COLORADO MESA UNIVERSITY

SEVENTH ANNUAL

STUDENT SHOWCASE

2016

Friday, April 29, 2016

SHOWCASE PROCEEDINGS

coloradomesa.edu/showcase

About the Student Showcase

The Student Showcase highlights student works involving creativity, discovery, research, innovation and/or entrepreneurship through sessions by undergraduates at Colorado Mesa University and Western Colorado Community College. The Student Showcase builds on classroom experience and is a venue where students can share their work with faculty, student peers and community members. Students participating in this campus-wide forum have distinguished themselves as scholars. Showcase Proceedings contain the sessions' abstracts.

Contents

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Proceedings

Friday, April 29, 2016
Grand Junction, Colorado

Colorado Mesa University

Western Colorado Community College
A Division of Colorado Mesa University

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Showcase Participants

Showcase Participants (continued)

Showcase Participants (continued)

Showcase Participants (continued)

Abstracts

OPENING SESSION

Presenter(s)-Major: **Kasey Benish - Bus Admin-Management & Economics, Devin Freda - Exercise Science, Megan Lewin - Bus Admin-Finance, Kristina Massey - Liberal Arts, Elem Teaching**
Title: HIGHER EDUCATION TODAY: A TOWN HALL DEBATE SPONSORED BY ALPHA CHI
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: In the early twenty-first century, American higher education appears to be a somewhat contentious subject. Considering the increasing tuition costs and cuts to state funding, not to mention the so-called shrinking of the middle class, many Americans seem reluctant to take on the academic and economic challenge that is college. In response to such concerns, some politicians have begun to champion the idea of free tuition. Collectively, these issues raise a number of questions about American higher education. In pursuit of informed answers, the CMU Chapter of Alpha Chi, the National College Honor Society, has organized a Townhall Debate centered on "Higher Education Today." Colorado Mesa faculty and administration will respond to questions from audience members, with potential topics including state funding, standardization, and personal responsibility. The team hopes that this event encourages the CMU community to reflect on the broader challenges and advantages associated with higher education while enjoying a lively debate between prominent education professionals.

Abstracts

STUDENT SHOWCASE SESSIONS

Presenter(s)-Major: **Nikolas Adams - Business Administration, Montgomery Carlo - Pre-Engineering, Ashley Church - Mechanical Engineering Technology, Rachel Culpepper - Mechanical Engineering Technology, Danny Gamboa - Pre-Engineering**
Title: SOLAR TRACKING
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: Studies have shown that solar panels produce up to 40% more energy when the cells track along with the movement of the sun. As solar energy is becoming more popular in today's society, there is a need to find a more efficient way to use solar energy. Solar energy is better for the environment, and more eco-friendly than burning fossil fuels. The purpose of this project is to prove that a rotational solar panel is more efficient than a stationary solar panel. This will be proven by converting a two track battery powered race track to a solar powered track. One track will be powered by the stationary solar panel, and the other by the rotational solar panel. This project is to inform current and future solar panel users how to get the most energy from their solar panels.

Presenter(s)-Major: **Jesus Aguirre - Pre-Engineering, Carter Anderson - Pre-Engineering, Fredrick Nyamekye - Pre-Engineering, Christene Ragudos - Mechanical Engineering Technology**
Title: TORQUE TRANSFER AND GEAR RATIOS OF DIFFERENTIAL GEARS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: The differential is a component most people know nothing about, yet is utilized in almost all motorized vehicles from cars and trucks to ATVs and tractors. While it is a relatively simple part, cars would be nearly impossible to drive without them. Differentials serve the purpose of allowing the tires to move separately from each other in order to let the car turn smoothly, as well as providing gear reduction to allow the engine to turn the wheels as its most efficient speed. This project demonstrates this process with an interactive model that shows how differences in torque inputs affect wheel speed outputs for different everyday driving situations. This project is an effective demonstration for anyone to learn about differential gears in a simple, yet interactive display.

Presenter(s)-Major: **Christopher Aiken - Business Administration-Finance, Patrick Breidel Jr - Business Administration-Landman/Energy Mgt, Dalton Horan - Business Administration-Finance, Parker King - Business Administration-Finance, Luke Sandstedt - Business Administration-Finance**
Title: THE FUTURE OF ENERGY
Department: Business
Sponsor: Morgan Bridge

Abstract: The energy industry, and more specifically the oil and natural gas industry, are always innovating to keep up with the changing times. This project analyzes some of the companies in the oil and gas industry in order to see what has made them successful throughout the years and will help them continue to be successful in the future.

Presenter(s)-Major: **Abigail Akin - Business Administration-Marketing, Mackenzie Dyer - Business Administration - Emerging Markets, Micheal Macias - Business Administration-Management, Emily Nagel - Business Administration-Entrepreneurship**
Title: VARIABLES AFFECTING STUDENT RETENTION
Department: Business
Sponsor: Deborah Parman

Abstract: There are many variables impacting student retention rates in higher education. In order to better understand these variables, a collection of secondary research, including family backgrounds, external factors, institutional practices, and learning

styles of students, was collected and summarized. The goal of this literature review is to understand which of these factors most impact student retention rates. The issues discussed throughout this presentation give insight on what factors affect retention rates in higher education.

Presenter(s)-Major: **Trevor Alberts - Pre-Engineering, Brogan Butler - Mechanical Engineering Technology, Chaille Dalley - Pre-Engineering, Caitlin Torgerson - Pre-Engineering**
Title: WATER WORKS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: People usually encounter static electricity when wearing socks on carpet or rubbing a balloon on someone's head to make their hair stand up. Static electricity also can attract or repel a polar liquid, such as water. A charged rod, positive or negative, placed near a polar liquid will move the liquid. The purpose of this project was to design and build a demonstration for the Math & Science Center that would show the effects of a charged rod near a stream of water. The design featured an enclosed box with a stream of water flowing from the top. Four metal rods along the stream became charged when their assigned buttons outside the box were pressed, forcing the straight stream into a wavy pattern. The project will allow the children of the Math & Science Center to experiment with and learn the effects of static charges near a polar liquid.

Presenter(s)-Major: **Duncan Alger - Business Administration - Hospitality Management, Rain Felkl - Business Administration - Hospitality Management, Courtney McGinnis - Business Administration, Spencer Weinberg - Business Administration - Emerging Markets**
Title: SLIGHTLY ELEVATED HOSTEL
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of four students in Hospitality Management Sales and Marketing created a hostel/resort concept and marketing plan for a backpacker's hostel located in Mount Hood, Oregon. This group focused their efforts towards constructing a marketing plan for the property and providing a unique and innovative idea aimed toward adventurous youth. Motivation behind this project came from the increase in backpackers exploring the U.S. What better place to start than the majestic Mount Hood, located in Oregon? With such a large demand for hostels in other countries, the idea is to bring that same hostel culture to the U.S., providing clean, affordable, safe accommodations with a vibrant and energetic atmosphere for young and adventurous explorers traveling on a budget.

Presenter(s)-Major: **Gary Allen - Music-Performance, Micah Dancy - Music-Business, Cameron Honnen - Music-Education, Joseph Moher - Music-Performance, Zachary Rea - Liberal Arts-Social Science**
Title: POP VIDEO RECORDING PROJECT ON "SAIL"
Department: Music
Sponsor: Darin Kamstra

Abstract: In the creation of this piece, the goal for us as students has been to utilize the skills of recording and mixing engineers in a practical setting, and through this project you will see the end result of all this work. To ensure that we remain well rounded, we also had to arrange and perform the music ourselves. We chose to arrange the popular song "Sail" by Awolnation because we could take advantage of the elements of the piece to accommodate the diverse skill sets of the members of the group. This presented many obstacles in recording with microphones and good performances, as well as obstacles in mixing and arranging and synchronizing the audio with the videos. In all, we took a multi-faceted academic project and turned it into an enjoyable music performance video. We can take the skills used in this project out into future real-world recording and mixing scenarios.

Presenter(s)-Major: **Emily Altenburg - Nursing-BSN, Savannah Herland - Nursing-BSN, Leah Vanderheiden - Nursing-BSN**
Title: RECUMBENT VERSUS UPRIGHT BIRTHING POSITIONS
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: This study explores historical and modern birthing positions and the implications of each on the process and outcome of labor. Historical birthing positions are best known for utilizing gravity's pull and a woman's full range of mobility. In contrast, modern birthing positions are notorious for taking place on a hospital bed, are generally limited to recumbent positions, and lack variability throughout the labor process. The problem observed was that, although there is sufficient evidence to contraindicate recumbent birthing positions as the standard in birthing practice, they are still by far the most commonly used. The purpose of this study is to identify why this phenomenon of stationary, recumbent birthing is taking place, keeping in mind that the reasons for this are multidimensional. The proposed hypothesis is that provider convenience, modern interventions in birthing,

cultural conceptions of birth, and overall insufficient knowledge regarding positioning on the part of both providers and patients all detract from the use of more effective, gravitational birthing methods. This study used the literary analysis of 15 international, peer reviewed resources to collect information pertaining to the topic of birthing positions currently utilized during labor. After performing this extensive literature review, it was concluded that upright birthing positions do indeed provide women with unique benefits and prevent many adverse outcomes.

Presenter(s)-Major: **Alan Althoff - Computer Science, David Gilmore - Computer Science, Josiah Norfleet - Computer Science, Logan Saruwatari - Computer Science**
Title: CMU SLIDER GAME
Department: Computer Science, Mathematics & Statistics
Sponsor: Lori Payne

Abstract: Pattern recognition is an important aspect of problem solving. Learning this skill is a vital part of any critical thinking. It turns out that practicing this technique through simple puzzle games can increase cognitive reasoning at any age. This issue will be addressed by having students solve a simple puzzle. The game itself is a square grid containing a set of sliding tiles that, when put in proper order, form a picture. The application will allow the user to select different sizes of grids and different background pictures.

Presenter(s)-Major: **Jacob Ames - Business Administration - Hospitality Management, Lucille Facinelli - Business Administration-Marketing, Priscilla Suarez - Business Administration - Hospitality Management, Zoe Woodworth - Business Administration - Hospitality Management**
Title: WAHKEENA RESORT "MOST BEAUTIFUL"
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of four students designed, administered, and marketed a potential functioning resort concept. This hypothetical resort includes image and concept planning. The subsequent marketing portfolio was created to address and compare the competitive advantages of their resort to comparable properties in the area. Included within the task is the creation of a comprehensive marketing plan, taking into account quality of rooms, outdoor activities, a spa experience, and other resort amenities. Major conclusions gathered from marketing critiques were: 1) Gain a significant percentage of the market share 2) Build brand awareness as a year round resort, and 3) Establish recognition of outdoor safety.

Presenter(s)-Major: **Dakota Amos - Pre-Engineering, Andrew Strait - Pre-Engineering, George Van Dorpe - Pre-Engineering, Zebulon White - Pre-Engineering**
Title: WHEEL OR NO WHEEL - A HOVERCRAFT COMPARISON
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Jody Kliska

Abstract: Hovercrafts use blowers to produce a large volume of air below the frame of the craft. The difference between the higher pressure air below and lower pressure air above produces lift, which causes the frame to float above a surface. The purpose of this project was to design a display that would compare the acting force on two different types of vehicles: a hovercraft and a replica truck. The demonstration was an elaborate design that used sand, force-measuring equipment, and a hand built hovercraft, to show that hovercrafts produce less friction. A spring scale was used to accurately measure the forces along the direction of travel. The designers will demonstrate the functionality of their unique hovercraft versus a truck and show what may be the future of transportation and educate people on the forces around them.

Presenter(s)-Major: **Dolores Anchondo - Nursing-BSN, Nicholas Derr - Nursing-BSN, Carlye Johnston - Nursing-BSN**
Title: PREVENTION OF PAIN IN NEONATES USING SUCROSE
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: The prevention of pain in the neonate population should be a priority for all health care providers, not only for ethical reasons, but for developmental reasons as well. Neonates are at a great risk of having neurodevelopmental complications as a result of prematurity, which leads to various, painful nursing interventions. Although research has not fully discovered the best method to treat neonatal pain, there are proven methods that have been successful at reducing pain in minor procedures. According to a literature review, sucrose is an effective and reliable intervention to reduce the occurrence of pain in the neonates undergoing minor, painful procedures. It has been proven that sucrose is effective in reducing short term pain and distress by increasing endogenous opioids. The use of sucrose should be implemented as evidence-based practice protocol in the neonate population.

Presenter(s)-Major: **Laura Andersen - Liberal Arts-Elementary Teaching**
Title: READING AND WRITING CASE STUDY
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The purpose of the Assessment Process, Practice and Analysis Learning Study is to prepare the teacher candidate to assess each student's knowledge and usage of reading and writing strategies and to analyze the results of assessments for instructional purposes. For this project, the teacher candidate completed a case study by conducting multiple reading and writing assessments on one elementary student. An analysis of the data collected from the assessments shows the student's strengths and weaknesses in reading and writing; based upon this analysis, the teacher candidate provided information about what reading and writing strategies the student should learn next. The teacher candidate will share what she learned about assessing a student's strengths and weaknesses in reading and writing and how the results of assessments can impact literacy instruction for individual students. This project is important because the teacher candidate must know how to measure a student's mastery of reading and writing strategies, in order to meet the individual needs of students.

Presenter(s)-Major: **Keren Lynne Angeles - Biological Sciences-Biology, Colt Burtard - Biological Sciences-Biology, Jordyn Madsen - Biological Sciences-Biology, Danielle May - Biological Sciences-Biology, Michelle Phillips - Chemistry**
Title: PRO-APOPTOTIC PROTEIN INTERACTIONS OCCURRING IN EARLY INTRINSIC APOPTOSIS MAY INFLUENCE APOPTOTIC RESISTANCE IN AN IN VITRO MODEL OF BREAST CANCER
Department: Biological Sciences
Sponsor: Kelly Jean Craig

Abstract: It is estimated that 250,000 new cases of invasive breast cancer will be diagnosed in women this year. Cancer cells commonly evade programmed cell death, or apoptosis, which is controlled by the mitochondria and apoptotic proteins. This intrinsic apoptotic pathway involves the pro-apoptotic proteins, Dynamin-related protein 1 (Drp1) and Bcl-2 associated X protein (Bax), which translocate to the outer mitochondrial membrane to interact and promote mitochondrial fission and membrane permeabilization. This Bax-Drp1 interaction allows cytochrome c translocation from the mitochondria to the cytoplasm to continue apoptotic signaling. This study assessed the translocation of these proteins during apoptotic induction in a cell model of breast cancer. Using immunocytochemistry and intensity correlation analysis, the data showed decreased Drp1 mitochondrial colocalization despite increased Bax protein expression on the mitochondria in breast cancer cells compared to noncancerous breast epithelium. Apoptotic resistance was further observed by the inability to induce cytochrome c translocation in our breast cancer cells with an apoptotic-inducing drug, staurosporine. These data suggest that apoptotic resistance lies upstream of cytochrome c release and a deficient mitochondrial interaction between Bax and Drp1 could exist in our breast cancer model. Future studies will assess the physical interaction of Bax and Drp1 using co-immunoprecipitation assays.

Presenter(s)-Major: **Kelsi Arrieta - Biological Sciences-Biology, Ashly Pennington - Biological Sciences-Biology**
Title: AN UPDATE ON MOLECULAR IDENTIFICATION OF *CONIATUS* SP. FOUND IN THE U.S.
Department: Biological Sciences
Sponsor: Zeynep Ozsoy

Abstract: Tamarisk (Tamarix spp.) is an invasive shrub introduced in the United States in the 1900s as a possible erosion control plant. However, it quickly outcompeted many of the native plants in riparian ecosystems due to the lack of any natural predator. The introduction of a leaf beetle, Diorhabda carinulata, as a biological control agent in 2001 proved to be effective in controlling the tamarisk. In 2006 another beetle species, that was not intentionally introduced, was found feeding on tamarisk in Arizona. This species was later identified as the splendid tamarisk weevil, *Coniatus splendidulus*, which has since been found in most of the western states. Cytochrome Oxidase-I (CO1) gene sequence was used to compare the *Coniatus* sp. found in the U.S. to specimens collected in their native range. Previous maximum parsimony analysis of the sequences suggested a single introduction event into the U.S. The specimens collected in Italy, Turkey and more recently Jordan, Iran, Uzbekistan and Bulgaria appear to be genetically different than the *Coniatus* sp. found in the U.S. DNA analysis has allowed the construction and expansion of a phylogeny of Coniatus; bringing closer the goal of identifying the origin of the Coniatus weevils found in the U.S.

Presenter(s)-Major: **Gabrielle Arterburn - Liberal Arts-Geology**
Title: TAYLOR GROUND STONE: USE-WEAR ANALYSIS IN CONTEXT
Department: Social & Behavioral Sciences
Sponsor: John Seebach

Abstract: Originally excavated by Marie Wormington in 1951-1952, the Taylor Site in Western Colorado continues to provide new insights into prehistoric culture. Analysis of the ground stone artifacts was undertaken as part of a larger investigation conducted by a team of local archaeologists. The site yielded 316 total ground stone artifacts. Of these, only three artifacts are present in the Taylor Site collection at the Denver Museum of Nature and Science. Extant artifacts, quantitative measurements, qualitative examination and secondary source structures and techniques were combined to create a use-wear analysis

methodology in order to study the ground stone. The results of the study include a full description and analysis of the artifacts as well as situating those artifacts in their larger spatial and archaeological context. Though the study and conclusions are limited by the small sample size, new insights into the artifacts and site have been revealed. Furthermore, the project has proven the utility of old collections from excavated sites in advancing contemporary understanding of Colorado archaeology and prehistory.

Presenter(s)-Major: **Acacia Ator - Nursing-AAS, Katrina Graff - Nursing-AAS, Kandu Sherpa - Nursing-AAS, Anna Velasquez - Nursing-AAS**
Title: STERILE TECHNIQUE
Department: Health Sciences
Sponsor: Genell Stites

Abstract: In the late 19th century, Louis Pasteur developed germ theory, which led the way for Joseph Lister to successfully use sterile technique in 1867 by applying carbolic acid to compound fracture wounds. The mortality rate from infection plummeted drastically. Bacteria are ubiquitous, and some are good for us while others are harmful. Minimizing the exposure to these harmful bacteria is very important in the health-care setting. Sterile means free from germs and it is used to prevent contamination from microorganisms. Prevention of nosocomial, or health-care related infections is an essential responsibility of nurses today. Strict rules are utilized regarding what we know about infection prevention, and followed to minimize the risks of getting an infection. The joint commission recognizes that barriers, environmental controls, and contact guidelines are some of the chief aspects of sterile technique. Breaks in sterile technique can and do occur, even for the most conscientious nurses. Infections are associated with increased health care costs, and unnecessary patient pain and suffering. Prevention of nosocomial infections, therefore, takes on great significance in today's dynamic health care environment. The goal of this project is to recognize common breaks in sterile technique, and to implement methods to prevent future occurrences.

Presenter(s)-Major: **Thu Thu Aung - Medical Laboratory Technician, Tammy Bordlemay - Medical Laboratory Technician, Caitlin Warneke - Medical Laboratory Technician**
Title: JUST BREATHE: A GLIMPSE INTO THE FUTURE OF BREATH ANALYSIS
Department: Health Sciences
Sponsor: Tracy Matthews

Abstract: Since the time of Hippocrates, breath aromas have provided clues of the health status of patients. Physicians have associated breath odors with disease states; a sweet, fruity smell to uncontrolled diabetes, an aroma of urine with kidney failure, a sewer-like stench with lung abscesses, and a fishy odor with advanced liver disease. More recently, ethanol, a volatile organic compound (VOC), has been accurately measured and widely accepted in the well-known alcohol breath analyzer test. Today, the modern era of sophisticated analytical tools has allowed for testing of other exhaled VOCs that can aid in the diagnosis and monitoring of a patient's health status. There are over two hundred volatile compounds contained in a normal sample of human breath that can assist in the diagnosis of diseases such as lung cancer, renal and liver diseases, pulmonary tuberculosis, gastrointestinal diseases, and breast cancer. In this poster, we review the medical literature and research efforts that have been carried out in order to introduce emerging breath analyzer tests to screen for biomarkers found in breast, lung, and gastric cancers.

Presenter(s)-Major: **Ashley Avery - Nursing-AAS, Andrea Deltondo - Nursing-AAS, Monika Milton - Nursing-AAS, Tiffany Morford - Nursing-AAS**
Title: ADVANCED DIRECTIVES
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Life is full of unexpected surprises. Young or old, at any time a dramatic change may cause a rapid decline in one's cognitive and/or physical abilities. Advancements in today's medical treatment have changed the way that we care for the dying. What kind of medical care would someone want if they were too ill or hurt to express their wishes? Advance directives are legal documents that allow someone to spell out their decisions about end-of-life care. They give them a way to tell their wishes to family, friends, and health care professionals and to avoid confusion later on. It is important to have an advanced directive, whether they are a young healthy adult in their 20's, or a frail older adult with several medical diagnoses. Where does one obtain an advance directive? Has anyone's doctor ever talked to them about an advance directive? Who has access to someone's advance directive and should it be part of their medical records? As nurses, it is important to have access to this information to provide effective care and promote patient autonomy. Advance directives not only preserve patient autonomy, but also reduce non-essential medical care. The material in this presentation will answer these questions based on research and clinical experience.

Presenter(s)-Major: **Natalie Bagnard - Mechanical Engineering Technology, Andrew Bristol - Mechanical Engineering, Kevin Hilken - Mechanical Engineering Technology**
Title: CANOLA OILSEED PRESS TESTING & ANALYSIS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Francisco Castro

Abstract: Canola seed is a crop that requires less water usage than other oil seed crops and can be grown in a variety of different climates. Many farmers around Western Colorado will not grow canola seed because there is no economically practical system available to crush the seed and extract the oil. The goal of this project is to provide local farmers on the Western Slope of Colorado with the means necessary to extract, settle, and filter oil from canola seed. There are two main objectives for this project: to assemble a working and portable oilseed press apparatus, and to ensure the press meets the efficiency ratings of the manufacturer, Cropland Biodiesel, as well as the requirements of the project sponsor, Dr. Perry Cabot of Colorado State University. Testing was done to verify the extraction efficiency by measuring and comparing a known weight of seed to the weight of the oil extracted from the seed.

Presenter(s)-Major: **Randal Baker - Manufacturing Technology-Machining Technology, James Ray - Manufacturing Technology-Machining Technology**
Title: ONE CYLINDER HORIZONTAL ENGINE
Department: Western Colorado Community College
Sponsor: Bill McCracken

Abstract: By constructing this steam engine, we are trying to see if steam is a viable green energy for today. All resources used in the operation of this engine are renewable. This steam propelled piston engine consists of a one cylinder horizontal engine that rotates a shaft. This project demonstrates the many technical skills necessary to make an engine operational. In addition to the machining skills required, it takes a strong understanding of how the engine works, design and engineering skills, creativity to make it original, and time management to make sure everything is constructed properly and accurately in a timely manner. This project also shows great educational value due to the high amount of research that is needed, the experience in completing the project, exploring the possibilities of implementing design changes, how it functions, and even practical applications for modern technologies. This project will exhibit a high skill level in many aspects of new product design, engineering, and manufacturing processes.

Presenter(s)-Major: **Quinnten Baker - Pre-Engineering, Daniel Lawley - Pre-Engineering, Justin Marker - Pre-Engineering, Jaime Rodriguez-Roggie - Pre-Engineering**
Title: INVERTED PENDULUM
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Bevill

Abstract: The inverted pendulum is a simple mechanical system that can be controlled with a PID (proportional, integral, derivitive) controller to keep the arm of the pendulum upright and balanced. The goal of this presentation is to demonstrate how these different components affect the fluidity and balance of the pendulum. By adjusting any of three knobs, the user can change the gain values for responsiveness in terms of proportional, integral, and derivative values of the movement of the arm. This allows the user to get a visual representation of what can happen when values are critically damped or under-damped. An Arduino Uno was placed on a cart that also had a potentiometer anchored to it. The pendulum was attached to the potentiometer in such a manner that its movement could be detected and the cart could move in response.

Presenter(s)-Major: **Nicole Balaz - Medical Laboratory Technician, Rebeca Lechleitner - Medical Laboratory Technician, Jasmine Van't Hoff - Medical Laboratory Technician**
Title: THE HIGHS AND LOWS OF MEDICINAL MARIJUANA: A CLINICAL REVIEW OF THE HEALTH EFFECTS OF MARIJUANA FOR NEUROPATHIC PAIN MANAGEMENT
Department: Health Sciences
Sponsor: Tracy Matthews

Abstract: Marijuana, a class I drug, has been legalized in twenty three states for medicinal purposes. This research asks if medicinal marijuana is an effective treatment for chronic pain management and its effects on human health. The reviewed clinical trials were chosen at random and looked at the effects of marijuana on patients with chronic neuropathic pain. Approximately five hundred patients participated in these clinical trials. They were observed for efficacy of pain management and adverse effects related to the cannabis treatment. In general, studies showed cannabis use had a clinically significant reduction in pain based on the visual-analog-scale compared to those on a placebo treatment. Cannabis use also resulted in the presentation of some adverse effects such as dry mouth, a feeling of being "high," nausea, coughing, and other non-serious effects more often than

with placebo use. In conclusion of this review, medicinal marijuana was found to provide pain relief to patients and resulted in few, non-serious, adverse effects. Further research needs to be performed before medicinal marijuana can be used as the primary treatment for neuropathic pain management.

Presenter(s)-Major: **Andris Balodis - Pre-Engineering, Thorsen Milton - Pre-Engineering, Eric Pipkin - Pre-Engineering, Dalton Rauer - Pre-Engineering**
Title: VALVELESS PULSE JET ENGINE
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Nathan McNeill

Abstract: Pulse-jet engines are the simplest, lowest in cost, lightest weight and easiest to operate jet engines in the world. A pulse jet is a simple metal tube comprised of a combustion chamber, intake and output tubes. All valveless pulse jets operate using the principles of pressure differentials and acoustic resonance to sustain the deflagrations that power the engine, similar to the way a piston powers a traditional internal combustion engine, but using air pressure instead of a piston. The purpose of this project was to construct a functioning valveless pulse jet engine to demonstrate how pressure differentials and resonance can create a self-sustaining reaction to create thrust. The effect that different size and shape exhaust nozzles had on the thrust output of the engine was tested to see if the engine could be made to be more powerful. The results of these tests will be shown at the Student Showcase.

Presenter(s)-Major: **Daniele Balsamo - Radiologic Technology, Jessica Brittingham - Biological Sciences-Biology, Whitney Pigao - Radiologic Technology**
Title: DOSE REDUCTION STRATEGIES IN NEONATAL RADIOGRAPHY
Department: Health Sciences
Sponsor: Olga Grisak

Abstract: The increased survival rate of premature infants has been linked to an increase of exposure to ionizing radiation from diagnostic imaging in the Neonatal Intensive Care Unit. The operational difference of each portable x-ray unit combined with nonspecific training in imaging premature infants has led to some unnecessary exposure of non-target organs, increased patient dose, and repetition of exposure due to poor quality radiographs or presence of artifact in essential anatomy. This is of concern because neonates are highly radiosensitive and have the life expectancy to develop long term effects. Recently, professional organizations have recognized the need to develop standardized dose reduction methods. Implementation of this initiative requires a group effort between the radiographers, radiologists, and equipment vendors to develop a baseline chart that is projection and weight specific. Another recent approach is to utilize *The Look Excellent Chest Radiography* mnemonic to aid the radiographer in taking a quality image while reducing exposure repetition. These efforts contribute to the reduction of patient dose in the population group that is most vulnerable to ionizing radiation.

Presenter(s)-Major: **Kenneth Banning - Mechanical Engineering, Keegan Kaiser - Mechanical Engineering, Robert VanRoosendaal - Mechanical Engineering**
Title: FRETTING CORROSION ON THE TAPERED HIP STEM IN A TOTAL HIP ARTHROPLASTY
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Francisco Castro

Abstract: Total hip arthroplasty is an operation in which the patient's hip is replaced by a prosthetic. Hip arthroplasties began in the 1930's using stainless steel as the primary material for the prosthetic. The early design had numerous problems with corrosion that led to health issues including cytotoxicity, genotoxicity, carcinogenicity, and metal sensitivity. Hip prosthetics have since evolved to designs which use advanced materials in an effort to prevent mechanical problems like fretting corrosion. The primary focus of this project was to research the current testing methods of hip prosthetics, and to gain a better understanding of fretting corrosion at the connection of the femoral head and the tapered hip stem through mechanical testing.

Presenter(s)-Major: **Sara Barrow - Nursing-BSN, Haley Bright - Nursing-BSN, Amelia Harris - Nursing-BSN**
Title: CHILDHOOD DEPRESSION AND THE USE OF ALTERNATIVE ANIMAL THERAPY
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: This research involves examining the effectiveness of treatment modalities towards adolescent depression. Depression in children is commonly treated with a combination of therapy and medications such as selective serotonin reuptake inhibitors (SSRIs), selective norepinephrine reuptake inhibitors (SNRIs) and tricyclic antidepressants (TCAs); of these, SSRIs (specifically Prozac), are the only drugs approved for use in children. The goal of this evidence-based practice study is to show that alternative treatment methods, such as animal-assisted therapy (AAT), should be implemented as a standard of care for

children diagnosed with depression. This has been done by utilizing and examining various types of research designs. Upon evaluation of these designs, it has become clear that animal-assisted therapy is a beneficial treatment option that incorporates pets as therapeutic agents for goal-directed interventions. It allows patients to develop a deep bond with the animal that provides emotional support, facilitates improved social interactions, and increases feelings of self worth. (CRC Health, 2015). Through showing the benefits of integrating AAT into standard practice, this research highlights the importance of alternative therapies for a more individualized approach in the treatment of childhood depression.

Presenter(s)-Major: **Jesse Battles - Mathematics**
Title: DIGITAL SIGNATURES
Department: Computer Science, Mathematics & Statistics
Sponsor: Markus Reitenbach

Abstract: This presentation will focus on the discrete logarithm problem and how it is used to digitally sign documents using a public and private key pair.

Presenter(s)-Major: **Joshua Beacham - Business Administration, Chelsea Deming - Business Administration, Priscilla Drewry - Business Administration-Management, Parke Overmiller - Business Administration-Landman/Energy Management, Lorena Trujillo - General Accounting**
Title: STUDENT RETENTION AND DEPARTURE IN HIGHER EDUCATION
Department: Business
Sponsor: Deborah Parman

Abstract: This literature review explores articles, reports, journals, and news focusing on which practices enable and influence student retention in higher education. The literature explores institutional practices/values that positively affect student retention. Next, it describes factors impacting student departure and why students voluntarily leave their institutions. Finally, it explains individual characteristics that play a role in the student departure/retention process as well as family characteristics influencing the student retention process. The literature further investigates external factors such as how a weak economy or doubtful job outlook might impact retention rates at institutions of higher education as well as comparing and contrasting the effectiveness of academic vs. social support in boosting rates of retention at institutions. The literature review ends with an examination of how students' learning styles affect retention rates.

Presenter(s)-Major: **Curtis Beckel - Pre-Engineering, William Bovard - Pre-Engineering, Bradley Morgan - Pre-Engineering, Raul Uribe - Pre-Engineering**
Title: WINE BARREL CLEANING SYSTEM
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Jody Kliska

Abstract: Considering the significant cost ($300-$1000), oak wine barrels must be cared for as efficiently and consistently as possible. A properly cared for wine barrel can last five to six years, and consistent cleaning can reduce the cost-per-bottle by 16-67 cents for exclusively oak aged wines. The purpose of this project was to design a more cost effective replacement for the client's current cleaning system. The cleaning system designed aimed to be one-tenth the cost of the current industry standard ($2500) while maintaining the same functionality. The design simplified the current model and as such, streamlined the manufacturing process. The designers will demonstrate the importance of low cost equipment in a market setting.

Presenter(s)-Major: **Ciara Beegle - Business Administration-Finance, Tyler Ehlers - Sport Management, Luke Mclean - Business Administration-Finance, Kristina McLeslie - Business Administration-Finance, Kyle Serrano - Business Administration-Human Resources Management**
Title: FAST FOOD INDUSTRY
Department: Business
Sponsor: Morgan Bridge

Abstract: The financial strategy of five of the top companies in the fast food industry will be reviewed and analyzed to evaluate how financial strategy impacts net income for both the companies and the fast food industry.

Presenter(s)-Major: **Zachary Bellew - Computer Science, West Castro - General Engineering, Benjamin Skogen - Computer Science**
Title: TIMELY
Department: Computer Science, Mathematics & Statistics
Sponsor: Lori Payne

Abstract: Timely is a universal windows application that will allow businesses and individuals to efficiently and effectively organize their time. It will use computer algorithms to determine an optimal work schedule based on individual employee feedback, work hours, shift patterns, employee positions, employee availability, and others. These optimizations are optional and will be editable by a manager after a schedule is produced. There will be two different interfaces, one for a manager and one for employees. All users will be asked to create and maintain a login to access the schedule and information regarding other employees, time off requests, and related business information. Skills and techniques learned in User Interface Design as well as Intro to Algorithms were used to develop the interface and create the schedule optimization process.

Presenter(s)-Major: **Steven Belus - Environmental Science & Technology, Casey Gorsett - Environmental Science & Technology, Curtis Logsdon - Environmental Science & Technology, Andrew Mansfield - Environmental Science & Technology**
Title: ASSESSING SEEDING SUCCESS AND EROSION POTENTIAL OF SLOPED AREAS ON THE PINE RIDGE FIRE AREA
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: New post-fire rehabilitation practices in the 21st century focus on the planting of native grasses, shrubs, restoration of soil and site stability, hydrologic function, and biotic integrity. Seeding treatments are often applied after wildfires to assist with rehabilitation in areas with steep slopes, poor soils, or arid environments. The 2012 Pine Ridge Fire burned a cumulative 13,920 acres pinyon-juniper woodland and sage steppe southwest of De Beque, CO. The burned area was assessed by a BAER (Burned Area Emergency Response) team that was formed from national and local restoration experts. The team decided based on budget and desired effects that they would revegetate using three different seed mixes, one for standard areas, one for steep slopes, and one for harsh soil sites. This study will look at seeding success relative to slope steepness and aspect. Erosion potential will also be assessed at each study site. This study will help managers determine if their seed mixes are effective at establishing desired vegetation cover and controlling erosion.

Presenter(s)-Major: **Ryan Benson - Mechanical Engineering Technology, Carlos Ibarra - Mechanical Engineering Technology**
Title: AUTONOMOUS TRACKED ROVER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Bevill

Abstract: The purpose of this project is to create an autonomous rover capable of completing navigation assignments without human interaction. The vehicle will be controlled by a logic board and will be provided navigation coordinates via RF transmitter. Navigation is completed using a GPS module as well as distance sensors to avoid obstacles the rover may encounter. Two motors drive the vehicle allowing for independent steering and traction control. The drive mechanism consists of two tracks rotating individually, allowing for a greater off road capability than traditional wheel-based drive systems. This project has a great potential for growth in simple markets such as toys and educational robotics. Further development of similar projects is currently being used in the design of autonomous vehicles and advanced robotics.

Presenter(s)-Major: **Caitlyn Berry - Nursing-BSN, Andrea Campbell - Nursing-BSN, Brittany Ott - Nursing-BSN, Jamie Quere - Nursing-BSN, Brittany Wilson - Nursing-BSN**
Title: DETERMINANTS OF NONCOMPLIANCE IN INFANTS RECEIVING PALIVIZUMAB PROPHYLAXIS AND FURTHER EFFECTS ON RELATED HOSPITALIZATIONS
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: Background and Significance: Respiratory Syncytial Virus (RSV) is the primary cause of lower respiratory tract infections in children under the age of five. Palivizumab (Synagis) is the only prophylactic regimen approved by the FDA for the prevention of RSV. Despite the implementation of the palivizumab prophylaxis into care settings nationwide, there continues to be high rates of hospitalizations related to RSV. Purpose: This study aims to examine determinants of noncompliance in infants receiving palivizumab prophylaxis and subsequent hospitalizations. Theoretical Framework: The framework of this research is based on Dorothy Johnson's behavioral system model, which focuses on the most efficient and effective way to prevent illness through behavioral functioning. Method: A descriptive quantitative study will be conducted to determine common factors that

decrease patient compliance, and then we will further analyze the effects on hospitalizations. The study will take place over the 2015-16 RSV season on an inpatient pediatric unit at Saint Mary's Hospital, Grand Junction. A survey created by our team will be distributed to the subjects' parents upon admission to the hospital with RSV. The survey will be used to evaluate the following determinants of compliance: cost, insurance approval, availability, transportation, education, and parents' understanding of RSV or Palivizumab.

Presenter(s)-Major: **Charles Bisbee - Computer Science, Zachary Brown - Computer Science, Carter Hough - Computer Science**
Title: TABLE TRACKR: A RESTAURANT TABLE MANAGEMENT SYSTEM
Department: Computer Science, Mathematics & Statistics
Sponsor: Lori Payne

Abstract: The success of a restaurant is often dependent on factors such as the speed, efficiency, and communication of its staff. However, in the loud and chaotic atmosphere of a restaurant, the disruption of these key factors often results in a less than satisfactory dining experience, leaving staff overwhelmed and customers unhappy. For this reason, it is important for businesses operating in the food industry to have a powerful system that not only facilitates speed, efficiency, and communication, but enhances them. This project steps in to fill that role by providing a system for restaurant hosts, waiters/waitresses, and bussers to manage every step of the lifecycle of a table in a restaurant from assigning customers to a seat to notifying waitstaff of a dirty table. Table Trackr provides a functional, aesthetically pleasing, and staff-friendly interface that allows different staff members to access separate parts of the system that are relevant to their specific job. The result of this is a system which will enhance the efficiency of a restaurant's staff and increase the happiness of its customers.

Presenter(s)-Major: **Alaina Bittner - Studio Art, Layna Brown - Studio Art, Danielle Carver - Liberal Arts-Elementary Teaching, Kristina Dooley - English-Writing, Seirrha Key - Studio Art, Kaitlynn King - Studio Art, Nellie Knutson-Steck - Undeclared, Martha McCoy - Non-Degree Seeking, Isah Mckenzie - Graphic Design, Barbara Meeker - Non-Degree Seeking, Mindy Rice - Non-Degree Seeking, Kira Rogowski - Environmental Sciences & Technology, Linda Skinner - Non-Degree Seeking, Samuel Speir - Studio Art, Cameron Williams - Studio Art, Colin Williams - Studio Art**
Title: POETRY BROADSIDES AND JAPANESE STAB BOOKBINDING
Department: Art & Design; Languages, Literature & Mass Communication
Sponsor: Josh Butler and Jennifer Hancock

Abstract: This presentation displays the collaboration between the Crafting Poetry and Lithograph classes. Poets and artists worked together to design "broadsides" with both images and text, and participants then bound the prints together into books using the Japanese Stab Binding technique of bookbinding developed by Yotsume Toji. Poems were selected by artists based on inspiration and visual imagery. The project displays the benefits of interdepartmental learning and collaboration between students from different fields of artistic study.

Presenter(s)-Major: **Brandi Blackburn - Nursing-AAS, Allison Chandler - Nursing-AAS, Kara Hotard - Nursing-AAS, Megan Smith - Nursing-AAS**
Title: HUMAN PAPILLOMAVIRUS (HPV) IMMUNIZATIONS: HOW EDUCATION CAN BREAK THE STIGMA OF "THE SEX VACCINE"
Department: Health Sciences
Sponsor: Genell Stites

Abstract: This research focuses on the use of education as a strategy to change the misconception surrounding the human papillomavirus (HPV) immunization. The team will use evidence-based research and local demographics to show that the HPV vaccine is beneficial for both males and females, yet does not promote early sexual activity.

Presenter(s)-Major: **Benjamin Blandina - Mechanical Engineering, Clancy Garoutte - Mechanical Engineering, Kenneth Klein - Mechanical Engineering Technology**
Title: FILAMENT WINDING MACHINE AUTOMATION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Brett Hensley

Abstract: Schauenburg Flexadux Corporation is a company that manufactures ducting for mining applications. This ducting can range from one foot in diameter to seven feet in diameter. The current machine, which produces the ducting, has been used for over 30 years. No major improvements have been made over the years, and producing the ducting is labor intensive. This machine is manually controlled by a series of push buttons and adjustment knobs. This lack of automation can lead to flawed ducting or wasted material. The primary goal of this project is to design, build, and test a one-tenth scale fiberglass filament

winding machine and a full-scale industrial controls system that is capable of automating the manufacturing process. The project was broken into constructing five main elements: the main frame, the traversing frame, the traversing drive system, the rotary drive system, and the control system. The winding machine will utilize a programmable logic controller, ladder logic code, a human machine interface, rotary encoders, and variable frequency drives to control the accuracy and automation of the machine. The test bed will function as a platform that Schauenburg can use for testing new duct sizes as well as new fiberglass weave patterns. Overall, the automation of the machine should reduce flawed ducting as well as eliminate wasted material.

Presenter(s)-Major: **Justin Blaskowsky - Biological Sciences-Biology**
Title: PURIFICATION, SEPARATION AND BIOCHEMICAL ANALYSIS OF ZOOSPORICIDAL AGENTS FROM *PETUNIA X HYBRIDA*
Department: Biological Sciences
Sponsor: Margot Becktell

Abstract: *Phytophthora infestans* is a common pathogen of potatoes, tomatoes and, to a lesser extent, petunias. This pathogen is most famously known to have caused the Irish Potato Famine of 1845. Previous work in our lab has shown that crude extracts from petunias have zoosporicidal activity against *P. infestans*. Proton nuclear magnetic resonance (^{1}H NMR), carbon (^{13}C) NMR, and mass spectrometry (MS) data obtained suggest that the extract has a high degree of similarity to the known structure of amphipathic sucrose esters. The aim of this work is to purify and separate the crude extracts from petunias with the ultimate goal of identifying the compound or compounds responsible for the lytic activity against zoospores. For purification and separation, solid phase extraction with hydrophilic-lipophilic balanced cartridges and TLC methods were utilized. These protocols were established by previous authors using sucrose esters from petunias and tobacco. Subsequent analysis of the filtrate may yield more complete and clear results to identify the chemical structure(s). A thorough understanding of the compound(s) in question may lead to further research aimed at understanding the petunia's resistance to this pathogen and a possible method of protection for other, more susceptible plant species.

Presenter(s)-Major: **Elisabeth Bloom - History-Teaching (Secondary)**
Title: RAISING A NATION: THE IMPORTANCE OF NAZI MOTHERHOOD
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: In spite of prevailing gender roles that limited women to certain spheres, motherhood has always been seen as an important role in building nations. Traditionally their "job" has been to raise their children to be patriotic citizens. Nazi Germany was no exception in this regard, as it promoted German motherhood in implementing its ideological goals. Motherhood in the Third Reich was important in order to breed a "genetically pure" race and to nurture Nazism. A problem with the heavy emphasis on motherhood was that it detracted from women's roles in other aspects of German society. During the Weimar Republic women were allowed to be doctors, educators, and fill in for other professional roles. When Hitler became chancellor, most of those opportunities vanished and the number of women in the workplace declined. Women who sought education or professional careers were often seen as unpatriotic since they were not fulfilling their vocational purpose. Women, as Hitler and other Nazi leaders believed, were meant to maintain home lives in order to pave the way for the next thousand years. Although the Thousand Year Reich never reached fruition, long-term programs were set in place to encourage women to give birth and raise "genetically pure" Nazi citizens. These programs included schools for young women of birthing age to indoctrinate them with Nazi political beliefs, prestigious awards such as the Nazi Motherhood medal given to ideal German mothers, government loans for newlyweds, and propaganda which idealized women's societal roles. These programs not only encouraged the next generation of Nazis, they also elevated the patriotic importance of motherhood while discouraging other female roles.

Presenter(s)-Major: **Jared Boese - Computer Science, Marayna Flemming - Mathematics, Kylie Garcia - Computer Science**
Title: MAVFUEL COFFEE
Department: Computer Science, Mathematics & Statistics
Sponsor: Lori Payne

Abstract: Many students have wanted to have coffee but did not have the time to get one between classes due to long lines and short periods between classes. This has led the group to develop an app for Colorado Mesa University students to order coffee online and have it delivered to their desired location. Many programs are easy to use for some users but not all users. The group will show that an interface can allow for ease of use for both parties; customers and employees. The customers want a simple, fast experience when ordering coffee. The employees will also want a simple process, but need more information displayed to them in an efficient manner to expedite their delivery process. For this presentation the group will create an order as a student and receive the order as an employee.

Presenter(s)-Major: **Kayla Boria - Nursing-BSN, Kyra Carr - Nursing-BSN, Alivia Wolfe - Nursing-BSN**
Title: UMBILICAL CORD CARE BEST PRACTICE
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: The purpose of this literature review is to examine the effects of dry cord care compared to other topical agents like alcohol, chlorhexidine, and human breast milk. The methodology utilized in acquiring evidence-based articles as data was through advanced Google searches, such as Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Colorado Mesa University (CMU) library. Overall, dry umbilical cord care is the most current, evidence-based practice for decreased cord separation time in newborns. Gaps in the research included lack of recent experiments, numerous independent variables, and inconsistent health care within various countries. Comprehensively, researchers have concluded dry cord care should be standard practice and many protocols have been implemented in hospitals to execute this change.

Presenter(s)-Major: **Che Bou-Matar - Business, Frederick Candelario - Computer Science, Abigail Cook - Accounting, William Reed - Business Administration**
Title: INFLUENCES OF CONSUMER BUYING BEHAVIOR
Department: Business
Sponsor: Emma Fleck

Abstract: Would you recognize something extraordinary in an ordinary setting and inconvenient time? Based on concepts from our Principles of Marketing class, this presentation will discuss the outcome of a social experiment with a world class classical musician playing at a metro station during rush hour and relate this to the marketing influences of consumer buying behavior. One of the core questions we examine is if you would listen to the music. In a period of 43 minutes, 1,097 people passed by. Seven people stopped to listen for at least a minute, and 27 gave money. The musician raised a total of $52.17 in 43 minutes. We relate these outcomes to three types of consumer influences: situational, psychological and social. The situational circumstances of location and time were inconvenient. Psychological factors are based on personality, attitudes, perception and motives. The music appealed to a wide spectrum of people for a variety of psychological reasons: children in tune with perceptions; musicians with knowledge and appreciation; and a man's emotional impact and a woman who recognized him. How do you influence people to listen to the music? The answer lies with social influences which was validated seven years later at the same metro station.

Presenter(s)-Major: **Colton Bowen - Manufacturing Technology-Machining Technology, Shane Romero - Manufacturing Technology-Machining Technology**
Title: 3D VIRTUAL REALITY GOGGLES
Department: Western Colorado Community College
Sponsor: Bill McCracken

Abstract: Many technological advances in 3 dimensional (3D) videos have been made recently. A recent advancement in this technology is the 360 degree capability of 3D imaging. Many different videos and images are readily available to view on popular websites such as YouTube and Google Images. Numerous people have found these videos and images to be captivating and fascinating. As a result the market for alternative viewing options has spawned. Many different models exist, varying from booths you can sit inside to small glasses you wear on your face. Using Computer Aided Design (CAD) software, Computer Aided Manufacturing (CAM) software, 3D printer, and Computer Numerical Control (CNC) Mill the team will create a pair of goggles composed of aluminum and plastic. These goggles will be secured to the head using a head harness. The goggles will utilize a tray in the lid to secure a cell phone horizontally for optimal viewing. The face piece of the goggle will have built in magnification lenses as well as a cushioned nose piece for comfort. These 3D Virtual Reality goggles will allow a new form of viewing experience for this new and exciting video and imaging capability.

Presenter(s)-Major: **Lance Bradford - Mechanical Engineering Technology, Yelsi Flores - Pre-Engineering, Talon Ivie - Pre-Engineering, Tyler Vallin - Pre-Engineering**
Title: RESONANCE FREQUENCY INDICATOR
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Francisco Castro

Abstract: Resonance is an occurrence when a vibrating system or an external force drives another system to oscillate with greater amplitude at the natural frequency of that system. The response amplitude is a relative maximum, also known as the system's resonance frequency. At resonance frequencies, small periodic driving forces have the ability to produce large amplitude oscillations which can violently shake different materials. The purpose of this project is to show that matching the natural frequency of materials can cause those materials to oscillate violently. This oscillation can be dangerous; for example as with the Tacoma Narrows Bridge Failure (November 7th, 1940). We used an R/C (radio-controlled) motor to discover the natural frequency of various construction materials, and a tachometer measured the RPM's (Rotations per Minute) of the motor when the natural

frequency of the tested material was reached. An accelerometer was placed on the material to record the acceleration of the material when the natural frequency was indicated. The recorded accelerations are helpful in testing the durability of machines or buildings in order to avoid the natural frequency of such objects.

Presenter(s)-Major: **Thomas Brooks - Animation, Film & Motion Design, Melissa Vargas - Animation, Film & Motion Design**
Title: VIDEO PROJECTION MAPPING
Department: Art & Design
Sponsor: Carolyn Quinn-Hensley
Abstract: For the student showcase, participating students will be presenting a live performance in the form of VPM, or Video Projection Mapping. Projection Mapping is a new projection technique that has been embraced by artists and designers to turn almost any surface into "spatial augmented reality." Projection Mapping is applied to advertising, live concerts, theater, gaming, and sculpture. Millumin, a French mapping software program, is used to warp and mask the projection on to fabricated three-dimensional structures. The challenge is to make still and moving images perfectly fit irregularly shaped planes. A synchronized sound track brings the entire presentation to life.

Presenter(s)-Major: **William Brown - Pre-Engineering, Michael Sandoval - Pre-Engineering, Conner Swatloski - Pre-Engineering, Dakota Yourkowski - Pre-Engineering**
Title: BIREFRINGENCE AND PHOTOELASTICITY
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: Imagine driving across a bridge and being able to see the stresses in the structure as a color spectrum of light. This can be demonstrated through the use of photoelasticity, or the double refraction of polarized light through a transparent material under stress. This project focused on designing a model bridge out of Lexan plastic with different configurations and forces acting on it as variables. The photoelastic principles were clearly shown through a spectrum of colors. To see these color indices of stresses, known as birefringence, polarized glass was used to aid in visualization with the naked eye. As expected, the bridge was sturdier with triangular supports, and when one of these supports or trusses were taken out, the birefringence demonstrated that the bridge became structurally weaker. To conclude, by using polarized light and polycarbonate plastic, birefringence along with photoelasticity can be easily demonstrated.

Presenter(s)-Major: **Megan Brown - Mechanical Engineering, Leandro Lara - Mechanical Engineering Technology, Cameron Morley - Mechanical Engineering**
Title: CO-CULTURE FLOW SIMULATION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Francisco Castro

Abstract: A high throughput protein printing method used on glass slides has been developed by Ph.D. student Mike Floren and Dr. Wei Tan, from the University of Colorado-Boulder. This advancement allows for further research of interactions between cells and proteins, referred to as co-culture studies. The scope of this project includes developing a device in which a co-culture environment, simulating the physiological flow in a human body, to allow for testing. The following is the design for the co-culture environment; a slide with the printed proteins will be secured in a chamber, a membrane to simulate tissue will be secured to the slide, and the chamber will allow flow of a median. The flow system is designed in SolidWorks, converted to CAM (Computer Aided Manufacture) software, and fabricated using a CNC (Computer Numerical Control) machine. The SolidWorks model for the system will be subjected to CFD (Computational Fluid Dynamics) analysis to ensure that flow is laminar over the co-culture environment. Preliminary calculations ensuring laminar flow across the device, appropriate pressure differential (Bernoulli's estimation), ideal flow rates, Reynold's numbers, and entry lengths based on given varying physiological shear stresses.

Presenter(s)-Major: **Kelly Bryant - Chemistry**
Title: BEER BREWING KINETICS: RATES OF THERMAL DECOMPOSITION OF ISO-ALPHA ACIDS
Department: Physical & Environmental Sciences
Sponsor: Tim D'Andrea

Abstract: Humulones, cohumulones, and adhumulones are alpha acids found in the hop flower, which is used widely during the beer brewing process. These alpha acids isomerize into iso-alpha acids during the brewing process. Iso-alpha acids are extremely important compounds found in beer, as they contribute the large majority of hop bitterness to the finished product. Over time, however, degradation of iso-alpha acids occur due to light exposure and temperature, causing the flavor profile of beer to drastically change. In this research, rates of thermal degradation were studied for standard samples of iso-alpha acids at different temperatures via high-performance liquid chromatography (HPLC). In addition, the activation energy of this reaction was

measured. The generation of reliable rate constants with varying temperature is important to gain a superior understanding of the shelf life of beer, which will benefit breweries and beer enthusiasts alike.

Presenter(s)-Major: **Elliot Buchanan - Pre-Engineering, Hayden Haveman - Pre-Engineering, Luke Pagni - Pre-Engineering, Ryan Zinke - Pre-Engineering**
Title: OPEN FACE TRANSMISSION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: While gears are hardly ever seen, they are vitally important in the modern world. Gears are the backbone that enable almost every wheel to spin. The focus of this project is to explain how the scientific concept of gear reduction can be used to efficiently achieve various output speeds. By varying gear ratios, an input speed can be drastically altered to reach a more desirable output speed. A spinning gear meshed with a gear half its size will produce double the output speed; likewise, a spinning gear meshed with a gear double its size will produce half the output speed. This project will be a self contained, portable, and user interactive scaled-down model of a simple two-speed manual transmission. The display will have physical and numerical output data. The input speed will be determined by the user, and the output speed, which will be varied by the user when shifting to a different gear ratio, will be significantly different. This will accurately demonstrate how a transmission in a car works.

Presenter(s)-Major: **Christopher Buck - Mechanical Engineering Technology, Ryan Kawano - Mechanical Engineering Technology, Thomas Nielson - Mechanical Engineering Technology**
Title: WOOD STABILIZATION IN A HIGH-PRESSURE VESSEL
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Brett Hensley

Abstract: The goal of this project was to improve upon previous work by determining the optimal method for stabilizing different wood species. The physical properties and natural appeal of wood can be improved through stabilization. By designing, building, and testing a high-pressure vessel, methacrylate esters (ME) can be forced into the voids in the microstructure of the wood. The ME hardens when heated to the right temperature, creating a solid wood-plastic composite (WPC). Black walnut and hard maple were tested with varied pressure levels, as well as varied times for which those pressures were held. The optimal stabilization method was determined by following standard procedures for measuring changes in water absorption, density, and hardness. These properties are commonly assessed to quantify a stabilization process. Pressures ranging from 1000 psig to 3000 psig were utilized to determine if higher pressures further improved the stabilization process.

Presenter(s)-Major: **Krista Bullock - Nursing-AAS, Annette Coggins - Nursing-AAS, Leslie Fink - Nursing-AAS, Andrea Goble - Nursing-AAS**
Title: CUPPING THERAPY
Department: Health Sciences
Sponsor: Genell Stites

Abstract: With prescription opiate addiction being one of the biggest problems today, a group of students researched the effects of cupping therapy to treat pain. A majority of people will develop serious pain in their lifetime. Conventional pain management involves treatment of pain with opiates, which has led to an increase in opiate addiction, including heroin use, among college-aged adults. There has been an increase in opiate dependence and overdose in college-aged adults and therefore an alternate pain management is needed. Cupping therapy has been around for over two-thousand years and used to treat multiple health conditions, including pain. Cupping involves applying a heated cup to the skin, generating a partial vacuum that mobilizes blood flow and promotes healing. This research shows the use of cupping therapy and other alternative pain therapies will reduce the use of opiate pain medication for pain relief.

Presenter(s)-Major: **Katherina Burkett - Biological Sciences-Biology**
Title: TESTING THE SENSITIVITY OF *PHYTOPTHORA INFESTANS* TO SUCROSE MONOLAURATE VIA DISC AND AGAR DIFFUSION METHODS
Department: Biological Sciences
Sponsor: Margot Becktell

Abstract: *Phytopthora infestans*, the causal agent of the disease known as late blight, is a pathogen of potatoes, tomatoes and petunias and is recognized for its role in the Irish Potato Famine. Observations in our lab have shown that extracts from petunia leaves have a lytic effect on *P. infestans* zoospores, and biochemical analyses of our extracts suggest that sucrose esters (SEs) may be the source of this lytic activity. Furthermore, a commercially available SE, sucrose monolaurate (SM), also causes a similar level

of zoospore lysis. While the zoosporicidal activity of SM has been confirmed in our lab, the inhibitory effects of SM on the growth of *P. infestans* in vitro have not been tested. The purification of putative SEs from petunia extracts is still in progress, therefore, SM was used to obtain baseline data on the potential for SEs to inhibit growth of *P. infestans* on culture plates. To carry out our tests, a US-24 isolate of *P. infestans* was exposed to various levels of SM using disc and agar diffusion methods. These experiments are ongoing and the final results will be presented. This research will provide insight into the inhibitory capabilities of SM on *P. infestans* beyond zoospore lysis.

Presenter(s)-Major: **Nikole Burns - Nursing-BSN, Maren Cherveny - Nursing-BSN, Mecia Pitton - Nursing-BSN, Amber Sigler - Nursing-BSN**
Title: THE INCLUSION OF COMPLEMENTARY AND ALTERNATIVE MEDICINE EDUCATION IN UNDERGRADUATE NURSING EDUCATION AS REFLECTED IN NURSING INTERVENTIONS
Department: Health Sciences
Sponsor: Stacie Schreiner

Abstract: The researchers have identified a gap in current knowledge concerning the status of Bachelor of Science in Nursing (BSN) education related to Complementary and Alternative Medicine (CAM) therapy and utilization of CAM based nursing interventions. The purpose of this research is to determine if nursing students who complete a comprehensive and foundational course of study in CAM therapies utilize CAM therapies in their interventions more than BSN students who do not receive a comprehensive and foundational course in CAM. The research is a comparative, non-experimental, descriptive design that will be conducted using a survey created by the researchers. The survey questions will determine the level of CAM education, exposure, instruction, and utilization by practicing BSN educated nurses. BSN nurses are the selected population owing to the fact the education process undertaken to obtain their degree begins with no prior knowledge related to CAM; other degree programs may ultimately have different CAM course requirements. The sample size proposed is a minimum of 50 survey respondents; more responses will increase the validity of the results.

Presenter(s)-Major: **Kayleigh Busse - Liberal Arts-Elementary Teaching**
Title: CULTURALLY DIVERSE CLASSROOM COMMUNITY
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: Positively engaging each individual student within the classroom creates a community-building atmosphere. Establishing a community creates an environment in which students are willing to participate. Research shows that promoting meaningful communication and language across the curriculum has benefits for all students, particularly English Language Learners. Culturally diverse students have unique perspectives, and incorporating community-building activities provides opportunities for all students to become knowledgeable of these new perspectives. Research suggests effective accommodation techniques for students who are English Language Learners in reading, writing, oral language, vocabulary, content-domain literacies, and other skills areas. Other content areas need the incorporation of accommodation strategies as well. Each student has a right to a quality education and accommodations for students who are English Language Learners will benefit their overall learning in the classroom.

Presenter(s)-Major: **Aspen Campbell - Nursing-BSN, Amanda Lloyd - Nursing-BSN, Allison McNulty - Nursing-BSN**
Title: A MINDFULNESS-BASED STRESS REDUCTION POLICY FOR HOSPITAL NURSES
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: The work a nurse performs is personal and reflects the passion and commitment given every day. Over time, this passion can lead to fatigue and even burnout due to the emotional, mental, and physical stresses experienced. A common result of burnout is a decrease in job satisfaction, which leads to a higher turnover rate of nurses in medical facilities. Jon Kabat-Zin developed the Mindfulness Based Stress Reduction (MBSR) program to foster self-compassion, awareness, and stress reduction. Many studies have been conducted using models of MBSR to research the effects of mindfulness on nursing. A review of 15 professional journal articles was conducted. These journal articles discussed research studies and peer reviews of previously published literature on nursing stress factors, the consequences of stress for the nurse, and the outcomes of MBSR methods. This paper presents evidence that the use of MBSR training improves levels of stress and job satisfaction in nurses. Therefore, the authors propose the initiation of a hospital policy for a Mindfulness Based Stress Reduction program for nurses.

Presenter(s)-Major: **Kelsey Cantwell - English-Writing**
Title: DOCTRINE OF A MAN THINKING
Department: Languages, Literature & Mass Communication
Sponsor: T.J. Gerlach

Abstract: Not only is Ralph Waldo Emerson renowned for the superior quality of his lectures but also for the strength in the Transcendentalist ideology that he preached throughout his essays. As a major proponent of thinking for oneself, Emerson used his essay "The American Scholar" to instruct a group of [male] students in Cambridge, Massachusetts. During his presentation, he addressed the importance of understanding the role of a "scholar" in everyday life. In the analytical essay written in the form of a narrative, the presenter will discuss Emerson's principles that he describes as being the foundation of a "Man Thinking,"or a man who thinks for themselves while rejecting common societal conventions. By providing the audience with specific examples from the text that depict the importance put on human and environmental nature as well as the written word in the style of prose, the presentation will attempt to exemplify Emerson's goal of singular originality in one's work.

Presenter(s)-Major: **Diana Carey - Nursing-AAS, Sarah King - Nursing-AAS, Aspasia Linn - Nursing-AAS, Adrian Sandoval - Nursing-AAS**
Title: TREATMENT AND PREVENTION OF LOWER BACK PAIN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: The majority of people believe when low back pain is present, medication or other device will help alleviate the symptoms. However, new research is showing that increased physical activity can prevent or even reduce back pain reoccurence. Back pain affects millions of people around the world, and in America the health industry spends billions of dollars each year on treatments. Any form of exercise can be beneficial, from core strengthening and walking, to aerobics. The main conclusion from the research proves back pain treatment can be as simple as getting up and moving around.

Presenter(s)-Major: **Bryan Carlson - Theatre Arts-Acting/Directing**
Title: SONNET 29 IN TWO
Department: Theatre Arts
Sponsor: Mo LaMee

Abstract: For the student showcase, I will be presenting two versions of Sonnet 29 by William Shakespeare. Version one will be speaking the sonnet in verse, while the second version will be sung. Speaking in verse and singing are much the same in that they sound beautiful, but they are also meant to tell a story. No matter how beautiful the words, if the actor cannot communicate the story, the meaning is lost, and the actor becomes a performer. For an actor, the story is paramount. I haven't considered myself to be an actor up until 2 years ago. I was more focused on simply singing the song, dancing the dance, and saying the lines. But I began to find more depth to my profession. I decided to tackle this piece because it marks two of the most challenging acting mediums, verse and song. These were also mediums that I thought that I did extremely well, until I learned how much deeper my education could go. In song, it's sometimes hard to remember that you're telling a story or advancing a plot; you remember that high G that's coming your way and panic. While in verse, passing the language along to the audience can be the greatest challenge. I want to pursue two of the most challenging, for me, aspects of my acting career.

Presenter(s)-Major: **Dusty Carlson - Physics**
Title: ATOMIC BOMB BLAST WAVES
Department: Physical & Environmental Sciences
Sponsor: Jared Workman

Abstract: This project investigates the evolution of blast waves resulting from high energy explosions. Using the Sedov-Taylor blast wave solutions, the leading edge of an atomic bomb explosion can be represented as a function of the density of the medium the blast wave propagates in, the energy released, and the time after detonation. This can then be used to estimate the energy yield of various atomic bombs detonated throughout history. Then, using gas dynamics and the Rankine-Hugoniot shock jump conditions one can approximate the temperature, density, and pressure just inside the resulting shock wave. This study analyzes these solutions and the dynamics at different radii within the blast wave using analytic as well as numerical calculations in Python.

Presenter(s)-Major: **Edgar Carrasco - Pre-Engineering, Trey Lambrecht - Pre-Engineering, Jacob Pacheco - Pre-Engineering, Carolina Yamada - Pre-Engineering**
Title: DIGITAL WATER CURTAIN
Department: Computer Science, Mathematics & Statistics
Sponsor: Marc Fischer

Abstract: Visualize water falls that make images out of falling water. These may be images of water dolphins diving into a pool or geometric designs falling from the sky. The purpose of this project was to create a digital water curtain programmed to create

a visual representation of the famous Fibonacci spiral. This was achieved by programming an Arduino motherboard to control power to a series of electromagnet water valves controlling the flow of water, building an image in sheets. These electromagnet water valves are more commonly known as solenoid valves and are mostly present in irrigation system manifolds. Successful testing of this project would mean a successful script of code that in fact did control these electric valves to create the Fibonacci spiral and could lead to many more images.

Presenter(s)-Major: **Danielle Carrillo - Theatre Arts-Acting/Directing**
Title: MENTAL ILLNESS IN ARTISTIC PROFESSIONS
Department: Theatre Arts
Sponsor: Timothy Pinnow

Abstract: Because artistic professions often have a higher prevalence of mental illness (Ludwig), a higher prevalence of childhood trauma or abuse (Ludwig and Kaufman), and a higher prevalence of severe mental illness such as schizophrenia and bi-polar Disorder(Juda), mental illness may have an association with creativity and the creative process. Treatment centers should be more accessible to the public and there should be more resources within artist unions. There is a higher rate of suicide among artists because of mental illness and more mental health facilities should be available for artists.

Presenter(s)-Major: **Kristi Casias - Nursing-AAS, Cortney Ferganchick - Nursing-AAS, Jessica Harrell - Nursing-AAS, Jeannine Rubalcaba - Nursing-AAS**
Title: BENEFITS OF IMPLEMENTING BAR-CODED MEDICATION ADMINISTRATION SYSTEMS IN HEALTHCARE FACILITIES
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Bar-coded Medication Administration (BCMA) is an inventory control system that uses bar-codes to prevent human errors in the distribution of prescription medications and automates the inefficient and error-prone paper-based MAR process. According to studies, medication errors cause at least one death every day and injure approximately 1.5 million people annually in the United States. The BCMA system is designed to aid the nurse in verifying the "five rights" of medication administration. BCMA ensures that the nurse is giving the right drug to the right patient, via the right route, in the right amount and at the right time. One medical center study showed that use of the BCMA system reduced non-timing medication errors by 41.4%. Timing errors in medication administration fell by 27.3%, and the potential adverse drug events (other than those associated with timing errors) fell 50.8%. Major conclusions gathered from studies show that implementation of BCMA in healthcare facilities increases patient safety, dramatically decreases medication errors, aids in verifying the "five rights" to medication administration, and allows real-time documentation of medication administration.

Presenter(s)-Major: **Erica Chamberlain - Nursing-AAS, Scout Nunes - Nursing-AAS, Jacie Temple - Nursing-AAS, Kathy Unger - Nursing-AAS**
Title: THE PROBLEMS WITH PATIENT IDENTIFICATION
Department: Health Sciences
Sponsor: Genell Stites

Abstract: This research focuses on patient identification in the elderly, especially those in long term care facilities. Through research and lived experiences by nurses the need for accurate identification becomes harder to achieve when dementia and other dementia like disease processes cross paths with the increased risk of faulty skin integrity. When dealing in medication administration patient identification is the first and most important lesson taught. As you will see though this presentation patient identification needs to be moved to the top priority in care facilities per the risk factors associated to the patients.

Presenter(s)-Major: **Mitchel Chavez - Pre-Engineering, IvAnn Garcia Dickerson - Pre-Engineering, Nathaniel Glennon - Mechanical Engineering, Steve Tomlinson - Mechanical Engineering Technology**
Title: KINETIC ENERGY CONVERTER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Andy Affrunti

Abstract: Hikers exert energy that is often wasted. The amount of energy lost has potential to be captured and to be used for electricity. The goal of the project was to create a device that harnesses kinetic energy created by human movement. The energy could then be stored and reused as electrical energy to power smaller electric devices like cell phones, cameras, and GPS devices. The project showed that kinetic energy is a viable method of capturing energy through the use of magnetic fields, which can then be stored and used as electrical energy. The device captured energy created by movement that could be used to charge electrical devices.

Presenter(s)-Major: **Kevin Chlopek - Computer Science, Robert Fenske - Computer Science, Alexander Martinez - Computer Science**
Title: VIRTUAL LAB LIBRARY
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: This project is a computer server that contains a series of virtual machines (VM's) that are accessible to any computer on the same network. In computer science, students are required to familiarize themselves with a variety of operating systems. To ease the cost of the hardware, students have resorted to using virtual machines, which are essentially an operating system (OS) environment installed on software meant to imitate dedicated hardware. Students have been installing these VM's onto their personal computers to be able to participate in a variety of classes without spending large of money for a brand new machine. However, these VM's take up large amounts of memory and slow down the host computer when running. A VM Library on a server would allow students to use a variety of operating systems without partitioning out large amounts of memory on their own personal computers (PC's) to run them.

Presenter(s)-Major: **Shane Christensen - Manufacturing Technology-Machining Technology, John Palmer - Manufacturing Technology-Machining Technology, Rylan Piper - Manufacturing Technology-Machining Technology**
Title: CUSTOM FABRICATED LIGHTSABERS
Department: Western Colorado Community College
Sponsor: Bill McCracken

Abstract: Anyone born after 1976 knows the iconic glow of a lightsaber. This sci-fi weapon has captured the interest of many, and is the central focus of our endeavor. This project will consist of four high quality lightsabers created from the ground up to the highest standards of durability and aesthetics. Hours of research, design and wiring sketches, Solidworks files, and 3D printing are all steps leading to the actual CNC and manual manufacturing of the products. The 3D printer plays another part in the chassis fabrication for two of these lightsabers just prior to assembly and electronics setups. Properly constructed, they will display movie-like realism while proving that quality lightsabers are a possibility at many different budgets. Light, sound, and vibration feedback allow for a truly immersive dueling experience – one that any fan dreams of. The recent release of *Star Wars: The Force Awakens* has only furthered the interest in these futuristic weapons, and the need for a better lightsaber has never been more prominent. Through this project, a business model, Vaapad Customs, has been created that promotes lightsabers fabricated with care to customer design.

Presenter(s)-Major: **Dane Clark - Process Systems Technology, Benjamin Hansen - Electronics Technician, Gavin Marshall - Process Systems Technology, Gerardo Martinez - Process Systems Technology**
Title: FILAMENT EXTRUDER
Department: Western Colorado Community College
Sponsor: Martin Chazen

Abstract: The purpose of this project is to extrude recycle High-Density Polyethylene #2(HDPE), in order to cut down on plastic waste and to be able to recycle 3d Plastic Filament or other plastic materials. The process will be monitored and controlled with a Programmable Logic Controller (PLC).

Presenter(s)-Major: **Stacy Clark - Nursing-BSN, Emilia Ludwig - Nursing-BSN, R Jeremy Weiner - Nursing-BSN, Tatti West - Nursing-BSN**
Title: FECAL MATTERS
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: An overwhelming percentage of the patient population receiving treatment regimens that involve antibiotics are developing serious healthcare associated infections (HAIs) caused by Clostridium difficile (C. difficile). According to Varier et al. (2015), after successful treatment of the initial infection, 30-65% of those patients returned to the hospital again with a relapse of recurrent C. difficile infection (RCDI). This paper evaluates twenty journal articles that have researched the effectiveness of fecal microbiota transplantation (FMT) to treat RCDI. FMT attempts to restore normal intestinal flora. A potential risk of FMT can be the potential transmission of an infectious disease from the fecal donor. Other complications vary based upon the administration technique, such as increased risk of bowel perforation with colonoscopy and risk of aspiration from administration with a nasogastric (NG) tube. As research continues, FMT is unveiling a credulous link between altered intestinal microbiota and gastrointestinal disease states, such as RCDI (Lee et al., 2015). The purpose of this study is to conduct evidence-based research on the efficacy and safety of FMT as a treatment method for RCDI and to propose that the current standard of care be replaced to improve patient outcomes.

Presenter(s)-Major: **Chase Clayton - Pre-Engineering, Mallory Coats - Pre-Engineering, Noah Jackson - Pre-Engineering, Austin Shepherd - Pre-Engineering**
Title: ELECTROMAGNETIC LEVITATION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Jody Kliska

Abstract: The team's display is intended to demonstrate Lenz's Law of understanding how electromagnetic circuits follow Newton's Third Law and the conservation of energy. Lenz's Law states "If an induced current flows, its direction is always such that it will oppose the change it produced." The team built an electromagnetic levitation display. They showed this by creating electromagnets that oppose one another so that an object can be suspended due to the opposite polarity caused by a current flow such as a battery. The device has two magnets that make a piece of metal float between them. The team tested different strength inputs to the magnets, and different materials used to levitate. The results achieved were that magnets with opposite polarity can suspend objects. This is important because in the future trains, for example, can use magnetic levitation to travel.

Presenter(s)-Major: **Cody Cline - Theatre Arts-Acting/Directing**
Title: NO KID LEFT BEHIND
Department: Theatre Arts
Sponsor: Mo LaMee

Abstract: As an actor, one must excel at different ways of thinking and performing. Each character the audience will see is not a stereotype. They are a human being with different thoughts and emotions. My "About Me" will be a stand-up comedy piece about how I react to school and why I think theatre helped me go on.

Presenter(s)-Major: **Cody Cline - Theatre Arts-Acting/Directing, Hannah Fisher - Theatre Arts-Acting/Directing**
Title: AMELIORATION: THE ACT OF MAKING SOMETHING BETTER
Department: Theatre Arts
Sponsor: Mo LaMee

Abstract: With movies becoming more technical, theatre is slowly losing its audiences. But no movie, no matter how magical, is as impactful as a live performance. Nothing can captivate the senses quite like a live show; both parties must be willing to lose themselves to the world of the play. They must trust each other through the journey the show takes them on, and in the end they must accept whatever fate awaits them. Most importantly, they must want to leave the theatre feeling ameliorated.

Presenter(s)-Major: **Drew Collins - Computer Science, Luke Schaefer - Computer Science, Michael Sweeney - Computer Science**
Title: MODERN WEB APPLICATION FOR RESERVATION AND INVENTORY TRACKING
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: For a business that rents equipment to the public, managing reservations can be a headache. Overlapping reservations, over-booking certain items, and ensuring that reservations are correctly held creates a logistical mess. The Colorado Mesa University Outdoor Program manages equipment rentals and reservations for the student body and general public. This project will demonstrate the use of a web-based solution to the reservation management problem experienced by the CMU Outdoor Program. The presenters will demonstrate how an online reservation solution using modern web technologies such as MySQL, PHP, HTML5, CSS, JS and Mustache can be used to solve a real-world problem of organization and planning.

Presenter(s)-Major: **Fred Cook - Environmental Science & Technology**
Title: DELINEATION OF SOILS WITH HIGH SELENIUM LEACHING POTENTIAL IN THE GRAND VALLEY IRRIGATION DISTRICT
Department: Physical & Environmental Sciences
Sponsor: Verner Johnson

Abstract: Farmers in the Grand Valley have been irrigating crops with Colorado River water for over a century. The Grand Valley Canal was completed prior to 1910, and the Government Highline Canal was completed in 1917. In the 1980s scientists at the Kesterson National Wildlife Refuge in the San Joaquin Valley, California, discovered that selenium, leached from local soils, was causing death and deformities in fish and wildlife. Many of the soils in the Grand Valley are derived from Mancos Shale, which has been identified as a primary source of selenium. Several government projects have studied the selenium problem and funded remediation efforts. The Grand Valley Salinity Control Project, in operation from 1979 to 2012, made great strides in the reduction of selenium and other salts loaded to the Colorado River by improving irrigation systems. The Project's improvements

reduce the transport of salts from Grand Valley soils to the Colorado River by more than 140,000 tons annually. However, selenium loading remains an important issue and irrigation is still the primary source of selenium loading. This project is designed to locate potential problem areas for future study and remediation.

Presenter(s)-Major: **John Cools - Nursing-AAS, Jennifer Hanel - Nursing-AAS, Gregory Johnson - Nursing-AAS, Terry Steele - Nursing-AAS**
Title: HYPERTHERMIA PREVENTION AND TREATMENT
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Hyperthermia, more commonly known as heat stroke, is a major concern for people of all ages. In this area, summer temperatures can reach over 100° F, which adds to the potential for hyperthermia. Hyperthermia can cause life-long issues and is life-threatening. The team will present some evidence-based strategies for prevention of hyperthermia, signs of hyperthermia and what to do if signs of hyperthermia are noticed.

Presenter(s)-Major: **Ashleigh Cooper - Hospitality Management, Cara Hampton - Business Administration-Marketing, Corinne Williams - Business Administration-Management**
Title: RESORT CONCEPT WITH A SALES MARKETING PLAN
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of three students designed a resort concept with a sales and marketing plan for their HMGT 450 class. The recreational resort concept will meet the need for tourism in the Aspen, CO area. The background information to understand this is that as a group, we study three other resorts to learn and understand all functions of a resort similar to how our Aspen Grove Resort will be run. Our research includes internet, mailed brochures, telephone conversations, and interviews of hotel owners and operators. This research will be demonstrated with a PowerPoint and detailed information explaining the resort concept, resort offering, and sales and marketing plan. The intended audience for this project is potential investors. Students will be able to use skills and abilities learned during this process to help further themselves in future opportunities in their careers.

Presenter(s)-Major: **Yareth Corral - Nursing-BSN, Emily Jio - Nursing-BSN, Kailey Kaiser - Nursing-BSN**
Title: PREOPERATIVE MEDICATION AND ANESTHESIA AWARENESS
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: Accidental awareness under general anesthesia (AAGA) is a phenomenon that occurs when patients become aware during an operation while under general anesthesia. AAGA can have psychological consequences for the patient and lead to legal action taken against the hospital, anesthesiologist, or anesthetist. The objective of this evidence-based research is to compare the effects of administering an amnesic medication pre-operatively versus not administering an amnesic medication pre-operatively in order to reduce the incidence of AAGA. When used prior to surgery, medications such as benzodiazepines and dexmedetomidine are used for their amnesic and anxiolytic properties. Studies have shown successful reduction in incidences of AAGA due to their amnesic mechanism of action.

Presenter(s)-Major: **Rob Courtney - Sport Management, Carolyn Erickson - Business Administration-Finance, Brandon Hoff - Business Administration-Finance, Corey Jimerson - Business Administration-Finance, Daniel Mott - Accounting-Public Accounting**
Title: COMMERCIAL BANKING FINANCIAL STRATEGIES
Department: Business
Sponsor: Morgan Bridge

Abstract: A group of five students selected and researched key competitors within the commercial banking industry. The focus of this study is to compare and contrast financial strategies across the industry.

Presenter(s)-Major: **Tiana Couse - Criminal Justice**
Title: RELIGIOUS BELONGING AND CONFIDENCE IN SOCIAL AND POLITICAL INSTITUTIONS IN THE UNITED STATES
Department: Social & Behavioral Sciences
Sponsor: Isabella Kasselstrand

Abstract: The First Amendment to the United States constitution addresses freedom of religion and the separation of church and state: "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." However, previous literature has found that the historical influence of Christianity in laws, policies, and political representation

have left individuals of other religious faiths and no faith feeling excluded (Edgell et al. 2006). The dominance of Christianity in government can, for example, be seen in politics today, with almost all representatives claiming a Christian faith (Gonzalez 2012; Lunceford 2012). This begs the question: Is there a relationship between religious affiliation and confidence and trust in various aspects of the government (e.g. confidence in the executive branch of the government, the U.S. Supreme Court, the military, Congress, and the educational system, and trust in politicians)? If so, how much of this relationship can be credited to political identity, race, gender, age, income, level of education, and general trust? This question is examined through cross-tabulations and multivariate regressions using data from the General Social Survey from 2014. The findings may offer a partial explanation for the continuous decline of Americans' confidence in political institutions (Abrajano and Alvarez 2010; Chanley 2002; Dalton 2005; Rudolph and Evans 2005). Such a decline is ultimately detrimental to social cohesion, a functioning democracy, and the efficiency of government.

Presenter(s)-Major: **Emily Crine - Theatre Arts-Music Theatre**
Title: BROADWAY AND THE FUTURE BUSINESS OF MUSICAL THEATRE
Department: Theatre Arts
Sponsor: Jeremy Franklin

Abstract: The future continuation of the Broadway musical is entirely reliant on the business' ability to adapt to the modern audience's needs. The fields of representation on the Broadway stage are greatly expanding. Accordingly, it is necessary that this portrayal of larger demographics on-stage continues to widen audiences and thus increase the financial and historical success of mainstream musical theatre. Musicals such as *Fun Home* and *Hamilton* are the leading candidates for such modern-day representation. They are essential not only in introducing younger audiences to musical theatre, but also in educating long-time theatre-goers to the changing ways of the business and society as a whole. The purpose of this presentation is to reflect on Broadway's current impact on the general public, increase its historical significance, and to anticipate what may happen in Broadway's future. Additionally, the presentation will emphasize the necessity for more progressive subject matter and portrayal of culture in highly-commercialized stage musicals.

Presenter(s)-Major: **Cassidy Crippen - Liberal Arts-Elementary Teaching**
Title: EMPOWERING STUDENTS WITH ADD AND ADHD
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: This presentation will demonstrate various approaches of working with students that have been diagnosed with ADD or ADHD. The main methods I will be explaining will be yoga, deep breathing and teaching basic skills such as self-management and basic listening skills. There will be a short video to be shown during my presentation, called "Beyond the ADD Myth" to correlate with the message of my presentation. From this research, it has been shown that there are many alternatives to achieve optimal engagement between the teacher and the students in the classroom that prove to be more beneficial than medication given to young students with ADD and ADHD.

Presenter(s)-Major: **West Crouch - Environmental Science & Technology, Francisco Hernandez - Environmental Science & Technology, Jesie Hladik - Environmental Science & Technology, Christina Schulte - Environmental Science & Technology**
Title: ANALYSIS OF HEAVY METALS FROM ACID ROCK/MINE DRAINAGE IN RED MOUNTAIN CREEK NEAR OURAY, CO
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: In the 1900s, Red Mountain Pass near Ouray was home to the most productive silver and gold mines in the state of Colorado. Since then, all of these mines have been abandoned with no clean-up or remediation due to the General Mining Act of 1872. Currently these abandoned mines act as a conduit for water to flow through, collecting heavy metals and forming acid mine drainage. The geochemistry of this area has the same effect through acid rock drainage. Our goal for this study is to evaluate the concentrations of heavy metals in tributaries leading into Red Mountain Creek, and recommend how mitigation of acid mine/rock drainage can proceed. Several water samples will be collected along Red Mountain Creek and its tributaries. These water samples will be analyzed to record the amount of total dissolved metals, total metals, and pH.

Presenter(s)-Major: **Jessica Cruz - Nursing-AAS, Karen Keyes - Nursing-AAS, Mary Reuss - Nursing-AAS**
Title: OLD MEDICINE FOR A NEW AGE
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Cancer is a debilitating disease but the treatment can be even more debilitating. Western medicine offers many ways to combat side effects of chemotherapy and radiation. What if there was more to offer than just another pill? We will explore

the use of Complementary and Alternative Medicine (CAM) in conjunction with modern medicine to ease the side effects that cancer patients experience. While western medicines provides relief from common side effects from cancer treatment, many times these additional treatments cause their own negative and undesirable side effects. CAM therapies offer many different approaches to common maladies, which are often less invasive as well as less expensive. Often these alternative therapies are without side effects and in many cases have lasting and beneficial outcomes. We will impress the need to implement CAM therapies in not only cancer treatment but into everyday life.

Presenter(s)-Major: **Melissa Cunningham - Hospitality Management, Madison Harmes - Business Administration, Marta Kudasik - Business Administration, Cheyenne Sanchez - Business Administration**
Title: RESORT CONCEPT, SALES, AND MARKETING PLAN
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of four students, majoring in hospitality, have designed and organized an idea for a resort and created its marketing plan. The project allowed the groups to create any type of resort in any area in the Western United States using an unlimited budget. The main point of this project is to emphasize the key topics learned in the classroom and use these tools to develop the sales and marketing plan. The development of this resort, sales and marketing plan includes the full concepts, amenities, size, location, target market, and layout design. This project also includes the full organization of the resort's operations and management sections. All of this is organized into six phases: Resort Concepts, Resort Offerings, Space Design, Human Resource Management, Operations Management, and Sales and Marketing Plan. This group's specific resort plans for an underground cavern resort located in Aspen, Colorado. This resort is being designed to be a sophisticated, high class, and adventurous themed resort that will cater specifically to families and couples with established incomes and a desire for a unique resort experience.

Presenter(s)-Major: **Mark D'Ambrosio - Music-Performance**
Title: SONG OF SINGING STEEL
Department: Music
Sponsor: Darin Kamstra

Abstract: *Song of Singing Steel* is an original composition and my debut into composing for percussion ensembles. *Song of Singing Steel* is written in three movements for an ensemble of seven percussionists and a Hang player. The Hang is a Swiss percussion instrument not more than twenty years old, and is one of the rarest instruments in the world today. For this reason, no notated music has ever been written for it. This piece was my attempt to highlight the beauty of the Hang while introducing it into the world of written percussion music.

Presenter(s)-Major: **Juanita Davidson - Business Administration-Marketing-Finance, Enrique Escobar - Business Administration-Finance, Carissa Loper - Business Administration-Finance, Anna McGinnis - Business Administration-Finance, Jorge Pantoja - Accounting-Public Accounting**
Title: THE TRENDY TRILLION DOLLAR INDUSTRY
Department: Business
Sponsor: Morgan Bridge

Abstract: The objective of this collaborative presentation is to conduct an analysis of the top company leaders in the high-fashion design industry. The purpose is to provide a thorough understanding of how the top companies in their industry maintain and maximize market share, minimize risks, and create above-average value and returns for their shareholders within a competitive market. Secondary research data will be used to help assess the criteria and components of the industry as well as conducting an analysis of the internal financial and annual reports in order to understand strategy specific to each company's leverage, financial operations, and competitive advantage.

Presenter(s)-Major: **Deseray Davis - Biological Sciences-Biology**
Title: HAPLOTYPE DIVERSITY AND GENETIC DIFFERENTIATION AMONG FOUR POPULATIONS OF SEA WORMS ALONG THE NORTHERN PACIFIC COAST OF THE UNITED STATES
Department: Biological Sciences
Sponsor: Aparna Palmer

Abstract: Because sea worms (polychaetes) are so abundant in coastal habitats worldwide and because they profoundly influence the physical and biological processes in those areas, they are excellent model organisms for studying the evolution of coastal marine animals. The goal of this study was to determine the amount of genetic differentiation that exists among several populations of the polychaete species, *Naineris quadricuspida*. Fifty-two sea worms were collected from four locations off of the coasts of Washington and Oregon. To test the hypothesis that there is no difference among the four populations genetically, 16S

ribosomal DNA sequences from the collected specimens were used to analyze haplotype diversity and measure the levels of genetic differentiation. This study is important because it can contribute to a more complete understanding of how evolution may occur in marine environments.

Presenter(s)-Major: **Ethan Davis - Pre-Engineering, Dylan Hallett - Pre-Engineering, Garrett Jensen - Mechanical Engineering Technology, Javier Romero Hernandez - Liberal Arts-Mathematics**
Title: WALL MOUNTED PSYCHROMETER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Nathan McNeill

Abstract: The air we breathe can have many effects on not only ourselves but the environment around us. Knowing humidity levels are an important fact to account for when building projects or from day to day living. The purpose of this project is to make an indoor psychrometer focused around stability, minimal mobility, and non-reliance of digital technology—basically making a wall-mounted version of a sling psychrometer. The better known sling psychrometer was made in order to calculate relative humidity of the atmosphere, yet obtaining a reading from such a device in an indoor setting might be dangerous as swinging a glass thermometer could lead it to break. Simplicity is key, as calibrating an analog tool and eliminating digital input will eliminate variable changes that may facilitate user experience, but will ultimately leave less variable changes to be calculated. A motor-powered fan was used to optimize airflow in our project. Therefore, the designer's finished product was completed following the previously stated parameters and made humidity reading an easier task indoors.

Presenter(s)-Major: **Kori Davis - Nursing-BSN, Sierra Geroux - Nursing-BSN, Kendra Wildenberg - Nursing-BSN**
Title: PAIN MANAGEMENT POST CAESAREAN BIRTH
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: This evidence-based proposal explores articles and studies on pain management techniques for women post-caesarean section, including the Patient Controlled Analgesia (PCA) pump and Transcutaneous Electrical Nerve Stimulation (TENS) unit. Inflammatory reactions that occur after the traumatic process of a caesarean section result in continuous and serious pain. A literature review revealed the preferential treatment by some sources were PCA pumps while other sources preferred the TENS unit in conjunction with other pain management modalities. The risks and benefits for the recovering mother within the first 24 hours after delivery are described in this proposal. The mother's opinions regarding pain management are also explored.

Presenter(s)-Major: **Peter Davis - Accounting, Haley Turley - Accounting-Public Accounting**
Title: ECONOMIC IMPACT REPORT OF HUNGER IN MESA COUNTY
Department: Business
Sponsor: Nathan Perry

Abstract: This study calculates the economic costs of hunger in Mesa County, Colorado. The methodology used focuses on three primary categories: the economic loss due to hunger for hunger-related charity, illness and psychosocial dysfunction, and impaired education and lower productivity. The study outlines potential causes of hunger in Mesa County and assesses the economic benefit of public intervention to prevent hunger.

Presenter(s)-Major: **Jennifer Dennison-Jones - Pre-Engineering, Chad Merrick - Mechanical Engineering, Daniel Quin - Pre-Engineering, Alec Rose - Pre-Engineering**
Title: MAGNETIC LEVITATION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: Many individuals fantasize about owning a hoverboard, and most believe that they are completely fictional because the technology does not yet exist. However, levitation can be achieved in many ways. One way is by the use of magnetism. Magnetism is an invisible force that is caused by small currents of moving electrons that repel and attract one another. The resulting fields can create strong repulsive forces, which can be used for levitation. This project demonstrated the feasibility of levitation by using magnetic forces of the same polarity to raise a "hoverboard" a short distance from a table surface. The project's hoverboard used neodymium magnets arranged in a way to provide levitation for a small-scale skate board, known as a tech-deck. The resulting model demonstrates the possibilities of magnetic levitation on a much larger scale.

Presenter(s)-Major: **Miranda DePriest - Biological Sciences-Biology**
Title: FUNCTIONAL DIVERGENCE OF LUCIFERASE PARALOGS IN *PHOTURIS PENNSYLVANICA*
Department: Biological Sciences
Sponsor: Matthew Stansbury

Abstract: Luciferase is the gene family responsible for bioluminescence in *P. pennsylvanica*. There are multiple copies of luciferase, as well as two types of bioluminescence: a continuous basal body glow, and discrete, bright flashes emitted from the photic organ. Previous transcriptome expression data established that luciferase 1 (luc1) mRNA was found in the photic organ segments while luciferase 2 (luc2) was transcribed throughout all body segments. We sought to investigate whether the luciferase paralogs were responsible for the different types of bioluminescence. The expectation was that luc1 was responsible for the photic organ flashes and that luc2 was responsible for the basal body glow. RNAi was used to selectively knock down the functions of luciferase paralogs luc1 or luc2. Larvae were injected with dsRNA of either luc1, luc2, both luc1 and luc2, or neither. The phenotypes of the resultant pupae were analyzed by measuring pixel intensity of standardized photographs. Of the seven pupae that were able to be recorded, all followed the expected pattern. The results imply that luc1 may be primarily responsible for the photic organ flashes and luc2 may be responsible for the continuous basal body glow found throughout the body of adult *Photuris*.

Presenter(s)-Major: **Kaitlin Dillon - Environmental Science & Technology, Adriana Garcia - Environmental Science & Technology, Kira Rogowski - Environmental Science & Technology, Morgan Walker - Environmental Science & Technology**
Title: BURROWING OWL NESTING TERRITORY FIDELITY FOLLOWING PIPELINE CONSTRUCTION AND DISTURBANCE IN EASTERN UTAH AND WESTERN COLORADO
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: The Western Burrowing Owl, Athene cunicularia-hypugaea, is listed as threatened in Colorado and as a Species of Concern in Utah. Despite this classification, there are no existing penalties in Colorado for Burrowing Owl habitat destruction, only for direct mortality. Additionally, there are no current conservation programs for the Burrowing Owl in Utah. Furthermore, oil and gas pipeline construction has left Burrowing Owl territory disturbed, but it is unknown whether the Burrowing Owl maintains fidelity towards individual burrows or to overall territory. To assess this question, a study was conducted in eastern Utah and western Colorado following BLM protocol employing a call and response system in control and experimental (pipeline disturbed) territories at 10 sites. Additionally, ecological effects of pipeline construction and historical land uses of the territories were examined. These results will aid in further decisions on pipeline alignment and BLM management options.

Presenter(s)-Major: **Gavin Downey - Mechanical Engineering, Aaron Howell - Mechanical Engineering, Kristopher Jones - Mechanical Engineering**
Title: FORMULA SAE CHASSIS OPTIMIZATION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Kessler

Abstract: Mesa Motorsports, a division of the CMU Engineering Club, competed in their first Formula SAE (FSAE) competition in May of 2015. FSAE is an international collegiate student design series, organized by the Society of Automotive Engineers (SAE). Teams are tasked to design, build, test, and race a small formula style racecar that must comply with a strict set of rules outlined by SAE. The project objectives were to re-design, fabricate, optimize, and test Mesa Motorsport's FSAE chassis for the 2016 competitions. The primary goals of the project were to improve the previous chassis by reducing the weight by 20%, improving driver ergonomics, and increasing manufacturability and safety. Design and simulation was achieved utilizing a Solidworks 3D computer model. Multiple design iterations and finite element analysis were performed during the design process. The manufacturing processes were greatly improved by use of precision cutting methods and fabrication jigs. After fabrication was complete, physical strain and non-destructive tests were implemented in order to validate the design.

Presenter(s)-Major: **Stephanie Drake - Nursing-BSN, Alexa Johnson - Nursing-BSN, Crystal Morris - Nursing-BSN**
Title: IMPLEMENTING A HIGHER NURSE TO PATIENT RATIO
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: Patient quality of care has been positively impacted by raising the nurse to patient ratio. This research first began in California and has since motivated other states to follow. In January 2004, California passed a mandatory nurse to patient ratio specified for each unit. Studies conducted by the state have found that increasing nurse to patient ratios improves patient outcomes. This systematic review is to propose implementing a higher nurse to patient ratio to not only avoid adverse outcomes but to improve costs for the hospitals. The objective of this proposal is to make nurses more readily available to meet the needs

of patients by improving the quality and value of care they receive and avoiding job dissatisfaction and nurse burnout. Currently, there has been no success in passing a law regarding nurse staffing on a national level due to a disagreement about acuity versus mandated staffing. The design of this review is to look at hospitals with mandated staffing versus hospitals that do not have a policy in place. This is a systematic review of 15 articles discussing the pros and cons of implementing nurse to patient ratios.

Presenter(s)-Major: **Marie Dreher - Exercise Science, Alexis Evoniuk - Exercise Science, William Hawk - Exercise Science, Allie Morris - Exercise Science, Elizabeth Wood - Exercise Science**
Title: VERTICAL JUMP GROUND REACTION FORCES CHANGE WITH LOAD
Department: Kinesiology
Sponsor: Gerald Smith

Abstract: Dominant versus non-dominant tendencies can affect performance and increase the risk for injury. Bilateral discrepancies often exist and are related to jump characteristics. This project seeks to determine if ground reaction forces (GRFs) differ bilaterally during a countermovement jump and the effects of load on these differences. Four physically active college students were asked to perform a series of maximal effort countermovement jumps under various conditions: double-leg and single-leg without load and with additional loads of 10% and 20% of their bodyweight. Five jumps were performed per load for each jump type (45 total). The additional load was applied with equal weight distribution in a weighted vest. The peak GRF was measured with force plates and used to differentiate between dominant and non-dominant jump characteristics. Results were analyzed using T-Tests with a single-subject design. The dominant leg supplied the greater GRF than the non-dominant leg regardless of load or jump type, and, in comparison to double-leg jumps, single-leg jumps provided a greater combined force. However, our findings indicated no relationship between load and bilateral asymmetry. GRFs are highly variable and bilateral differences are dependent upon individual characteristics—they may not accurately assess risk of injury or significantly affect performance.

Presenter(s)-Major: **Dane Dulaney - Pre-Engineering, Alexandra Fieber - Mechanical Engineering Technology, Vail Hall - Mechanical Engineering**
Title: AUTONOMOUS ROVER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Bevill

Abstract: The purpose of this project will be to create an autonomous rover that is capable of navigating to specified GPS coordinates and delivering a payload. For the purposes of this project, the payload will be modeled using wooden blocks approximately 1.5”x1.5”x1.5”. This rover will be capable of obstacle avoidance, navigating through rough and uneven terrain, meeting speed and navigation requirements, and will be able to deliver payloads to designated GPS waypoints transmitted to the rover via radio frequency. For a showcase demonstration, the rover will have eight minutes to navigate to two separate GPS waypoints separated by as much as 300ft, deliver payloads, and return to its starting position while avoiding any obstacles it may encounter.

Presenter(s)-Major: **Mark Eisenhauer - Liberal Arts-Elementary Teaching**
Title: ASSESSING EARLY LITERACY STRATEGIES
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The Assessment Practice, Process, and Analysis Learning Study project is a collaborative venture between a local school district and CMU’s Center for Teacher Education. In this case study, the teacher candidate will select a focal child and use a combination of reading and writing assessments to measure the student’s knowledge of phonics in relationship to the stages of literacy development. The teacher candidate will gain experience in selecting and administering reliable and valid assessments. In addition, the teacher candidate will develop skills in analyzing data based on the student’s performance and will be able to make recommendations for future instruction.

Presenter(s)-Major: **Joshua Entrekin - Pre-Engineering, Nicholas Hazlewood - Pre-Engineering, Lucas Lefebre - Pre-Engineering, Tanner Mast - Pre-Engineering**
Title: WIRELESS PHONE CHARGING AS DEMONSTRATED BY MAGNETIC INDUCTION
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: Cell phones have been common place in society since cellular technology has increased rapidly during the last few decades. However, most people do not understand how this technology operates. One technology of particular interest is the wireless cell phone charger. The charger is simply plugged into the wall and the cell phone is placed on the pad. The phone

then charges without the physical connection of wires. This project aims to show how these wireless cell phone chargers operate by demonstrating how a copper coil creates a magnetic field that can be used to power a light bulb. Turning the light bulb on by simply moving it into the magnetic field demonstrates how magnetic induction transfers power without the use of a physical connection. Armed with the knowledge of magnetic induction, the somewhat mysterious wireless phone charger becomes less mysterious and much more intriguing.

Presenter(s)-Major: **Arminel Estevez - Spanish-Literature & Language**
Title: THE INVERSION OF THE FAIRY TALE IN "EL ALMOHADÓN DE PLUMAS" WRITTEN BY HORACIO QUIROGA
Department: Languages, Literature & Mass Communication
Sponsor: Mayela Vallejos-Ramirez

Abstract: Fairy tales are an ever present source in literature. The presence and meaning of these undercurrents are often an indicator that something good is going on in the story. When the same symbols that represent something magical and blissful are inverted to represent the unhappiness of a young woman named Alicia who is recently married and the events that follow her being married, it turns the narrative into a horror story. The use of the seasons at the very beginning of the story and the castle-like mansion that they live in, and the five day time frame, in which the story develops, gives the story a feeling of solitude and cold reality instead of the happily ever after that Alicia was hoping for.

Note: This presentation will be given in Spanish.

Presenter(s)-Major: **Robert Fenske - Computer Science, Dakota Giles - Business Administration-Entrepreneurship, Madeleine Hayduk - Business Administration-Management, Cole Hughes - Business Administration-Entrepreneurship, Emma La'a - Mass Communication-Media Strategies & Applications, Luis Pena - Business Administration-Management, Denis Terzic - Business Administration**
Title: EAT MY SNOW(BOARDS)
Department: Business
Sponsor: Georgann Jouflas

Abstract: Testing gravity's limits with a board and a mountain is the closest thing we as Coloradans get to flying, and with our love of snowboarding comes the passion of building a snowboard. Human beings aren't made from cookie cutters. We have different heights, weights, and stances; why should our snowboards be the same? We want to work with customers to create their own personalized snowboard. Clients can chose the size, shape, width, and core materials of their unique board as well as create their own graphics on the top sheet.

Presenter(s)-Major: **McCady Findley - Environmental Science & Technology, Bryn Marah - Environmental Science & Technology, Shon Wilson - Environmental Science & Technology**
Title: TRACING DUST ORIGINS FROM DELTA, MESA AND MONTROSE COUNTIES TO THE GRAND MESA
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: Dust deposition and movement is an essential component of land management, especially in Western Colorado. The plethora of recreational and multiple use activities on public lands such as off highway vehicle use, livestock grazing, hiking and mountain biking affect soil stability and dust generation. Accumulations of dust have the potential to not only affect air quality, but also accelerate snowmelt. In order to understand the movement of dust in the Grand Valley, research was conducted to determine mineral compositions from dust and soil samples collected from Mack, Grand Junction, Delta, Montrose, and the Grand Mesa. This study attempts to conclude if current land management practices implemented by the Bureau of Land Management are adequate in the prevention of adverse effects of dust on the environment.

Presenter(s)-Major: **Ross Fischer - Mechanical Engineering, Keenan Jewkes - Mechanical Engineering**
Title: A PARTIAL SOLUTION TO MODELING THE ANISOTROPIC MATERIAL PROPERTIES OF FUSED DEPOSITION MODELING ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PLASTIC COUPONS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Kessler

Abstract: Many input parameters are available for the fused deposition modeling (FDM) process and it is known that some of these parameters have significant effects on mechanical properties of FDM parts. The manner in which material is deposited during the FDM process results in anisotropic properties in the final products. In general, this study will utilize an artificial neural network (ANN) to predict 2-D mechanical properties of the resultant prototypes based solely on orientation. Specifically, Part 1

of this study presents data that not only verifies the results of previous research but provides confidence that printer output is reasonable and sufficient to train, validate, and test an ANN. Broad correlations are made between printing parameters and mechanical properties and the mechanisms by which these parameters effect properties is discussed. Three input parameters were chosen for this study and methodically varied along a pre-determined range while printing prototypes (i.e. tensile specimens). The prototypes' mechanical properties were determined through tensile testing. Results suggest that layer height, printing pattern, and infill density have significant effects on FDM manufactured parts strength, stiffness, and ductility.

Presenter(s)-Major: **Kollin Fleener - Radiologic Technology, Kase Kuhns - Radiologic Technology**
Title: NEW APPLICATION OF DIGITAL TOMOSYNTHESIS IN DIAGNOSTIC RADIOLOGY
Department: Health Sciences
Sponsor: Olga Grisak

Abstract: Digital Tomosynthesis (DTS) is a newly emerging three-dimensional imaging technology that is able to reconstruct an image from a series of projections taken at different angles by a single x-ray tube. These projections at different planes allow for more detail than a single-plane radiograph. DTS is primarily being used in examinations of the breast and chest; however, studies have shown there is a diagnostic potential for the technology if applied to examinations of musculoskeletal, vascular, and dental imaging. In many instances, during chest radiography, a radiologist cannot confirm or rule out the possibility of a suspected pulmonary lesion by solely looking at a chest radiograph. To improve diagnosis, a computed tomography (CT) scan is done routinely as a follow up procedure in order to gain more information about the suspected pathology. Studies have shown that DTS can be utilized as an alternative follow up procedure to help identify the suspected pulmonary lesions. It also holds sizable advantages in cost efficiency and patient dose reduction over computed tomography while providing the necessary diagnostic information.

Presenter(s)-Major: **John Fowler - Computer Science, Zachary Kennison - Mechanical Engineering, MaKayla Kovac - Mechanical Engineering, Hayden Murphy - Pre-Engineering, William Ramsey - Mechanical Engineering, Ashley Weber - Liberal Arts-Business Administration, Shauna Wilson - Sport Management**
Title: INFINITE INK
Department: Business
Sponsor: Georgann Jouflas

Abstract: Infinite Ink is a startup originating from the idea of refillable dry erase markers. The goal is to reduce the plastic waste from the millions of markers used annually. This startup is utilizing the Lean Launch methodology for innovating the product and creating a business plan. This startup uses the nine building blocks of the business model canvas which are used as a guide to explore all of the potential components of designing a business from the ground up. The primary customers are higher education institutions and schools, although other markets such as restaurants and large businesses are also being explored. The scope of the project is to have refillable units in the classroom or in faculty offices that would dock the markers and refill them when not in use. The refilling units or pods would have refillable reservoirs to negate the need for disposable cartridges.

Presenter(s)-Major: **John Fowler - Computer Science, Garrett Hause - Computer Science, Khallid Williams - Computer Science**
Title: WABI-SABI YOGA
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: Local companies in Grand Junction either do not have a website, or a very basic one, and this group wanted to change that for one local yoga studio. The group is creating a web application for Wabi Sabi, a local yoga studio. The group will be developing this web application using MEAN stack (MangoDB, Express, AngularJS, and NodeJS). The group chose MEAN stack because it can create a full stack web application using only one language for everything, which is JavaScript. The group will also be taking the existing web site and updating it using Handlebars. The version control in this presentation will use GitHub. It is a great tool to be able to manage data within a group setting.

Presenter(s)-Major: **Kalvin Fukumoto - Computer Science, Austin Greaney - Computer Science, Logan Saruwatari - Computer Science**
Title: KIOSK PRESENTATION SOFTWARE FOR MODERN INFORMATION SOURCES
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: The Computer Science department is in need of software that will allow a screen to display upcoming events and important information in the form of a slideshow. The software allows for administrators to update and manage the content from anywhere on campus. The software also pulls in data from the current campus wide system known as Channel 2. Content

for slides is easily editable by someone with no experience in programming. Additionally, the software allows dynamic content such as remote websites with webGL components to be displayed in the same manner as the current Channel 2 content. These improvements beyond the standard slide presentation will allow the Computer Science department to display rapidly changing information relevant to information security and software development.

Presenter(s)-Major: **Ian Gallagher - Physics**
Title: RESONANT FREQUENCIES OF A NON-UNIFORM ACOUSTICAL SYSTEM
Department: Physical & Environmental Sciences
Sponsor: David Collins

Abstract: In this work, theory and experiment are employed to understand an acoustical system containing two identical closed tubes connected with a shorter one. The system will resonate at characteristic frequencies. It is observed that the resonant frequencies vary, as the dimensions of the connecting tube vary. The resonant frequencies of this acoustic system are measured, and compared to the analytical and experimental results as a function of the connecting tube section. This system is mathematically equivalent to the system involving a wire loaded at its middle point.

Presenter(s)-Major: **Gabriel Gallegos - Music-Business, Natalie Houston - Music-Business, Ian McGuire - Music-Business, Benjamin McLam - Music, Destinee Reed - Music-Business**
Title: PRODUCING "THE POWER OF LOVE"
Department: Music
Sponsor: Darin Kamstra

Abstract: Under the direction of Dr. Darin Kamstra, McLam and the Hearthrobs have prepared an arrangement originally performed by Huey Lewis and The News named "The Power of Love." The prepared song was arranged, recorded, edited, mixed and synchronized with video by its members. For the first time, through this project, students experimented with multiple microphones, microphone recording techniques, acoustics, software editing, sound effects, and more. This project supported a new perspective on how difficult it is to create a professional recording. The value from this project is manifested in the skills and experiences the students gained. These can be used to create self-produced music, obtain employment in recording or editing, promoting bands, and anything related to music technology. Members are Natalie Houston (trombone, costumes), Ian McGuire (trumpet, video recording), Gabe Gallegos (vocals, video editor), Ben McLam (keyboards), and Destinee Reed (guitar). Guest artists are Cody (saxophone), Tzetzi (bass) and Dan (drums).

Presenter(s)-Major: **Elisa Galvan - Liberal Arts-Elementary Teaching**
Title: STUDENT ASSESSMENT ANALYSIS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The process of assessing students in literacy is a way to measure specific skills that are critical for students to be successful in reading, which can also affect their writing. In order to obtain accurate levels of a student's abilities, it is necessary to do an initial screening, progress monitoring, diagnostic assessments, and outcome assessments. The initial skills that a student demonstrates allows for choosing assessments that will indicate where a student's weaknesses are, and it gives the teacher a starting point from where to begin with the teaching of the student in order to help them attain long-term mastery of skills that will enable students to become effective readers and writers. Using formative and summative assessments will help to determine next steps for students and will also demonstrate a student's overall understanding of concepts. Through the use of varied assessments, a student teacher can become familiarized with how to effectively use and administer different assessments and also how to interpret the results in order to know what next steps to take with a student in order to help them achieve the necessary skills for overall growth to proficiency. Assessment is important because there is a great demand for teachers to meet the needs of students in their classroom who are at different developmental levels. Assessment has a great impact on student placement and instructional needs. Assessment will also show whether or not students are meeting their goals set by themselves, teachers, or administration.

Presenter(s)-Major: **Timothy Gerken - Geology**
Title: RARE GREEN RIVER TERRACES SOUTH OF GREEN RIVER, UTAH - CONSTRAINING THE GREEN RIVER'S AGE
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: The immense amount of Neogene erosion and probable uplift recorded in the southwestern United States is complex and the subject of much debate. South of Green River, Utah, exceptionally high (>200 m above the modern river) and thus rare Green River terraces are present. These multiple terrace levels record the river's past and can be used to provide age constraints for river incision in the region. The higher the terrace lies above the modern-day Green River, the older the terrace.

By mapping, both in the field and using imagery available through ArcGIS, these rare river terraces will be used to evaluate the timing of erosional and uplift events in the region. Estimated age dates can be assigned to each individual terrace based on comparisons with previously dated Green River and Colorado River terraces near the study area. In summary, the mapped terraces and age estimates will provide insight on long-term landscape evolution in the region.

Presenter(s)-Major: **Sean Gerving - Liberal Arts, Computer Science, Jeffrey Ross - Computer Science, Jacob Santos - Computer Science**
Title: INK MAPS
Department: Computer Science, Mathematics & Statistics
Sponsor: Lori Payne

Abstract: This program will assist the user in locating local artists within the Grand Valley area. Users can perform a search, which looks up artist profiles, shop locations, and minimum base pricing. Each user will have a personal profile, log in and password that will save their selected favorite artists and/or styles. Artists may also create personal profiles to showcase their featured pieces for public viewing. Users will have the option of utilizing the evaluation tool that suggests examples of art within their search criteria.

Presenter(s)-Major: **Ryann Gibbens - Graphic Design-Visual Design, Nicholas Hill - Graphic Design-Visual Design, Michael Murphy - Graphic Design-Visual Design**
Title: & PRESS
Department: Art & Design
Sponsor: Eli Hall

Abstract: The project will display the answer to how letterpress, and specifically the resurrection of a single Chandler & Price Letterpress, donated by a CMU alumni, increases the Graphic Design students' knowledge of typography. This project was motivated by the love of letterpress and the quality of education it brings through designing and producing with old world technology. After several attempts at using the press and with proper instruction, the wealth of knowledge attained about typography and print design is enormous. It should be shared with everyone. It's an incredible sight to see this machine, which is over a century old, slowly come back to life. This project will explain each step of the process of bringing the press back into functional form and proceed to print. The project is to show the restoration from beginning to production. It starts with the pick up of the C&P letterpress in Fruita, Colorado where it had sat for 30 plus years. Important aspects of the presentation include the journey to the CMU campus and many hours of rehab and love poured into this project. Then ultimately the design pieces, in which the strong letterpress aesthetic will be on display. The presenter will display a video documenting the whole process along with examples produced by the letterpress. He will also discuss with onlookers how the press went from discarded junk in Fruita to being a functional press located in Colorado Mesa University's press shop, and if the logistics can be secured, the press will be onsite and printing. The presentation aims to increase awareness of this resurging art form and to show how old technologies have a substantial value in the educational space. Anyone unfamiliar with letterpress and how it works in today's Graphic Design industry, along with anyone who may want to produce something on a letterpress but doesn't know how to facilitate that goal, may be interested in this presentation.

Presenter(s)-Major: **Kaitlyn Gilmore - Chemistry-Biochemistry, Erik Heine - Biological Sciences-Biology, Robin Marley - Biological Sciences-Biology, Amber McCormick - Biological Sciences-Biology, Clarisa Owens - Chemistry-Biochemistry**
Title: SYNTHESIS OF NOVEL GOLD(III) COMPLEXES
Department: Physical & Environmental Sciences
Sponsor: David Weinberg

External Funding: Acknowledgement is made to the donors of the The American Chemical Society Petroleum Research Fund for support of this research.

Abstract: Gold(III) complexes have shown potential for converting strong sp3-hybridized C-H bonds to various other types of bonds. In order to determine the conditions necessary for breaking these types of C-H bonds, novel gold(III) complexes are being synthesized with ligands that direct these types of C-H bonds toward the metal center. The ligands being used are 2-tert-butyl-1,10-phenanthroline and amide derivatives of 8-aminoquinoline. These ligands were selected in part due to their relatively rigid ring structures, which could prove useful for preventing side reactions. Syntheses of ligands from previously published papers were necessary in order to synthesize the gold(III) complexes. The type of ligand and specific conditions determined whether an oxo-bridged gold(III) dimer or a monomeric gold(III) complex was generated. In order to synthesize the monomeric gold(III) complexes, sodium tetrachloroaurate, water, and an organic solvent were combined. In addition to the monomeric gold(III) complexes, oxo-bridged gold(III) dimers have also been synthesized. The synthesis of the oxo-bridged dimers involved the combination of an amide ligand with potassium tetrachloroaurate, silver tetrafluoroborate, and organic solvent. The 2-tert-butyl-1, 10-phenanthroline ligand, under silver(I) conditions, formed gold(III) monomeric complexes in the presence of water, while the

8-aminoquinoline amide ligands formed oxo-bridged gold(III) dimers under silver(I) conditions in the absence of water. Attempts are currently being made to complete the synthesis and characterization of additional gold(III) monomers and dimers.

Presenter(s)-Major: **James Goff - Chemistry**
Title: QUANTUM CHEMISTRY CALCULATIONS FOR A NUCLEOPHILIC AROMATIC SUBSTITUTION REACTION
Department: Physical & Environmental Sciences
Sponsor: Phillip Kiefer

Abstract: Computational quantum chemistry calculations are presented that study the energetics of a chemical reaction, specifically a nucleophilic aromatic substitution reaction. The reaction path from reactant to product was mapped out on substituted and unsubstituted benzenes. Of particular interest are the reaction barrier height along that path and whether an intermediate is present along that path. The ground state electronic structure along the reaction path was obtained within both Hartree-Fock (HF) and density functional theory approximations. The successes and failures of various electron exchange and correlation approximations are analyzed in terms of reaction path features. The methods for obtaining the reaction path and identifying transition states and intermediates will also be discussed.

Presenter(s)-Major: **Anel Gomez - Nursing-AAS, Katlynn McGee - Nursing-AAS, Destiny Mullen - Nursing-AAS, Nicolle Thatcher - Nursing-AAS**
Title: ALTERNATIVE THERAPY: ESSENTIAL OILS
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Being in nursing school is stressful for students. As nursing students we have found essential oils helpful in reducing this stress. There are medications for everything today and with them come all of their side effects, adverse effects, toxicity and even failure of organs which could essentially lead to death. Research has found a way to decrease the usage of medications normally taken routinely to manage symptoms. This research focuses on alternative therapies regarding pain, sleep, and stress relief by using essential oils in everyday life. There are more benefits to using these oils, opposed to western medications, than most people are aware of. Our goal is to educate people about the benefits of using these oils over medications.

Presenter(s)-Major: **Luiz Goncalves - Pre-Engineering, Danae Lanigan - Mechanical Engineering, Taylor Rucker - Mechanical Engineering Technology**
Title: EKAM ANALYSIS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Brett Hensley

Abstract: Osteoarthritis is the most common form of arthritis affecting 1 in 10 adults over the age of 25, and nearly 4 in 10 adults over the age of 65. The severity and rate of progression of medial compartment knee osteoarthritis are related to loading of the knee during walking, more specifically, to the external knee adduction moment (EKAM). In many cases, variable-stiffness shoes have been shown to reduce this moment and can be used to slow the progression of osteoarthritis. There are several different types of variable-stiffness shoes. Unfortunately, one type of shoe has been shown to reduce one patient's EKAM while increasing another's. Using laboratory equipment, a patient's EKAM can be measured in order to determine if a pair of variable-stiffness shoes can benefit a patient or not. The problem is that this equipment is impractical as it is very expensive. The goal of this project is to design a device capable of measuring a patient's EKAM, without the use of laboratory equipment, in order to determine if a pair of variable-stiffness shoes will benefit a patient.

Presenter(s)-Major: **Gema Gonzalez - Spanish-Applied Professional**
Title: OPPRESSION AMONG POVERTY
Department: Languages, Literature & Mass Communication
Sponsor: Mayela Vallejos-Ramirez

Abstract: This essay will explain the concept of poverty and marginalization and how it affects the life of a young girl. For this purpose, the short story "El regalo" by Julieta Pinto, a Costa-Rican writer, will be used. The story is about a young girl named Hilda who is rejected by her family because of her ugliness and how she grows up with that feeling of being criticized and judged by everyone. Because of her lack of confidence and love she got pregnant at age fifteen and she is responsible for raising her child. The main issue in this story is how poverty affects her emotionally and physically, where she is taking a role as an adult working long hours collecting coffee and delivering food in order to survive. When she finally meets someone real, a good friend who she can trust, she decides to give her something valuable and special, her own son.

Note: This presentation will be given in Spanish.

Presenter(s)-Major: **Brittany Goss - Nursing-AAS, Cynthia Hennessey - Nursing-AAS, Matthew McDonald - Nursing-AAS, Morgan Zillmann - Nursing-AAS**
Title: H2WHOA!
Department: Health Sciences
Sponsor: Genell Stites

Abstract: This project is aimed at increasing the amount of water patients drink. The research will look at ways to make water more available to patients, make water more appealing, and ways to make patients and staff more aware of the benefits of drinking water. The proposal we are presenting is how to get people to drink more water to benefit their health. The motivation for this project was our real life experiences and being witness to the effects of dehydration among patients, especially those in long term care facilities while simultaneously learning about the positive effects of adequate hydration. We plan to explore the impact of greater availability, greater attraction and acknowledgment of the benefits of hydration.

Presenter(s)-Major: **Megan Goss - Business Administration - Hospitality Management, Katherine Scott - Business Administration - Hospitality Management, Rebecca Waugh - Business Administration - Hospitality Management**
Title: KAYA RESORT CONCEPT
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of three students created a resort concept as a part of the Hospitality Management 450 curriculum. The objective was to create a unique resort concept residing in the western United States. The project was under the contingency that the resort has unlimited budget. A development was broken up into five phases: resort concept, resort offerings, space design, human resource management, and operations management. A marketing strategy was also developed in addition to the development plan. The concept chosen by the team was Kaya Resort, located outside of Fairbanks, Alaska. Kaya Resort is an adventure lodge which is open year round, showcasing seasonal activities and the beauty of the surrounding area. The resort features glass igloo lodging where guests can witness the wilderness of Alaska, as well as the Aurora Borealis during specific seasons. The resort also features luxurious cabins, standard rooms, unique restaurants, and a spa.

Presenter(s)-Major: **Natalie Gould - English-Literature**
Title: THE ECONOMIC IMPACT OF COMMUNITY IN RELATION TO HOMELESSNESS
Department: Languages, Literature & Mass Communication
Sponsor: Jeremy Jurgens

Abstract: Homelessness is an issue that has heavily affected Mesa County and Colorado in general, since the 1800's. From past to current evidence, local shelters, newspaper articles, and statistics, we can discern how the situation has escalated from only affecting a small group, to affecting a significantly larger portion of the community. Several solutions, for example, enlisting the homeless in the military, have been attempted, and others are currently being developed. Research gathered from the 2014-15 year shows that there has been a significant decline in the number of volunteers at shelters and donations received from fundraising and other sources. Specifically, this project will take an economic approach, by focusing on how the financial stability of the community affects homelessness. This method tellingly demonstrates specific details and reveals how a mathematic approach can be applied to help resolve the issue. This framework clearly represents how much help is actually needed, allowing people to more accurately visualize a realistic goal of improving both economic and social problems in our community. With this in mind, we can begin to discern what can be done today in order to reduce homelessness both locally and nationally.

Presenter(s)-Major: **Danielle Graf - Radiologic Technology, Angela Kastrup - Radiologic Technology, Ellie Piffer - Radiologic Technology**
Title: IMPORTANCE OF RADIOGRAPHIC EVIDENCE IN CHILD ABUSE CASES
Department: Health Sciences
Sponsor: Olga Grisak

Abstract: Every year millions of children become victims of suspected neglect and physical abuse. A significant number of physical abuse cases result in fatalities, prevalently among infants and toddlers. As members of the front line in health-care services, radiologic technologists must be conscious of the signs and possible indicators of child abuse. Inconsistent patient history, misleading accounts of events, and common fractures such as those to the ribs, classic metaphyseal lesions, and long-bone shaft fractures are typically associated with child abuse. Diagnostic radiography is an important tool in discovering and confirming suspected physical abuse. The radiologic technologist must be proficient in pediatric patient positioning and radiation protection practices to produce images that would provide radiographic proof of physical trauma. The most commonly obtained radiographic study for the clinical evaluation of patients of suspected bony injury is a skeletal survey. This study along with other radiographic modalities provides crucial evidence to support legal action in child abuse cases.

Presenter(s)-Major: **Elise Graham - Nursing-BSN, Cheryl Short - Nursing-BSN, Amber Ziek - Nursing-BSN**
Title: PROTON PUMP INHIBITORS: IS IT WORTH THE RISK?
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: Proton pump inhibitors (PPIs) are antisecretory drugs with numerous indications and are commonly used in the hospital setting. PPIs are utilized in the hospital largely for stress ulcer prophylaxis. However, many studies suggest that the side effects and rebound effects of PPIs might be more significant than the potential benefits. The purpose of this research project is to examine and assess the significance of studies stating that PPIs might be overused. The authors collected and examined fifteen research studies with varying purposes such as stress ulcer prophylaxis use in non-critically ill patients, PPI use in hospital setting, the significance of osteoporosis and clostridium difficile with PPI use, and the overall prevalence of prescription increases due to overutilization. Adverse reactions are not to be ignored; there are significant correlations between clostridium difficile and PPI dosages. In conclusion, there is a prevalence of inappropriate PPI use and increased occurrences of side effects associated with PPIs.

Presenter(s)-Major: **Walter Green - Geosciences-Geology**
Title: PALEOENVIRONMENTAL RECONSTRUCTION OF THE FLUVIAL SYSTEMS OF THE SALT WASH MEMBER OF THE NORRISON FORMATION THROUGH THE STUDY OF EXHUMED PALEOCHANNELS IN EAST CENTRAL UTAH
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: Studying ancient environments helps to understand modern climatic changes and impacts on local ecosystems. Ancient fluvial systems provide excellent snapshots of paleoenvironmental conditions as their sediments give clues about tectonic and climatic events that formed ancient landscapes. The purpose of this study is to reconstruct the paleoenvironment of the Salt Wash Member of the Morrison Formation of central Utah, by measuring and interpreting exhumed paleochannels. The Salt Wash Member reprents a Jurassic-aged river systems that are now exposed as exhumed paleochannel sandstones. Measuring these amazingly well exposed channels' paleocurrents, widths, lengths, depths and sediment content will assist in the interpretation of the provenance and paleoclimatic setting of this fluvial system.

Presenter(s)-Major: **Walter Green - Geosciences-Geology**
Title: A STUDY OF GEOCHEMISTRY AND MINEROLOGY OF THE GREEN RIVER FORMATION OF GRAND MESA, WESTERN COLORADO
Department: Physical & Environmental Sciences
Sponsor: Rex Cole

Abstract: Grand Mesa is capped by a sequence of Miocene (10 Ma) lava flows that has a present-day footprint of about 155 km^2. This cap is slowly being compromised by the weathering of the less competent underlying sedimentary layers. These layers, including the Green River Formation provide, the foundation of the Grand Mesa. Deposited in the Eocene Epoch, the Green River is a lacustrine environment preserved as shale, and marlstone with interbedded sandstones and limestones. The Formation is a source of several landslide failures surrounding Grand Mesa. These landslides can be minor, less than an acre, too several thousand acres, as witnessed in the catastrophic West Salt Creek Slide in 2014. This study hypothesizes that the presence of expansive clays are a contributing factor to landslide events. Using x-ray diffraction and x-ray florescence, geochemistry and minerology of 17 Green River samples collected from Grand Mesa, Douglas Pass and Rio Blanco County, Colorado, were quantified and compared to previous studies. The presence of these clay minerals was notably higher in the Grand Mesa samples, thus supporting the hypothesis. By studying the geochemistry of the Green River Formation, we can create a database for comparison to other localities and depositional environments to expand our knowledge of these types of failures.

Presenter(s)-Major: **Chance Guerrero - Pre-Engineering, Ernesto Robles - Pre-Engineering, Jacob Serbousek - Pre-Engineering, Jared Taylor - Pre-Engineering**
Title: BALLISTIC PENDULUM
Department: Physical & Environmental Sciences
Sponsor: Brian Hosterman

Abstract: Since its invention in 1742, the ballistic pendulum has been used to assess the velocity of a bullet. Shortly after, safer methods have been introduced into various levels of physics classes around the world. The purpose of this project is to create a ballistic pendulum apparatus that is self-setting and capable of variable changes. The apparatus created has a simple overall design with very complex moving components. The advantage of the simple design is it presents a user-friendly mechanism for the normal class setting. The design is capable of launching balls of various masses and types as well as interchangeable spring strengths for the spring gun used for the initial launch. Changing the spring length changes the force with which the ball is launched. At the final position of the ball, a guide was placed in order to reroute the ball back to the launch position. This

eliminated an instructor-driven reset process that is common in similar designs. The designers hope to create a fully functional device that is durable enough for repeated use in physics labs as well as class demonstrations.

Presenter(s)-Major: **Mickey Guziak - Geosciences-Geology**
Title: SALT TECTONICS AND CHRONOLOGY OF THE SINBAD VALLEY ANTICLINE AND SALT CREEK GRABEN IN MESA COUNTY, COLORADO
Department: Physical & Environmental Sciences
Sponsor: Rick Livaccari

Abstract: The salt anticline region of western Colorado and eastern Utah is an incredibly stunning area both geologically and visually. Formed by Pennsylvanian-aged salt movement and resulting in two or more events of structural deformation over the past 250 million years, the salt anticlines exist as a series of long, narrow valleys originating in the east and extending northwest into Utah, and include Moab Valley, Sinbad Valley, Dolores Valley and Paradox Valley among others. Hundreds of faults and small scale collapse structures exist along the flanks of the anticline valleys, one of which is the focus of this report. Located in close proximity to the Uncompahgre Plateau and the town of Gateway, Colorado, Sinbad Valley trends northwest and has a large graben extending northeast, perpendicular to the valley axis. This feature has not been studied to a great extent and could provide clues on the chronology of the Paradox Basin salt movement. Close observation of the faults and looking for small scale deformities will help address this question. A geologic map will be prepared along with unit descriptions and structural features. Also, a more detailed look at the unconformity between the Permian and the Triassic will be completed to allow for speculation on ancient deformation events.

Presenter(s)-Major: **Brooke Haberkorn - Nursing-BSN, Ashleigh Hansen - Nursing-BSN, Ashley Rickstrew - Nursing-BSN, Kendra Williams - Nursing-BSN**
Title: THE USE OF A PEANUT BALL DURING LABOR
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: This evidence-based study compares the effects of two different laboring interventions amongst women with epidurals. A review of evidence-based literature evaluated the effectiveness of laboring with a Peanut Ball versus not using a Peanut Ball. The study was performed to determine whether or not the Peanut Ball helped labor progress. The research has shown that women with epidurals have trouble positioning themselves because of their paralysis; therefore, the positioning of the woman can slow down the progression of labor. The use of a Peanut Ball in the second stage of labor helps open the pelvic outlet and descend the fetus. Use of this equipment decreases cesarean and assisted operative rates significantly, allowing for more spontaneous vaginal births.

Presenter(s)-Major: **Michael Hale - Geosciences-Geology**
Title: UNCOMPAHGRE PLATEAU ANCIENT RIVER GRAVEL DETRITAL ZIRCON AND PEBBLE COMPOSITON ANALYSIS WITH RESULTING PALEOGEOGRAPHICAL INTERPRETATION
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

External Funding: This project was funded in part by grant 2014-1001 from the Unconventional Energy Center.

Abstract: The Colorado River drainage basin has undergone major changes over the last 40 Ma that are recorded on the Uncompahgre Plateau in the form of ancient river gravels, including anomalous basalt boulders. The Southern Rocky Mountain Volcanic Field (SRMVF) ca. 22-40 Ma began actively erupting rhyolite enriched ignimbrites from the Sawatch Trend then migrated southwest to the West San Juan Mountain calderas which erupted rhyolite ignimbrites as well. Zircon grains created during these episodes of volcanism are found more abundantly in the rhyolitic magmas. Detrital zircons collected from ancient Columbine Pass, Grand Mesa, and Cactus Park river gravels are compared with detrital zircons in the modern Uncompahgre, Gunnison, and Colorado Rivers. Modern rivers show a sparse representation of SRMVF age zircon grains while ancient river gravels of the Uncompahgre Plateau and Grand Mesa record an abundance of SRMVF age zircons. Pebble counts of ancient and modern river gravels will be analyzed to determine similarities and differences with patterns established from the detrital zircon analysis. Basalt boulders scattered along the crest of the Uncompahgre Plateau ca 27 Ma provide a maximum depositional age for the Columbine Pass river gravels while the youngest detrital zircon grain ca. 22.3 +/-3.5 Ma provides a minimum depositional age.

Presenter(s)-Major: **Jacob Hall - Computer Science, Roman Puzey - Computer Science**
Title: THE POINT IPHONE APP
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: The Point is a student run restaurant and bar on the Colorado Mesa University campus. In order to take advantage of the growing food industry needs for technology, the group has built an iPhone application for customers to engage with. Using

a unique user interface design, the group has made an easy-to-use application that would allow customers to view menus, order food, see upcoming events, and get rewarded for their purchases, all from their own iPhone. During this presentation the group will show a hands-on demonstration of the application in development and talk about what choices were made while working with a business to meet their needs.

Presenter(s)-Major: **Caleb Hardaway - English-Literature**
Title: *ROMEO AND JULIET*: A TRAGEDY?
Department: Languages, Literature & Mass Communication
Sponsor: Barbara Geiger

Abstract: The poetry and plays written by William Shakespeare during the late 16th and early 17th centuries have since been held highly by academia. Throughout years of studies there have been specific topics and questions of debate on Shakespeare's work that have remained unanswered. Among these topics is the dispute of whether the popular play *Romeo and Juliet* is in fact a tragedy. Many literary critics do not consider the play one of Shakespeare's great tragedies, regardless of its enduring popularity. In my essay I use a framework laid out by Teresa Guerra de Gloss from her presentation at the conference of SEDERI in 1992 –a presentation with the intent to redefine Shakespearian tragedies– as well as works of other Shakespearian experts (A.C. Bradley, Dorothea Krook-Gilead) to create a literary equation in order to yield a conclusion to the ongoing question –should Shakespeare's *Romeo and Juliet* be considered a tragedy? Through the process of creating this literary equation and testing it on *Romeo and Juliet* I found that the play should not be considered a tragedy –it falls more along the lines of a comedy. By relocating the play into a more suitable category it becomes more easily evaluated and understood.

Presenter(s)-Major: **Aric Harper - Pre-Engineering, Stormy Ramsay - Mechanical Engineering Technology, Tyler Shehorn - Pre-Engineering, Luis Terrazas - Pre-Engineering**
Title: VACUUM CHAMBER WITH ELECTRONIC MOTION SENSORS
Department: Physical & Environmental Sciences
Sponsor: Brian Hosterman

Abstract: It is a scientific fact that two objects in a vacuum experience identical acceleration due to gravity. However, this fact is merely a concept to most students unless it can be demonstrated empirically. The purpose of the vacuum chamber is to demonstrate that acceleration due to gravity is constant in a vacuum, and to provide the opportunity to observe this law in action. The motion sensors collect data about position, velocity and acceleration which prove that laws and equations concerning gravity are accurate. To demonstrate that drag due to air molecules is responsible for objects accelerating at different rates in normal atmosphere, the vacuum chamber also doubles as a pressure chamber. This allows observation and data collection at levels exceeding atmospheric pressure on earth (i.e.: 150% atmosphere). The designers will demonstrate a useful learning tool for physics departments as students study gravitational acceleration.

Presenter(s)-Major: **Zachary Harr - Biology-Secondary Teaching**
Title: ISOLATION OF MYXOBACTERIA FROM MESA COUNTY SOILS
Department: Physical & Environmental Sciences
Sponsor: Kimberly White

External Funding: This project was funded in part by a grant from the American Society of Pharmacognosy.

Abstract: Soils from Mesa County were collected with the purpose of isolating myxobacteria, Gram-negative bacteria with proteolytic activity and an interesting life cycle. These bacteria are known producers of secondary metabolites with fascinating biological activity. Soil samples were collected in the Grand Junction area and plated on nutrient poor plates spotted with Eschrichia coli as a protein source. Viable myxobacterial colonies were indicated by fruiting body formation, swarming behavior, and/ or proteolytic activity and purified via standard microbiological techniques. These specimens will serve as the starting point for further investigations, including large-scale liquid culture, biological testing and the isolation of bioactive components.

Presenter(s)-Major: **Kathryn Hawley - Biological Sciences-Cellular, Molecular and Developmental Biology**
Title: DYSREGULATION OF MITOCHONDRIAL MEDIATED APOPTOSIS IN BREAST CANCER: DYNAMIN-RELATED PROTEIN 1 (DRP1)
Department: Biological Sciences
Sponsor: Kelly Jean Craig

External Funding: This project is funded by the Saccomanno Undergraduate Summer Biomedical Research Internship grant program.

Abstract: The evasion of apoptosis is a major hallmark of cancer and a vital factor that contributes to therapeutic resistance in patients with malignancies. The mitochondria, known as the "power house of the cell", also play a dominant role in the control of

intrinsic apoptosis, making mitochondria an ideal organelle to consider when trying to elucidate mechanisms of apoptotic evasion in cancer, namely of the breast. Previously, shorter mitochondria were observed in our metastatic breast cancer cell line, despite the notion that fragmented mitochondria are indicative of apoptosis. This led to the investigation of the pro-fission and pro-apoptotic protein, dynamin-related protein 1 (Drp1), which localizes to the mitochondria upon the induction of apoptosis, creating membrane pores, allowing for the release of cytochrome c oxidase and the propagation of further apoptotic events. The aim of this study was to determine the localization of Drp1 and understand possible mechanisms of control that modulate Drp1 function and activity within breast cancer cell lines. This knowledge could provide invaluable insights of apoptotic resistance in cancer cells and identify putative therapeutic targets.

Presenter(s)-Major: **Antonio Hermosillo - Dance**
Title: PHILOSOPHICAL ARTIST
Department: Theatre Arts
Sponsor: Megan Glynn

Abstract: Musical artists summarize their life experiences through ballads, instrumentals, and raps. This performance is a rap that tells the story of a man who has gotten to know many artists at this university that have a Facebook, Instagram, or Twitter. The potential to show off their work online is free and in the palm of their hands. However, these artists use their online presence not to display their artistic side, but rather to upload selfies, lattes, and sunsets. This piece summarizes a different viewpoint for artists to understand that the attention from selfies isn't as strong as the attention from an uploaded monologue, scene, dance, or song. The music that will be used is titled "Bruh" from upcoming rapper Lil Dicky, off his debut album *Professional Rapper*. In two to three minutes, the performer will share his philosophy on artists and their online presence, while also describing what he has done online in terms of showing artistic work.

Presenter(s)-Major: **Kaylyn Higgins - English-Writing**
Title: A VOICE FOR A WITCH
Department: Languages, Literature & Mass Communication
Sponsor: Randy Phillis

Abstract: The literary analysis of Brechtian theatre theory in the plays *Vinegar Tom* by Caryl Churchill and *Byrthrite* by Sarah Daniels allows for a deeper understanding and appreciation of the feminist movement within twentieth century British drama. The plays focus on aspects of history in order to contemporize and act as sites of contention between feminist attitudes and the oppression of patriarchal society. By looking at how both Churchill's and Daniels's plays incorporate Brechtian theatre theory, this presentation will demonstrate how the two playwrights vocalize aspects of the modern feminist debate. Brechtian theatre theory provides feminist drama with a postmodern aesthetic that allows for the feminist representation of gender as an alternative to the traditional realistic representation. The presenter finds that this alternative representation encourages the audience to engage in the issues presented and learn to question and challenge the oppressive standards by evaluating what is important to each of them.

Presenter(s)-Major: **Brenna Hjelle - Environmental Science & Technology, Anna Rich - Environmental Science & Technology, Victoria Sauer - Environmental Science & Technology, Jessica Wolf - Environmental Science & Technology**
Title: STUDY OF CURRENT SELENIUM CONCENTRATIONS AND LOADINGS IN MESA COUNTY ON THE GUNNISON AND COLORADO RIVERS AND THEIR TRIBUTARIES
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: Since the late 1980s multiple studies have been performed to analyze selenium concentrations in Mesa County, Colorado. The geology of the area is rich in Cretaceous shale deposits found within the mancos shale formation which results in higher amounts of selenium being present in the soils and eroding into the waterways. The Grand Valley is famous for the rich agriculture, and many of these studies were performed to analyze the effects of agriculture on the selenium concentrations in the Colorado and Gunnison Rivers and their tributaries. Historically the amounts of selenium in the Colorado and Gunnison Rivers and their tributaries have been out of compliance with the EPA recommendations. The interest of the study is to collect and compare the new selenium concentration and loading data with the historical data in the same or similar locations on the Gunnison and Colorado Rivers and in their tributaries.

Presenter(s)-Major: **Jordan Hoffman - History-Teaching (Secondary)**
Title: POLITICAL AND SOCIAL INTERACTIONS BETWEEN HOME FRONT CIVILIANS AND SOLDIERS FROM THE THIRTY YEARS WAR (1618-48) TO THE SECOND WORLD WAR (1939-45)
Department: Social & Behavioral Sciences
Sponsor: Vincent Patarino

Abstract: Much has been made by historians about the devastation caused by war, especially in regards to the treatment of home front civilians. Most often, civilians, both peasants and townspeople, have been seen mainly as victims, who suffered as a result of war. Current interpretations, however, note that the uncertainty of warfare for both civilians and occupying military forces fostered a turbulent social and economic environment that led to unexpected interactions, behaviors, and judgements. The important role civilians played in military conflicts are often overlooked, especially how their economic and social support affected the soldiers' morale. Civilians and soldiers had meaningful encounters with one another as allegiances to political entities were either emboldened or questioned. Using a variety of primary source documents, this presentation will unravel some of the economic and social tensions between civilians and soldiers from the fifteenth to the mid-twentieth century, identifying a more complex set of interactions between military personnel and home front populations.

Presenter(s)-Major: **Devon Hoffman - Nursing-BSN, Huntyr Maclaskey - Nursing-BSN, Chad Roberts - Nursing-BSN**
Title: UTILIZING ESTABLISHED INTRAVENOUS CATHETERS FOR BLOOD COLLECTION
Department: Health Sciences
Sponsor: Sue Mathews

Abstract: This paper explores 15 peer-reviewed articles covering 46 studies focusing on the comparison between hemolysis rates of venipuncture blood draws and peripheral intravenous catheter (PIVC) blood collections. Laboratory values, blood draw methods, and PIVC sites were also compared. The authors performed a systematic search on PubMed, EBSCO, and Google scholar to assess if hemolysis rates and lab values were skewed between utilization of a PIVC blood draw versus a standard venipuncture draw. Of the 15 articles researched, 12 of them showed comparable and/or below the clinical benchmark of a 2% hemolysis rate. Results varied depending on the methods, location, and the equipment used in each study. In conclusion, using the proper technique and equipment while utilizing a PIVC for blood draws on patients can be an acceptable method for obtaining blood samples on all floors.

Presenter(s)-Major: **Shanna Hoopengardner - Mathematics**
Title: HERBRAND STRUCTURES AND THE COMPLETENESS THEOREM FOR FIRST-ORDER LOGIC
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: When mathematicians want to show that something is true, they write a proof. But what does it mean for something to be true? And why is a proof considered evidence of truth? Logic is a way of determining what must follow from what, and every logic has both a syntax and semantics associated with it. This project considers only first-order logic because it is complete. The Completeness Theorem for first-order logic states that if a logical expression is valid (i.e., true in all semantic models), then it can be proven symbolically. This is a celebrated theorem because it links the syntax and semantics of a first-order language. However, satisfying the hypothesis of the theorem can be difficult when there is an infinite model, or an infinite number of models, to consider. Constructing and using a special model known as an Herbrand structure simplifies this problem and makes it easier to apply the Completeness Theorem. Specific examples, such as theorems from group theory, will be used to demonstrate the importance of an Herbrand structure as the bridge between syntax and semantics.

Presenter(s)-Major: **Lindsey Hunger - Liberal Arts-Elementary Teaching**
Title: IN-DEPTH ANALYSIS OF ONGOING ASSESSMENTS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: In the classroom an educator must create assessments that align with learning targets in order to drive instruction in a meaningful manner, and instruction needs to be designed with specific student needs in mind. However, giving an assessment is just the beginning. Not only must an educator give an assessment, but take those results and interpret them in a way that will benefit each individual student. The purpose of this study was to investigate pre-, ongoing, and post-assessment in the classroom, explicitly targeting reading and writing. This study was focused on one student, who was neither benchmark nor intensive in need, but average in her educational development. Pre-, ongoing, and post-assessments were given to the student, and data was collected, and in return that data was taken apart and analyzed from the lowest to highest errors. Analyzing the data obtained from the reading and writing pre assessments were the deciding factors of what assessments would then be given next for getting the student developmentally to the next level.

Presenter(s)-Major: **Chelsea Jackson - Business Administration-Hospitality Management, Mariah Martin - Business Administration-Hospitality Management, Elizabeth Prickett - Business Administration-Management**
Title: INFINITY RESORT
Department: Business
Sponsor: Britt Mathwich

Abstract: A group of three students are putting together a resort concept and marketing plan to pitch to a group of investors. The team was allowed to design the resort from scratch making it their own unique concept. The goal is to develop a luxury resort that can compete with other local resorts providing a memorable experience for guests, creating local jobs, and helping to market California as a resort destination. This will include the mission and vision statement, resort layout, amenities and marketing plan. The team's basic design is a luxury all-inclusive resort located in California, which has 35 villas. There are an assortment of amenities ranging from a top of the line spa to a water park and a variety of activities for guests to experience.

Presenter(s)-Major: **Donald Jarrin - Geology**
Title: CLASSIFICATION OF GLACIAL DEPOSITS IN RIDGWAY, COLORADO, NORTHERN SAN JUAN MOUNTAINS
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: The focus of this project is to understand the glacial history in the northern San Juan Mountain region near Ridgway, Colorado. Using optically stimulated luminescence (OSL) data, physical characteristics, and weathering characteristics of the glacial sediments the glacial deposits were classified. Six terraces were identified with heights above the river ranging from 4 – 49 m. There are 3 moraines with heights ranging from 17 – 127 m that are associated with the oldest terraces; no moraines are associated with the younger terraces. The common belief in the San Juan Mountains is that smaller moraines are Pinedale in age and larger moraines are Bull Lake in age. With OSL dating this idea was found to be inaccurate due to the size variation of the moraines. Using OSL dates the terraces and moraines were divided into two categories. Moraines greater than the 23.3 ± 1.6 ka OSL age are Bull Lake in age and everything younger is of Pinedale age. This hypothesis is supported by an older date of >76 ka from one of the higher terraces. These OSL dates are the first absolute age estimates for these deposits which opens the door for more research to be done.

Presenter(s)-Major: **Kirstin Jastak - Psychology-Counseling Psychology, Jacquelyn Minnillo - Psychology-Counseling Psychology**
Title: ANXIETY ABOUT THE END OF LIFE IN THE ELDER COMMUNITY
Department: Social & Behavioral Sciences
Sponsor: Susan Becker

Abstract: This study explores mortality salience, sources of symbolic immortality and anxiety in elders who are at the end of life. Elders who have no living offspring were expected to focus on sources of symbolic immortality that are more material (a charitable legacy). We hypothesized that elders who no longer have living offspring or for whom family is far away would experience more difficulty with anxiety due to mortality salience since their best sources of symbolic immortality (offspring) are not easily available. For these elders we expected other sources of symbolic immortality to be a concern for them, such as leaving a financial legacy to the community or other life accomplishments. Since sources of symbolic immortality are very personal and individual, our hypotheses were tested with a mixed methods procedure, including some standardized questionnaires and qualitative methods to analyze the open-ended questions. Results suggest ways to approach end-of-life issues with elders including suggestions for how caregivers can have a positive influence on elders coping with the end of life.

Presenter(s)-Major: **Tiana Johnson - Psychology-Counseling Psychology, Courtney Yarbrough - Psychology-Counseling Psychology**
Title: ROCKY MOUNTAIN HIGH: COLORADANS CHANGING PERCEPTIONS OF AMENDMENT 64
Department: Social & Behavioral Sciences
Sponsor: Jacob Jones

Abstract: The following research examines data collected over two years (2013-2015) on Coloradans perceptions of the regulation and taxation of marijuana (Amendment 64). One of many discoveries that will be discussed is that Coloradans' perception of marijuana and associated laws have become significantly more positive over the last two years.

Presenter(s)-Major: **Anna Johnson - Biological Sciences-Biology, Mary Young - Biological Sciences-Ecology, Evolutionary, & Organismal Biology**
Title: CLIMATE CHANGE'S EFFECTS ON THE REPRODUCTIVE SUCCESS OF ASH-THROATED FLYCATCHERS AND MOUNTAIN BLUEBIRDS IN WESTERN COLORADO
Department: Biological Sciences
Sponsor: Susan Longest

Abstract: Climate change has been a growing topic since the 1980s. Studies have suggested that hatching dates in bird populations are moving earlier in the season to match food availability. This project focuses on the effects of climate on the reproductive success of Ash-Throated Flycatcher and Mountain Bluebird populations. Data were compared across 15 years for populations in Unaweep Canyon in Western Colorado based on nest box observations submitted to NestWatch, an online database of nest records operated by the Cornell Lab of Ornithology. This study tested the prediction that changing climate, microclimate, and nest box material have an effect on the reproductive success of these two populations. These results will provide more information on the reproductive success of Ash-Throated Flycatchers and Mountain Bluebirds throughout their range and how they differ in response to climate change.

Presenter(s)-Major: **Courtney Johnston - History**
Title: WOMEN, CHRISTIANITY, AND THE LAW IN THE ROMAN EMPIRE
Department: Social & Behavioral Sciences
Sponsor: Douglas O'Roark

Abstract: The rise of Christianity signified the beginning of rapid change across Europe. Christianity grew so quickly in part because it appealed to the powerless in society, women included. Some scholars argue that the rise of Christianity elevated the status of women converts in society. When looking at how the laws regarding women changed from the time of Augustus to the time of Justinian, did the lives of women really improve? The analysis of marriage, divorce, and property laws over 500 years attempts to answer this question.

Presenter(s)-Major: **Bethany Kanesky - Mathematics**
Title: META-STRATEGIES IN THE PROPOSITIONAL LOGIC
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: Even though it may be difficult to pinpoint exactly what is going on in our brains as we work our way through a problem in mathematics, there's something happening, so what is it? This project looks at possible models of the meta-logic that run beneath the surface while working through a resolution refutation in the propositional logic. Because of the hyper-exponential size of the space of formulas without strategies and prior knowledge, what kind of steps are being taken to ensure efficient forward progress? It turns out, that a meta-logic using prior knowledge constructs strategies that are reasonably efficient. The prior knowledge used to construct the meta-logic is based, in part, on concrete visual aids as well as creating sub-goals.

Presenter(s)-Major: **Jacob Kaplan - Environmental Science & Technology, William McDonald - Environmental Science & Technology, Orianna Rubin - Environmental Science & Technology, Zachery Schuler - Environmental Science & Technology**
Title: RESTORATION OF TAMARISK AND RUSSIAN OLIVE DOMINATED, BEAVER INFLUENCED, AND SELENIUM CONTAMINATED WILDLIFE REFUGE ALONG THE COLORADO RIVER
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: The Orchard Mesa Wildlife Area is a Bureau of Reclamation owned property on the south bank of the Colorado River in Grand Junction near 29 Road used as native species habitat corridor. This site has undergone previous restoration efforts, but lack of maintenance has allowed invasive species and selenium concentrations to reach problematic proportions. These problems have further been exacerbated by the actions and habitation of beavers within the wildlife area. We will perform a site assessment on the vegetation, selenium, and hydrology to better inform management practices. We will also develop a plan to repair previous improvements on site to ensure sustained ecological function. Our end goal is to investigate further improvement techniques to remove invasive vegetation, mitigate beaver damage, reestablish native plant species, and reduce selenium accumulation on site.

Presenter(s)-Major: **Mary Kastendieck - Nursing-AAS, Marietta King - Nursing-AAS, Danielle Recchia - Nursing-AAS, Amber Schell - Nursing-AAS**
Title: HANDWASHING AND HEALTHCARE
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Does frequent handwashing by healthcare workers decrease the risk of patients acquiring infections in the hospital? According to the Centers for Disease Control (CDC), 648,000 people in the U.S. each year alone develop infections while in the hospital. Out of those 648,000, 75,000 of them will die as a result of healthcare workers not performing proper hand hygiene. In order to understand why hand hygiene is so important, one must understand how germs enter the body. Germs enter the body through the nose and mouth, but the most common way that infections are spread is via direct contact (hands). Even though hands may not be visibly soiled, germs still reside in the cracks and crevices of skin. For example, people rub their eyes and nose frequently, often without thinking about it. In order to prove that this is true, our group will culture common objects touched every day by healthcare workers and show the results of these cultures in a petri dish. Perhaps the visual revelation of the amount of bacteria that these objects contain will make the public more aware of how important it is to wash those hands!

Presenter(s)-Major: **Sean Kennedy - Mechanical Engineering, Isaac Koch - Pre-Engineering, Aaron Troxel - Mechanical Engineering**
Title: METHANE FLUX CHAMBER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University and University of Colorado Boulder
Sponsor: Francisco Castro

Abstract: Methane is the second largest greenhouse gas emitted from the United States and has a 25 times greater impact on the environment than carbon dioxide. In 2002, NASA launched a satellite to measure atmospheric methane concentrations across the globe. The satellite observed a methane concentration over the Four Corners region of the United States. A portable methane emissions measuring device has been used to annually measure methane seepage out of the ground in the region. The rate of seepage is known as methane flux. The University of Colorado Boulder's environmental science department, led by Dr. Michael Hannigan, is interested in measuring the methane flux. They have submitted a senior design project to the University of Colorado Boulder/Colorado Mesa University partnership program to design and build a device that will measure the methane flux from the soil on a continuous basis. The requested device has to be able to operate autonomously for an extended period of time, in order to assist in the tracking of the migration of the methane seeps. This autonomous methane flux measuring device will better inform the sponsors of how methane seeps change across seasons and according to different environmental factors.

Presenter(s)-Major: **Willis Kennedy - History**
Title: TEACHERS IN THE NAZI STATE: INDOCTRINATION, COORDINATION, AND THE BUREAUCRATIC LEVIATHAN
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: Recently, questions have been raised concerning federal intrusion into public education. One of these questions is what are the social implications when a central government sets and administers education policy? To enhance the understanding of the possible advantages and potential pitfalls of federal intervention, this research provides a case study of the education system in Nazi Germany. During the nineteenth and early twentieth centuries, German education stood as a model for other modern nations. Traditions from Frobel's Kindergarten to Humboldt University were shaken to the core when Nazis ascended to power in 1933. Very quickly, National Socialism swept educators into the bureaucratic leviathan of the Third Reich. As the Nazis consolidated power, the scope and intensity of the indoctrination of teachers increased. Younger more fanatical teachers replaced those who had engaged in various forms of resistance during the early years of the Nazi regime. This research will investigate: What, if anything, went wrong? What were the Nazi education goals? Were these goals achieved? Was government intervention essential to these goals?

Presenter(s)-Major: **Tessa Kester - Exercise Science, Erin Lielkoks - Exercise Science, Samantha Modrick - Exercise Science, Michaela Wilson - Exercise Science**
Title: THE EFFECT OF VARIOUS HEATING MODALITIES ON ANKLE FLEXIBILITY
Department: Kinesiology
Sponsor: Brent Alumbaugh

Abstract: Thermal therapeutic modalities have been shown to aide in increasing range of motion. Previous studies have shown that ultrasound, heat packs, and stationary cycling in combination with stretching have improved range of motion in various joints. The purpose of this project was to investigate the independent effects of ultrasound, heat packs, combination of ultrasound and heat packs, and stationary cycling on ankle dorsiflexion passive range of motion. Four subjects were randomized into specific orders of treatment with one treatment being administered per day, allowing a minimum of 48 hours in between each

treatment session. Before beginning treatment protocols, five baseline measurements were recorded. After each treatment, five measurements of the ankle dorsiflexion passive range of motion were taken using a goniometer by the same clinician pushing the ankle into dorsiflexion. Ultrasound treatment was applied to the Achilles tendon for seven minutes at a frequency of 3MHz and intensity of 1 W/cm2. Heat pack treatment was applied to the calf muscles for seven minutes. The combination treatment included the same parameters simultaneously. Stationary cycling was conducted for 10 minutes with the subject's heart rate at 130-140 BPM. Each modality yielded a significant improvement ($p<0.05$) for at least one of the participants. For female 1 and male 2, ultrasound proved to be the most effective modality. For male 1, heat pack was the most effective modality, and interestingly ultrasound decreased range of motion for this subject. Lastly, female 2 showed greatest improvements after the combination treatment of ultrasound and heat packs. Some modalities worked best for different subjects, though the data indicates that ultrasound by itself or in combination with heat packs is most effective.

Presenter(s)-Major: **Lacee Kilgore - Business Administration-Finance, Lauryn Lee - Business Administration-Management, Nicholas Mabry - Business Administration, Dustin Rivas - Business Administration**
Title: AIRLINE INDUSTRY
Department: Business
Sponsor: Morgan Bridge

Abstract: This team of researches is analyzing and comparing the regional airline industry and four major companies within the industry including: United Airlines, Southwest Airlines, Delta Airlines, and American Airlines. The team is going to look at the financial standing of each airline company and project what these companies are going to do in the near and extended future.

Presenter(s)-Major: **Andrew Knarr - Political Science**
Title: HOW "WE THE PEOPLE" KILLED THE CONSTITUTION
Department: Social & Behavioral Sciences
Sponsor: Bill Flanik

Abstract: Contemporary concerns with U.S. federalism are not the result of lackluster politicians or "troubling times." Instead, they stem from an outdated federal power dynamic. This paper's argument synthesizes scholarship on early American political development with original interpretations of key junctures in American history, including the Civil War, Progressive Era, and the Great Depression. These events redefined the purpose of government, political representation, and the scope of authority. They transformed American federalism into an arrangement that the Founders would scarcely recognize. This radical shift took place through the erosion of limited government, checks and balances, and separated federal powers.

Presenter(s)-Major: **Samuel Knoll - General Engineering, George Lara - Pre-Engineering, Micah McLaren - Pre-Engineering, Lane Sanders - Pre-Engineering**
Title: PNEUMATIC EXOSKELETON ARM
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: An "Ironman" suit has always been thought of as a comic book fantasy, however this fantasy is already becoming a reality. Exoskeletons are an emerging technology being explored by the military and in the medical field. Some exoskeletons are even being used to help aid patients in physical therapy after injuries. Pneumatics, hydraulics, or a combination of the two are used to simulate the motion of a muscle by contracting and expanding like a muscle does. The purpose of this project is to use pneumatics to simulate the contraction of a bicep muscle. To do this a pneumatic muscle was designed and built with TechFlex (flexo-weave) to act as the bicep muscle which would in turn control an exoskeleton arm enabling the user to lift up to 70 lbs. The TechFlex was pumped with air from an air compressor that is activated by electrodes connected to the bicep. The arm used different lengths and widths of tube to witness the change in output. For example, a shorter length of tube in the pneumatic muscle would output a shorter range of motion, but higher output of power. Likewise, a longer tube would show larger range of motion, yet less power.

Presenter(s)-Major: **Jaden Koos - General Engineering**
Title: ELECTROMAGNETIC COIL GUN
Department: Computer Science, Mathematics & Statistics
Sponsor: Marc Fischer

Abstract: In recent years the development of new and alternate technologies has advanced dramatically, one of the more interesting advancements is the Coil Gun. A Coil Gun uses electricity and magnetism to propel a metal slug down range. While the technology is still somewhat inefficient, through research and prototyping an efficient and effective design is the desire of this project. The Coil Gun in this project will be a small scale example of the power and usefulness of this technology. Other uses for this technology would possibly a type of magnetic suspension, magnetic trains, and even art uses. The coil gun is a simple technology; participators only need a brief understanding of circuits to understand the principles being used.

Presenter(s)-Major: **Joseph Laughlin - Theatre Arts-Acting/Directing**
Title: THANK YOU FOR STANDING IN MY WAY
Department: Theatre Arts
Sponsor: Mo LaMee

Abstract: An original spoken word monologue on the Zen of human conflict, interspersed with monologues from Tony Kushner's *Angels in America* (the part of Roy Cohn), William Shakespeare's *Romeo and Juliet* (the part of Mercutio), and Rajiv Joseph's *Bengal Tiger at the Baghdad Zoo* (the role of the Tiger). All four pieces come together to create a humorous, but poignant, look at a world with so many differing ideologies and why those differing ideologies serve to make us all better, more complete people.

Presenter(s)-Major: **Coryann Ledford - Athletic Training**
Title: TRAUMATIC BROKEN MANDIBLE OF A WOMEN'S LACROSSE PLAYER
Department: Kinesiology
Sponsor: Jeremy Hawkins

Abstract: A case study was conducted regarding a collegiate women's lacrosse player following a traumatic injury to the mandible. The purpose of this case study is to discuss the prevalence and proper treatment of a broken mandible in a sports setting. At the time of the injury, the first responder under the supervision of a certified athletic trainer performed the on-field evaluation of the athlete and made the decision to refer to the emergency department for x-rays. It was discovered that the athlete had a bilateral fracture of the mandible that was to be handled surgically. The fractures were managed by putting her in arch bars and maxillomandibular fixation. In doing so the physician attempted to restore normal alignment by lifting the tooth fragments outward. The patient's diet was modified to accommodate for maxillomandibular fixation. Two weeks post surgery the patient reported to be progressing well, suffering from no pain, tolerating her diet, and maintaining weight. The arch bars were removed one month post injury. At that time the patient was counseled to see her dentist for a good dental cleaning and to continue with a soft diet for two more weeks. One month later she reported no problems with eating, drinking, or opening her mouth, and her teeth alignment was normal. She was cleared to normal activities.

Presenter(s)-Major: **Rachael Lind - English-Writing**
Title: *MARY POPPINS* THE FEMINIST
Department: Languages, Literature & Mass Communication
Sponsor: Barry Laga

Abstract: Some schools of thought like formalism take an ahistoric perspective, ignoring the particular context of, say, a poem, story, play, or film. However, history and representations are intertwined. Each influences and reflects the other. Therefore, to understand the complexity and relevance of a text, one must situate it within its historical context. Working with Stephen Greenblatt's theory of culture and language, my presentation explores and analyzes the film *Mary Poppins*. By using a process of praising and blaming, *Mary Poppins* responds to the debates about gender roles in the 1960s. Given the renewed interest in gender politics, it is an ideal time to look back on *Mary Poppins* as a product of second wave feminism. While many may view the movie as a simple, feel-good Disney movie, it is more useful to explore the work as both a product and shaper of gender discourse.

Presenter(s)-Major: **Lauren Lipski - English-Teaching (Secondary)**
Title: THE HUMAN/NONHUMAN BINARY IN FRANK HERBERT'S *DUNE* UNIVERSE
Department: Languages, Literature & Mass Communication
Sponsor: Barry Laga

Abstract: The debates surrounding cloning in modern society are ones that have been addressed in science fiction, such as Frank Herbert's *Dune* series, far before scientific discoveries made these ideas potential realities. The following presentation will use Diana Fuss's literary theory of the nonhuman to examine how the presence of genetically manufactured humans in several of Herbert's *Dune* novels allows one to question the distinction of human and nonhuman itself. The presentation will focus specifically on the character of Duncan Idaho, a genetically "grown" human brought back to life thousands of times. His struggle to define, find and attain humanity helps us question our own assumptions and categorizations regarding the human/nonhuman.

Presenter(s)-Major: **Lauren Lipski - English-Teaching (Secondary)**
Title: THE DESEXUALIZATION OF THE MOTHER AND EROTICISM IN ANACRISTINA ROSSI'S "UNA HISTORIA CORRIENTE"
Department: Languages, Literature & Mass Communication
Sponsor: Mayela Vallejos-Ramirez

Abstract: The presenter will use a social feminist approach in order to discuss how religious and patriarchal ideas influence a woman's sexual perception of her body, especially in Costa Rican society, which results in the desexualization of the mother figure.

In addition, Anacristina Rossi's short story, "Una historia corriente" ("An Ordinary Story") will be used in order to examine the relationship between understanding of the body and the process of self-actualization.

Note: This presentation will be given in Spanish.

Presenter(s)-Major: **Hannah Liss - Psychology-Counseling Psychology, Steven McKinley - Psychology-Counseling Psychology, Jared Schmidt - Psychology-Counseling Psychology**
Title: MITIGATING MORTALITY SALIENCE EFFECTS WITH RELAXATION OR MINDFULNESS: CHANGES IN DEATH THOUGHT ACCESSIBILITY AND WORLDVIEW ADHERENCE
Department: Social & Behavioral Sciences
Sponsor: Susan Becker

Abstract: This study examined mindfulness meditation as a method for coping with the anxiety that comes from feelings of existential terror as a result of mortality reminders. Terror Management Theory states that once humans developed awareness of their own impending death, they developed existential terror, and that terror led to anxiety (Pyszczynski, Greenberg, Solomon, & Maxfield, 2006). Sources of symbolic immortality are one way people cope with the anxiety from existential terror. Sources of symbolic immortality include a polarization of one's world view (world view defense) and an increase in risk taking behaviors (Pyszczynski, et al., 2006). Experienced Dzogchens who incorporate mindfulness meditation as a daily practice have increased mindfulness, and reduced reactions to mortality reminders (Caine, 2014). This study sought to determine if mindfulness mediation could be a method by which people could reduce their initial reaction and anxiety to mortality reminders. Mindfulness meditation focuses on a present awareness of the here and now instead of a future focus and could possibly serve as a buffer to the anxiety created by mortality reminders. We hypothesized that mindfulness meditation would mitigate mortality salience effects. We compared mindfulness meditation to progressive muscle relaxation and a control and measured worldview defense and death thought accessibility.

Presenter(s)-Major: **Audrey Maclennan - Environmental Science & Technology, Spencer Randolph - Environmental Science & Technology, Charles Springer - Environmental Science & Technology, Rachael Swiatek - Environmental Science & Technology**
Title: MCINNIS CANYONS NATIONAL CONSERVATION AREA: MAPPING RUSSIAN KNAPWEED (RHAPONTICUM REPENS) AND DEVELOPING A TREATMENT AND RESTORATION PLAN FOR DEVIL'S CANYON
Department: Physical & Environmental Sciences
Sponsor: Deborah Kennard

Abstract: Native to Eurasia, Russian knapweed (Rhaponticum repens) was first introduced to North America during the late 1800s. Since its introduction, it has become noticeably widespread throughout many regions of the continent, especially in the western portion of the United States. It is a noxious, invasive species that spreads quickly once established by producing dense patches of cloned sister plants. Recently, Russian knapweed was identified within the McInnis Canyons National Conservation Area. The goal of this project will be the mapping of Russian knapweed using GPS and GIS technology through field data collection and the development of a removal and restoration plan.

Presenter(s)-Major: **Audrey Maddox - Spanish-Literature & Language**
Title: SELLING YOUR SOUL TO THE DEVIL - EXPLORING MAN'S STRUGGLE BETWEEN THE DESIRE FOR WORDLY POSSESSIONS AND THE DESIRE FOR SPIRITUALITY IN "UN PACTO CON EL DIABLO" BY JUAN JOSÉ ARREOLA
Department: Languages, Literature & Mass Communication
Sponsor: Mayela Vallejos-Ramirez

Abstract: The lure of earthly pleasures has caused many good people to stray from their former beliefs and morality. Some may say that these people 'sold their soul to the devil' in order to obtain possessions of this world. In "Un pacto con el diablo," Mexican author Juan José Arreola deals with this issue in a fantastical way when a man finds the devil sitting next to him in a movie theater, where he watches a film about another man's experiences with the devil. This oral presentation will discuss Arreola's use of the two complimenting plots, irony, and symbolism to portray the timeless struggle of man's desire for material possessions versus the desire for spirituality.

Note: This presentation will be given in Spanish.

Presenter(s)-Major: **Mikayla Mahovsky - Mathematics-Statistics**
Title: FACTORIAL ANALYSIS WITH APPLICATIONS IN ACRYLIC ADHESIVES
Department: Computer Science, Mathematics & Statistics
Sponsor: Richard Ott

Abstract: This project is a collaboration between a CMU student and Reynold's Polymer Technologies, Inc., an international acrylic sheet manufacturer. The objective of this multi-phase project is to use statistical analysis to define an acrylic formulation that increases both the strength and fatigue-time of acrylic adhesives, while achieving the fastest cure speed possible. This project focuses on the first phase, which will use a 3-factor, 3-level, randomized, Complete Factorial Design and Analysis to determine what factor-levels affect the average molecular weight of polymers. The three factors examined are: mix weight, polymers as a percentage of the mix, and initiator concentration. Each of these factors will include three levels: low, medium, and high. The results of this first phase will then be used in the next phase which intends to use Central Composite Design to fine-tune a new acrylic formulation for Reynold's Polymer Technologies, Inc. to add to their existing line of products. Through this innovative project it may become possible to construct larger and more advanced aquariums and other structures with international applications.

Presenter(s)-Major: **Bryn Marah - Environmental Science & Technology**
Title: FLORISTIC INVENTORY OF MCINNIS CANYONS NATIONAL CONSERVATION AREA
Department: Biological Sciences
Sponsor: Stephen Stern

External Funding: This project was funded in part by BLM grant L15AC00128.

Abstract: The McInnis Canyons National Conservation Area is a unique and ecologically diverse area located on the western edge of Colorado. It serves as one of sixteen National Conservation Areas in Utah, Nevada, Colorado, New Mexico, Arizona, California, Idaho, and Alaska. The area is comprised of 123,400 acres within the Black Ridge Canyons Wilderness and is home to the Black Ridge, Rabbit Valley, Ruby-Horsethief and Devil's Canyons. A floristic inventory of the area is underway in collaboration with the Bureau of Land Management with the hope of better understanding the diversity of the area. Site surveys as well as field collections of plant specimens have been utilized in the formation of herbarium specimens, with data from field collections also stored within Geospatial Information Systems and online databases. The results from the study will be implemented in BLM land management practices through the creation of site appropriate seeding mixes and ecological site descriptions. The preliminary results based upon ~250 collections made during the 2014 field season will be shared during the discussion.

Presenter(s)-Major: **Jessica Marquez - Nursing-AAS, Jennifer Stahl - Nursing-AAS, Septimber Topai - Nursing-AAS, Kaleen Velasquez - Nursing-AAS**
Title: NEEDLE STICK SAFETY
Department: Health Sciences
Sponsor: Genell Stites

Abstract: The CDC estimates that 62-88% of sharps injuries could have been potentially prevented through needle stick safety. Needle stick injuries are a hazard for those who work in the healthcare setting. These injuries can occur at any time when people use, disassemble, or dispose of needles. This can even relate to the tattoo community and the need for education on sharps safety and potential threat of contamination. With education throughout the community, we can help decrease the risk of injuries and exposure to blood born pathogens. We intend on teaching proper usage, disposal and storage techniques. We will have a mannequin arm to show proper technique of IV insertion, injections and venipuncture.

Presenter(s)-Major: **Trisha Martinez - Nursing-AAS, Kristen Sandoval - Nursing-AAS, Desiree Trujillo - Nursing-AAS, Teri Wilkes - Nursing-AAS**
Title: FALL PREVENTION
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Falls in the elderly and in patients result in increased incurred medical costs, injuries, longer hospital stays and mortality rates. Falls and the prevention of falls in the elderly are especially important. The elderly are at greater risk for traumatic injury from a fall (i.e. broken hip), and it increases the mortality rates in those over 70 more than 25% in the year following a fall. Fall prevention is not about reacting to a fall after it has happened but about putting in place actions and protocols to help prevent the fall from happening in the first place. Some preventative measures include removing clutter and items (throw rugs) that could cause tripping, wearing appropriate footwear (well-fitting shoes, non-skid slippers), assisting persons to the restroom/ to transfer/ambulate when needed and using appropriate assistive devices and gait belts, teaching on correct use of assistive devices, discussing medications that could predispose a reaction that could cause a fall (BP medications, narcotics), making referrals for appropriate therapy, and doing frequent "checks" on persons with cognitive and mobility deficits that may predispose them to increased falls. A decrease in falls would in turn decrease hospital stays, injuries, medical costs and deaths.

Presenter(s)-Major: **Kristina Massey - Liberal Arts-Elementary Teaching**
Title: UTILIZING MULTIMODALITY INSTRUCTIONS IN THE CLASSROOM AND COMMUNITY
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: The presentation demonstrates the importance of clarity and utilizing different modalities, or ways of teaching, while giving directions to individuals—particularly children and children with specific learning disabilities. It is crucial to provide clear instructions because without knowing where to begin or how to do something, completing tasks, even seemingly small tasks, can be quite the challenge. The modalities for instructions are: visual (seeing), auditory (hearing), tactile (hands on), and kinesthetic (body movement). It is important that these four modalities are utilized appropriately while giving directions, but every modality does not have to be utilized for every set of directions. A brief activity will reveal the struggles that children who are English Language Learners, children with auditory processing disorders, and children with dyslexia encounter during every set of instructions. Ideally the activity will encourage audience members to apply the suggestions offered when working with children and ultimately any individual in order to provide clarity and offer encouragement.

Presenter(s)-Major: **Beth McBride - History**
Title: THE HONEST INTENT OF JOHN COLLIER
Department: Social & Behavioral Sciences
Sponsor: Steven Schulte

Abstract: In the United States' contentious history with Native Americans, there are many examples of deception by United States government agencies: hundreds of treaties, which were never honored as well as thousands of American Indians being forced off their native lands and on to reservations. The Commissioner of Indian Affairs was created in 1824 to direct the newly formed governmental agency, The Bureau of Indian Affairs. The Bureau's Commissioners were appointed by Presidents to oversee U.S. relations with the various Native American issues. Focusing on one particular Commissioner, John Collier, highlights the complicated relationship between the United States and American Indians. Collier, the Commissioner of Indian Affairs from 1933 to 1945, and his tenure represent the paradox of attitudes and governmental actions towards Native Americans. Collier's policies towards the Navajo peoples, culminating in the livestock reduction policies implemented in the 1930's, reflects the impossible conditions executed by government intervention in American Indian lives. Collier's lifelong desire to help Native Americans instead ended in disaster for the Navajos.

Presenter(s)-Major: **Nolan McDonald - Geosciences-Geology**
Title: DETERMINING THE RELATIONSHIP OF THE WINGATE SANDSTONE WITH THE ANCESTRAL ROCKY MOUNTAINS USING SUPER BOUNDING SURFACES
Department: Physical & Environmental Sciences
Sponsor: Larry Jones

Abstract: Super bounding surfaces serve as the only correlatable surfaces in the Jurassic eolian Wingate Sandstone in Western Colorado. Studying, mapping, and correlating these surfaces can assist in making predictions about basin location and geometries. The Wingate Sandstone extended for hundreds of kilometers across western Colorado, eastern Utah, and northern Arizona. The paleo wind directions of the Jurassic were southeasterly. The Wingate Sandstone pinches out somewhere between west of the Gunnison River at Delta, CO and the Black Canyon of the Gunnison National Park. The eastward extent of the ancient sand sea is unknown, although many predict that the Ancestral Rocky Mountains structurally bound it to the southeast. Using super bounding surfaces (boundaries of complete erg deflation, which serve as correlatable surfaces across formations), the relationship between deposition of the Wingate Sandstone and the Ancestral Rocky Mountains can be determined. If the lower super bounding surfaces truncate first in a southeasterly direction, then the Ancestral Rocky Mountains structurally controlled the easterly extent of the Wingate Sandstone, resembling an onlap sequence. If upper super bounding surfaces truncate first in a southeasterly direction, then it would appear as if the Wingate Sandstone was uplifted and eroded post-deposition.

Presenter(s)-Major: **Makayla McMullen - Liberal Arts-Elementary Teaching**
Title: STUDENT LITERACY ANALYSIS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: Teachers use different types of formative and summative assessments to progress monitor their students. These assessments are given to establish baselines, check for understanding, and evaluate overall growth. The basis of this project focused on using various assessments in reading and writing to progress monitor a 5th grade student's development. This case study was conducted over a period of three months on one student who was initially at benchmark. This case study determined the importance of using assessments to analyze where the student was developmentally, determined the next steps to further literacy growth, and summarized overall academic performance.

Presenter(s)-Major: **Jessica Meier - Theatre Arts-Music Theatre**
Title: LIVESTREAMING: THE DIGITAL FUTURE OF LIVE THEATRE
Department: Theatre Arts
Sponsor: Jeremy Franklin

Abstract: In order to keep up with the exponentially growing use of technology and the preferences of the younger theatre-going generation, live theatre needs to evolve along with those changes. Through research of livestreaming, theatre's history with digital media, and the benefits and drawbacks of streaming college/smaller theatre (Robinson Theatre in particular), a proposal to stream performances online to audiences at CMU will be created. Broadway, Off-Broadway, and regional movie theatres already experiment with this technology via BroadwayHD, Digital Theatre, and other paywall streaming services in order to record shows and broadcast them to viewers around the country. Colorado Mesa University's theatre program and productions could benefit from livestreaming its performances to the general populace, both monetarily and marketing-wise.

Presenter(s)-Major: **Douglas Mestas - Radiologic Technology, Thaddeus Wilcox - Radiologic Technology**
Title: PET/MRI ADVANCEMENT IN MEDICAL IMAGING
Department: Health Sciences
Sponsor: Olga Grisak

Abstract: One of the newest technologies that has been developed in radiology within the last decade is positron emission tomography/magnetic resonance imaging (PET/MRI). This modality is a new hybrid-imaging system that combines the structural information of magnetic resonance imaging with the functional information provided by positron emission tomography. These two powerful imaging technologies can now be performed simultaneously, which provides comprehensive diagnostic information to aid in early detection of cancer, monitoring of disease progression and evaluation of the treatment response. In comparison to currently utilized positron emission tomography/computed tomography technology (PET/CT), PET/MRI provides a unique opportunity to reduce patient radiation dose and minimize the risk for developing secondary radiation induced malignancy. This project is focused on the functionality and capabilities of PET/MRI scanners as well as their future applications. PET/MRI technology is currently used for medical research purposes; the limitations in the clinical utilization will be discussed in the project.

Presenter(s)-Major: **Jessie-Marie Millican - Computer Science, Sage Porter - Computer Science**
Title: MAVPLANNER
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

Abstract: MavPlanner is a scheduling software which allows multiple users to schedule students' tests at the same time. This allows for faster and more efficient scheduling. MavPlanner allows schedules to be saved and organized to not overwhelm the user.

Presenter(s)-Major: **Robert Millican - Physics**
Title: PHYSICS OF A BOOMERANG
Department: Physical & Environmental Sciences
Sponsor: Bill Tiernan

Abstract: A thrown boomerang has a complex motion, including the well-known ability to return. The motion of a boomerang can be explained using principles of aerodynamic lift and the gyroscopic effect. Analyzing the motion using these concepts yields a relationship between the linear velocity (v) and rotational velocity (ω) of the boomerang required to accomplish a returning orbit. Using a simple model of a person's throwing motion, it was determined a relationship between v and ω. Values for v and ω were measured using video tracking system that yields three dimensional coordinates of the boomerangs center and wing tips. Dr. Tiernan is the faculty sponsor for this project and helped guide the theoretical and experimental work. Video measurements were performed in the CMU Monfort Family Human Performance Lab with assistance from Dr. Smith.

Presenter(s)-Major: **Joseph Moher - Music-Performance**
Title: *GROUND ABOVE, SKY BELOW*, AN ORIGINAL COMPOSITION BY JOSEPH MOHER
Department: Music
Sponsor: Darin Kamstra

Abstract: In listening to this piece, one can hear right away familiar elements that draw the ear in – especially the use of choir to create ethereal and fantastical atmospheres. The ears quickly become caught off guard, however, as the percussion enters in odd time, vocal glissandi carry through the phrases, and an array of technical challenges become self-evident. Initially, I set out to write a piece of music that combined my two main musical talents (percussion and singing) with new composition styles, yet I was ultimately confronted with the option to experiment with the very notion of what it means to combine voices (the sky) with percussion (the ground). In this sense, the title of the piece perfectly captures my ultimate aim in writing this piece: to invert and distort the traditional roles (voice gets the melody, percussion keeps time) of these instruments. For a full SATB choir and nine

percussionists, *Ground Above, Sky Below* is something I hope will hold a unique place in the worlds of both choral and percussion repertoire.

Presenter(s)-Major: **Kacee Montgomery - Dance**
Title: SURRENDERED
Department: Theatre Arts
Sponsor: Megan Glynn

Abstract: This is a contemporary dance project set to the techno song "Robot" by Yron Sparks. This project focuses on the idea of control. Most have felt like they have been controlled or manipulated in some manner. This piece focuses on two opposing sides of control: surrender and domination. This expresses, through dance, a physical reaction to the opposing sides of control.

Presenter(s)-Major: **Craig Moore - Environmental Science & Technology**
Title: FLOATING WETLAND SYSTEMS: MANAGING AQUATIC PLANTS AS A SELENIUM SEQUESTRATION STRATEGY
Department: Physical & Environmental Sciences
Sponsor: Gigi Richard

Abstract: Excessive concentrations of selenium in natural water systems is of growing concern in western Colorado. Selenium is a non-metal chemical element, and an essential human micronutrient in small doses. However, high concentrations of selenium can lead to deformities and death in aquatic wildlife. For this project we investigated the capability of locally available aquatic plants to sequester selenium from a local pond. We selected four plant species*: Juncus balticus, Eleocharis palistrus, Scirpus microcarpus*, and *Carex nebrascensis*, based on known or predicted ability to uptake selenium, on ability to tolerate high saline water, and on local availability. We constructed a floating wetland system using 20 replicates of each species and Beemats™ floating wetland mats. After a six month residence, plants were processed and sent to ACZ Labs for chemical analysis. All species do show the presence of selenium, with higher concentrations in the roots than leaves, however, results are preliminary pending completion of final lab analyses.

Presenter(s)-Major: **Louis Morales Shnaider - Biological Sciences-Cellular, Molecular, & Developmental Biology**
Title: THE DEATH PENALTY IN THE UNITED STATES
Department: Languages, Literature & Mass Communication
Sponsor: Christine Hein

Abstract: The idea behind the Bill of Rights was to protect individual citizens of the United States from the federal government gaining too much power. The Eighth Amendment in the Bill of Rights specifies that the government is not allowed to implement any kind of "cruel or unusual" punishment. This work examines the unethical nature of the death penalty due to the cruelty of administering capital punishment inaccurately. The death penalty is still highly controversial and is predicated upon the discussion whether this punishment is Constitutionally based upon the credentials found in the Eighth Amendment. The methods employed under the death penalty have been found to produce cruel outcomes recorded over time include electrocution, lethal injection, asphyxiation, and the firing squad. In order to explore these faulty administrations deeper, this presentation will examine specific cases regarding criminals who have received faulty administration of the death penalty to fully understand the cruelty imposed on each individual. This examination and explanation is aimed to persuade those in favor of the use of capital punishment to show that it is indeed a cruel and unusual act that takes away a human's basic rights as listed in the United States' Constitution.

Presenter(s)-Major: **Kristina Morben - Biological Sciences-Biology**
Title: DEVELOPMENT OF TEMPERATURE CORRECTION FACTORS FOR USING BIOELECTRICAL IMPEDANCE ANALYSIS IN THE FIELD
Department: Biological Sciences
Sponsor: Eriek Hansen

Abstract: Indices describing fish condition are useful tools for fisheries management. Condition indices using length-weight relationships are less sensitive to changes than proximate body composition (water, lipid, and lean masses; PBC) measurements. Bioelectrical impedance analysis (BIA) can be used as a non-lethal technique for quantifying PBC. BIA measures resistance (R_m) and reactance (Xc_m) of fish tissue for use in multiple regression models to estimate PBC components. Our goal was to develop BIA techniques for sensitive and endangered fishes. Resistance and reactance values have a negative linear relationship with temperature, and we developed a temperature correction factor (TCF) to calibrate field temperatures to 19 °C, the temperature used to develop the multiple regression models in the laboratory. To develop the TCF, fish were acclimated from 19° C to 29° C. After acclimation, fish were acclimated to five colder temperatures in 5° C increments. At each temperature (29, 24, 19, 14, 9, and 4 °C), R_m,- and Xc_m were measured to create the TCF equations, $R_m=R_i + \alpha(T_m - T)$ and $Xc_m=Xc_i + \alpha(T_m + T)$. Where R_i = calculated resistance at T_i = 19 °C, α = slope, and T_m = treatment temperature. The TCF enables BIA measurements at field temperatures.

Presenter(s)-Major: **Cameron Morley - Mechanical Engineering**
Title: CALCULATING POWER OUTPUT IN RUNNERS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Kessler

Abstract: The power of a mechanical or electrical system is generally simple to calculate or test. The power of a human being is a concept that has not been examined in near enough depth. This project will explore methods of calculating the power output of a human being. By equipping a subject with the force sensing technology, power can be more accurately estimated. Using the Human Performance Lab provided by Colorado Mesa University, force vectors are obtained and the relationship between the force distribution on the sensors and vectors is found. This data provides a force with a directionality; using this in concert with GPS technology, power is obtained, as cadence and stride length are derived from this information. The data is then compared to information provided by the standard GPS watch in order to see if power output can be estimated by using this assumingly unrelated data. It is possible that cadence can provide a moderately accurate power estimation. This power calculation can be used to predict training patterns and prevent injury. Understanding that a decrease in power output might mean that the subject should rest or stop working out completely has the potential to not only enable the elite athletes to reach higher heights, but also to keep the layman away from overtraining injuries.

Presenter(s)-Major: **Megan Neal - Liberal Arts-Elementary Teaching**
Title: 3RD GRADE READING AND WRITING ASSESSMENT CASE STUDY
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The project, Assessment Process, Practice and Analysis Learning Study (APPALS), is designed for future teachers to address the validity and reliability of assessments used in today's educational system and to analyze how student growth is shown through these assessments. An intensive case study on a selected student is done, and the student is given a series of reading and writing assessments, both formative and summative. The student's progress is closely monitored, and using the analyzed data collected from assessments, instruction is adjusted and new strategies are added to better fit the student. The intended audience is teachers, parents of students, future teachers, and anyone who may be interested in seeing how assessments are used to analyze growth and learning of students. The results of this project will show how the student changed over a three-month period and allow the teacher candidate to get a closer look at reading and writing. The purpose of this project is to inform others about how students grow and develop over a period of time and to show the significance of assessment in the elementary classroom.

Presenter(s)-Major: **Philip Nelson - General Engineering, Gunnar Pagni - Mechanical Engineering**
Title: AUTONOMOUS ROVER
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Bevill

Abstract: The purpose of this project is to design and build a fully autonomous rover. The rover, for its final mission, must use a radio frequency receiver to interpret GPS coordinates put off by a radio frequency transmitter. Once the rover has received the coordinate point it must successfully navigate there all while using obstacle avoidance algorithms and being able to surpass possible rough or uneven terrain. When the rover lands at the first GPS point the rover will drop a payload, in this case a 1.5in x 1.5in x 1.5in wooden cube. After the cube is dropped the rover will again pick up a new set of GPS coordinates from another radio frequency transmitter and navigate to its new destination where it will drop its final payload. Once all payloads have been deposited the rover will return to the home or starting GPS coordinates.

Presenter(s)-Major: **John Nielsen - Pre-Engineering, Delaney Robison - Pre-Engineering, Ryan Sachetti - Pre-Engineering, Gregory Waldorf - Pre-Engineering**
Title: WIRELESS LIGHTING BY A TESLA COIL
Department: Physical & Environmental Sciences
Sponsor: Brian Hosterman

Abstract: Nikola Tesla's intention in 1891 was to develop a method for wireless lighting systems. The purpose of this project was to demonstrate electrical resonance and electromagnetic fields. An AC power supply was used to transmit an electric current to the primary coil. This was then transferred to the secondary coil, by resonance, creating an electromagnetic field. The Tesla Coil created was used to wirelessly transmit electricity to power a light bulb from some distance away, and the strength can be altered by varying the voltage inputs. The designers demonstrated this electromagnetic concept that Tesla discovered, and hoped to add a creative touch to his technology.

Presenter(s)-Major: **Treyton Nusbaum-Davis - Geosciences-Geology**
Title: AVENUES OF GROUNDWATER FLOW AND THE POSSIBILITY FOR SOIL PIPING IN THE WEST SALT CREEK LANDSLIDE, WESTERN COLORADO
Department: Physical & Environmental Sciences
Sponsor: Gigi Richard

Abstract: The purpose of this study is to determine if soil piping is a plausible mechanism of groundwater flow in the West Salt Creek Landslide, which was triggered in May 2014 near Collbran, Colorado. This will be determined by obtaining a discharge from the stream currently flowing on the toe of the landslide as well as in West Salt Creek, which flows below the landslide. Discharge will be measured using a flow probe provided by Colorado Mesa University. The difference between the two discharge measurements will be considered an estimate of the amount of groundwater discharging from the slide. The difference in the discharges could further indicate the occurrence of soil piping, especially if the difference is large. If soil piping is occurring it could be a possible explanation for the cause of the landslide and a continued concern to government officials. This information may also be used in a predicative capacity for the areas on the flanks of Grand Mesa. In summary, data in this report will be used to determine if soil piping is a significant contributor to groundwater flow from the landslide.

Presenter(s)-Major: **Bryan Ohm - Geosciences-Geology**
Title: GREEN RIVER TERRACES AND THE PROVENANCE OF RIVER GRAVELS IN AREAS SOUTH OF GREEN RIVER, UTAH
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: The history and complexity of the Green River has long been a topic of research from the early explorers to modern day geologists. The Green River flows in a southern direction starting from the Wind River Mountains in Wyoming, through Desolation Canyon, and across the Mancos Shale badlands in southern Utah before its confluence with the Colorado River. Aerial photographs along with GPS elevations taken in the field will be used to map ancient Green River terraces. Fieldwork will also include a number of pebble counts done whenever a major change in strath elevation is observed. By mapping the river terraces that crop out south of Green River, Utah, along with collecting pebble count data, a new correlation can be made that will connect this little known area, to areas studied elsewhere along the river to improve our understanding of the Green River's history.

Presenter(s)-Major: **Kelsey Olson - Liberal Arts-Elementary Teaching**
Title: INCLUSIVE EDUCATION AND PURSUING PASSIONS
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: As a teacher, it is crucial to encourage students to pursue their passions. Every student is going to be different, and it is important to accept students for their differences and encourage them to use those differences to figure out what they were born to do. All people have different brains and ways of thinking. Teaching in a way that allows for these differences has been proven to be effective. Research on inclusive education shows that students who embrace differences in the classroom are able to find solutions that better themselves quicker than when not in inclusive educational settings. Students with disabilities who are included in the daily lessons with the rest of the class get to experience education the same way and feel included. Encouraging students to take charge of their own learning is a part of inclusive education, and teachers need to help students learn to think for themselves, as well as encourage them to become whoever they wish to be.

Presenter(s)-Major: **Mickala Palmer - Biological Sciences-Biology**
Title: CHARACTERIZATION OF TARDIGRADE GENUS COMPOSITION IN WESTERN COLORADO AND EASTERN UTAH, WITH SPECIAL EMPHASIS ON THE GENUS *ECHINISCUS* SCHULTZE, 1840
Department: Biological Sciences
Sponsor: Aparna Palmer

External Funding: This project was funded in part by a Desert Ecosystem Analysis and Restoration (DEAR) grant.

Abstract: A better understanding of tardigrades results in a better understanding of their ability to survive extreme environments. The tardigrades throughout Colorado and Utah are especially equipped for enduring environmental pressures and, thus, are exceptional model organisms to study for this reason. In this study, specimens were collected from three locations, including the Colorado National Monument, the Dominguez Canyon Wilderness Study Area (also in Colorado), and Arches National Park in Utah. Specimens were analyzed using light microscopy and four genera were identified using morphological characteristics and morphometric analysis. The results indicated that three genera, including *Echiniscus, Milnesium* and *Macrobiotus*, were distributed throughout all of the locations, but one genus, *Ramazzottius*, was only found in the Colorado National Monument. The genus *Echiniscus* was specifically evaluated to determine if the specimens in the three areas are comprised of the same species. Because tardigrades can endure harsh conditions, this knowledge may lead to important scientific advancements such as long-term tissue preservation and preventing or slowing DNA decomposition in the future.

Presenter(s)-Major: **Justin Pearce - Biological Sciences-Biology**
Title: MONITORING MOOSE ON THE MESA
Department: Biological Sciences
Sponsor: Susan Longest

Abstract: Monitoring large mammal distribution in a large area has never been an easy job. That is why it is important for future biologists to improve and create new techniques in order to get more accurate results. Currently Colorado Parks and Wildlife (CPW) conducts occupancy surveys and vegetation assessments to better understand which areas the moose are utilizing and to estimate the carrying capacity of the Grand Mesa. While conducting occupancy surveys, tracks and scat can be scarce, which may skew the results. To more accurately assess the areas that are being utilized by the moose population on the Grand Mesa, we deployed non-invasive, motion-detecting trail cameras. Trail cameras allow for constant monitoring of the habitat during both day and night to determine where animals are distributed, as well as which species are eating the different types of vegetation. Over 80,000 photos were collected during the summer of 2015 and were analyzed to determine species present in different habitats and foraging behavior. If the camera traps prove to be beneficial at tracking moose occupancy, the CPW may continue to improve and utilize this technique.

Presenter(s)-Major: **Kathryn Perroni - Liberal Arts-Elementary Teaching**
Title: MUSIC AND MEMORIZATION, WHY DOES IT WORK?
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: This research focuses on the idea that music can help increase the memorization of information in students, specifically students who are English Language Learners and students with special needs. Given this information, this activity and presentation are intended to show how music can help aide students' fine and gross motor skills, and help develop their vocabulary and listening skills. For the activity, half of the participants are given a list of the first seven elements on the periodic table of elements and asked to memorize them. The second half of the participating group is asked to watch a video which uses music to teach the same seven elements on the periodic table. Participants can re-watch the video as many times as they need. Both groups of participants will regroup after five minutes to see how music or lack of music affected memorization of the first seven elements on the periodic table.

Presenter(s)-Major: **Melissa Peterson - Biological Sciences-Biology**
Title: THE BIRDS AND THE GRASSHOPPERS: EFFECTS OF CLIMATE CHANGE ON PREDATOR-PREY PHENOLOGY
Department: Biological Sciences
Sponsor: Susan Longest

Abstract: Bird species rely on the availability of food resources to be successful in reproduction. In response to climate change, many avian species are arriving earlier to their breeding grounds. Prey availability seems to drive the advancing phenology. Birds match their timing of breeding with peak food abundance for their hatchlings. As warming temperatures are linked to earlier prey availability, birds must change their arrival time to breeding grounds in order to raise chicks during the peak of food availability. The underlying question of this ecological relationship is if birds are adapting to meet changing food availability. In this study, data on the breeding behavior of Mountain Bluebirds and Ash-Throated Flycatchers in Unaweep Canyon, Colorado for the past 15 years were analyzed for changes in arrival time to breeding grounds. These data were compared with historic grasshopper phenology data. In addition, real-time grasshopper samples were collected in 2015 to sample the species and frequency of the insects. The collective data were used to test the hypothesis that Mountain Bluebirds and Ash-Throated Flycatchers will lay clutches earlier in the year to match the early hatch dates of grasshoppers due to climate change.

Presenter(s)-Major: **Viktoria Petrose - History-Teaching (Secondary)**
Title: UNIFIED IDENTITIES: NAZI UNIFORMS AND PRISON BADGES
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: Seeking an explanation for the 11 million deaths that resulted from the Holocaust, numerous historians continue to grapple with the tragic history of Nazi Germany. Though scholars have not come to a consensus, most recognize that the Nazi regime's success in manipulating the German population into supporting their anti-Semitic exploits was a significant factor in the development of the Holocaust. Adolf Hitler and his followers used a variety of techniques, like anti-Jewish films, to obtain public support for a unified German identity that excluded 'inferior' segments of the population. They then used clothing to reinforce that German identity and further isolate the remaining population. During the Holocaust, Nazi officials confined groups, like the Jews or the Gypsies, to small neighborhoods and forced them to wear badges indicating their inferior identities. Conversely, Nazi guards were given uniforms that were adorned with the Nazi symbols that emanated German pride. Using the symbolism of clothing, the Nazi regime was thus able to segregate portions of the German population and prescribe them with new identities. Convinced of their superior identity, many of the regime's soldiers felt enough distance from their imprisoned counterparts to

comply with the systematic murder of the prisoners. Thus, the regime used clothing as a tool to coax ordinary men into the slaughter of innocent men, women, and children. Though the soldiers' uniforms were not the only factor that enabled them to commit murder, they helped provide the soldiers with a Nazi identity that encouraged a murderous anti-Semitism. Because of the effects that it had on Europeans during World War II, society should uphold an awareness of the symbolic nature of clothing. In the case of the Holocaust, clothing was powerful enough to allow people to commit murder and strip people of their humanity.

Presenter(s)-Major: **Jazmyn Phillips - Theatre Arts-Dance**
Title: A TRIO
Department: Theatre Arts
Sponsor: Megan Glynn

Abstract: The aesthetic of dance has an ever-changing history, like that of music and art. This presentation will specifically expose the rebellious period between the 1950s and 1970s, labeled as postmodern. During these years, some choreographers turned their backs on the expectations of rigorous technique and dramatic storylines, and moved their focus to abstract reflections of movement. A section of an original work will be learned and performed to obtain a better understanding of postmodern dance.

Presenter(s)-Major: **Brianna Powell - Geosciences-Geology**
Title: GEOLOGIC MAP OF THE SNYDER FLATS AREA IN UNAWEEP CANYON, COLORADO
Department: Physical & Environmental Sciences
Sponsor: Verner Johnson

Abstract: The Uncompahgre Plateau is a geologic feature that trends north-east in the northern portion of the Colorado Plateau and is intersected perpendicularly by Unaweep Canyon. Previous studies of the Uncompahgre Plateau and Unaweep Canyon have shown magnetic anomalies and cataclasts. These studies have shown that heat sources created the anomalies and cataclasts. The mineralized cataclasts contain calcit, fluorite, amethyst, hematite, malachite, and epitheral barite. The purpose of this study is to enhance the geologic map of Snyder Flats, an area along the rim of Unaweep Canyon, to determine the presence of hydrothermally altered cataclasts in this area. By defining the presence of the cataclasts, the extent of the heat source in this area may be determined. After the geologic map is created, further studies in the area may be conducted, including gravity surveying, which will increase the understanding of the paleotectonic setting of the Uncompahgre Plateau.

Presenter(s)-Major: **Jordan Quintana - Radiologic Technology, Benjamin Shaw - Radiologic Technology**
Title: REDUCING PATIENT DOSE IN INTERVENTIONAL RADIOGRAPHY
Department: Health Sciences
Sponsor: Olga Grisak

Abstract: This project aims to focus on methods to minimize patient dose in pediatric interventional radiography (IR), specifically for the age group of 0-6 years. Pediatric dose awareness in IR is of particular importance because of patients' higher sensitivity to ionizing radiation. Interventional procedures, which use fluoroscopy to diagnose and repair diseases in the blood vessels, do not occur frequently in children; however, the most common pediatric procedures involve repairing heart defects. In addition, there are discrepancies in the protocol of reducing pediatric dose between facilities in the United States and facilities around the world. These discrepancies, as well as the possible long term effects of high-dose ionizing radiation to children, will also be discussed. The main conclusion drawn from the research is that dose reducing strategies in pediatric IR should be implemented to the fullest extent. These strategies include utilizing the intermittent x-ray beam, creating standardized reference dose limits for pediatric patients, and maintaining an effective quality control program for the fluoroscopy equipment.

Presenter(s)-Major: **Jaron Ragsdale - Geology, Environmental**
Title: THE EROSIONAL HISTORY OF THE GRAND MESA BASED ON APATITE-HELIUM THERMOCHRONOLOGY: IMPLICATIONS FOR COLORADO RIVER EVOLUTION AND GRAND CANYON FORMATION
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

External Funding: This project was funded in part by grant 2014-1001 from the Unconventional Energy Center.

Abstract: The Grand Mesa, near Grand Junction Colorado, is capped with a well-dated 10 million year old basalt flow that rises ~1500 m above the Colorado River and the floor of the Grand Valley. The age and height of the basalt flow are concrete evidence of fast downcutting by the Colorado River over the past 10 million years. One key question is when within the past 10 million years did the Colorado River incise to form the Grand Mesa. The reason for this intense period of downcutting has been fiercely debated, but new apatite-helium cooling history data from the flanks of the Grand Mesa could provide key evidence to narrow down the possibilities. Specifically, cooling ages can be used to constrain the timing of post-10 Ma (million years old) river incision. The date that the Colorado River incised can then be compared with other major events of the lower Colorado

River drainage basin. Formation of the Grand Canyon at 6 Ma is a major aspect of this investigation. Incision by the Colorado River within the past 6 Ma would imply large-scale transient knickpoint propagation upstream triggered by the Grand Canyon's formation.

Presenter(s)-Major: **Cody Rapke - Geosciences-Geology**
Title: BRINGING NEW LIGHT TO THE GEOLOGIC HISTORY OF THE BLACK CANYON OF COLORADO USING SUPER BOUNDING SURFACES IN EOLIAN SANDSTONES
Department: Physical & Environmental Sciences
Sponsor: Larry Jones

Abstract: The idea that the Wingate Formation (eolian) onlapped the Precambrian Black Canyon Group is a widely accepted theory. However, this is not a certainty. There is the possibility that the Wingate Formation buried the entire region, and when the region was subject to uplift the Wingate Formation was eroded. Super-bounding surfaces are a feature found in eolian units and can be traced laterally for 10's of kilometers or even more. Bounding surfaces have been used in other regions of the western U.S. to help interpret the units' geologic history. Bounding surfaces in the Wingate Formation have not been traced between Grand Junction and Montrose, Colorado. This study will focus on super-bounding surfaces in the Wingate Formation, tracing them from Grand Junction towards the Black Canyon near Montrose. Bounding surface geometries will be described and mapped using measured sections. This study will either confirm that the Wingate Formation onlapped the Precambrian, or give evidence that the Wingate Formation buried the region and was then subject to uplift.

Presenter(s)-Major: **William Rasmussen - Geosciences-Geology**
Title: ALTERNATING LOW FLOW VENTILATION AND THERAPEUTIC HYPOTHERMIA SYSTEM
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Kessler

Abstract: In recent years there has been extensive research in the use of therapeutic hypothermia for the treatment of cardiac and neurologic trauma. There has been even more interest by the United States military in using therapeutic hypothermia on the battlefield following an explosion from an Improvised Explosive Device. The purpose of this student -designed ventilator is to investigate the possibility of, first, having a portable ventilator that is easy to use and is designed for use in the field, and second, the ability to place the patient in therapeutic hypothermia while in the field prior to arriving at a Trauma Center. This is a proof of a concept project to demonstrate that the ventilator can meet the criteria for safe and effective. Then to establish the hypothermia system is able to reduce the temperature in a simulated body in a time frame faster than conventional techniques by means that are in-line with the skill set of a Combat Medic / Emergency Medical Technician.

Presenter(s)-Major: **Sophia Reck - Biological Sciences-Biology**
Title: USING BIOELECTRICAL IMPEDANCE ANALYSIS TO ESTIMATE POST-MORTEM INTERVAL
Department: Biological Sciences
Sponsor: Eriek Hansen

Abstract: An estimate of the post mortem interval (PMI; i.e., time of death) is a vital piece of information used by law enforcement agencies throughout the legal process. Current methods for estimating PMI include: tissue lividity, forensic entomology, total body scoring (TBS), and other observational approaches. However, these methods of decomposition assessment are limited by their subjectivity. A quantitative technique for estimating PMI was needed to improve current methods. Bioelectrical impedance analysis (BIA) was used to measure resistance (R) and reactance (Xc) of biological tissue in human remains. As human remains decompose, the R and Xc of tissues changed in predictable patterns (e.g. R increases as human remains desiccate). Consequently, BIA can be used as a quantitative approach for estimating PMI. To develop BIA as a technique for estimating PMI, R and Xc were regularly measured on decomposing human remains. There was a strong correlation between accumulated degree days (ADD) and stage of decomposition. ADD was used to normalize the differences between time of death and BIA measurements. R, Xc, ADD, and TBS were measured in order to compare correlations between BIA metrics (i.e., derivations of R and Xc) and ADD. The correlations between BIA metrics and ADD will be reported.

Presenter(s)-Major: **Katherine Richards - Psychology-Counseling Psychology, Michelle Robertson - Psychology-Counseling Psychology, Eric Vandenheuvel - Psychology**
Title: WELL-BEING: HAVE ONLINE INTERACTIONS OVERPOWERED FACE-TO-FACE INTERACTIONS?
Department: Social & Behavioral Sciences
Sponsor: Jacob Jones

Abstract: Previous researchers have demonstrated that relationships play a major role in our well-being. Relationships among well-being, interpersonal relations, and social support on social network sites and in face-to-face environments has been a topic of interest. Thus, the purpose of this study is to take a more in depth look at how positive and negative interpersonal interactions in online and face-to-face environments affect a person's well-being. In the present study, we questioned college students

using three questionnaire sections: demographics, the PANSE, and the PERMA Profiler. After closing the survey, there were 352 participants that completed the survey: 248 females, 101 males. The average age of the participants was 22.94 years. Positive emotional support received face-to-face and positive relationships were strongly correlated, $r(329) = .461$, $p < .05$. Positive instrumental support received face-to-face and positive relationships were strongly correlated, $r(329) = .458$, $p < .10$. In general, face-to-face interactions have a stronger effect on our relationships when compared to online interactions. Overall, it seems like positive emotional support has the biggest effect on our relationships and well-being in any environment.

Presenter(s)-Major: **Eivind Roed - Pre-Engineering, William Rozman - Pre-Engineering, Sean Snediker - Pre-Engineering, Dillon Vavak - Pre-Engineering**
Title: VISUAL DISPLAY OF SOUND: HARMONIC RESONANCE THROUGH MULTIPLE MEDIUMS
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Sarah Lanci

Abstract: Sound is heard by everyone every single day, but it is hardly ever seen. The goal of this project is to demonstrate sound as it travels through air and into different mediums, such as sand, non-Newtonian fluid, and water. A test frame will be designed utilizing four speakers, a metal plate, a tone generator, and the different mediums to visually show how sound creates standing waves. A metal plate will be placed on the speaker with one medium on top of it. Using the tone generator, different frequencies will be played through the speakers. As the sound travels through the metal plate, the plate vibrates and creates troughs and crests. The medium collects in the troughs and creates a visual representation of the standing wave. The final presentation will consist of a portable display box, equipped with buttons to play various frequencies and housings to protect the speakers.

Presenter(s)-Major: **Jordyn Roles - Liberal Arts-Elementary Teaching**
Title: ANALYZING LITERACY ASSESSMENTS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: This project is a case study utilizing formal and informal assessments on one first grade student to determine the student's knowledge about literacy strategies in reading and writing. Validity and reliability of assessments used to monitor student progress will be studied. Analysis of assessment tools and student strengths after implementing assessments with the student will aid in determining the next steps for the student's literacy learning.

Presenter(s)-Major: **Samantha Sams - English-Teaching (Secondary)**
Title: UNTIL YOU FIND A HOME
Department: Languages, Literature & Mass Communication
Sponsor: Jennifer Hancock

Abstract: This creative nonfiction piece is a short memoir that examines the author's experiences with depression and river running. The memoir employs a technique called the braided narrative; the piece is complied of three separate, yet interrelated essays, or threads. This technique is essential in that it allows the author to cover her experiences in Alaska, Florida, and Colorado, over a three-year span of her life, in just fifteen pages. For her presentation, the author will introduce and discuss the major points of each thread. In addition, she will read highlights from the memoir.

Presenter(s)-Major: **Olivia Sayer - Biological Sciences-Biology**
Title: *DICTYOSTELIUM DISCOIDEUM* AS A CANCER CELL MODEL IN DRUG DISCOVERY
Department: Biological Sciences
Sponsor: Kyle McQuade

Abstract: Natural compounds have been used for thousands of years for many medicinal purposes including pain relief to injury and disease treatment and more. The purpose of this project is to assess the bioactivity of drugs and natural products using *Dictyostelium discoideum*. *Dictyostelium* is a model organism for human cancer cells. It is an effective model for many reasons. First, its life cycle contains many steps, most of which are analogous/homologous to when human cells go awry. Thus, drug affects can be assessed on many steps of the cell cycle to determine in which step(s) a drug has an effect and therefore the mechanism by which a drug is working. Second, the genome of *Dictyostelium discoideum* has been completely sequenced, and many of the genes present have homologs in humans which, when altered, are pathogenic. Third, *Dictyostelium* are genetically tractable, meaning you can add and subtract genes to alter the mechanisms by which certain drugs act. You can then determine the efficiency of the mechanisms. However, the first goal of this project is to determine an accurate method to assess *Dictyostelium* cell growth in high throughput. Once a method for accurate growth measurement has been determined, it will be used to screen an NIH library of approximately 200 bioactive compounds. The idea is to look for compounds that exhibit notable effects in the *Dictyostelium* model and to look at the response of the *Dictyostelium* cells to the compounds because these compounds could potentially exhibit these effects in human cells as well.

Presenter(s)-Major: **Hayleigh Scofield - Liberal Arts-Elementary Teaching**
Title: DIFFERENTIATED INSTRUCTION IN AN INCLUSIVE ELEMENTARY CLASSROOM
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: This research will focus on the benefits of differentiated instruction through various teaching strategies in an inclusive elementary classroom setting. Each individual child learns and retains information best when exposed to their preferred learning modality: visual, auditory, reading/writing, or kinesthetic instruction during a lesson. Some children may require a combination of these different modalities to learn. These different modalities are called learning styles. The research presented will demonstrate ways that each learning style can be incorporated into lessons through intentional planning and execution. A short video will be shown of visual, auditory, reading/writing, and kinesthetic differentiation being implemented in a college classroom to show that meeting different learning styles can go beyond an inclusive elementary classroom and extend to all learners.

Presenter(s)-Major: **Nicholas Scott - Geology**
Title: DETERMINATION OF RIVER HISTORIES AND FORMATION OF UNAWEEP CANYON BASED ON QUATERNARY RIVER GRAVELS FOUND IN GATEWAY AND WHITEWATER, COLORADO
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: For over a century geologists have debated which river is responsible for carving Unaweep Canyon. Numerous studies have used modern river courses, alignment with nearby river canyons, and pebble counts of Quaternary river terraces near the eastern and western ends of the canyon to determine whether the Colorado or the Gunnison River once flowed through Unaweep. Peale believed that the Gunnison was to blame, however Gannett later said that it was the Colorado. The first physical evidence was provided by Cater in the form of abundant volcanic Gunnison River gravels near Gateway at the western end of Unaweep. In 2011, William Hood attributed the formation of the canyon to the Colorado, once again using river pebble counts. Hood found red siltstone clasts (common within the modern Colorado River) in Quaternary river terrace gravels near Gateway. A more recent study, done by Soreghan, again disputes this evidence and claims that it was definitely the Gunnison and not the Colorado River that carved Unaweep. In order to address this ongoing debate on the origins of Unaweep Canyon, an investigation of newly exposed river gravels near Gateway will be done in an effort to solve the mystery and end the century-long debate.

Presenter(s)-Major: **Kaitlin Senko - History**
Title: THE NATURAL ENEMY OF DEMOCRACY: THE ACCEPTANCE OF IRISH CATHOLIC IMMIGRANTS IN MID-1800S AMERICA
Department: Social & Behavioral Sciences
Sponsor: Justin Liles

Abstract: Exposés, persuasive articles, and books from prominent authors of the mid 1800s questioned the role of Catholics in the devoutly Protestant post-Great Awakening America, often characterizing Catholics as incompatible with American democracy because of their ties to the strong hierarchy in Rome. Beginning in the 1830s, a mass of poor, uneducated, and unskilled Irish Catholics fleeing from poverty flooded into the industrializing North of the United States, and they were met with strong anti-Catholic prejudice and frequent targeted mob violence. To what extent did these immigrants integrate into American democracy or remain a distinct subculture? What effect, if any, did this integration have on the common American perceptions of Irish Catholics? The individual involvement of immigrants in church and civic causes demonstrates how the Irish Catholics began to adopt American ideals of democracy, while the American Catholic Church reinforced its hierarchy in the face of an 876% increase in the Catholic population. Based on the employment of Irish Catholics in hotels and hospitals, American sentiments appear to shift towards the acceptance of individual Catholics despite their faith by the 1860s. However, the continuing prominence of anti-Catholic violence and literature demonstrates the enduring nature of these prejudices.

Presenter(s)-Major: **Charmaine Severin - Liberal Arts-Elementary Teaching**
Title: ANALYSIS OF ONGOING LITERACY ASSESSMENTS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The Assessment Process, Practice and Analysis Learning Study is a project designed to give teacher candidates the opportunity to analyze a student's growth in literacy over a period of time. Over the course of the project, the teacher candidate used multiple research-based assessment tools to assess and record data on one specific student, the focus student. The assessments were in both reading and writing and were composed of pre, formative, summative, and post assessments. This project has the purpose of allowing teacher candidates the opportunity to carefully analyze the focus student's developmental literacy stage and growth over the duration of the project. While analyzing the student's used strategies and skills, the teacher candidate advised instructional steps a teacher should take to ensure that the student continues to grow in both reading and writing. This project gives teacher candidates the much needed practice of using formal and informal assessment to analyze

exactly what a student can and cannot do. Once teacher candidates have substantial data, they can practice the important skill of constructing purposefully planned instruction for an individual student's needs.

Presenter(s)-Major: **Nathan Simpson - History**
Title: HITLER'S SOLDIERS: UNITED AND POWERED BY THE SWASTIKA
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: War has given shape to societies since the beginning of civilization. However, early studies of military history, focused almost exclusively on battle scenes and tactics, gave limited agency to the historical actors themselves. In most societies, the soldier is perceived as a patriot who embodies and protects the cultural ideologies of that given society. They are honored for their sacrifices through holidays, traditions, parades, and memorials. But what happens when that military force fights for an ideology that emphasizes racial supremacy? Unit cohesion is essential to the ultimate success of any wartime mission or political goal driving the impetus for war. One way of forming that cohesion is through the use of symbols or military insignia with which soldiers can identify. In the case of Nazi Germany, the unification of soldiers and the population, in part, derived from the adoption of ancient runic symbols. Our cultural perceptions of Nazis and their use of the swastika and SS bolts demonstrate the problems associated in interpreting symbols and language in historical studies. In order to understand the implications that the use of symbols and language such as the swastika and SS bolts have had on our cultural perceptions of the period, we must trace them from their origins through the ideologies they came to represent in Nazi Germany. Thus, this research will demonstrate how Nazi Germany used the power of symbols to unify and provide soldiers with the moral acceptance of racial supremacy and motivation to carry out immoral atrocities. The scope of the research will also allow us to probe the foundations of Aryan ideologies, the importance of SS soldiers to Hitler's political agenda, and the moral struggles they have since come to face. This paper will ultimately shed light on the connections between war and the societies and cultures affected by their outcome.

Presenter(s)-Major: **Meagan Singh - Liberal Arts-Elementary Teaching**
Title: IRLEN SYNDROME: EFFECTS ON THE ELEMENTARY CLASSROOM
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: Many students find themselves constantly struggling to read as they peer into books that contain words that move, jump, or even disappear. This literary phenomenon is known as Irlen Syndrome. Using the research of Helen Irlen, the cause and effects are now well known and can be very useful in the realm of education. After identifying the effects of Irlen Syndrome, scientific research was conducted in order to determine what methods could limit the effects of this syndrome. This research would prove to be helpful in generating knowledge about the effects of Irlen Syndrome in the classroom environment and the responsibilities held by the teachers. Given this information, the presentation is designed to inform educators about Irlen Syndrome and the necessary steps to address it within their classrooms.

Presenter(s)-Major: **Jessah Skalla - Biological Sciences-Biology**
Title: DRUG DISCOVERY: METHODS FOR USING *DICTYOSTELIUM DISCOIDEUM* MOTILITY TO CLASSIFY BIOACTIVE COMPOUNDS
Department: Biological Sciences
Sponsor: Kyle McQuade

Abstract: *Dictyostelium discoideum* is a eukaryotic soil dwelling amoeba with a complex lifecycle consisting of a free living single cell stage and a cooperative multicellular stage in which the cells aggregate and move together, ultimately forming a stalk and spores. Because the stages of the *Dictyostelium* lifecycle rely on signaling mechanisms that are disrupted in human disease, the organism has been used routinely in drug discovery experiments. In the free living vegetative state, amoebae move using similar mechanisms and pathways to those used in human cells, making it an excellent tool in the identification of compounds that may affect human cellular growth and movement. In this project a method of analyzing the effects of potentially bioactive compounds on the motility of *Dictyostelium* using active cell tracks was developed. This method was employed to screen a library of compounds for potential drugs by subjecting *Dictyostelium* to varying concentrations of these compounds and creating time lapse imaging of their motility. The cells' speed, roundedness, and displacement were measured to classify potentially bioactive compounds and their effects on cell motility. EGCG and theaflavins from black tea were concluded to decrease motility and growth in *Dictyostelium* at concentrations between 35.7% and 2.23%.

Presenter(s)-Major: **Hans Snell - Music-Education**
Title: STRUGGLE BUS
Department: Music
Sponsor: Darin Kamstra

Abstract: As a music education major, composition and arranging are essential skills to develop because they lead to a better understanding of musical structure and theory. Additionally, the ability to arrange music for nontraditional ensembles is valuable

for directors of small programs that do not have the proper instrumentation for a traditional jazz, marching, or concert band. This composition started as a simple project in jazz combo and has transformed into a complex big band arrangement. The presentation will show the developmental process through which it was composed, as well as how the knowledge of this process can change the way we listen to jazz and music in general. It was created in order to allow students to improvise easily over simple chord changes while challenging them stylistically, technically, and tonally. The composition also provides opportunities for percussion students to be featured on the vibraphone.

Presenter(s)-Major: **Courtney Snyder - Pre- Nursing**
Title: OBESITY IN AMERICA
Department: Languages, Literature & Mass Communication
Sponsor: Christine Hein

Abstract: It is a widely known fact that obesity has escalated into an epidemic in our modern-day society. Obesity can lead to numerous health issues including hypertension, diabetes, and heart disease. Research states that the United States spends approximately $147 billion dollars a year treating 35% of the population that is considered obese. If this disease is affecting such an extensive amount of the population, what is America doing to combat the issue? Between the increase in sedentary lifestyles, the over-promotion of cheap, high-calorie food, and the inability to maintain a balanced, healthy lifestyle, American society is promoting this detrimental and unhealthy way of life. This presentation takes a closer look into America's involvement in the development of the obesity epidemic and exposes how big of a problem it truly is.

Presenter(s)-Major: **Brandon Stanfield - History-Teaching (Secondary)**
Title: POLITICAL MANIPULATION: RACE, RELIGION, THE NATION, AND THE NAZIS
Department: Social & Behavioral Sciences
Sponsor: Adam Rosenbaum

Abstract: The National Socialist movement in Germany relied on the manipulation and coercion of ordinary Germans to accomplish some of the most animalistic and horrific acts of genocide. By placing race and the state at the center of Nazi movement, the regime forced Germans to comply with their goals. However, the Nazis had to be especially careful with religion. Religion was used as a tool to placate the German population and motivate them into endorsing the National Socialist agenda. The combination of racial politics and religion allowed Hitler and the Nazis to create a genocidal regime that would be responsible for the deaths of millions of innocents. This paper will seek to identify the use of religion by the Nazi regime to inspire further compliance among ordinary Germans that allowed them to commit extraordinary acts of evil. The desire for writing and presenting this paper came from an interest in the Nazi regime and their ability to manipulate the masses to commit atrocities. The audience will require basic knowledge on the Nazi regime and the conditions within wartime Germany through the years of 1939 until 1945. The final draft of the paper will be shared in a lecture form that will allow for questions and answers about conclusions. This paper will show the complex nature of the Nazi regime by demonstrating how they tailored their ideology to draw more support from the German population, thus further complicating the narrative of Nazism. The intended audience for this paper is anyone who has an interest in the Nazi regime and a desire to learn more about the complex and often inconsistent nature of Nazi ideology and their use of religious language, rituals, and symbolism to inspire pseudo-religious devotion in the German people for the regime.

Presenter(s)-Major: **Melissa Statler - English-Literature**
Title: ANTICIPATORY PSYCHOLOGY: REVISITING CHARLES BROCKDEN BROWN'S *EDGAR HUNTLY* THROUGH THE WORKS OF ERNEST BECKER
Department: Languages, Literature & Mass Communication
Sponsor: Randy Phillis

Abstract: *Edgar Huntly*, in the context of psychoanalytic reading, has many times been read and interpreted through a Freudian lens. While interpretations such as these are applicable to the text and can offer valuable ways of looking at the work, they fail to illuminate the full extent to which Brown explored the human psyche. By using the work of cultural anthropologist Ernest Becker (a scholarly defense of whom is also crafted in this piece), and more specifically, his 1973 work *The Denial of Death*, the presenter constructs the argument that, in *Edgar Huntly*, Brown explored and reflected psychological ideas that were not only unexplored by the science of his day, but were also post-Freudian in nature and not fully circulated until well over a century later.

Presenter(s)-Major: **Kortni Stillwagon - Theatre Arts-Music Theatre**
Title: THE IMPORTANCE OF THE ARTS IN EDUCATION
Department: Theatre Arts
Sponsor: Timothy Pinnow

Abstract: Who is to say which subjects are the most important for students to learn in schools? In recent years, arts programs have increasingly been getting cut from the K-12 curriculum for various reasons. According to multiple sources outlined

throughout this essay, it has been proven that teaching the fine arts in elementary, middle, and high schools is imperative to the overall growth and development of a student's mind and learning ability. While there are a variety of reasons to justify why arts programs are being cut by schools, there may be educational consequences for students who have not had access to the arts. This essay intends to prove the importance and worth of teaching the arts to K-12 students and to outline the many benefits the arts can have on one's overall intelligence and development.

Presenter(s)-Major: **John Swiger - Manufacturing Technology-Machining Technology, Brandon Taulbee - Manufacturing Technology-Machining Technology**
Title: HIT AND MISS ENGINE
Department: Western Colorado Community College
Sponsor: Bill McCracken

Abstract: This project encompasses the application of computer-aided design and manufacturing technologies as well as traditional methods in the manufacture of a proven internal combustion engine design. This demonstrates revisiting outmoded technologies and designs with computer-aided design and analytical tools to explore possible future applications of a hit and miss engine.

Presenter(s)-Major: **Jake Ten Eyck - Geology**
Title: SEDIMENTARY AND PETROGRAPHIC ANALYSIS OF THE OHIO CREEK/ DARK CANYON INTERVAL, WESTERN COLORADO AND EASTERN UTAH
Department: Physical & Environmental Sciences
Sponsor: Rex Cole

Abstract: The Dark Canyon (Utah) and Ohio Creek (Colorado) are thin but widespread conglomeratic units that crop out over a lateral distance of over 150 miles and unconformably overlie Cretaceous Age Mesa Verde Group and underlie Tertiary Age Wasatch Formation rocks. These units have raised curiosity in the local research community because of their stark difference in grain size from the surrounding geologic units. Petrographic analysis of these samples will be helpful in revealing quantitative differences in the provenance of these units. The samples will be analyzed using Folk and Boggs classification schemes with a special emphasis on the various chert pebbles in the samples. Point count data will be collected and compared both from a mineralogical view, and also from a paleogeographical view. After classification of the mineralogy of the units, further analysis into possible source areas will be conducted.

Presenter(s)-Major: **Josh Thompson - Chemistry-Biochemistry**
Title: THE SYNTHESIS OF NOVEL GOLD(IIII) COMPLEXES TOWARD THE DEVELOPMENT OF CATALYSTS FOR THE FUNCTIONALIZATION OF C-H BONDS
Department: Physical & Environmental Sciences
Sponsor: David Weinberg

External Funding: Acknowledgement is made to the donors of the The American Chemical Society Petroleum Research Fund for support of this research.

Abstract: The high electrophilicity of gold(III) makes it a good candidate for the catalysis of organic reactions. Currently much research is being done on the ability of gold(I) to catalyze organic reactions however similar gold(III) research is far behind. In order to facilitate a variety of reactions, ligands have proven capable of directing functional groups toward metal centers. In this aim novel gold(III) compounds are being synthesized to test their potential as catalysts in organic transformations. These gold (III) compounds have been bound to previously synthesized ligands to direct strong sp3 hybridized C-H bonds toward the metal center. Currently novel gold (III) compounds are being synthesized using both t-butyl phenanthroline and amide derivatives of 8-aminoquinoline with various alkyl groups directed for reaction at the gold metal center. Using sodium tetrachloroaurate, a variety of novel gold(III) complexes have been synthesized with these ligands. These gold(III) compounds being created will be used to determine their effectiveness in both directing strong sp3 hybridized C-H bonds toward the gold(III) center as well as to determine the efficacy of gold(III) to partially oxidize these bonds. The successful synthesis of gold(III) compounds capable of partially oxidizing C-H bonds would prove to be an extremely useful reaction in converting petroleum feedstocks to useable plastics and fuels.

Presenter(s)-Major: **Duncan Touzjian - Theatre Arts-Acting/Directing**
Title: I'M NOT A PSYCHOPATH, I JUST PLAY ONE ON STAGE
Department: Theatre Arts
Sponsor: Mo LaMee

Abstract: As part of the Theatre Capstone class, three monologues will be presented: one comedic, one dramatic, and one classical. In this instance, the pieces will be from Martin McDonagh's *The Lieutenant of Inishmoor* (comedic), Joe and Tony Gayton's *Hell on Wheels* (dramatic), and Christopher Marlowe's *Dr. Faustus* (classical). All three pieces are very dark and portray

different reactions and atmospheres surrounding tragedy and horror. The worlds of each of these monologues are bleak and unforgiving, and each speaker has lost something dear to them. The contrast between them illustrates the many different paths a life can take after such a loss: revenge, regret, or acceptance.

Presenter(s)-Major: **Adam Trumbo - Chemistry**
Title: STRUCTURAL INVESTIGATIONS OF MINERALIZED CATACLASTIC ZONES IN UNAWEEP CANYON AND THE SIGNIFICANCE OF STRUCTURAL CONTROL IN RELATION TO THE FORMATION OF UNAWEEP CANYON
Department: Physical & Environmental Sciences
Sponsor: Verner Johnson

Abstract: The Uncompahgre Plateau in west-central Colorado is a fault-bounded, uplifted block, of Precambrian rock overlain by Mesozoic sedimentary deposits. Unaweep Canyon cuts a jagged path through the sedimentary, igneous and metamorphic rock from the northeast to southwest in the northern Uncompahgre Plateau. In eastern Unaweep Canyon alongside Nancy Hanks Gulch is a faulted and mineralized zone bearing calcite, fluorite, amethyst, epithermal barite, hematite, goethite, malachite, and azurite, which maintains continuity across Unaweep Canyon. These mineralized fractures extend through Precambrian and Mesozoic strata possibly terminating in the Entrada Formation. Two other confirmed fracture zones, with minimal mineralization and cross-canyon continuity, have been discovered to the west of Nancy Hanks Gulch. Investigation of these mineralized fracture zones has provided a detailed structural map of eastern Unaweep Canyon indicating pre-existing faults, originating during the Laramide tectonic development of the Uncompahgre, predated the canyon. In addition, the network of related fractures can hypothetically be applied to model structural control across a zone of weakness as the origin of formation for Unaweep Canyon.

Presenter(s)-Major: **Casey Utemei - Liberal Arts-Elementary Teaching**
Title: ANALYZING STUDENT LITERACY ASSESSMENTS
Department: Teacher Education
Sponsor: Cynthia Chovich

Abstract: The Assessment Process, Practice and Analysis Learning Study is designed to assist future teacher candidates in analyzing a focal student through assessment data. This project will provide practice for a teacher candidate to conduct assessments and use the data to determine suggestions for the next steps in assisting the focal student. The assessment data will also provide information on the student's literacy strategies (in terms of reading and writing) and her strengths as a learner. This project will allow the teacher candidate to practice using research-based assessments, which includes selections based on pre, formative and summative assessments. With this background and experience of using assessments, the teacher candidate will have the opportunity to broaden content understanding of not only utilizing assessments but also the importance that assessments have in the teaching profession. Today's classroom teacher is required to develop instructional strategies based on assessment data to effectively meet the needs of students. This project will assist in strengthening the teacher candidate's strategies that will be used as an approach in furthering students' learning growth.

Presenter(s)-Major: **Troy Utley - Studio Art**
Title: THE MOST HEINOUS CRIME A JOKE CAN POSSIBLY BE
Department: Languages, Literature & Mass Communication
Sponsor: T.J. Gerlach

Abstract: In the modern day, many major media outlets and content developers tend to lean on crass and base humor or cutting satire to provoke a response from their readers and listeners. The intent of this presentation is to present an alternative. Over the course of six to seven minutes, the presenter will read aloud a piece of prose intended to provoke a humorous response. The piece in question will use only the driest humor and feature an offbeat conclusion. Utilizing an emphasis on wordplay and a feeling of the surreal, and straying away from toilet humor, the presentation is intended to showcase of a more innocent form of humor. During the remaining time, the presenter will briefly discuss the nature of wordplay and common forms of humorous juxtaposition.

Presenter(s)-Major: **Lisa Van Kirk - Geosciences-Environmental Geology**
Title: ANCIENT RIVER COURSES OF THE UNCOMPAHGRE PLATEAU IN WESTERN COLORADO: ALKALI FELDSPAR PROVENANCE INVESTIGATION
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: Upon the Uncompahgre Plateau, well rounded ancient river gravels are found throughout the mountainous terrain at elevations exceeding 9500 ft. These ancient gravels are 4000-5000 ft. higher in elevation than the modern river systems surrounding the Uncompahgre Plateau. Migration and evolution of these ancient river courses have likely formed in response to uplift of the Uncompahgre Plateau. Unanswered questions remain to be solved including which ancient river(s) were directly responsible for the erosion of the Uncompahgre Plateau. Because several kilometers of rock have been removed over the past ca.

30 Ma, the removal of source area rocks has increased the difficulty of identifying the ancient river. Furthermore, modern rivers in the region contain similar abundance of intermediate-composition volcanic gravel clasts, which further complicates interpretations of depositional origins. However, anomalous pink alkali feldspar (AFS) granites found within the ancient river gravel deposits may prove important. Although these AFS granites are very minor in abundance compared to intermediate volcanic gravels, it is believed that their uniqueness will greatly aid with identifying gravel provenance, and possibly improving our understanding ancient river courses. It is suggested that the Telluride Conglomerate is a plausible source for these pink AFS granites.

Presenter(s)-Major: **Chris Walker - Biological Sciences-Biology**
Title: BEHAVIORAL CHARACTERISTICS OF *PHYTOPHTHORA INFESTANS* ZOOSPORES ON THE LEAF SURFACE OF VARIABLY SUSCEPTIBLE HOSTS
Department: Biological Sciences
Sponsor: Margot Becktell

Abstract: *Phytophthora infestans* is an economically significant pathogen that infects many common agricultural hosts, including potatoes and tomatoes. Certain hosts, such as petunias, have inhibitory effects on the *P. infestans* zoospore infective stage. Efforts in the lab have shown that crude extracts from petunias consistently lyse *P. infestans* zoospores. This lytic effect may be caused by sucrose esters produced by the trichomes of petunias. However, the behavior of *P. infestans* zoospores on host surfaces where these trichomes exist has not been explored. The goal of this study was to observe *P. infestans* zoospores on the leaf surfaces of highly susceptible (tomato and potato) and less susceptible (petunia and Nicotiana benthamiana) hosts. To achieve this, leaf sections from each host were treated with *P. infestans* zoospores, then observed via 3D light microscopy. On tomato and potato leaf environments, *P. infestans* zoospores swam freely for ~3-6 minutes before settling, and germinating; on petunia and N. benthamiana leaves the zoospores swam for less than two minutes before settling to attempt to germinate, or would lyse. This research, in concert with ongoing efforts to isolate the causative substances, offers greater insight into the host-pathogen interactions that have important economic impacts on susceptible crops.

Presenter(s)-Major: **Whitney Watson - Biological Sciences-Biology**
Title: IDENTIFICATION OF CANNABIS SATIVA STEMS AND ROOTS USING DNA BARCODING
Department: Biological Sciences
Sponsor: Stephen Stern

Abstract: In the past biological specimens were identified solely using morphological features such as shape, size, and color of body parts. This method usually required a professional taxonomist to identify species and if the specimen was damaged or underdeveloped in some cases even the professional taxonomist could not identify the species with certainty. In 2003, Paul Herbert proposed the idea of "DNA barcoding" as a way to identify species. This method uses a very short genetic sequence from a standard part of the genome as a unique marker for identifying species, which is similar to a barcode at the supermarket. DNA barcoding can be used as both a tool for taxonomists to supplement the knowledge that they already have, and it can also be used by non-experts that need to make a quick identification. We utilized genetic barcoding to identify dry roots and stems that would otherwise be difficult to positively identify. Here we discuss the extraction, amplification and sequencing process used to make positive identifications of Cannabis sativa using the ITS (internal transcribed spacer) molecular marker.

Presenter(s)-Major: **Rondelle Whittle - Geosciences-Environmental Geology**
Title: GROUNDWATER SALINITY TRENDS RELATED TO IRRIGATION IN THE GRAND VALLEY, AND UPPER COLORADO RIVER BASIN
Department: Physical & Environmental Sciences
Sponsor: Andres Aslan

Abstract: The groundwater system in many of the irrigated valleys in the Upper Colorado River basin is produced almost completely by deep percolation of inefficient irrigation systems. Irrigation efficiencies include seepage from unlined ditches, and over-irrigation causing unnecessary runoff, increased infiltration, and increased return flow to the river. Irrigation efficiencies in the Grand Valley are less than 50%. This leads to increased levels of salinity in the Colorado River system as shallow groundwater passes through the Mancos Shale and saline soils. Salts from irrigated soils account for 85% of all human-induced salt load in the Colorado River. The current project proposes to examine the change in water quality caused by irrigation over time. The study will be conducted by comparing the pH, conductivity, water hardness, total dissolved solids, and sodium content of water in the Highline Canal and approximately 10 tributary drainages that discharge irrigation water to the river. A study of this nature was conducted in 1991-1992 by Butler et al. (1994), who presented data on the above parameters for return ditches in the Grand Valley. Chemistry of present-day irrigation return water will be examined and compared with those values obtained in the 1994 study and other similar studies.

Presenter(s)-Major: **Jacob Williams - Chemistry**
Title: DETECTION AND IDENTIFICATION OF NEGATIVELY-CHARGED GOLD NANOPARTICLES USING PH INDICATOR ARRAYS
Department: Physical & Environmental Sciences
Sponsor: Samuel Lohse

Abstract: Engineered nanoparticles (NPs), man-made materials less than 100 billionths of a meter in diameter, are starting to pervade the world in which we live. Engineered NPs are now used in a wide array of applications ranging from microelectronics, to next-generation batteries, and nanotherapeutics. Although nanotechnology enables a host of new applications, engineered nanomaterials health risks remain poorly understood. Thus, engineered NPs pose a potential health and environmental hazard. Currently, there are very few inexpensive and convenient methods for detecting and identifying nanomaterials. We are investigating a potentially inexpensive and high-throughput NP detection that can detect and identify nanomaterials based on their size, shape, and composition. Our potential NP detection system consists of an array of six available pH indicators. Though none of the indicators are specific for NPs, the overall color change array of the indicators gives a response which appears to be specific to the organic molecules displayed on the NP surface. The ability of the sensor to identify nanomaterials based solely on their surface chemistry suggests the possibility that sensors of this type could be used to detect and identify a wide variety of nanomaterials in a variety of real-world situations.

Presenter(s)-Major: **Jessica Wood - Liberal Arts-Elementary Teaching**
Title: EFFECTIVE EDUCATIONAL PRACTICES FOR STUDENTS WITH AUTISM SPECTRUM DISORDER
Department: Teacher Education
Sponsor: Ann Gillies

Abstract: Students with Autism Spectrum Disorder (ASD) have unique challenges that require educators to consider classroom setup, routine, and instruction when planning. There has been a substantial amount of research indicating common communication, social, behavioral, and academic issues among students with ASD. The research has not led to implementing a prescribed instructional program by school districts. Six core areas of focus for an educator to consider are systematic instruction, individualized education program, family involvement, a daily routine, structured learning environment, and behavioral support. These six areas include strategies that educators have used and have shown to be effective to use with students with ASD.

Presenter(s)-Major: **Megan Wood - English-Writing**
Title: "THE WASTELAND" AS WRITERLY TEXT
Department: Languages, Literature & Mass Communication
Sponsor: Barry Laga

Abstract: "The Waste Land" by T.S. Eliot is a notoriously vexing text to interpret. The apparent disjunction, multiple languages employed, and extensive footnotes have made the poem's function unclear to many readers over the years. However, by thinking in terms of "writerly texts" theorized by Roland Barthes, we notice that "The Waste Land's" ambiguity allows readers to derive meaning from the experience. The theory of "reader as writer" gives the reader more agency and engages the reader as a producer of the text, rather than a mere consumer of the text. By reading the poem as "writerly," the most frustrating characteristics become the very features that transform readers into creators as they actively construct connections out of a collage.

Abstracts

SPECIAL EXHIBITS

Presenter(s)-Major: **Corbin Cooper - Mechanical Engineering Technology, Westlyn Johnston - Pre-Engineering, Keegan Kaiser - Mechanical Engineering, Connor Lumley - Pre-Engineering, Thomas Nielson - Mechanical Engineering Technology, Morgan Ryan - General Engineering, Dirk Smuin - Mechanical Engineering Technology**
Title: MESA MOTORSPORTS FORMULA SAE 2016
Department: Mechanical Engineering Partnership Program, Colorado Mesa University & University of Colorado Boulder
Sponsor: Scott Kessler

Abstract: The Colorado Mesa University Engineering Club has designed and built a competition car for the yearly Formula SAE design competition series. Mesa Motorsports is competing for the second time in Michigan in May, and for their first time at the Lincoln, Nebraska competition in June. The competition involves designing a small formula-style car, gathering funds, fabricating it from scratch, marketing it to potential investors, and racing it against hundreds of other universities. The team is comprised of seven groups tasked with designing sub-systems including chassis, powertrain, intake/exhaust, suspension, driver ergonomics, brakes, and aerodynamics. The team is excited to unveil their vehicle for this year's international competition.

Presenter(s)-Major: **Randal Baker - Manufacturing Technology-Machining & Manufacturing Trades, Brandon Bourg - Psychology-Counseling Psych, Colton Bowen - Manufacturing Technology-Machining & Manufacturing Trades, Edgar Carrasco - Pre-Mechanical Engineering, Shane Christensen - Manufacturing Technology-Machining Technology, Corbin Cooper - Applied Mechanical Engineering, Adam Hall - Manufacturing Technology-Machining & Manufacturing Trades, Nathan Hawley - Applied Mechanical Engineering, Gary Heard - Mechanical Engineering Technology, Javier Romero Hernandez - Liberal Arts-Mathematics, Kevin Hilken - Applied Mechanical Engineering, Devin Montgomery - Mechanical Engineering Technology, Rylan Piper - Manufacturing Technology-Machining Technology, Stormy Ramsay - Mechanical Engineering Technology, James Ray - Manufacturing Technology-Machining Technology, Shane Romero - Mechanical Engineering Technology, John Swiger - Manufacturing Technology-Machining Technology, Jeffery Takos - Manufacturing Technology-Welding, Brandon Taulbee - Manufacturing Technology-Machining Technology, Christopher Walters - General Engineering, Reo Weisgerber - Manufacturing Technology-Machining Technology**
Title: CNC MACHINING II CLASS PROJECT: DESIGNING UNIQUE DESKTOP CLOCKS
Department: Western Colorado Community College
Sponsor: William McCracken

Abstract: Engineering and Manufacturing students enrolled in the Computer-numeric Control (CNC) Machining II class are presenting their uniquely designed desktop clocks manufactured to industry specifications in the CNC machining laboratory. Student use CAD/CAM design software to design their projects, then select the proper CNC machining processes to complete their work.

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