultured on growth medium at 30°C. Fungal growth was subcultured to provide pure culture. For each pure culture, morphological characteristics of the conidia and hyphae were observed to help identify each strain. So far, eight fungal isolates and one bacterial isolate have been isolated from *Rhus glabra*. Microscopic examination of the conidia and hyphae has suggested that three of the fungal isolates appear to be members of the genus *Alternaria*. Current work involves further identification of the symbionts by both biochemical assays and through DNA sequencing. In addition, we will test the fungal isolates to determine if the reported medicinal effects of *Rhus glabra* can be attributed to the fungal endophytes.

(P26) **Acid Affect (HCl) on the pH value of Chemical Solutions**  
**Sheldon Walsh, Jedeshkeran Chandrasegaran**, McCoy School of Engineering, College of Science and Mathematics  
Mentor(s): Dr. Mahmoud Elsharafi  
Energy crises becoming biggest threat to human beings. The threat of enhance oil recovery (EOR) technology is being a trending name among the most oil exporting countries. Enhance oil recovery technology is the tertiary method used in the oil rigs and it can increase the accumulative oil/gas production to extra 20-40% from the reserve volume. Polymer flooding is a very mature method with more than 40 years of applications. It has been shown to be effective in recovering inswept oil by improving the mobility ratio. This would maximize the oil recovery from wells, increasing the profits of the oil industry, which would in turn lower the cost of gas and oil.  
To study polymer flooding, the acid effect of brine solutions. Brine solutions of Sodium Chloride, Calcium Chloride and a mix of percentage of Calcium Chloride with Sodium Chloride were used to mimic the conditions in the well. Different concentrations (6N,1N) of Hydrochloric Acid were added to these solutions because the equilibrium of the reaction is based on its salinity. Two different types of polymers were also used in our study; to understand the different effects the brine solution had on their swelling. In the end the temperature effect was studied using the pre-swelled samples.  
There was a slight increase in precipitation when the temperature increased. We noticed that all temperature effects ended at 80°C. We concluded that higher swelling levels were at higher pH levels; with the optimum being between 6-7 pH levels where 100% swelling occurs. The 1N concentration of HCl solution fit those conditions the best.
Using the Fourth-Order Runge-Kutta Method to Determine the Dynamic Response of a Free Vibrating Laminated Composite Shallow Shell Panel

Melanie Ronoh, Vongai Nyikayaramba, Gayal Hewakuruppu, McCoy School of Engineering, College of Science and Mathematics
Mentor(s): Dr. Salim Azzouz

The pressing need for faster aircrafts is becoming a crucial issue for military and business operators. This quest is faced with many technical difficulties and complications. Such complications may appear in the form of a harmful skin panel vibration (flutter) that damage the aircraft’s skin panel during supersonic or hypersonic flights. This EURECA project is a continuation of the EURECA Spring 2017 project task is to determine the free vibration dynamic behavior of shallow shell panels. The nonlinear Finite Elements Method uses the First-Order Plate theory, the von Karman nonlinear strain theory, and the Marguerre shallow shell theory. In the previous EURECA projects, the nonlinear modal first-order and second-order coefficients were determined for a free vibrating isotropic and composite laminate shallow shell panels at various panel height-rises. A numerical technique is proposed herein to solve the nonlinear free vibration modal equation of motion. This technique is based on the use of the 4th order Runge-Kutta numerical integration method. This method is developed to solve simultaneously the three nonlinear equations of motion of the free vibrating shallow shell panel. A first task during this semester is to build an understanding of the 4th order Runge-Kutta method, then to program the method into a Matlab code. The modal time responses of the free vibrating shallow shell panel are then determined for various panel height-rises. It is predicted that the free vibration response of isotropic shallow shell panel time response will be either a periodic limit cycle or a chaotic response.

Isolation and Identification of Dalquest Yucca Soil Bacteria

Meaghan Rose, Biology, College of Science and Mathematics
Mentor: Dr. Magaly Rincón-Zachary

Endophytes are microscopic organisms, typically fungal or bacterial, that live within a host plant. Endophytes, by definition, do not harm the host plant in any way, and in most cases they actually provide a source of additional nutrients or antibiotic compounds. For example, nitrogen fixing endophytes provide a usable source of nitrogen to the host plants. We investigated if endophytic diversity within yucca species was related to bacterial diversity from the surrounding soil. We examine bacterial endophytes in Yucca thompsoniana and Yucca faxosoniana seeds. Seed and soil samples were collected from multiple individuals of these species from the Dalquest Desert Research Station. The soil samples were mixed with sterile water and glycerol for storage at -80°C freezer, while the seeds were surface sterilized for endophyte extraction.

Four unique bacterial endophytes were isolated from each seed type. Based on the physical morphology and metabolic test results, each seed type had one unique endophyte species and 1 species in common. The DNA from all four endophytes was extracted and the prokaryotic 16S ribosomal RNA gene was amplified by polymerase chain reaction. The amplified DNA was sent to a third party for sequencing. Two unique isolates were identified from the soil. The isolated soil bacteria were members of the genus Bacillus while those from seeds were members of the genera Eriwinia and Pantoea. These results do not support the hypothesis in that we expected to find higher diversity within the soil. The lack of soil bacterial diversity could be due to the fact that the soil samples were not adequately stored.

Dynamic Contact Angle Measurements

Omar Clarke, Jomarie Leblanc, Sheldon Walsh, McCoy School of Engineering, College of Science and Mathematics
Mentor(s): Dr. Mahmoud Elsharafi

One of the major problems arising in the Oil Industry is those associated with oil extraction. The ideal conditions on the rock surface should be water wet conditions, to facilitate the easy extraction of oil. Contact angle measurements are key to determine surface tension between solids and various fluids. In conducting this project we will determine these contact angle measurements that arise between different fluids as they interact with other fluids and the solid surface. If the rock wettability is oil wet, the oil company may need to change the rock wettability. We will determine wettability (water wet or oil wet), analyze how the effect of different brine concentrations on wettability and contact angle
measurements using the Dynamic Contact Angle Analyzer (DCA 315). In our research we found out that the single fluid or mixture of fluids with the lowest contact angle, and in turn the highest surface tension, satisfies the requirements to correct the rock wettability and thus aid in oil extraction. From early experimentations, we found out that the fluid that fulfils these requirements is surfactant, even when mixed with different brine concentrations, its surface tension remains high. Another aspect to this project is measuring these parameters while under the variance of temperature. As surface tension is affected by the reservoir temperature. This increase in temperature, brings about a decrease in surface tension thus allowing the values for contact angle to increase.

High Performance Computing: DNA Sequencing

Anthony Enem, Ali Khalid, Computer Science, College of Science and Mathematics
Mentor(s):: Dr. Eduardo Colmenares-Diaz

In DNA sequencing, the shortest common superstring applies to the reconstruction of a genome from fragments or chunks of that same genome. This process can be referred to as the assembling of genome fragments. Sequencing small chunks of DNA is relatively easy. The problem arises with sequencing larger molecules. It is similar to assembling a puzzle without knowing what the final product would look like. The goal is to put together fragments of DNA to create a whole-genome sequence consisting of each of the fragments. While it is an article of faith that the shortest superstring formed from all fragments will be the most likely sequence, this seems to work reasonably well in practice. Our goal is to implement a sequential and parallel solution to the problem using C++ and MPI (Message Passing Interface) library and then measure their performance.
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