



COLORADO MESA
UNIVERSITY

THIRD ANNUAL



2012

SHOWCASE PROCEEDINGS

Wednesday, April 25, 2012

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. The sessions' abstracts are published in this *Showcase Proceedings*.

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STUDENT SHOWCASE PROCEEDINGS



Wednesday, April 25, 2012
Grand Junction, Colorado



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ABSTRACTS



Presenter(s): **Zachary Adair, Craig Freeborn, Jimmy Uribe**
Title: THE BABYLONIAN AND SUMERIAN HISTORY OF MATHEMATICS
Major(s): Mathematics, Mathematics - Secondary Education Licensure,
Mechanical Engineering
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: Students from every school system have math classes and they have history classes, but very rarely do you see each subject infused together. Throughout the history of human existence we see a correlation with the growth of mathematics and advancement as a society. For this reason it is vital to study how mathematics was used to advance societies and how the structures of different societies opened pathways for the more advanced mathematics we study today. This project is a record of two societies, the Sumerians and the Babylonians, and how they used mathematics to build their societies into some of the notable empires of their day. We will highlight what their society was like, their contributions to mathematics, how these contributions were used, and point out some of their societal flaws which led to the limits of their mathematics. The result will give you just a segment of the story which is the history of mathematics.

Presenter(s): **Katrina Adams**
Title: FIGURES IN SYLVIA PLATH'S POEM "DADDY"
Major(s): English - Secondary Education Licensure
Department: Languages, Literature and Mass Communication
Sponsor: Barry Laga

Abstract: My essay "Figures in Sylvia Plath's poem Daddy" demonstrates my understanding of an assignment given in Intro to Literary Theory and Criticism which required us to read a chapter in Bennett's book describing what figures were in literature and applying that knowledge to a piece of our choosing. After careful consideration about what figures meant and how they affect the meaning of literature, I chose Sylvia Plath's poem "Daddy" because it is rich with figures. Throughout my essay I first argue that Plath uses figures in this poem to show how she really feels about her estranged father. Then I argue that Plath uses these figures to further the distance she feels from her father by comparing herself to the Jewish people and her father to the German soldiers. Above all, I argue that Plath uses strong figures from World War II to show the distance she feels from her father.

Presenter(s): **Kristian Ambors, Milton Arroyo, Jared Cahalan, Sergio Mendoza**
Title: SOUND SLUG
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Arun Ektare

Abstract: This program will record sound waves and measure the associated frequencies, then display the frequencies by means of graphs. During the recording of the sound waves, live graphs will interpret the frequencies. The graphs that can be displayed measure distribution of frequencies, and occurrence of amplitude. The recording can be manipulated after it has taken place by different options that the user has. Programming skills used included user interface design, graphic design, and data capture from the microphone.

Presenter(s): **Caitlin Anderegg**
Title: SPERNER'S LEMMA AND THE BROUWER FIXED POINT THEOREM: REAL WORLD APPLICATIONS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Markus Reitenbach

Abstract: The field of mathematics is widely diversified and separated into many different specializations and topics of study. One such field is Topology and this is where one finds Sperner's Lemma. Although the classical construction of Emanuel Sperner's capstone idea is deeply rooted in topological ideas, the number of applications outside of topology is astounding. For example Sperner's Lemma can be used to construct an elegant proof of the Brouwer Fixed Point Theorem, traditionally a hard algebraic topology concept to master. Using these two results, we will look at some real world applications including Game Theory topics such as John Nash Jr.'s hallmarked Nash Equilibrium, the Fair Division Algorithm, Rental Harmony, and the Cake Cutting Problem.

Presenter(s): **Clinton Anderson**
Title: HOLOGRAMS AND FOURIER ANALYSIS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Philip Gustafson

Abstract: From entertainment to medical technology, holograms have proven useful and interesting. Mathematics plays an important role in the representation of holograms. Unlike standard photographic images, holograms capture both intensity of coloration and phase differences in the image signal, which enable a 3D image rendition. This is achieved through the use of a reference light beam in combination with the light reflected from the image, which together produces a diffraction pattern. We will examine how Fourier analysis can be used in the representation of this diffraction pattern, including the use of Fourier matrix expansions and the 2D Fast Fourier Transform. A historical review of hologram advancements will also be discussed.

Presenter(s): **Thane Anderson, Jeffrey Potter**
Title: FANS AND HOW THEY AFFECT SPORTS IN SOCIETY
Major(s): Kinesiology - K-12 Education, Physical Sciences, Sport Management
Department: Kinesiology
Sponsor: Elizabeth Sharp

Abstract: Fans affect the social world of sport and are also influenced individually by sport. Research shows that fans not only support a team through watching live games, but also gain personal satisfaction through watching a game. The research also shows the purpose of sport is to identify one's identity and pride through one's team and how it can impact a person's emotions. The data collection methods used were observation of fans in real life and on television, surveys, and personal interviews. The significance of this research is that fans meaningfully influence sport. Preliminary results show that fans have a mutual understanding of their place in sports, which includes cheering and other forms of celebration. The intended audience of this research are individuals who may want to learn about the importance of fans within a sport social world.

Presenter(s): **Robert Archer**
Title: THE SHADOW OF IRMA GRESE: THE SS-AUFSEHERINNEN AS A REFLECTION OF SOCIAL MEMORY AND THE BANALITY OF EVIL
Major(s): History
Department: Social and Behavioral Sciences
Sponsor: Vincent Patarino

Abstract: The death, suffering, and barbarity during the Holocaust led to numerous and challenging questions: How could this happen? Were both genders involved, and if so, in what capacity? As the international community moved to answer these questions, they found that both sexes actively participated. Many German women were guilty of actively supporting or working for the Nazi regime, and as a result of news agencies like the Gaumont British News, Irma Grese became especially notorious internationally. Grese became the standard of the beautiful, yet deadly Nazi woman. During her post-war trial, the paradoxical image of the beautiful and deadly female concentration camp guard entered into public social memory. It is one that has survived into our contemporary culture. Images in movies, books, internet forum boards, pornography, and even musical works have all accepted and further disseminated the constructed image of beautiful, deadly, and hyper-sexualized Nazi women. By deconstructing this problematic image, we find that most women who worked in the concentration camps were nothing like Grese in either their appearance or their brutality. Indeed, many of these women were ordinary women—in appearance and background—guilty of horrific actions; not beautiful, hyper-sexualized mass murderers, a clear example of Hannah Arendt's thesis of the *Banality of Evil*.

Presenter(s): **Rhys Arithson**
Title: DEVELOPING A CAREER PATH IN PSYCHOLOGY: TRANSFERABLE SKILLS AND KNOWLEDGE FROM CAMPUS TO WORKPLACE
Major(s): Psychology
Department: Social and Behavioral Sciences
Sponsor: Susan Becker

Abstract: Higher education needs to respond to a more practical view of undergraduate education in psychology. The psychology program at CMU has been working toward a skills development model in its coursework. A student and alumni developed survey has been launched in order to evaluate the effectiveness of classes and experience at CMU at preparing students for their post-graduate educations, careers in psychology, and related fields. The project asks the question, "How well do the educational experiences at CMU provide transferable skills and knowledge to the workplace and to graduate education?" Data are analyzed using descriptive and qualitative method once data collection is completed. Results allow us to paint a picture of graduates' career development, including a summary of the skills alumni have found to be most valuable. Results will be useful both to current students as they consider career options and to the Psychology program itself.

Presenter(s): **Ryan Baker**
Title: GEOLOGIC MAP OF THE COLORADO AND GUNNISON RIVER TERRACES OF THE GRAND VALLEY
Major(s): Physical Sciences - Environmental Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

Abstract: The Colorado and Gunnison Rivers meander through the semi-arid, sage-pinion environment of Grand Junction, Colorado, and as the rivers have incised, they have left behind an important record of fluvial terraces. These terraces tell the story of where the rivers flowed and how fast they carved the Grand Valley during the Quaternary Period. This map compiles and standardizes GIS data on fluvial terraces from published and unpublished geologic maps of the Grand Valley. Field work was performed in unmapped areas to fill in gaps. Anomalous terraces were investigated and field checked. The terraces are up to 170 meters above the modern river level

and trend progressively towards the north, suggesting the river has shifted north. The final map expresses the paths of the ancient Colorado and Gunnison Rivers, which will be used as the basis for more precise measurements to estimate the rate of long-term river down-cutting, as well as for studying the reasons behind river incision.

Presenter(s): **Ryan Baker**
Title: THE GEOLOGIC MAP OF THE GRAND VALLEY
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Verner Johnson

Abstract: The geologic map of the Grand Valley consolidates published geologic maps into one comprehensive map. This map can be used as a tool to more completely understand the geologic history of the Grand Valley, as an aid in the preliminary planning and design of structures, and as a supplement to environmental studies. The map was created by combining GIS files downloaded from the United States Geological Survey for the following 7.5 minute quadrangles: Colorado National Monument, Grand Junction, Clifton, and Palisade. Geologic features were digitally rendered for the Lands End 7.5' minute quadrangle. The files were merged in ArcGIS 10, and opposing interpretations were reconciled using aerial photographs. The final map was formatted and symbolized using the Federal Geographic Data Committee Geologic Mapping Standards (2006). The block diagram was created by combining an aerial photo, with a digital elevation model in ArcScene, exporting it to Adobe Illustrator, and editing it with information gleaned from the geologic maps. The cross sections were created using A to A' ArcGIS extension and edited in Adobe Illustrator. GIS has proved to be excellent tool in the preparation of this geologic map.

Presenter(s): **Brittniy Baleztena, Betsy Hancock, Brandi Nolan, Kathleen Scribner**
Title: THERAPEUTIC HYPOTHERMIA
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Beth Bricker

Abstract: Cooling the body to 32 to 34 degrees Celsius using various external and internal methods is not routinely used in the United States to preserve neurologic function after cardiac arrest. It has been shown to have positive neurologic outcome in Europe and Australia, but little evidence exists elsewhere. Therefore, the use of therapeutic hypothermia in the United States needs further research to address the effects it has on patients experiencing cardiac arrest. The significance of this study presents considerable long-term positive effects for patients meeting inclusion criteria following a cardiac arrest. The purpose of this study is to determine that therapeutic hypothermia reduces negative neurologic effects post cardiac arrest. This study will implement a quasi-experimental trial with blinded assessment of outcome. It will be a convenience sample from St. Mary's Hospital in Grand Junction, Colorado, consisting of 150 men and women who meet the criteria for therapeutic hypothermia. The neurologic outcome post-intervention will be measured by the Cerebral Performance Scale. It is proposed that therapeutic hypothermia will have positive neurologic benefits.

Presenter(s): **Adrienne Barlow**
Title: RESTLESS METAPHOR- LOVE CARD PROJECT
Major(s): Political Science
Department: Art
Sponsor: Suzie Garner

Abstract: Over the past year and a half, I have engaged in a community art project focusing around the most complex and confusing of emotions, love. *The Love Card Project* has taken notes from other community art projects that seek to bring people together by demonstrating commonalities among an enormously diverse group. The

project's ultimate intent is to answer the question, "What is love?" I collect cards by asking anyone, anywhere, to participate and provide them with simple instructions: using whatever medium they choose, they need to define love on a 2.5 inch by 3.5 inch Artist Trading Card and then return it. Since its inception, the project has collected over 320 cards from CMU students, faculty and staff, family, and friends from all over Colorado. There are even a few cards from other countries. This project has shown how complex love really is and what it means to people of all different backgrounds. The project takes its form in many mediums which is one of the exciting parts of it. As a collection of work, the project takes on greater significance by demonstrating the convoluted aspect of love. Sometimes it's thorny, sometimes it's serene, but it's always deeply affecting.

Presenter(s): **Taylor Bisbee**
Title: PRINTING INTAGLIO
Major(s): Art - Studio Art
Department: Art
Sponsor: Joshua Butler

Abstract: Intaglio printing has existed since the 15th century, where it was originally employed to advertise metal engravings on armor. It was quickly realized that intaglio prints were an art that exceeded just advertisement; artists began apprenticing under goldsmiths to master the art of engraving and employ this skill in expressing themselves by creating fine art prints. The goal of this presentation is to familiarize the viewer with the process of creating a contemporary intaglio print and various ways of printing the zinc plate once it has been created.

Presenter(s): **Michael Bizer, Braden Neptune**
Title: GREEK AND ROMAN INFLUENCES ON MATHEMATICS
Major(s): Mathematics - Secondary Education Licensure
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: Greek mathematics was different from Babylonians and Egyptian mathematics. The principle reason for this was that the Babylonians and Egyptians used their mathematics for practical applications while the Greeks did math for math's sake. This allowed the Greeks to develop mathematics well beyond that of the Egyptians or Babylonians. While the Greeks were brilliant problem solvers whose main tool was geometry they were limited by their numbering system. This is evidenced in their approximation for pi. Nevertheless, the method of exhaustion (trapping the area of a circle between two shapes they could calculate) used the idea of infinity to get an approximation for pi. Another notable mathematical contribution was the idea of "proof". The Romans that followed the Greeks weren't interested in mathematics for anything other than running their empire. If anything, they stagnated mathematical growth by the number system they imposed upon Western Europe. In this presentation the cultural differences that drive the evolution of that culture's mathematics and the limitations it imposes will be examined.

Presenter(s): **Shawna Blachley, Christi Carter, Nicole Gracie, Amber Hasson**
Title: HEALTHCARE: PREVENTION OF MUSCULOSKELETAL INJURIES
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Research proves that a large amount of musculoskeletal injuries could have been prevented if proper use of body mechanics and safety were used. How can we protect those who are taking care of others and prevent ourselves from becoming patients? The motivation to work on this is that if we cannot take care of ourselves, how are we going to take care of others? Workers compensation does not benefit anyone in the situation when someone gets hurt. Bringing awareness of safety in body mechanics will help reduce workers compensation payouts from health care companies. Background information would include the reader needing

to understand musculoskeletal injuries and body mechanics and how they relate to the clinical settings. Statistical information regarding workers compensation claims in various medical settings in the state of Colorado will summarize the research proving that this is an issue. We will show how to assess the environment and be conscious of the environmental hazards surrounding health care workers in their daily tasks and techniques to use to prevent musculoskeletal injuries. The larger significance in this project is preventative medicine to keep nurses as care takers and not as patients. The intended audiences for this project are health care workers, safety committees and the general public.

Presenter(s): **Zachary Black, Pace Bates, Aaron Clymer**
Title: FLUID DISPENSING LINEAR GANTRY
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Francisco Castro

Abstract: GPD, a local equipment manufacturer, has asked this student team to research and design a Gantry system that improves various aspects of current systems. A Gantry system is a linear locomotion device that contains a bridge or scaffold unit that can transport a module along a single axis. Improving the current system involves performing faster operations (loading, calibrating, dispensing, and unloading) and reducing the floor area occupied by the system. A proposed design that includes the mechanical and electronic aspects will be presented.

Presenter(s): **Matthew Bollinger, Ron Brinkerhoff, David Maier, Aron Smalec**
Title: ACADEMY ACE
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Arun Ektare

Abstract: For many years police academy students have been studying and learning law aggressively with few to no resources until the release of the beloved "Baca Book." The "Baca Book "has been a valued resource for law enforcement with its summarized and well delivered legal content pertaining to law enforcement. With modern advances in educational systems and teaching modalities it is very feasible to provide interactive electronic content to discover, learn, and understand complex legal constructs used and implemented in law enforcement today. Academy Ace serves as a ground breaking medium for learning and understanding modern law enforcement legalities and intricacies.

Presenter(s): **Marisa Boraas**
Title: LATE TERTIARY DRAINAGE EVOLUTION IN THE SOUTHERN RIVER BASIN, WYOMING
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

External Funding Source: National Science Foundation

Abstract: The Green River Basin of southwestern Wyoming has undergone changes in its drainage patterns over the course of the past 50 Ma. Samples of fluvial deposits were taken in an attempt to understand the evolution of the basin. Detrital zircon analysis was performed in order to ascertain the origin of these sediments. Zircon is a mineral known for its resistance to both chemical and physical weathering. This, coupled with its tendency to include uranium but not lead in initial cooling, lends itself as a powerful tool in provenance determinations of sedimentary deposits through the use of radiometric dating. This study is a comparison of two samples, both taken at locations east of Flaming Gorge Reservoir, WY. One sample is from the Oligocene Bishop Conglomerate which overlies the second sample of unknown fluvial origin. Differences in composition can be found in the zircon data. The Bishop Conglomerate contains a majority of Precambrian-aged grains and very

few of younger age. The majority of these grains are consistent with ages in the Unita Mountains, which is known to be the source of the Bishop Conglomerate. In contrast, a majority of the unknown fluvial zircons are of 30-40 Ma age, much fewer Precambrian grains.

Presenter(s): **Andrew Borman**
Title: A MINERALOGIC AND PETROLOGIC STUDY OF THE MIOCENE "GOODENOUGH" FORMATION, GRAND MESA, COLORADO
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Rex Cole

Abstract: The poorly defined "Goodenough" Formation underlies the basalt cap of Grand Mesa and ranges from 15 to 274 meters thick (50 to 900 feet). The unit has also been called the "Unnamed Unit." Outcrops of the "Goodenough" are located throughout the landslide bench of Grand Mesa. The age of the unit is not well constrained, the unit lies between the 10 million old basalt flows and the Eocene Green River Formation. Units that may be equivalent to the "Goodenough" are the North Park, Middle Park, Browns Park, and Troublesome Formations. The 34 samples being studied come from 13 locations. Of these samples 29 percent are mudrocks, 38 percent are sandstones and conglomerates, 3 percent are volcanic lithics, 12 percent are pebble samples and 18 percent are limestone. To gain a better understanding of the lithology of the rocks, hand samples, thin sections, and x-ray diffraction will be used to examine and describe the mineralogy, petrology, and texture.

Presenter(s): **Emily Breiner**
Title: ECOLOGICAL FACTORS DRIVING LARVAL DEVELOPMENT RATES
Major(s): Biological Sciences
Department: Biological Sciences
Sponsor: Thomas Walla

External Funding Source: Tri-Beta National Biological Honor Society

Abstract: The rate at which insects develop has direct implications for fitness, with faster developing individuals exhibiting faster population growth rates, more generations per year and a concordant increase in relative contribution to future generations. We investigated ecological factors influencing development rate in Lepidopteran larvae. Using a caterpillar rearing database to measure larval development time, we tested for patterns among larvae reared under three conditions to explore the factors driving development time. In the first experiment we controlled for temperature and tested the effect of elevation on development time by rearing larvae from different elevations in a common 2000m environment. In a follow-up experiment we compared larval development time between *Ithomiini* larvae reared in their native habitat at different elevations thus measuring the combined effect of temperature and elevation. In a third experiment we compared the development time of six families of Lepidoptera collected and reared at 250m in a Costa Rican wet forest to the same families collected and reared at 2000m in eastern Ecuador to establish the generality of these patterns in the neotropics. We found strong support for the role of warmer, lower habitats driving faster development, and a slow-down in development for transplanted larvae.

Presenter(s): **Nicholas Brenholtz**
Title: THE PROGRAMMATIC SIDE OF ORIGINAL COMPOSITIONS
Major(s): Music - Liberal Arts
Department: Music
Sponsor: Darin Kamstra

Abstract: The turn of the 19th century had new developments in music, including a huge debate as to whether a story line should be used in instrumental music or not. Hector Berlioz, the leader of the programmatic side, is best known for his *Symphonie*

Fantastique. On the other side, there is Johannes Brahms, who is the leader of what he called "Absolute Music." The presenter will demonstrate techniques used by composers that effectively show story lines through music, including his own original composition entitled "Criminal's Minds" for solo tuba with piano accompaniment. Sequenced realizations of the first movement, "The Catch," will be played for the audience's appreciation and understanding of programmatic music.

Presenter(s): **Kenneth Bretey, Jesse Coquoz**
Title: MONITORING DEVIATION IN ARBITRARY WAVEFORM GENERATORS
Major(s): Mechanical Engineering
Department: Computer Science, Mathematics & Statistics
Sponsor: Rick Ott

Abstract: Deviations in arbitrary waveform generators can be seen using a computer interface data collection system. Arbitrary waveform generators generate electric signals used in circuit analysis. Electrical engineers rely on accurate electric signals to make measurements in a circuit. The measurements gathered from the equipment are used in the design of other circuits and the trouble shooting of circuits. Waveform generators must provide correct and accurate signals in order for the engineer to complete any task correctly. A computer interface data collection system made by LabView can show with accuracy the values of an electric signal from a waveform generator. An increase in signal frequency can display an increase in deviation, and deviation seen varies randomly within a certain range for each frequency examined. Statistical analysis techniques can be used to elaborate the deviations seen from the waveform generators.

Presenter(s): **Jesse Brewer, Tim Johnson**
Title: COEFFICIENT OF RESTITUTION FOR GOLF EQUIPMENT
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: The coefficient of restitution of golf clubs impacts golfers around the world. A high coefficient of restitution is ideal for a golf driver. The coefficient of restitution for golf clubs was tested by measuring rebound height of a golf ball dropped from a set height onto a golf club face. Coefficients of restitution for multiple golf clubs are compared to determine statistical differences in different golf clubs.

Presenter(s): **Suzanne Bronson**
Title: NEW SPEAK - THE NEOLOGISM OF GAMING LANGUAGE
Major(s): English - Writing
Department: Languages, Literature and Mass Communication
Sponsor: Julie Bruch

Abstract: My presentation will discuss the new invented lexicon that is entering the English language through usage by young people who are playing various electronic games. These new words have no origin other than these games and are slowly becoming part of adolescents' non-gaming speech. Society should take note because, according to Robert Lane Greene from *The Economist* (December 13, 2010), "The idea that language influences thought is a profound, exciting and possibly disturbing one." If language does shape the mind, studying this new lexicon is just as important as monitoring the Motion Picture Association of America (MPAA) ratings associated with these games. I will be applying the terminology and language rules I have learned from my History of English class.

Presenter(s): **Melanie Butler, Candys Betsworth, Kendra Meder**
Title: ANIMATION: PERSISTENCE OF VISION
Major(s): Graphic Design- Print/Animation, Graphic Design - Animation
Department: Art
Sponsor: Carolyn Quinn-Hensley

Abstract: The word animation is derived from the Latin word anima, meaning “life” or “soul”. Thus, animation is the act of bringing an entire world—even universe—to life. This display is intended to be an immersive environment, consisting of an entire room. Along the outer walls, strategically placed computers will continuously loop a single animation created by a senior during the fall semester of 2011. Corresponding to the animation will be a movie poster advertising the film. The focal piece of the show will be a professionally printed book featuring a two-page spread from each student detailing the animation process. This book will also be presented via overhead projection to allow the audience to view the book together while also providing the tactile project. Through the use of both print and animation, the premise is to bring the viewers into the world of animation, to feel a part of it and to share the language.

Presenter(s): **Leland Byers**
Title: FIGHTING MONSTERS, AND BEING TAXED FOR IT? A LOOK AT POSSIBLE GOVERNMENT TAXATION IN VIRTUAL WORLDS
Major(s): Business Administration - Management
Department: Business
Sponsor: Johnny Snyder

Abstract: This paper's purpose is to explore the possibilities of applying taxes to digital items produced in virtual worlds, primarily considering massive multiplayer online role playing games (MMORPG). This is in reaction to Blizzard Entertainment announcing the opening of an auction house to coincide with the release of the video game *Diablo III*. This auction house will allow for both real and virtual currencies to be used, directly linking digital items with a real world value. Since no business, of this size and recognition, has done such a thing in the United States it could lead to the government becoming more involved in the virtual worlds and how they are seen in the eyes of the law. To explore this topic a general review of Internet taxation and bartering was created, along with a method of seeing how easy it is to place a value on a digital item. Lastly, a look at what some countries have done when taxing virtual worlds will be presented.

Presenter(s): **Kelsey Carpenter**
Title: SCHATZKER TYPE II LATERAL TIBIAL PLATEAU FRACTURE
Major(s): Athletic Training
Department: Kinesiology
Sponsor: Robert Ryan

Abstract: Background: A 42 year old physically active male fell from an eight foot ladder resulting in a Schatzker type 2 comminuted fracture of the left lateral tibial plateau with some fracture fragments depressed up to 7 mm. The athletic training student was involved in the rehabilitation process during an off campus clinical rotation. Differential Diagnosis: Schatzker Type II fracture of the left lateral tibial plateau. Uniqueness: An estimated 1% of all fractures are to the tibial plateau, a majority of which come from falls. While the athletic trainer in the traditional setting may not be involved with an injury of this severity, those in the extreme and high impact sport settings or those in the clinical and industrial settings are likely to see this type of injury. Depending on the surgical protocol and fracture type, the recovery time for a tibial plateau fracture may vary from one to several months. The primary limiting factor is the amount of damage to the articular cartilage.

Presenter(s): **Shanachie Carroll**
Title: WHAT'S GOOD FOR THE GOOSE IS GOOD FOR THE GANDER:
HOW UTILITARIANISM INFLUENCES DECISION MAKING IN
DYSTOPIAN LITERATURE
Major(s): English - Secondary Education Licensure
Department: Languages, Literature and Mass Communication
Sponsor: Maureen Neal

Abstract: This paper examines a series of dystopian texts and the societies found within. Particular interest is given to Harry Harrison's "Make Room! Make Room!" and "The Ones Who Walk Away from Omelas" by Ursula LeGuin. In each text, society has somehow morphed into a dystopia; it is this paper's goal to offer a potential explanation of this shift by using a utilitarian lens. In other words, this paper seeks to answer the research question: How do utopias become dystopias? In many ways, this paper lays essential groundwork for future conversations about the role of utilitarianism in dystopian literature, especially in its role in influencing decision making—which seems essential in the transition between utopia to dystopia. This isn't to suggest that people consciously choose to transition from one to the other; rather the role utilitarianism has influencing political and economic choices relies upon people being purely objective, which this paper argues is difficult to do consistently.

Presenter(s): **Thena Collins-Walton**
Title: SHOULD ONLINE LEARNING REPLACE BRICK AND
MORTAR COLLEGES?
Major(s): Computer Information Systems
Department: Business
Sponsor: Donald Carpenter

Abstract: Should online learning replace brick and mortar colleges? This project explores the issues around the benefits and drawbacks to online learning. Arguments in favor highlight customizing learning to meet the needs of individual students, the new student types and how they are unique as well as budgeting issues. Then the focus turns to the drawbacks of online learning that include concern for quality of online education, budget effects and the relationship of success to the college experience. This author chose this subject as a result of being a returning student after 26 years, and the process it takes to achieve degree completion while working full time and maintaining a family. The research for this project educated the author on what a typical college student now is. You too may be surprised.

Presenter(s): **Andy Cook**
Title: DOES SOIL TYPE AFFECT TREE DENSITY OF PIÑON-JUNIPER
WOODLANDS AT COLORADO NATIONAL MONUMENT?
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Deborah Kennard, Verner Johnson

Abstract: This study considers tree density data compared to soil classification in an effort to determine the effects of soil type on tree density. I used ArcGIS with a soil-type layer file obtained from USGS and tree density data gathered by CMU students over a three year period. The tree density data consists of 431 100 square meter plots located on mesa tops within Colorado National Monument. 3,560 live trees were measured in a 1,600 hectare study area. The study area includes ten distinct soil classes, all originating from sandstone and primarily deposited by wind. The texture varies slightly from sandy loams to sandy clay loams. I also compared tree density to a buffered streams layer and a buffered roads layer to determine if either of these parameters had an effect on tree density or size. The results of this study show that the greatest tree density is in the Barx-Panitchen Complex soil type which is classified as a "very deep" soil that was formed in drainages or valleys. Study results also suggest that the intermittent stream channels in the study area have little effect on where trees grow or how large they grow and that the roadways have no effect on tree growth patterns.

Presenter(s): **James Coburn**
Title: GEOLOGICAL AND CULTURAL CONNECTION BETWEEN PREHISTORIC MESA VERDE, COLORADO AND CHACO CANYON, NEW MEXICO
Major(s): Sociology - Anthropology
Department: Physical and Environmental Sciences
Sponsor: Verner Johnson, Curtis Martin

Abstract: Since the early Spaniards found the cultural areas of Chaco Canyon, New Mexico, and Mesa Verde, Colorado, people have had a deep fascination about how the Anasazi were able to build sophisticated engineering structures in the most desolate places in the southwest. This fascination continues today. Both population areas appeared and disappeared within a few generations of each other, and they both were developed and eventually abandoned by the Anasazi. Is there a connection between these sites? If so how do they relate? ArcGIS is used to compare between the two cultural areas, in terms of geological and cultural connections between the two areas. The two geological formations, the Menefee and Cliff House Formations (Cretaceous Period) are present in both areas. ArcGIS is used to incorporate both geological and archaeological records to determine if these two formations were used in similar ways, by the natives in both population centers. Did the geology of the area facilitate similar development of Chaco Canyon and that of Mesa Verde? Or did the two population groups evolve differently, despite the similarities in the geological setting?

Presenter(s): **Kimberly Delgado, Leslie Bracewell, Nicole Brown, Brenda Coop**
Title: SAFETY - A NEEDLE STICK AWAY
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: No matter how safe a person thinks they are, an accident is just a "stick" away. So how can safety prevent further sticks with a dirty needle? Recapping and improper disposal leads to unnecessary needle sticks. Nurses deal with combative, delusional, or aggressive persons on a daily basis which increases a perfect opportunity for an accidental needle stick and invasion of a blood borne pathogen to enter the bloodstream. The CDC estimated that there are 600,000 to 800,000 occupational needle stick injuries each year, which could lead to serious or potentially fatal infections such as hepatitis C or HIV. According to OSHA (Occupational Health and Safety Administration), hospitals have reported paying up to \$3,500 for follow-up, monitoring and testing of an employee and up to one million dollars for people who have become infected. After this presentation, we anticipate that future and current health care employees will follow standard practice when handling sharps and that they will be proactive when dealing with combative, delusional or aggressive persons.

Presenter(s): **Derek Dodson, Frank Livingston, Greg Pierson**
Title: SMALL ENGINE DUAL FUEL CONVERSION (CNG & GASOLINE)
Major(s): Manufacturing Technology - Machining Technology, Process Control Technology, Technology Integration - Network Technician
Department: Western Colorado Community College
Sponsor: Bill McCracken

External Funding Source: Encana

Abstract: Given the recent instability with fuel commodities, many people have been considering alternative fuels as a viable source for running America's economy. One of the most abundant fuel sources in the United States is natural gas. Compressed Natural Gas (CNG) is domestically derived, it's more economically viable, and it burns much cleaner thus reducing greenhouse gas emissions. One of the most inefficient combustible engines is the small lawnmower engines. With recent governmental regulation there is a great potential that small combustible

engines will be completely banned if not tightly regulated. Therefore, our objective is to convert a small lawnmower engine to effectively run on a dual fuel conversion (CNG & Gasoline), making it functional for today and tomorrow. In order to convert a lawnmower engine to function on a dual fuel setup it required the reducing our CNG pressure from 3,600 psi to less than 0.5 psi as well as adapting the motor to permit CNG injection. Modifications will have to be made for successful operation. Our group is a collaborative effort with several individuals from multiple disciplines; these include Process Technology, Machining & Manufacturing Technology, and Networking & IT. By successfully converting small combustible engine to CNG will be pilot the process for individual citizens to convert their home equipment if such noted regulations or bans were implemented.

Presenter(s): **Ace Doehling, Matt Findley, Ozzy Schoonover**
Title: MODULAR TRANSPORTATION SYSTEM
Major(s): Manufacturing Technology - Machining Technology
Department: Western Colorado Community College
Sponsor: Bill McCracken

Abstract: We are fabricating and demonstrating a modular transportation system for the WCCC Campus. The goal is to create a one-off system that is an effective, efficient, and unique way to transport whatever the rider needs to move. The motivation behind our project is to create a cart that is mobile and conventional for transporting the rider and their cargo. The skill set to be incorporated in this project is bicycle fundamentals, electrical and mechanical engineering and metal fabrication. The overall significance of the modular cart is to easily transport whatever you need throughout the campus. The intended audience for our project is all the Colorado Mesa University students, faculty, and the community as a whole.

Presenter(s): **Mark Douglass**
Title: FORMATION MECHANISMS FOR ANIMAL COAT PATTERNS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Lisa Driskell

Abstract: Have you ever walked around the zoo, looking at all the endangered and exotic animals and asked yourself, "How did these animals get such striking color patterns?" How did the zebra get its stripes or how did the cheetah get its spots? Many animals exhibit a remarkable variety in coat patterns and coloration. The variety in color and pattern can be seen in both species to species and individual to individual. It is suggested by Dr. James Murray that a single pattern formation mechanism is responsible for producing all the observed coat patterns. This single pattern formation mechanism can be described using a reaction-diffusion model. In this presentation we will explore the underlying ideas behind this proposition and how the mathematics behind reaction-diffusion systems has evolved to describe how animals really do get their coat patterns.

Presenter(s): **Kayla Espinoza, Shane Daniels, Scott Hart**
Title: BOAT TELEMETRY
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Arun Ektare

Abstract: Software developed to be used for various calculations concerning a motor boat using hardware such as temperature sensors, magnetic sensors, and a GPS system. Specifically, the software will calculate RPM's, engine temperature, and directional information sent by the GPS system.

Presenter(s): **Morgan Faessler, Nicole Bacon, Lani Duncan, Jordan McMillen, Gina Panacci, Keegan Pfeiffer**
Title: LIGHT GIVES HEAT (LGH), MOVING ON TOUR
Major(s): Business, Business Administration - Entrepreneurship
Department: Business
Sponsor: Georgann Jouflas

Abstract: As a project for our Small Business Consulting class, we have been working with a local nonprofit organization company called Light Gives Heat (LGH) in their "Moving On-There is Beauty in Risk" campaign. The goal of the campaign is to get people to make a difference in our world by taking a risk and step outside of their comfort zone.

Our project has been to consult LGH to plan a nationwide tour and plan the budgeting to bridge the gap between businesses and collegiate student-run clubs and organizations.

We have put together a marketing package that offers promotional materials, fundraising opportunities, and a sustainable business model which is brought to each University to:

- Learn entrepreneur business skills
- Learn application of business skills
- Learn firsthand knowledge of a sustainable business model
- Learn how to inspire your community to make a difference in other people's lives
- Learn about fundraising opportunity for your CEO or Entrepreneurship Club

What takes place at each of these events:

- Showing of an award winning documentary created by the entrepreneurial couple, Dave and Morgan Hanslow, who were chosen by Oprah Winfrey for "People Who Make a Difference" in 2011 and were invited as guests on the Oprah show
- Products made by the empowered African entrepreneurs which will be featured in the stated documentary film will be for sale to benefit the creators and the sponsoring club

Presenter(s): **Bernado Felix**
Title: QUANTIFYING THE BITTERNESS OF BEER: THE ANALYSIS OF ISOHUMULONES
Major(s): Physical Sciences - Chemistry
Department: Physical and Environmental Sciences
Sponsor: Tim D'Andrea

Abstract: Separation and identification of components in complex mixtures is an integral part of chemistry. Our research is focused on separating isohumulones from beer samples and ultimately quantifying these compounds. Specifically, isohumulone, isocohumulone, and isoadhumulone are being analyzed using high performance liquid chromatography (HPLC). In order to get quantitative information, standard samples of the three compounds are used to create calibration curves. Isohumulones are formed in the brewing process from isomerization of alpha acids and contribute to the bitterness of a beer. In fact, bitterness of a beer is measured using an international bittering unit (IBU), which represents the ppm concentration of isohumulones in beer. The large majority of breweries do not measure the bitterness of their products; they simply estimate it. Knowing the IBUs of beer samples, however, would greatly help a brewery. As a result, we are working with a local brewery, Kannah Creek, in an attempt to quantify the IBUs of several of their beers. Thus far, the IPA has been found to have a bitterness of 81 ± 8 IBUs at the 95% confidence interval.

Presenter(s): **Kelsey Follett**
Title: THE EFFECT OF BEETROOT POWDER SUPPLEMENTATION ON MUSCLE OXYGEN CONSUMPTION IN A GRADED VO₂ THRESHOLD TEST
Major(s): Exercise Science
Department: Kinesiology
Sponsor: Brent Alumbaugh

Abstract: The current study attempts to establish whether ingesting a beetroot supplement for four consecutive days has an effect on resting blood pressure and muscle oxygen consumption during aerobic exercise. The practical implications of the study could be a prolonged running threshold for endurance athletes to elicit greater positive fitness adaptations. Also, from a medical standpoint, ingesting beetroot could be beneficial for people who suffer from hypertension, due to its exceptionally high nitrate level. Past research showed that dietary nitrate (in the form of beetroot powder) supplementation reduced the oxygen cost of low-intensity exercise and enhanced the tolerance to high-intensity exercise (Bailey et al., 2011). To our knowledge, this is the first study to investigate the effects of dietary nitrate supplementation on female subjects during aerobic running exercise, since past research focused solely on male subjects and primarily on anaerobic cycling exercise. The study results showed no significant difference between the supplementation and placebo treatment. It is possible that a higher intake of beetroot supplementation during aerobic exercise would prolong threshold runs and athletes would have a safe and natural way to improve their performance through nutrition.

Presenter(s): **Matthew Fought**
Title: SELENIUM BATCH STUDIES
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Russ Walker

Abstract: Selenium is well known to be an issue in Western Colorado. Many water bodies in the region have selenium concentrations that pose issues of water quality for use in agriculture. This Mancos shale derived pollutant has been the focus of many studies primarily addressing concentration loads at various times and locations throughout western Colorado. More poorly understood is the mechanisms that generate this pollutant from the parent material. Understanding the processes that mobilize this contaminate is an important consideration in management and understanding of selenium issues. During the spring semester of 2012 I will be using Mancos derived soil samples to perform a series of batch tests. These tests are intended to help establish parameters necessary for later column studies of selenium. These column tests will help identify release rates through dissolution of selenium from parent materials. The batch studies are methods of stirring soil samples with samples from varying locations, for varying times, and mixing with varying solutions. Interactions with nitrate concentrations are of interest in this study as well. Measuring solution concentrations of selenium will enable development of methods for the column studies later.

Presenter(s): **Ryan Frieling, Jacob Crane, Tara Liddicoat, Michael Morrissey**
Title: VICIOUS & DELICIOUS IMC
Major(s): Business - Entrepreneurship, Business - Management and Business - Marketing
Department: Business
Sponsor: Deborah Parman

Abstract: An Integrated Marketing Communications (IMC) plan was developed to provide a promotional plan for a startup business – a winery located in Western Colorado called Vicious and Delicious. This project was developed as part of Promotions class (an upper division marketing class) at Colorado Mesa University during the fall semester of 2011. Both the IMC written project and the corresponding presentation examines the target market, market size, and feasibility of various promotional approaches including advertising design, public relations,

and media planning. The group's approach to this project was to introduce "outside the box" thinking combined with a creative angle for the purpose of establishing and maintaining a strong competitive advantage.

Presenter(s): **Ellen Garcia**
Title: FALL FLORA GUIDE TO BANGS CANYON
Major(s): Biological Sciences
Department: Biological Sciences
Sponsor: Stephen Stern

Abstract: Bangs Canyon is a popular recreational area close to the Grand Valley. It provides an abundance of recreational activities, as well as a plethora of wildlife, plant life, and is of geological interest. Due to the wide use of the Bangs Canyon area, the authors undertook a project to compile a guide to the fall flora. This resource will be made available to the public so that users of the canyon can learn about the diversity of plant life. Additionally, this online resource will be useful to professors at CMU who would like to provide educational field trips to the canyon. The authors took three field trips to the area in October to identify plant species and take profile pictures. We identified 31 commonly encountered plant species and wrote a condensed description for each. The descriptions include the scientific name, common name, identifying characteristics of each plant, common uses of the plant, and their ecological importance. This user-friendly guide also contains a brief overview of the canyon's geology and can also be used for similar locations throughout the Monument landscape. We hope that this will be the first of a series of guides for the Grand Junction community.

Presenter(s): **Dainel Gatt**
Title: VARIABLE-STIFFNESS-SOLE SHOES: A NON-INVASIVE STRATEGY FOR TREATING THE PROGRESSION OF OSTEOARTHRITIS
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: Osteoarthritis (OA) is the most prevalent form of arthritis in the United States, with the knee being one of the most commonly affected joints. At the knee, OA affects the medial compartment 3.5 times more frequently than the lateral compartment. This greater incidence of medial compartment OA can be attributed in part to the larger mechanical forces transmitted across the medial aspect of the knee. Previous studies have demonstrated that a variable-stiffness-sole shoe may be an effective, non-invasive way to decrease OA pain and may have the potential to slow the progression of knee OA. The purpose of this research was to determine the most efficient stiffness ratio for reducing external knee adduction moment during walking.

Presenter(s): **Jennifer Graham, Alexander Asay, Michael Dunlop, Benjamin Haveman, Tyrell Kipp, Roderick Maclean, Max Schultz, Aaron Tofsrud, William Walsh**
Title: LARAMIDE-AGE STRUCTURES OF THE NORTHERN COLORADO NATIONAL MONUMENT–FRUITA AREA OF THE UNCOMPAHGRE PLATEAU, WESTERN COLORADO
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Rick Livaccari

Abstract: We have produced a detailed, 1:7,500 scale map of the northern Colorado National Monument–Fruita area of the Uncompahgre Plateau, western Colorado. Multiple Laramide-age structures are found in this area. They include a complex pattern of monoclines and oblique-slip faults linked together by a series of left-lateral strike-slip faults. We have recognized five Laramide-age structures in the northern Colorado National Monument – Fruita, CO area. From south to north these are: (1) the Lizard Canyon normal fault system (new name), (2) the Bull Canyon-

Redlands monocline and reverse fault system, (3) the Devils Canyon monocline (new name), (4) the Flume Creek monocline and (5) the Colorado River monocline (new name). The Lizard Canyon fault system consists of a series of steeply north-dipping, normal faults with a minor right-lateral (E-W striking) or a left-lateral (WNW-ESE striking) strike-slip component. The Bull Canyon-Redlands monocline and reverse fault system is a regionally developed structure that consists of a WNW-ESE striking, steeply south-dipping, left-lateral reverse fault and associated monocline. This structure has 500 ft of vertical structural displacement and is inferred to have even more left-lateral strike-slip displacement. The existence of left-lateral strike-slip is based on the presence of oblique, west-raking slickenside striations. The Devils Canyon monocline is a locally developed, WNW-ESE striking structure that has 350 ft of vertical structural displacement. The NW-SE striking the Flume Creek monocline is a regionally developed structure that terminates in this area. The NW-SE striking Colorado River monocline is a regionally developed structure that is found in the Dinosaur Hill area. This structure is inferred to be the largest structure in this area with up to 2,500 ft of vertical structural displacement. The Colorado River Monocline has little topographic expression because most exposed strata defining this structure are the slope forming Jurassic Morrison and Cretaceous Mancos Formations. The cliff-forming strata that are found along this structure (Burro Canyon and Dakota Formations), locally form small cliffs along the southern bank of the Colorado River. All of these structures are strain compatible and indicate a Laramide-age NE-SW shortening direction.

Presenter(s): **Brandon Gregg**
Title: GAME THEORY
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Phil Kavanagh

Abstract: Have you ever wondered about different strategies used in games? Game theorists use rational behavior to make strategic decisions that can be expressed through mathematical equations. In this talk, the focus will be on the mathematics involved in two-person zero-sum games. Examples of these games include matching pennies, chess, and poker. In a two-person zero-sum game, each player has a set of strategies to choose from and game theory is based on the assumption that both players behave rationally and attempt to maximize their winnings. Each player's gain is at the cost of the other player's loss. Typically optimal strategies are not pure but rather involve randomization. The goal of my project is to show how to use linear programming to find optimal strategies for the two players. A simplified poker game will be used to illustrate this technique. The background and history of game theory will also be briefly discussed.

Presenter(s): **Russell Gregory**
Title: GROUPS OF PERFECT SHUFFLES
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Erik Packard

Abstract: Have you ever wondered how card tricks are done and what secrets are behind some of those tricks? In this talk we will discuss perfect shuffles and how perfect shuffles enable us to move the top card of the deck to any position in the deck. We will also investigate a formula that will give the position of any card after two special "perfect" shuffles. It is possible to form a mathematical object called a group by taking sequences of these shuffles. To understand the group structure is a difficult task, but there are fun results that help.

Presenter(s): **Amanda Haire, Mary Pierik**
Title: EFFECT OF REGULARLY SCHEDULED ORAL CARE ON THE OCCURENCE OF HOSPITAL-ACQUIRED PNEUMONIA IN NON-MECHANICALLY VENTILATED ADULTS
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Judy Williams

Abstract: A research study is proposed to test the hypothesis that a strict oral care protocol will reduce the occurrence of hospital-acquired pneumonia in non-mechanically ventilated adults. Patients will be randomly selected from several acute care units at St. Mary's Hospital in Grand Junction, Colorado. A control group will receive oral care using current hospital protocols. An experimental group will receive an oral care intervention whereby licensed dental hygienists will perform tooth brushing for two minutes followed by rinsing with chlorhexidine (Peridex® oral rinse) for 30 seconds once per shift. The occurrence of pneumonia will be determined by staff hospitalists. The doctors will be blinded as to which group the patient belongs. A patient will be considered to have acquired pneumonia if four conditions are met: adventitious breath sounds are heard on lung auscultation, a temporal temperature of greater than 37.5 degrees Celsius is present, infiltrates are present on chest x-rays, and these symptoms have occurred at least 48 hours after admission to the hospital. A chi square test of association will be used to analyze the data with a 95% confidence interval. Data will be collected for one year. A total of 160 patients will be studied.

Presenter(s): **Heather Hallock, Terrica Gibson, Rachel Hopper, Nazlie King, Melissa Parkison**
Title: PATIENT CENTERED CARE: PATIENT ADVOCATE
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: In this project we will recognize that nurses are, in fact, patient advocates. Allowing the patient to be a partner in their own care ensures that they receive compassionate and coordinated care based on respect for their preferences, values and specific needs. This type of care empowers patients and includes them in their health care plan. The patient's satisfaction is our goal, even if that level of care is less than what modern medicine has to offer. Patient centered care is meant to provide the highest quality of care, while still taking into account the patient's desires. As nurses, our focus is to guarantee that the patient's overall healthcare experience is positive for both patient and family, while providing quality care. This presentation will address how nurses are compassionate advocates for patients and providers of quality care, while focusing on the ultimate goal, which is patient satisfaction.

Presenter(s): **Samuel Hamilton, Paul DuCray, Dalton Ramsey**
Title: POTTERY KILN HEAT SENSOR AND REMOTE CONTROL APPLICATION
Major(s): Process Systems Technology,
Technology Integration - Network Technician
Department: Western Colorado Community College
Sponsor: John Sluder

Abstract: There is a need of remotely controlling a firing system, such as a kiln, and to monitor temperature ranges used in firing ceramics. This system enables students to view the progress of their ceramic projects. Therefore we have found that the best solution to this problem is to design and develop a system that, through a USB interface kit, would be capable of viewing and graphing temperature changes and view the change and variation in the temperature ranges. From this idea we also conceptualized being capable of remotely controlling the temperature through a device that almost everyone is carrying with them like a cell phone or any other internet connected device. This will require use of an internet capable Programmable Logic Controller to control and monitor the kiln.

Presenter(s): **Emily Harbert, Cora Charneskey, Eric Wilcox, Marshall Sweatt**
Title: AUTOMATED RESIDENT PROTECTION SYSTEM
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Arun Ektare

External Funding Source: The House (Karis, Inc.) and the Association for Computing Machinery

Abstract: Today, in the community, there are homeless teens with no place to go and no one to turn to. This problem has been recognized by members of the community, along with the non-profit organization, Karis, Inc. As a result, “The House” has been established and will be assisting local teens. The project goal is to create a safe environment for the teens by designing a night security system for “The House.” This will eliminate the need for onsite personnel to remain awake throughout the night. If accepted by the state, shelter costs will be reduced by tens of thousands of dollars each year, leaving additional funding to assist the teens in their transitions. Custom hardware including passive infrared detectors, sound sensors, panic buttons and infrared beam breaks are the basis of this system and they will be run by Arduino microcontroller boards over a wired network. A centralized server will log all sensor information and the custom software will look for anomalous activity, sounding alarms and notifying on and off-site personal as needed. The system utilizes Arduino, PHP, and MySQL.

Presenter(s): **Emily Haswell, Codi Garcia, Logan Locke, Nick Teal**
Title: NETWORKED ROBOTIC ARM
Major(s): Technology Integration, Network/Telecommunication Technician and Mfg Cluster-Machining Technology
Department: Western Colorado Community College
Sponsor: John Sluder

Abstract: As needs of companies change, the ability to remotely control devices and equipment has become more desirable. The use of a network controlled Programmable Logic Controller (PLC) gives the ability of controlling equipment remotely, thus replacing the need for key engineers to be on site. Motivation: The application of such devices is not limited to technological fields, as such devices can easily be controlled by a simple web interface. With this intercommunication simplified, the operator could be just about anywhere, relieving the relocation costs or training a new employee. It also allows the control of robots in potentially hazardous situations. Approach: PLC robotic arm monitored and controlled via a web interface. Demonstration: The ability to control the robotic arm via the network to place plastic beams on a pressure sensing bridge. Results: Work in progress. Conclusion: Demonstrating the flexibility and ease of remotely managing and controlling devices via a network.

Presenter(s): **Erin Haub, Leah Kurpjuweit, Laura Lehning, Toni Meadors**
Title: OVERCOMING EDUCATIONAL BARRIERS TO ADOPTING A SINGLE PAYER HEALTH CARE SYSTEM
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Debra Bailey

Abstract: The United States currently spends more money on health care than any other country in the world, yet life expectancies and other key health indicators are less favorable than other developed nations. In addition, the United States is the only industrialized nation that does not provide universal health care, also known as single payer health care (SPHC), for its citizens. Various proposals to provide U.S. citizens with universal health care (e.g. SPHC) have been made. However, due to a variety of barriers no such plan has been able to successfully survive the legislative processes. A key barrier to building necessary support is a lack of knowledge on the topic. The purpose of this research is to decrease the knowledge deficit related to single payer health care plan through education. The method used for this

study is a quasi-experimental pretest-posttest one group design. A convenience sample of Colorado Mesa University nursing students will be the participants. Education explaining SPHC will be provided through a Microsoft Office PowerPoint presentation. Evaluation of the education intervention will be measured by comparing the pretest and posttest results. Data will be analyzed using inferential statistics. Correlational data will be collected about the relationship between education provided and changing of opinion favoring a SPHCS. The researchers developed pretest, posttest, and an educational PowerPoint presentation to measure variables. We anticipate that there will be a positive correlation (upward, linear plot) in this study. Results would indicate a strong relationship between education that is provided and changes in opinion to favor SPHCS. This study will be a single tail test with a statistical significance of 0.05. This study will provide foundation for further studies, by showing that a knowledge deficit does exist and further education is needed to provide an educated population, and decrease barriers to health care coverage.

Presenter(s): **Cooper Hearne, Sergio Galindo, Nick Prinster, Cody Ray**
Title: DESIGNING A ROOFTOP GARDEN FOR THE EAGLE'S NEST RESTAURANT AT VAIL SKI RESORT
Major(s): Mechanical Engineering, Environmental Science and Technology, Process Technology, Business
Department: Physical and Environmental Sciences
Sponsor: Deborah Kennard

Abstract: As the world population continues to grow, competition for food looms as a daunting issue. As such, people and their communities are looking for ways to become more self-sustainable. With this goal in mind, an interdisciplinary research project was performed to design a rooftop greenhouse for the Eagle's Nest building in Vail, CO. The proposed greenhouse utilizes cutting-edge technology as well as creative ideas for its use and function. This is a large scale greenhouse project, utilizing a 4400 square foot area that will be divided amongst two growing environments. The advanced features in the greenhouse include: the renewable energy sources of geothermal heating and solar panels, newly developed "Sage Glass" which can be tinted with the touch of a button by an electrical current, and hydroponic growing techniques which use less water and no soil, while producing more food in less time. The greenhouse and its accompanying features will provide a local and sustainable source of fresh vegetables, herbs, and flowers for the building's four restaurants. In addition, this diverse and aesthetically designed greenhouse will be able to accommodate special dining events such as parties and weddings.

Presenter(s): **Caitlin Heath**
Title: THE IMPORTANCE OF HIGH-MASS STARS FOR METAL ENRICHMENT IN GALAXY CLUSTERS
Major(s): Physical Sciences - Physics
Department: Physical and Environmental Sciences
Sponsor: Jared Workman

Abstract: In galaxy clusters the mass ratios of metals (metals being defined as any element heavier than helium) observed is larger than expected for standard stellar populations. The initial mass function (IMF) describes the mass distribution of a stellar population in terms of the stars' initial masses. An accurate IMF which incorporates metals from population 3 (the earliest and metal free stars) and present day stars, as well as metal enrichment via winds from asymptotic giant branch stars (AGB, the late life stage of low to medium mass stars) is necessary to explain the discrepancy between theory and observation. Data from theoretical and observational studies on metal production from stars is collected. Computer models are used with this data to synthesize metal productions for varying IMFs and supernovae rates. These models serve as a first step to constraining more accurate IMFs.

Presenter(s): **Melissa Herald, Dennis Friedly, Rex Halterman, Demi Pettway, Jared Ricks, Meril Wallace, Donald Wilson**
Title: GLAZES FROM LOCAL MATERIALS
Major(s): Art - Studio Art, Biology, Business
Department: Art
Sponsor: Jake Allee

Abstract: The Western Slope has vast geologic resources readily available for the production of ceramic glazes made from local materials. Use of local materials for making glazes is uncommon in this region and has potential for cutting overhead costs in the production of studio ceramic art. Equally as important, the use of indigenous materials has potential to add meaning through physical connection to the location where the object is made. Hands-on testing of local materials for the development of ceramic glaze produces a product that contains a regional connection.

Presenter(s): **Andres Hernandez, Jason Logsdon**
Title: DRAG FORCE OF FORMULA 1 AND NASCAR VEHICLES
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Kessler

Abstract: The drag forces imparted on Formula 1 and NASCAR vehicles will be tested using a wind tunnel. Varied wind speeds will be used to simulate different driving speeds. The wind speeds tested will be determined using matching Reynolds numbers between the scale and full models. The results will be analyzed using various statistical tests. The drag forces will be compared to determine if a significant difference between the vehicles exists.

Presenter(s): **Jessica Hogue**
Title: MEASURING BOTTOM-UP RESOURCE DIVERSITY AND TOP DOWN HERBIVORE DIVERSITY IN A TROPICAL FOREST
Major(s): Biological Sciences
Department: Biological Sciences
Sponsor: Thomas Walla

Abstract: Patterns in the nature of herbivore–host plant interactions are the focus of studies seeking to understand the factors driving diversity. Plants in the genus *Piper* (Piperaceae) in a tropical montane forest of Ecuador are host to a specialist lepidopteran herbivore genus *Eois* (Geometridae), forming model interaction system that is abundant and broadly distributed in the Neotropics. In this investigation, we tested for ecological factors that explain the abundance of *Eois* caterpillars on a locally common but heretofore undescribed host plant *Piper* sp. Pink Belly. We predicted the abundance of *Piper* species within habitats enhances the herbivore load on all *Piper* hosts and potentially accelerates the evolution of host chemistry. Specifically, a high diversity and abundance of congeneric *Piper* plants may drive higher diversity and abundance of *Eois* caterpillars on *Piper* sp. Pink Belly. We collected 2200 *Eois* caterpillars from *Piper* sp. Pink Belly and quantified the total number of leaves of all *Piper* species in 32 spatially explicit plots. We used correlation and regression analyses to predict *Eois* species richness and abundance from the diversity and abundance of *Piper* plants in plots. Our results are interpreted in the context of herbivore-host plant evolution and the diversity of tropical ecosystems.

Presenter(s): **Christian Holcomb, Wes Owens, Jeff Zimmerman, Carson Brown, Jacob Bruno**
Title: CHAIN OF TITLE
Major(s): Business - Landman/Energy Management, Business
Department: Business
Sponsor: James Colosky

Abstract: We will be displaying a chain of title, an abstract of title, and other research relating to a particular tract of land located in Mesa County, including issues

arising under the original Ute Meridan Survey, ownership of minerals underlying waterways, and land descriptions in general.

Presenter(s): **Rebecca Howe, Derrell Lindsey**
Title: STATISTICAL ANALYSIS OF THE EFFECTIVENESS OF VARIABLE STIFFNESS SOLE SHOES USED TO REDUCE THE EXTERNAL KNEE ADDUCTION MOMENT.
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: Osteoarthritis (OA) affecting the knee joint is the most common type of osteoarthritis. Previous research has suggested variable-stiffness-sole shoes may reduce the pain associated with OA, by reducing the external knee adduction moment. The purpose of this research was to analyze the effect of sole stiffness ratio on external knee adduction moment. Shoes with sole stiffness ratios ranging from 1:1 to 3.5:1 were tested. Analysis of Variance (ANOVA) was used to analyze the data collected in this experiment.

Presenter(s): **Brandon Howell, Weston Vorderberg**
Title: MOMENTUM AND BASEBALL
Major(s): Mechanical Engineering
Department: Computer Science, Mathematics & Statistics
Sponsor: Rick Ott

Abstract: A baseball being struck by a bat has a varying rebound velocity based on the material composition of the bat (i.e. wood, composite, aluminum). A test was performed to study the difference in the coefficient of restitution of a baseball impacting the three material types of bats. The coefficient of restitution is the ratio of ball rebound speed to the ball inbound speed. The differences in rebound speed recorded through the experiment were tabulated and statistically compared to evaluate the higher coefficient of restitution.

Presenter(s): **Isaac Hudson, Kelsi Middleton**
Title: ON VEHICULAR SPOILERS
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Rick Ott

Abstract: The purpose of a spoiler on a vehicle is to generate downforce to increase traction between the wheels and the road. Spoilers are used most often on racing vehicles because greater traction is often required. This research examines the effects of different spoilers on vehicles. Three dimensional prints of small scale spoilers will be tested in a wind machine to gather data. Data will be examined to determine if there is a significant difference between the downforces and drag created by different types of spoilers. The findings may be useful in future designs of spoilers on vehicles.

Presenter(s): **April Ilacqua**
Title: INVESTIGATION INTO THE MECHANISM BY WHICH GREEN TEA CATECHINS AFFECT DICTYOSTELIUM DEVELOPMENT
Major(s): Biological Sciences
Department: Biological Sciences
Sponsor: Kyle McQuade

External Funding Source: TriBeta National Biological Honor Society

Abstract: Green tea has been suggested to promote health because it has a catechin, epigallocatechin gallate (EGCG). This compound has received much research interest as a potential therapeutic and protective agent, but the mechanism

by which it acts is not clear. The slime mold/social amoeba, *Dictyostelium discoideum* is a model organism that is being used to characterize the activities of potential pharmaceuticals. In the *Dictyostelium* life cycle, unicellular amoeba aggregate together and develop to form multicellular fruiting bodies, usually within 24 hours. The mechanisms required for these events (cellular motility, chemotaxis, phagocytosis, signal transduction, and cellular differentiation) have been studied extensively and require signaling events similar to that seen in vertebrates. This suggests that the amoeba is a useful system in which to characterize the effects of drugs intended for human use. We have shown that the green tea catechin EGCG blocks the *Dictyostelium* life cycle. EGCG is not toxic, blocks development, and the interruption in the life cycle may be blocked due to inhibition of signaling pathways required for cellular transition to differentiation and development. These data suggest that *Dictyostelium* is a useful model to characterize the activities of catechins and other natural products.

Presenter(s): **Tana Irwin, Kenneth Henderson, Victoria Hibberd, Amy Knepper**
Title: HAND WASHING SAVES LIVES
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Hand washing saves lives! According to the Centers for Disease Control and Prevention, “hand washing has the potential to save more lives than any single vaccine or medical intervention.” Everyone in the medical field knows that the first line of defense against infection is hand washing. Our team would like to extend that knowledge to the public by providing evidence based practice, short videos, and a hand washing experiment using a special soap that shows microorganisms that are left after improper hand washing. We would like the public to leave with a better understanding of how and when to wash their hands, how long to wash their hands, and what to use to wash their hands.

Presenter(s): **Melani Jensen**
Title: PROPOSED KOKOPELLI EXTENSION OF THE RIVERFRONT TRAIL
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Verner Johnson

Abstract: The City of Fruita plans to construct a section of the Riverfront Trail from James M. Robb Colorado River State Park to the Loma Boat Launch, known as Kokopelli extension. A section of trail is planned to be constructed along the north bank of the Colorado River between Little Salt Wash in Fruita and the Kokopelli Trailhead in Loma. Using GPS (Global Positioning Systems) and GIS (Geographic Information Systems) along the trail are mapped for environmental assessment. Information included are the 100 year flood, river discharge, and wetland sites. Potential hazards including the Fruita refinery, power lines, gas lines, and other industries are identified and mapped. Soils and vegetation features are also located. Creating a map of the proposed trail section is an important aid for future research and evaluation. The maps and database contain environmental and hazard sites from GIS/GPS. These maps and database will help the planner to decide on the final trail location. Organizing all the feature classes into a geodatabase will also provide easy access to all the information gathered for future researchers of the project.

Presenter(s): **Melani Jensen**
Title: SELENIUM CONCENTRATIONS IN SOIL AND MANCOS SHALE
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Russ Walker

Abstract: Selenium is a known source of contamination to water quality of the Gunnison River, Colorado River, and their tributaries in the Grand Valley region. Sources of selenium stem from use of irrigation, the arid climate, and the geochemistry of the Mancos shale. Past studies focused on selenium concentrations in surface waters and with little attention to selenium sources in soils and rock. Knowing the leaching rate of selenium through the Mancos shale provides information for future predictions of selenium concentrations into the ground water and surface waters. Water samples from tributary streams draining from the Mancos shale have been collected and analyzed for the major ions Na⁺, K⁺, Ca²⁺, Mg²⁺, Cl⁻, and SO₄²⁻. These major ions are used as a surrogate for selenium with the expectation that different locations will have different variation in major ion chemistry that will likely reflect different selenium concentrations. Variation in ion concentration established over time was used to establish which areas to collect soil and Mancos shale samples that will likely have a range of variation in selenium. These samples will be used for column studies on the movement of selenium through soil and Mancos shale.

Presenter(s): **Sydney Jensen**
Title: HEDONIC MODEL FOR HOUSE PRICES IN MONTROSE, COLORADO
Major(s): Computer Information Systems
Department: Business
Sponsor: Nathan Perry

Abstract: In Colorado, like most of the nation, house prices continued to rise each year at an astronomical rate. In 2005, house prices in Montrose, Colorado reached an all-time high before prices began to plummet due to the national recession. The supply of homes began to increase resulting in a saturation of homes on the market followed by a drastic reduction in prices. A linear regression is used to predict what the house price value was in 2005. This model is then compared to residential sales in 2011 to view the affect that the housing bubble has had on house prices in Montrose, Colorado.

Presenter(s): **Mandy Johnson, Jade Johnson, Elizabeth Reimer, Abbey Tubbs**
Title: EXPLOSION OF CULTURE AND MATHEMATICS
Major(s): Mathematics, Secondary Education
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: In general, there is a disconnect between history and mathematics. However, these are two topics that cannot exist without one another. Nearly everything in the history of civilization has been influenced by math, and nearly everything in mathematics was influenced by the culture of certain time periods. In this project, the mathematics developed during the Renaissance was studied. While the Renaissance is seen as an explosion of culture, most are not aware that it was also an explosion of mathematics. An examination of the mathematicians of this era as well as their discoveries and mathematical trends is given context by the inventions, rulers, and cultural habits during the Renaissance. The resulting information helps to connect the foundations of modern mathematics to mathematical discoveries during the Renaissance.

Presenter(s): **Steven Jones, Sam Hollar**
Title: SUSPENSION BRIDGE LOAD AND COST ANALYSIS
Major(s): Business Administration -Management, Construction Management
Department: Business
Sponsor: Kelly Bevill

Abstract: With any bridge construction project, the choice of materials requires a balance of cost, weight, and strength. Suspension bridges tend to be the most expensive to build, however, they are frequently used due to their relative efficiency in spanning large distances. This project is designed to demonstrate the math and science concepts used to determine how functional different members or materials on a suspension bridge are. This project uses load cells strategically placed on parts of a scale suspension bridge to measure the force transmitted by specific structural members in the design. In order to determine which forces are most important in bridge design and construction, the loads produced by static and dynamic forces will be measured and compared. Once the structural components producing the highest load measurements are identified, different construction materials will be substituted to observe how material usage has an effect on bridge performance. The resulting data will help develop a sense of cost associated with the construction of suspension bridges.

Presenter(s): **Kimberly Kellerby**
Title: ARE NATIVE GRASS SPECIES AND THE INTRODUCED CRESTED WHEATGRASS EQUALLY COMPETITIVE WITH CHEATGRASS?
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Tamera Minnick

Abstract: Cheatgrass (*Bromus tectorum*), an annual invasive grass, dominates the Grand Valley and the arid west. Land managers prefer perennial grasses to encourage soil and site stability, restore hydrologic function and increase biotic integrity. Two characteristics that make cheatgrass successful are the amount of seeds produced annually and that it germinates earlier than other grass species. Fifty plots were created in the greenhouse. All but the controls were planted with cheatgrass. Two weeks later the native grass species and crested wheatgrass were seeded into the designated plots. Temperature and precipitation were adjusted to mimic the growing season for the Grand Valley. There were two precipitation treatments, high and low, based on statistical analysis of long-term data from a local weather station. After eleven weeks, above ground biomass was collected, separated by cheatgrass and target native species or crested wheatgrass, dried and massed. Statistical analysis showed crested wheatgrass (*Agropyron cristatum*) competed against cheatgrass at the higher precipitation level. Of the native species, only squirrel tail (*Sporobolus cryptandrus*) produced any significant biomass when competing with the earlier started cheatgrass. Therefore, further studies need to be conducted to determine whether the presence of crested wheatgrass would allow for the subsequent succession of native species.

Presenter(s): **Edward Kobylarz**
Title: THE ROAD TO GETTYSBURG: TAKING AN IN-DEPTH LOOK AT THE EVENTS WHICH LED UP TO THE MOST CRITICAL BATTLE DURING THE AMERICAN CIVIL WAR
Major(s): History
Department: Languages, Literature and Mass Communication
Sponsor: Luis Lopez

Abstract: July 1-3, 1863 was arguably the most critical time during the American Civil War. The events which led the North and South to clash at Gettysburg during the summer of 1863 occurred well before the first bullets began to fly. Too often the events which occurred leading up to Gettysburg have been overlooked. This oral presentation summarizes a research paper on the topic and explains why it is so crucial to understand what led up to this important battle. Actual accounts from soldiers who participated in the battle, and secondary sources which broadly

summarize the sequence of events, were used to craft this paper, which argues the point that, had precipitating events been different, the war's outcome might have been drastically different as well.

Presenter(s): **Tessa Kruckenberg, Ed Brown, Alissa Embree, Emily Korce, Brianna Pettingill**
Title: NEEDLE HEALTH
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Studies show that nurses sustain the majority of needlestick injuries and that as many as one-third of all sharps injuries have been reported to be related to the disposal process. One out of every seven U.S. healthcare workers is accidentally stuck by a contaminated sharp every year. It is believed that only one out of three needle sticks is even reported. From these sharps injuries there have been 57 documented cases of HIV seroconversion among healthcare personnel through 2001. The Centers for Disease Control and Prevention estimates that 62 to 88 percent of sharps injuries can potentially be prevented by the use of safer medical devices. Needle stick injuries are 90% preventable through education. Here are five steps we created to help prevent needle stick injuries:

1. Use a recapping device so only one hand comes in contact with the needle.
2. If a sharps container is not by the patient's bedside take one with you.
3. Before you give the shot, make sure the placement of your other hand is out of the way from line of fire.
4. Before you give the shot, let the patient know that it will probably hurt a bit.
5. Teach IV drug users that new needles can be purchased at Wal-Mart for as little as \$20 for 100 of them (prescription required). A laundry detergent bottle with a cap that can be sealed is an inexpensive, efficient way to dispose of used needles.

Presenter(s): **Brita Lancaster**
Title: DATA INTERPRETATION FOR COAL CREEK BASIN AND CRYSTAL RIVER
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Russ Walker

Abstract: The goal of this project was to interpret data that has been collected from the Coal Creek Basin and the Crystal River. Coal Creek is a tributary to Crystal River and the watershed in the area has been heavily impacted by mining activities. The data analyzed has been collected over the time period of May 15, 1973 to February 7, 2008. The interpretation of the data will include evaluating for exceedances of Colorado water quality standards, looking for trends in time that may exist, any seasonal changes and variation patterns, and any patterns or trends that may exist from upstream to downstream. This work was performed for the Roaring Fork Conservancy. Roaring Fork Conservancy is a non-profit organization dedicated to watershed protection in Colorado.

Presenter(s): **Griffin Lewis**
Title: LOGIC PROGRAMMING IN CORRELATION TO CLOSED-WORLD REASONING
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: Classical logic is descriptive rather than procedural. For example, the Wason Selection Task (Wason 1968) indicates that the truth table description of implication is not sufficient for constructing a procedure that determines when

an implication is satisfied in a closed-world model. In this project we apply logic programming to closed-world models to construct procedures that satisfy a problem statement.

Presenter(s): **Matthew Luttrell**
Title: WHAT IT TAKES TO BE AN ELITE ATHLETE IN HIGH SCHOOL
Major(s): Sport Management
Department: Kinesiology
Sponsor: Elizabeth Sharp

Abstract: In the world of sports, athletes all dream of being the very best. Young athletes are often taught to become the best no matter the cost. This research will focus on what it takes to be an elite athlete in the minds of high school students. Participants were four football athletes, with different capabilities, such as fitness, agility and mental aspects of game. The purpose of the research is to evaluate how each participant's dedication plays a role in the process of becoming an athlete. Behavior will be analyzed as each athlete grows and becomes more familiar with the system. Understanding why high school athletes want to be elite will help coaches and players understand how to reach their goals. The results of the study will examine why each athlete thinks they are the best, does their action reflect their beliefs, and if their capabilities reflect their actions realistically.

Presenter(s): **Kohl Marconnet**
Title: PRE-COOLING EFFECT ON RUN TO EXHAUSTION
Major(s): Kinesiology and Exercise Science
Department: Kinesiology
Sponsor: Brent Alumbaugh

Abstract: The purpose of this study is to determine the effect lowering internal core body temperature prior to physical activity has on performance. This study will look at an environment of 26.7° C (80° F), a common temperature during the fall sport's season in much of the middle and western United States. A baseline run-time to failure will be completed one week prior to manipulation of core body temperature. Using an ice vest, the core body temperature will be lowered 1 degree Fahrenheit from the participants resting temperature before the start of activity. Research has shown when internal core body temperature rises athletic performance is hindered. Also, once the body reaches a certain temperature, muscle contraction and the body's buffering systems begin to fail. This research (to be completed) will evaluate the rate of temperature increase and the mean temperature that significantly effects muscle contraction, the buffer systems, and ultimately decreases performance. With this information significant differences in performance will be calculated. This information would be valuable for coaches and competitive endurance athletes of all ages and competition levels.

Presenter(s): **Daniel Martin, Jennifer Bullerwell, Ian Elliott, Josh Hoeft, Anthony Miller**
Title: 2012 LOGO SURVEY
Major(s): Mass Communication, Music - Business, Business, Business - Travel, and Tourism and Recreation Management
Department: Business
Sponsor: Deborah Parman

Abstract: For Consumer Behavior, an upper division marketing class at Colorado Mesa University, student groups were asked to design and present a survey using "popular" logos. The survey showed ten logos in total of five varieties of products and their "comparable" competitors. The survey used demographic information in addition to associated "feelings" towards the product. The survey was randomly distributed and then the data was analyzed. After analyzing the data trends, patterns and points of interest were identified to give an overview of the survey findings. With this information a company could determine a better marketing approach

regarding their logo (i.e. developing a new logo or looking into new target areas). The survey was developed and created for distribution on February 2, 2012.

Questions addressed by the survey were:

1. How well recognized is the product and can a person accurately name them?
2. What is the frequency of usage by those whom already use it?
3. What feelings are associated with this product?
4. What demographic groups are most associated with the product?

Presenter(s): **Kendra Martinez, Jake DeHart, Justin Howell**
Title: STETHOSCOPE HYGIENE
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Debra Bailey

Abstract: How clean is your stethoscope? The potential for the stethoscope to harbor micro-organisms is a well-known fact. Stethoscopes are carried by various health care workers throughout hospitals, as well as other places such as cars, homes, etc. All of these places create instances in which a stethoscope may become contaminated with various kinds of bacteria. In hospitals especially, stethoscopes are used for examination of patients who may be carriers for one or more types of bacteria. This kind of exposure provides the reasoning in which stethoscopes should be cleaned thoroughly and often to help decrease both the amount of bacteria carried on stethoscopes, as well as prevent the spread of bacteria to other patients or populations. This study will be conducted in order to find out how often health care workers clean their stethoscopes, as well as to determine if implementing an education protocol about how and when to clean stethoscopes, can reduce the amount of bacteria found on health care workers' stethoscopes, and increase the frequency in which health care workers clean stethoscopes. The study will be conducted between December 20th, 2011 and December 27th, 2011, will be conducted using a pre-test/post-test method, and will include swabbing stethoscopes from health care workers on 2 Center (2C) and 4 Center (4C) of St. Mary's hospital. A sample of 50 stethoscopes from each floor will be collected, 100 total. One floor will receive education, and the other floor will not, in order to help determine the effectiveness of said education. It is anticipated that after performing education to health care workers about effective ways to clean, how to clean and what to use to clean stethoscopes, that the amounts of bacteria found on stethoscopes will decrease.

Presenter(s): **Kimberly Martin**
Title: FOLLOWING THE HERD OR THE LONE MAVERICK: TESTING MESSAGES TO INCREASE RECYCLING BEHAVIOR
Major(s): Psychology - Counseling Psychology
Department: Social and Behavioral Sciences
Sponsor: Susan Becker

Abstract: The impact of messages to encourage recycling behavior through the manipulation of social norms was examined. Majority messages communicate that the desired behavior (recycling) is the normative response from most people. Minority messages communicate the opposite. Messages can also be very specific to the classroom setting where the behavior would take place, or more generalized. I hypothesize that majority messages which are specific to the classroom setting will be the most successful at encouraging recycling behavior but I am also testing whether a minority message that appeals to nonconformist ideals may also have a positive influence on recycling behavior. These results will help guide potential recycling programs in the school setting.

Presenter(s): **Kevin McKay, Sam Foster, Curtis Jones, Chad Snell**
Title: SHAUENBURG COAL CONVEYOR PROTOTYPE
Major(s): Manufacturing Technology, Process Systems Technology,
and Technology Integration
Department: Western Colorado Community College
Sponsor: Bill McCracken

External Funding Source: Shauenburg Flexadux Corporation

Abstract: Coal mined in the Colorado region is very dense and moist. Coal mined in the Rocky Mountain region is still a very clean energy source, compared to other coal sources in the world. One of the major challenges for the coal companies is to extract the moisture out of the coal. This conveyor belt prototype aids in extracting the moisture from the coal, helping the energy companies of our local area. We are to design a prototype that will demonstrate the function of the system, and will be used in energy conventions across the globe.

Presenter(s): **Benjamin Medina**
Title: STUDY OF GENDER INTERACTION AND UTILIZATION OF THE RECREATION CENTER
Major(s): Sport Management
Department: Kinesiology
Sponsor: Elizabeth Sharp

Abstract: This research focuses on the psychosomatic interaction of college students using the CMU Recreational Center. The methodology of this study was to observe and interview college students who participated in recreation activities. This study involved 12 people spanning three weeks, which included all varieties of students and faculty. The data compiled will further educate readers of the reasons and rational of why people participate in general recreational activities. The information has not been compiled to formulate a proper conclusion for the research; however a preliminary conclusion suggests that the primary users of the CMU Recreation Center utilize the facility for exercise. Consequently, a secondary motivating intrinsic factor is social interaction compelling participants to continually use the CMU Recreation Center.

Presenter(s): **Kelsey Mesch, Jessica Casebolt**
Title: HOW COACHES MAKE DECISIONS: AN INSIGHT TO ATHLETE SELECTION, POSITIONAL PLACING, AND WINNING
Major(s): Sport Management
Department: Kinesiology
Sponsor: Elizabeth Sharp

Abstract: The purpose of this project is to analyze coaching decisions in terms of choosing athletes, deciding what positions athletes will play, and winning strategies. It is the hope of the researchers to better understand what variables influence the decisions that coaches make. Information provided by this research will assist those who are interested in coaching in their endeavors as well as create clarity among spectators, players, and other coaches. Research methods include personal interviews with both coaches and athletes and investigating the relationships between coaches and athletes. Preliminary results show: 1) some coaches feel that winning is more important than having a happy team, thus sacrificing some positive effects of good team unity; 2) personal relationships between coaches and athletes affect decisions which could hurt the team as a result of personal gain; and 3) decisions are influenced by the length of coaching experience in both adverse and favorable ways.

Presenter(s): **Max Miller-Ridgeway, Natalie Bamford, Madison Everett, Aura Medrano**
Title: HYPERTEXTUAL AND MULTICULTURAL CHILDREN'S LITERATURE
Major(s): Secondary Education, Elementary Education, Liberal Arts -
Elementary Education Concentration, Social Science
Department: Languages, Literature and Mass Communication
Sponsor: Robin Calland

Abstract: Our group will be reading an excerpt from an exhaustively researched historical fiction about encounters between American and Japanese culture during the post-war occupation. The project drew upon more than a dozen volumes on language, culture, and history, as well as hundreds of hours of radio broadcasts, newsreels, and propaganda films. The story allows us to see how one culture views another, and intends to entertain, involve, educate, and provoke critical thought and creativity. We follow a Japanese boy groomed for war, who is forced to re-evaluate how he views both American culture and his own after he meets the fictional daughter of General MacArthur. The story is presented in digital format, allowing for wide distribution, and there are hyperlinks to meta-textual and audiovisual sources that allow the reader to explore and immerse themselves in the rich past from which the tale is derived.

Presenter(s): **Alyssa Mitchell**
Title: SYMMETRIC POLYNOMIALS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Shawn Robinson

Abstract: Many students have to complete an algebra class to obtain their degree. In these classes students are taught to solve equations and apply them into the real world, but one thing that is not necessarily taught to all the students is special properties that certain polynomials have. Investigating the properties that symmetric polynomials hold and showing the connections between them and the symmetric group S_3 will lead into the discussion of the relationship the characteristics of S_3 to the Schur Polynomials. This will display how you can define the Schur Polynomials with the characteristics of S_3 .

Presenter(s): **Santiago Montano, Luis Archuleta, Billy Ferguson**
Title: CNG/GASOLINE DUAL-FUEL CONVERSION
Major(s): Manufacturing Technology, Process Systems Technology,
and Technology Integration - Network Technician
Department: Western Colorado Community College
Sponsor: Bill McCracken

External Funding Source: Encana Corporation

Abstract: With the negative environmental and economic implications of using petroleum gasoline, it has become prudent to find new ways of reducing reliance on it. Considering the overall efficiency of compressed natural gas (CNG) and the fact there are so many petroleum gas vehicles already on the road, the sale, use, and promotion of after-market CNG dual-fuel conversion kits has the potential to make a large positive environmental and economic impact. As the market for CNG alternative fuel vehicles grows and the CNG refueling infrastructure is further developed, a certified center for the sale and installation of these kits may become attractive. This project will prove how a simple conversion kit can make a vehicle run on CNG and gasoline simultaneously, demonstrating it to be a very cost effective way to commute.

Presenter(s): **Tyler Nelson**
Title: MONTROSE SURVEY
Major(s): Mathematics - Statistics
Department: Computer Science, Mathematics & Statistics
Sponsor: Rick Ott

Abstract: We have been working on a survey that was given to the town of Montrose. We have analyzed the data and will be presenting our results to a committee. The survey was mainly dealing with the thoughts of the people in Montrose on their town buildings and roads. It also asked for their input on how things are going around town.

Presenter(s): **Vicki Neumann, Janelle Despres, Jannie Fockler, Wendy Miller, Christa Shaffer**
Title: TOXICITIES AND DRUG INTERACTIONS WITH HERBAL MEDICATIONS
Major(s): Nursing - AAS/RN; Sociology
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Healthcare providers are being increasingly confronted with the use of herbal medications by their patients. These medications play an important role in healthcare and most can be used without any serious problems or toxicities. Problems can be anticipated when they are used at an excessive dose, for prolonged duration or by patients who are on multiple modern pharmaceuticals. The main issues that contribute to problems with herbal medications are the public's perception that these products are inherently safe and a lack of knowledge about these products in the medical profession. According to the World Health Organization between 65 and 85 percent of the world's population (about 3 billion people) are using alternative medication, including herbal supplementation. This is a topic that will appeal to the general public and healthcare professionals. Our goal is to inform the audience of the side effects, drug interactions and potential toxicities of the most commonly used herbal medications, which should increase public awareness and decrease the risk of complications related to these drugs.

Presenter(s): **Meredith Newell**
Title: SYMPATHETIC: A PERFORMATIVE
Major(s): English - Writing
Department: Languages, Literature and Mass Communication
Sponsor: Barry Laga

Abstract: My art exhibit, "Sympathetic," is a creative and critical response to an assignment required in Introduction to Literary Theory. I applied the theory of "performatives" to the visual arts, but instead of using the theory to interpret a work of art, I created one. A performative "is a statement that not only describes an action but actually performs that action" (Bennett, 262). In this style, my piece performs the function of the sympathetic nervous system's fight-or-flight mechanism. To evoke the desired catharsis, my piece employs three devices. First, I've painted an abstract image of the sympathetic branch of the autonomic nervous system. Secondly, I have written an acrostic poem using the word "sympathetic," and layered that on top of the painting, the lettering growing smaller as the poem progresses. Finally, I have fashioned sharpened wooden dowels and affixed them to the frame of the canvas. The dowels work together with the ever smaller writing to pull the reader in, initiating their fight-or-flight response as they are faced with the decision to draw dangerously close to the sharp points or abandon the poem and leave it unfinished. The purpose of this work is to show rather than tell, by depending on the reader's response for its success.

Presenter(s): **Steven Nolan**
Title: GAME YOUR WAY TO THE TOP: A VIRTUAL EXPERIENCE FOR ENTRY LEVEL POSITIONS
Major(s): Computer Information Systems
Department: Business
Sponsor: Johnny Snyder

Abstract: This paper will discuss the idea that a video game can be used as a credible reference and work experience for an individuals' resume for entry level positions. The motivation behind this paper is simple: graduating students need work and some students have no work experience. With this in mind, where do they get the experience for their first entry level job? The perspective of this paper comes from the author and the real world experience that has been acquired through video games. The paper will discuss occupations that use video games in day to day training, video game experience that has furthered careers by providing work experience, and conclusions given on what video games can offer a potential employer. The results of this paper will illustrate that video games hold a spot in today's society as not only a training platform, but also ability to gain quality experience for an entry level position. This could increase the experience rate of new entrants in the market and possibly yield a higher percentage of college students acquiring jobs post-graduation.

Presenter(s): **Sara Page, Lindsey Gustafson, Courtney Krabbe, Jason Sewell**
Title: HEALTHCARE LITERACY
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: The purpose of this research is to identify the skills needed to increase health literacy. Our research will include the barriers in communication, employment status, level of education, age, background, and how these variables affect the patient understanding of why they need the level of care that healthcare professionals are providing. Our research will also include how we, as healthcare professionals, can educate the vulnerable populations such as elderly, minority and low income patients and people with chronic and/or with physical health conditions. The discussion will review why lower education levels and minorities need more education by healthcare professionals possibly due to the lack of reading and comprehension skills. We will discuss how employment can be a hazard to a person's health in all kinds of ways, such as what the patient is exposed to, working too much with little sleep and not seeing a physician for preventative care. Family background can also cause a barrier in healthcare because family is usually a big influence on a person and decisions concerning their healthcare. If a family member has the wrong information about certain health issues the misunderstanding may be passed to the patient. Healthcare professionals need to make sure that the patient and anyone involved in his/her care is informed and educated properly on health issues and concerns. In conclusion, we look forward to sharing more information needed to increase health literacy within the community.

Presenter(s): **Samuel Phillips, Cassidie Mims**
Title: WHAT TO WEAR WHEN RUNNING IN THE HEAT - OR SHOULD YOU WEAR NOTHING AT ALL?
Major(s): Exercise Science
Department: Kinesiology
Sponsor: Gig Leadbetter, Brent Alumbaugh

Abstract: This research determined whether the statements of various sportswear apparel companies are true to their claims. Companies state that their shirts are superior at keeping athletes cool. The incentive for this study was to enhance the performance of the CMU women's cross country team while running in a heated environment. Six female runners participated in four separate 30 min. treadmill running tests at 80% of their anaerobic threshold. During three of the trials, the subjects wore a different running shirt from Under Armor, Asics, and Icebreaker. The fourth trial was the

control with the subjects running in only their sports bra. Each test was administered in a controlled heat chamber (26.7-27.2°C, 20-30% humidity). At 0, 15, and 30 minutes, various variables were recorded, including: heart rate, rate of perceived exertion, and skin and fabric temperatures using a thermal imaging camera. There was a significant difference between Under Armor and Asics when compared to the control. The back skin was 1°C cooler at 30 minutes. Overall, there was no significant benefit of cooling during the trials. It must be noted that the trials were done in a controlled environment without the help of wind for evaporation and cooling.

Presenter(s): **Courtney Phillipy, Jessica Blair, Amber Mackey, Teresa Trehearne**
Title: A STUDY OF THE EFFECT OF ANTERIOR CRUCIATE LIGAMENT INJURY PREVENTION PROGRAMS AND THE INCIDENCE OF INJURIES IN FEMALE ATHLETES
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Beverly Lyne

Abstract: As athletics in the female population have become more prevalent and competitive, knee ligament injuries have also become a major problem with young female adults, leading to risk for acute complications, long-term diseases, and disabilities. The female population is statistically more at risk for anterior cruciate ligament injuries than the general population due to underlying developmental factors. Anterior cruciate ligament (ACL) knee injuries are common, especially in these active youth with still maturing knee anatomy. Although much more research needs to be done on the topic of preventing such injuries, current research and literature support the need for incorporating training about correct knee positioning during sports into practices and preparations. The purpose of this study is to discover the effect of Knee Ligament Intervention Program (KLIP), stress management, and lifestyle changes into everyday practice on the number of ACL injuries that occur in female athletes. This study will implement a longitudinal quasi-experimental review of the occurrence of ACL injuries when involving preventative training over five years. A sample size of 67 female athletes will be obtained using random sampling. It is anticipated that the inclusion of such preventative training will reduce the number of ACL injuries that occur during sports and other activities that affect the infrastructure of the knee.

Presenter(s): **Brian Preston**
Title: CORRELATION OF MIOCENE BASALT FLOWS IN WESTERN COLORADO USING GEOCHEMICAL DATA AND AGE DATES
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

Abstract: Basalt flows in western Colorado help tell a story about many aspects of the ancient Colorado River. The basalt flows can be used to help determine the amount of late Cenozoic uplift in the Rockies, as well as help determine the timing of deformation. Previous work by the U.S. Geological Survey used geochemical data in conjunction with age dates of basalt flows in the Eagle and Carbondale collapse centers to help constrain the timing of salt deformation and collapse. This project will expand this data set by compiling geochemical and geochronologic data from other locations throughout western Colorado. By correlating age dates of flows throughout western Colorado with geochemical data, this project will attempt to determine if there is a major correlation between volcanic events. This project will also help to determine the source of the basalt flows. By using data gathered from basaltic volcanic events a clearer picture of the uplift history can be obtained for the Rocky Mountains of western Colorado.

Presenter(s): **Seth Rains, Daniel Bonilla**
Title: ASSOCIATION OF CONSTRUCTION PROJECT MANAGERS (ACPM) CLUB AND THE NATIONAL ASSOCIATED SCHOOLS OF CONSTRUCTION COMPETITION
Major(s): Construction Management
Department: Business
Sponsor: Kelly Bevill

Abstract: In February 2012, Colorado Mesa University's Association of Construction Project Managers (ACPM) Club sent two teams, each comprised of six students from the Construction Management Program, to the Associated Schools of Construction (ASC) Student Competition in Reno, Nevada. Over 40 schools and 1,500 students from across the nation competed in this year's event. The ASC competition places students in real world situations to test the knowledge and skills learned through their Construction Management education. This presentation will focus on the project presented to the Heavy Civil category at the 2012 ASC Student Competition and Colorado Mesa University's team solution that resulted in a third place finish. Participation in the Student Showcase will not only bring about more awareness of the ACPM Club and the CM program, but it will also show how the ACPM Club contributes to the overall success of students at Colorado Mesa University.

Presenter(s): **Authumn Ransom, Anna Rehl, Edna Wellman**
Title: OBESITY AND NURSING SAFETY
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: The obese population is growing rapidly, 33.8% in 2010, 17% of children. With this increase, more medical interventions are needed for the large amount of medical problems that obesity brings. This affects the safety of staff on medical floors as well as safety for the patient. This research focuses on the staffing concerns and safety of staff and patients on medical floors in acute care, who are given obese patients without extra staff. All literature that was reviewed during the research phase of this project shows that safety is compromised all the way around. Research shows that staffing is not affected by the patient's weight or acuity level. Obese patients, however, take on average twice the staff and three times the time of their non-obese counterparts. Review of safety shows that staff is five times more likely to get injured on the job where there is a higher percentage of obese patients than non-obese patients. Patient safety is compromised, as well, with one out of every seven patients being "hurt" when staffing does not reflect the workload or when staff are not properly trained to care for the obese patient. Research has shown that education is needed to bring down the percentage of patients being hurt, with additional consideration to different staffing in the care of obese patients to provide greater safety for all involved.

Presenter(s): **Cody Ray, Sergio Galindo, Cooper Hearne, Nick Prinster**
Title: SUSTAINABILITY DESIGN COMPETITION
Major(s): Business - Management, Environmental Science, Mechanical Engineering, Process Technology
Department: Business
Sponsor: Georgann Jouflas

Abstract: A team of four students with varying academic backgrounds participated in The Sustainability Design Competition (SDC), a pilot program at CMU. Vail Resorts recognized the need to cultivate organically grown fresh produce and acted as the client in the year long project. Vail Resorts has 4 restaurants atop Vail Mountain located in the Gondoly building. In response to rising farm prices and the changing consumer needs Vail Resorts is exploring alternatives that accentuate its pre-existing eco-friendly brand image, promote sustainable operations, and also provide efficiencies for its mountain-top restaurants. The proposed solution is to build a green house with an enclosed gardening system on the Gondoly building roof top that provides a sustainable source of produce needed by Vail Mountain

Resort. The SDC members have developed a greenhouse proposal that integrates sustainability with the production of the locally grown products.

Presenter(s): **Christina Reed**
Title: OPTIMIZING WIRELESS SIGNAL TRANSMISSIONS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Shawn Robinson

Abstract: A current challenge with wireless transmissions is to minimize the probability of a receiving antenna “misreading” a signal. Signals transmitted over multi-antenna wireless network can be modeled by unitary matrices. The probability of receiving antenna “misreading” the signal can be approximated the diversity sum. A probability distribution of the diversity sum is provided by using a computer to generate random unitary matrices and calculate their diversity sum. This distribution is compared to published results and use implications for future research.

Presenter(s): **Jamie Requa**
Title: THE IRON CAGE OF RATIONALITY AND THE USE OF PSYCHOTROPIC MEDICATIONS AMONG VULNERABLE POPULATIONS
Major(s): Sociology - Human Services
Department: Social and Behavioral Sciences
Sponsor: Brenda Wilhelm

Abstract: In this paper, I analyze the use of psychotropic medications to treat challenging behaviors among two vulnerable populations, adolescents and the developmentally disabled. Both groups are prescribed medications for behavior modification purposes at higher rates than other populations within the United States, and in comparison to other countries. Through the application of Max Weber’s early 20th century social theories, I am able to present a clearer understanding of the social conditions that have led to this problem and support it. According to Weber, an “iron cage of rationality” has emerged in society that emphasizes the formal rational processes of calculability, efficiency, predictability, the use of nonhuman technology, and control over uncertainties. Weber argues that these formal rational processes in society could lead to irrational consequences and ultimately disenchantment with the world. I argue that the components of formal rational processes are present within the mental health treatment of adolescents and the developmentally disabled. The extensive use of psychotropic medications for behavior modification purposes among these vulnerable populations can ultimately be detrimental to the individuals involved, and potentially to society itself.

Presenter(s): **Sandra Rivera-Ventura, Tyler Armenta, Carissa Docteur, Jonathan Ligrani, Sandra Nunez**
Title: DECOMPOSING MOZART
Major(s): Music - Performance, Music - Music Education
Department: Music
Sponsor: Carlos Elias

Abstract: The analysis of forms and structures in Western classical music is a crucial part of comprehending works of art, in order to best represent the composer’s intentions in live performances. However, it takes a sufficient amount of time, practice, and discipline in order to gain enough knowledge of music theory to analyze pieces of music. The goal of our student group is to bring musical analysis to life in a way that simultaneously incorporates a visual representation of the formal structures with a live performance of the piece itself. We wish to instill a working knowledge of music theory to those who have had little experience with it, in the hope that people can gain a love and appreciation for classical music in a new and deeper way. We will perform and analyze *Mozart’s Quintet for Clarinet and Strings in A Major* (K. 581), *Movement I-Allegro*. Our ensemble is comprised of Sandra Rivera on Violin I, Sandra Nunez on Violin II, Tyler Armenta on Clarinet, Carissa Docteur on Violoncello, and Jonathan Ligrani on Viola.

Presenter(s): **Justin Robbins, Jesse Brewer, Jason Johnson**
Title: INTEGRATED HYDROPOWER SYSTEM
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Francisco Castro

External Funding Source: CU Boulder

Abstract: Hydropower is the largest source of renewable energy in the United States and is greatly implemented worldwide with advantages of reliability, renewability, efficiency and cleanliness. A hydropower system was designed and constructed, including a water tower, user-friendly LabVIEW™ interface and adaptive water wheel mount, to facilitate the analysis of fluid flow and water turbine design efficiencies. The hydropower system demonstrates the conversion of fluid energy to mechanical energy and will be used for future engineering students' projects. LabVIEW™ software enables the user to electronically control and monitor the performance of the system and water turbine. The software was used to analyze the overall system efficiency and performance of three student-designed water turbines to provide data for future system users. The developed system will introduce students to an integrative approach of design analysis/implementation and solidify fundamental engineering principles learned in coursework.

Presenter(s): **Mary Rosendale**
Title: ST. AUGUSTINE AND THE EARLY CHRISTIAN CHURCH
Major(s): History
Department: Social and Behavioral Sciences
Sponsor: Doug O'Roark

Abstract: St. Augustine was significant in the crafting of the Catholic doctrine on marriage, original sin, infant baptism, and free will and grace. The influence he had on the early Catholic Church still impacts the doctrine of the faith today. The Catholic Church is an enormously important and an influential institution; St. Augustine was one of the men who made the Catholic Church sustainable and prosperous. Augustine wrote a number of works, including tracts in defense of the early church against heretics. On the basis of these arguments leaders of the church such as Pope Pius XI were able to create a foundation that the Catholic Church is still based on today. In 1930 Pope Pius XI adopted aspects of Augustine's "The Good of Marriage" into Catholic doctrine. Augustinian views on original sin were enacted in the Catholic Church at the Council of Trent in 1545-63. St. Augustine helped to resolve the donatist controversy regarding whether or not infants should be baptized before coming into the age of sin. His views on grace and the free will of the human soul were so ground breaking that all further debates on predestination centered on Augustine's beliefs. Without Augustine the Catholic Church and Christianity for that matter would not exist in the way we know it today.

Presenter(s): **Patric Rostel**
Title: GRAND MESA BLOWDOWN AND STAND RECOVERY
Major(s): Environmental Science and Technology
Department: Physical and Environmental Sciences
Sponsor: Deborah Kennard

Abstract: In 2006 a severe windstorm event disturbed the subalpine forest on top of the Grand Mesa in western Colorado. The blowdown occurred near the Crag Crest trail at an elevation of 10,000-11,000 ft. We analyzed the differences in survival and damage classes among the two tree species, Engelmann Spruce (*Picea engelmannii*) and Subalpine Fir (*Abies lasiocarpa*). Ten 200 m² plots were established in both the blowdown area and a nearby control forest site. The diameter, species and damage category of each tree inside plots were assessed. The slope, aspect and direction of treefall of the study site were analyzed using ArcGIS. Results showed that the tree species seemed to influence the damage class as well as likelihood of mortality. The blowdown area showed a predominance of Engelmann spruce in the canopy before the blowdown. The understory showed a shift to subalpine fir regenerating after

the blowdown. The control forest understory was dominated by subalpine fir, but the canopy was dominated by subalpine fir in contrast to the blowdown area. This dominance by subalpine fir may be an indicator that this part of the forest is older than the blowdown area and did not experience a disturbance for a long time.

Presenter(s): **Scott Schindelar**
Title: COMPARISON OF THE UPPER AND LOWER WILLIAMS FORK FORMATION IN WESTERN COLORADO'S PICEANCE BASIN
Major(s): Physical Sciences -Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

Abstract: The Cretaceous Williams Fork Formation, located in western Colorado's Piceance Basin, has been a focal point for natural gas drilling over the last ten years. It's been well documented that the lower members of this unit are sand poor as opposed to the upper sand rich portion. It's also accepted that the Lower Williams Fork was deposited by sinuous fluvial systems based on sedimentary structures and paleoflow data. Differences between lower and upper Williams Fork sandstones will be used to determine changes in depositional processes and environments during Williams Fork time. Gaining understanding of the varying depositional processes will help shed light on the origin of high to low net gross sand in fluvial deposits.

Presenter(s): **Scott Schindelar, Kasmira Workman**
Title: GEOSTATISTICAL EVALUATION OF CROSS-STRATIFICATION IN FLUVIAL SANDSTONE BODIES, WILLIAMS FORK FORMATION IN COAL CANYON AND PLATEAU CREEK CANYON, WESTERN COLORADO
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Rex Cole

Abstract: Approximately 1280 feet (390.1 meters) of measured sections collected from 202 fluvial sandstone bodies in Coal Canyon and Plateau Creek Canyon north of Palisade, Colorado have been cataloged in Excel™. The measured sections span from the lower Williams Fork Cameo Wheeler interval to the middle Williams Fork's "Big Kahuna." The apparent-width values were determined by outcrop mapping, and set thicknesses were measured using a Jacob staff. Our objective is to see if sandstone-body thickness and lateral extent can be related to cross-bed set thickness in the outcrop. Gaining understanding of how average set thickness is related to sandstone bodies will allow sandstone-body size to be determined using subsurface core data.

Presenter(s): **Rebecca Schmelzer and Lukas Landing**
Title: CAN YOU KEEP A SECRET?
Major(s): Physical Sciences - Chemistry
Department: Computer Science, Mathematics & Statistics
Sponsor: Tracii Friedman

Abstract: Everyone from government leaders to online shoppers to teenage girls have some things that they would prefer to share only with very specific people. So, what can you do to convey your information to the intended party while keeping others thoroughly confused? Messages have been encrypted since the time of Julius Caesar; however, with the advancements in technology, the need to send private messages has caused cryptology to become a highly-valued branch of mathematics. Cryptology is the mathematical study of ways to make messages secret so that only those people who know the 'key' will understand the message. In this poster, we investigate some cryptological methods, including affine transformations, block and stream ciphers, and RSA encryption.

Presenter(s): **Peter Schulze**
Title: PROBING THE WAVE/PARTICLE PROPERTIES OF LIGHT
Major(s): Physical Sciences - Physics
Department: Physical and Environmental Sciences
Sponsor: David Collins

Abstract: Light behaves both as a particle and as a wave. An interferometer is used to examine the trade-off between distinguishing the path taken by a photon (a manifestation of light as a particle) in an interferometer and observing contrast in interference fringes (a manifestation of light as a wave). "Which-way" (WW) information, which provides the potential to identify which path is taken, can be encoded onto the photons in interferometry experiments. The WW information can be quantified and there are known theoretical trade-offs between this and the visibility of interference fringes. An experiment, which explores the trade-off between fringe visibility and WW information, is performed. This utilizes the polarization states of light using a Mach-Zehnder interferometer. The experiment is used to check whether the known theoretical trade-offs are valid.

Presenter(s): **Naomi Sikora, Shonda Cook, Tashi Lewis, Rebekah Wilson**
Title: EVIDENCE-BASED PRACTICE IN THE PREVENTION OF HOSPITAL ACQUIRED PRESSURE ULCERS
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Our project seeks to provide information on the prevention of hospital acquired pressure ulcers, using the most evidenced-based data. This information is vitally important, as the development of a single pressure ulcer can cost anywhere from \$5,000-\$60,000, depending on the severity, associated complications, the required treatment, and the extra time the patient must spend in the hospital. In the United States, hospital acquired pressure ulcers cost an already overwhelmed healthcare system an unnecessary billion dollars a year. Although the geriatric population is very susceptible to the development of pressure ulcers, anyone who is immobile for greater than 2 hours is at risk, including ICU, perioperative, and neurologically impaired patients. In the right environment, pressure ulcers have the potential to develop serious infections leading to systemic sepsis and possible death. Once skin tissue has been damaged, even if the ulcer successfully heals, tissue integrity at the site is forever impaired, and is more susceptible to future ulcer reoccurrence. Through simple, cost-effective interventions shown in our presentation, billions of dollars can be saved, and patient outcomes improved.

Presenter(s): **Nicole Silvano, Nancy Boyack, Ashley Cox, Felicia Walz**
Title: HYPNOANESTHESIA
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Debra Bailey

Abstract: Thousands of individuals annually undergo surgeries that require anesthesia. For many, anesthesia poses the problems of nausea, vomiting, and many other side effects. Anesthesia, while effective, can be difficult for a patient, and is not necessarily the only option for those who need to have surgery. Hypnosis in medicine has been around for years, but is not commonly used. Hypnoanesthesia has the potential to be beneficial for patients who are not good candidates for general anesthesia. This includes patients with severe anxiety, those with allergies to sedative medications, and those who would prefer another option. This method has proved to be successful on many occasions, and it even reduces post-operative pain. By reducing post-operative pain, the length of the hospital stay is shortened as well. This allows monetary benefits for the hospital and patient, while providing decreased discomfort post-operatively. Not all patients are good candidates for hypnoanesthesia. Patients must be evaluated by a psychiatrist, and anyone with a history of mental illness will not be able to participate in this method. The theory is that hypnotizing a patient who is already mentally unstable could trigger a psychotic

episode. The purpose of this study is to determine if hypnoanesthesia is a viable alternative to general anesthesia. The study will implement a quasi-experimental method, and will involve patients from St. Mary’s Hospital for the year of 2012. Patients will be asked if they would like to participate when it is found that they are in need of surgery. The anticipated result is that hypnoanesthesia is a viable alternative, and may be advantageous in certain scenarios (i.e., reducing post-operative pain).

Presenter(s): **Stuart Sinclair**
Title: CLIMATE CHANGE’S EFFECT ON BREEDING BEHAVIOR OF MIGRATORY BIRDS IN WESTERN COLORADO
Major(s): Biological Sciences
Department: Biological Sciences
Sponsor: Susan Longest

Abstract: More and more evidence is being collected that demonstrates global climate change, and addresses its effect on biological systems. The focus of this project is the effect of climate change on the breeding behavior and timing of breeding seasons in tree swallows (*Tachycineta bicolor*), including their preferences for habitat and environmental temperature. Tree swallows are small cavity-nesting birds that feed primarily on small air-borne insects. They migrate south during the winter and return to their breeding grounds as temperature, as well as insect availability increases. A variety of non-invasive behavioral observations, as well as temperatures taken from data loggers were used to determine arrival time in western Colorado in relation to temperature and habitat preferences. These results are important for understanding the effects of climate change on the reproductive behavior of *T. bicolor* breeding in western Colorado. This information can be applied to migratory bird species generally, as well as other species in the *Tachycineta* genus through an international collaboration investigating the effects of climate change on the breeding behavior of the entire genus.

Presenter(s): **Chase Snyder, Brian Groves, Ann Martinez, Stephan Sharman, Ryan Wilson**
Title: OIL AND GAS SPACING REGULATIONS
Major(s): Business - Landman/Energy Management
Department: Business
Sponsor: James Colosky

Abstract: A group of five students have done a presentation to better explain the reasons and procedures of spacing in the oil and gas industry. This presentation was put together to help explain why spacing regulations are put into place and how companies have to meet the requirements while working with mineral owners and lessees. Also this presentation explains how working interest, royalty interest, and any other overriding interest are calculated for the leases that are involved in the spaced areas. This project also explains the economical reasons that spacing is used to help reduce the amount of waste. Therefore, this project was done to help to better understand the reasons behind spacing in the oil and gas industry.

Presenter(s): **Sarah Spray, Maria Peters**
Title: PREFERRED INTENSITY EXERCISE IN THE TREATMENT OF DEPRESSION
Major(s): Nursing - BSN
Department: Health Sciences
Sponsor: Kristine Reuss

Abstract: The purpose of this study is to determine if exercising at one’s preferred level of exercise intensity leads to greater improvements in symptoms of depression, as compared with exercising at a prescribed level of intensity. One hundred women aged 25-40 years, who have been diagnosed with mild to moderate depression, will be recruited from local healthcare providers. All of the women will participate in an exercise regimen consisting of riding stationary bicycles for 40 minutes,

three days a week, for eight weeks. The study is a randomized controlled design. 50 of the women will be randomly assigned to the Intervention group, which will exercise at a self determined rate of exertion (Preferred level of intensity). The remaining 50 women will be assigned to the Control group, which will exercise at moderate aerobic intensity. This aerobic level will be 70% of the participant's maximum heart rate (Prescribed level of intensity) determined by age. Prior to beginning the exercise intervention and at eight weeks, all participants will be given a Beck Depression Inventory to determine levels of depression before and after the intervention. A pretest/posttest short term mood questionnaire (STMQ) will be given weekly immediately following exercise to identify short term mood elevation after exercise. These tools will help to quantify whether choosing one's own exercise intensity may lead to greater mood improvement compared to being assigned an exercise regimen at a fixed moderate aerobic intensity. The dependent variable will be analyzed using a one-tailed independent samples t-test.

Presenter(s): **Jeremy Styers, Will Lostumbo, Thomas Martens**
Title: ANODIZING LINE
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Francisco Castro

External Funding Source: Lewis Engineering, Inc

Abstract: Lewis Engineering, Inc. is a local precision machine shop that specializes in aerospace products, turbine engine components and industrial pumps. As part of its efforts to improve the quality and reduce costs related to its products, Lewis is planning to bring a new anodizing line system. A team of students will design, construct, and analyze an anodizing prototype, that in the future, will become a new full-scale anodizing line. The proposed prototype system will meet different specifications that involve mechanical, economical, safety and military aspects.

Presenter(s): **Brianna Sunderland, Tara Keif, Deborah McCoy, Jlynn McLaurin**
Title: SAFETY: THE DRUG-ADDICTED PATIENT
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: Consistent with the QSEN competency of safety, this presentation will focus on educating nurses on safely interacting with patients who have a substance abuse problem. Residents of the western slope seem to be particularly vulnerable to illicit or inappropriate drug use. As future nurses in this area, it is critical to the safety of both healthcare workers and patients that nurses have an understanding of the effects of these substances and understand how to best handle these patients. This presentation will inform viewers about visual and behavioral signs of potential drug abuse, safe de-escalation of patients experiencing withdrawal, potential hazards to be aware of in this population, individuals who are particularly susceptible to these problems, and treatment options including rehabilitation services available. Healthcare professionals should be skilled in safely enhancing the health and hygiene of patients with substance abuse problems. This demonstration of how to identify potentially dangerous patient situations and safely handle them applies not only to nursing care on the western slope, but to healthcare worldwide. Education is power and this presentation will empower nurses in our community to perform safe nursing care of drug-abusing patients in western Colorado.

Presenter(s): **Daniel Sunderland, Brandon Bearden, Kenny Gimple, Jerome Kiefer**
Title: MATH PRAXIS - BILINGUAL EDITION
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Arun Ektare

Abstract: This presentation will demonstrate the use and functionality of the *Praxis Math – Bilingual Edition* mathematical drill game as well as some of the design process and implementation of this software. This game was designed to provide a fun method for elementary students to learn basic mathematics using the technique known as drill and practice. Studies show that it is beneficial for a student to be able to look at a math problem and solve it in their head quickly. This game provides an entertaining bilingual interface for students to do just that, utilizing both English and Spanish. The game can be used in schools or can easily be run on a student's home computer.

Presenter(s): **Marshall Sweatt, Eric Wilcox**
Title: AUTONOMOUS ROBOTICS
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Phil Kavanagh

External Funding Source: Colorado Space Grant Consortium (NASA)

Abstract: In conjunction with PHYS 301 the presenters will demonstrate the process and completion of building and programming autonomous mini vehicles for extraterrestrial exploration. The evolution from the original design to the current model will be discussed. The robots were tested in Alamosa, CO as part of the Colorado Space Grant Consortium challenge. They are both original designs. The components included DC gear motors, servos, short range infrared sensors, a digital compass and a radio receiver. The robots were programmed using Arduino circuit boards with a programming language similar to C++. They competed in numerous courses autonomously, the results of which will be discussed. The robots will be demonstrated at the presentation.

Presenter(s): **YeonShim Takaki**
Title: MATHEMATICAL MODELING OF HYDRAULIC FRACTURING
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Dan Schultz-Ela

Abstract: Current procedures used to extract oil from unconventional rock retrieve only 45 - 55% of the oil. We will look at a model that shows the principal stress trajectories around an elliptical borehole for different combinations of fluid and tectonic stresses. These trajectories show the expected fracture patterns in hydraulic fracturing. The results should show that working with the tectonic stress region will produce a greater flow of oil, making for easier extraction and providing a greater supply.

Presenter(s): **Con Trumbull, Stanial Klassert, Nichole Redden**
Title: A PRELIMINARY GEOLOGICAL/GEOPHYSICAL INVESTIGATION OF THE COOK CANYON MAGNETIC HIGH, NW UNCOMPAHGRE UPLIFT, COLORADO
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Verner Johnson

Abstract: In 1979, geoMetrics performed an aerial magnetic survey in the Moab 1 degree by 2 degree quadrangle (geoMetrics, 1979). Johnson (1983) found and identified a positive magnetic anomaly, one of the strongest anomalies in the

Uncompahgre Plateau, as an intrusion in the Coates Creek-Cook Canyon area west of Glade Park in Western Colorado. The present study (Spring, 2012) is to determine the precise location of that anomaly on the ground using a proton precision magnetometer and GPS units. The result of the study shows the positive magnetic anomaly to be approximately 3300 nT (nanotesla) from high to low. Calculation using Peter's half slope method indicates the magnetic source is approximately 5,400' below the surface. Computer calculation using cylindrical shape with high susceptibility contract at .04 and at depth of 5,400' and 11,500' shows the observed and calculated magnetic anomalies are related. This suggests a mafic-type igneous pluton, thought to be of gabbroic composition, may be present. As there are no observed geologic disturbances such as joints or faults in the Mesozoic sedimentary rocks which overlie the pluton, it is likely a Precambrian event.

Presenter(s): **Amanda Walker**
Title: EXPERIENCING DESIRE AND PLEASURE THROUGH POETRY
Major(s): English - Secondary Education Licensure
Department: Languages, Literature and Mass Communication
Sponsor: Barry Laga

Abstract: It is no surprise that many people have an unnerving anxiety about reading poetry. This hostile attitude may result from a disdain for poetry and the tedious chore that reading a poem is often associated with, and some may wonder, "Can reading poetry be enjoyable?" For those, it may be difficult to fathom that such a trying task of working with poetry can in any way be connected with the elicitation of powerful emotions like pleasure and desire. Surprisingly enough, these two innate human feelings can indeed derive from an experience with poetry. Furthermore, the reactions of desire and pleasure can be encountered both within the content of a piece, as well as in the act of reading the work itself. The author of a text must exhibit skillful language usage such as imagery and symbolism, and working with a contradictory idea is always helpful for stimulating an engaged emotional response. Sharon Old's twenty-four line poem, "Sex Without Love" is a perfect example of how a literary work can provoke desire and yield pleasure. When the poem is read with the consideration of what it means to the reader, it becomes more personal; in this way desire is formed and pleasure is attained in an ongoing exchange. The literary scholar Andrew Bennett is used to elaborate on the instances in which desire and pleasure are stimulated via literature interaction. He also clarifies how the written language can arouse such emotions from the audience. Old's poem will be presented and analyzed to exhibit the way the intricate relationship between desire and pleasure is apparent in her work, and how these emotions are transmitted to the reader. Through this presentation, it should become apparent that reading poetry can be a wondrous experience flooded with desire and pleasure on multiple levels.

Presenter(s): **Katie Walters**
Title: REINTERPRETING "THE SAFETY DANCE"
Major(s): English - Literature
Department: Languages, Literature and Mass Communication
Sponsor: Barry Laga

Abstract: My music video "The Safety Dance" was inspired by an assignment given in Dr. Laga's Introduction to Film Studies course that required students to demonstrate a knowledge of basic film elements like mise-en-scene, cinematography, editing, and sound. After taking this course, I decided to create a music video that featured these elements, though not just for the purpose of introducing others to the world of film. As a musician, I was keenly interested in the element of sound—specifically, how the sound of a song affects its interpretation. Therefore, I took the 80's hit, "The Safety Dance," and re-interpreted it by creating an original cover of the song. I then took my version of the song, and built a music video around it. What I aim to show through this video and presentation is that altering the sound of a song allows one to recontextualize it, both audibly and visually.

Presenter(s): **Katie Walters**
Title: MUSIC AND RELIGION IN EARLY AMERICA
Major(s): English - Literature
Department: Languages, Literature and Mass Communication
Sponsor: Barry Laga

Abstract: This presentation offers an examination of the history of religious music in Early America. Three of these unique musical traditions are Shaker spirituals, Native American spirit-songs, and Black spirituals. However, this presentation is not simply a chronological record of religious music through time. More than reflecting specific styles of worship, religious music plays an integral role in both religious expression, and religious discernment. Put differently, the music itself reveals something to us of the nature of the religion it represents. The idiosyncratic styles in which the music was written and performed by people belonging to these early American religious groups celebrate the musicians' unique religious passions and beliefs.

Presenter(s): **Cori Ward**
Title: THE ATHENIAN ENCOUNTER
Major(s): History - Secondary Education Licensure
Department: Social and Behavioral Sciences
Sponsor: Doug O'Roark

Abstract: In the book of Acts, Luke described the intellectual capital in the Mediterranean world. The Greek culture, often entitled Hellenism, played a key role in the Apostle Paul's approach to philosophy, and specifically in his Mars Hill speech. This study looks deeper into the academic climate and the Hellenistic influences in which Paul was surrounded. It compares and contrasts this speech through the eyes of the Stoics, in whom he was addressing, and Paul's own experiences. The overall importance of this topic is due to the fact that Paul has molded and shaped the understanding behind the religion of Christianity. Several books in the Bible are founded on the presumption that Paul's message was an authentic and 'divinely inspired' ideology. Challenging this assumption by researching the Hellenistic metropolis of the Mediterranean and its effect on the apostle has sparked wide controversy. This scholarly controversy is crucial. If Paul's authenticity in his letters is indeed counterfeit, Christianity would therefore have arisen from nothing more than a syncretistic mixture of Jewish prophecy, oriental gnosis and Greek philosophy. It would dilute the assumption that his message or the book of Luke was genuine.

Presenter(s): **Crystal Wert, Caroline Dowd, Molly Roth**
Title: ANALYSIS OF BERNARD MADOFF PONZI SCHEME
Major(s): Accounting, Business - Finance
Department: Business
Sponsor: Craig Fossett

Abstract: A group of three students researched and analyzed the underlying factors involved in the estimated 60 billion dollar fraud perpetrated by Bernard Madoff. This fraud was perpetrated beginning at least as early as 1990 by using false or backdated account information to fabricate large returns on consumer investments, a scandal that was not revealed until late 2008. The research provided insight into the pressures involved in driving Madoff to commit fraud, the opportunities that allowed the fraud to occur largely undiscovered for more than a decade, and the rationalization used by Madoff to justify his actions. The results of the analysis provided three specific lessons of interest to fraud examiners and investors alike to promote awareness of how and why frauds are committed.

Presenter(s): **Derek West, Jeff Allen, Greg Wall**
Title: WIRE CRIMPING AND STRIPPING MACHINE
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Francisco Castro

Abstract: GPD is a local manufacturing facility dedicated to producing systems involved in the fabrication of printed board circuits, medical equipment, automotive chips, and consumer electronics. The manufacturing of these systems requires the fabrication of wires, which involves stripping and crimping processes. Currently, trained operators do these processes manually. In order for GPD to achieve an increase in the precision and accuracy in both the wire stripping and crimping processes, a group of students has been asked to automate these processes. The automation of this process could give way to the repeatability and accuracy desired. The final design will consist of a complete working machine for stripping a variety of casings, stripping different sized conductors and crimping multiple styles of connectors.

Presenter(s): **Caitlin Westerson**
Title: EAGER FOR EDUCATION: FACTORS AFFECTING ACADEMIC PERFORMANCE
Major(s): Sociology - Human Services
Department: Social and Behavioral Sciences
Sponsor: Abigail Richardson

Abstract: This paper explores the influence of multiple factors on cumulative grade point average, a key component in measuring academic performance. Through survey questionnaires handed out to 1000 public university students in Colorado, data were collected on the percentages of tuition students are paying, their employment status, their academic success, and motivational factors. Forms of payment examined include scholarships, grants, loans, and parental contribution, as well as student contribution. We expected to find that students who pay a greater percentage of their tuition perform better academically. The results, however, indicate that other factors have a stronger influence on academic performance.

Presenter(s): **Eric Wilcox, Marshall Sweatt**
Title: MENTORING FIRST ROBOTICS STUDENTS
Major(s): Computer Science
Department: Computer Science, Mathematics & Statistics
Sponsor: Warren MacEvoy

External Funding Source: Collbran Job Corps

Abstract: The FIRST (For Inspiration and Recognition of Science and Technology) robotics competition allows high school students to interact with industrial grade technology. The presenters were given the opportunity to mentor team 1158, Collbran Job Corps, in the programming of a robot for national competition. This year the robots were designed to play a basketball like game in which they had to shoot baskets from various positions in the field. This competition gives students the chance to be exposed to high-end electronics, programming, engineering and fabrication in a cooperative yet competitive environment. Few high schools nationwide take advantage of this program, yet Collbran Job Corps allow their students this exposure. The students competed in both Salt Lake City, UT and Denver, CO the results of which will be presented.

Presenter(s): **Amanda Williams**
Title: SILLY RABBIT: DYSTOPIAN LITERATURE IS FOR CHILDREN
Major(s): English - Secondary Education Licensure
Department: Languages, Literature and Mass Communication
Sponsor: Maureen Neal

Abstract: The power of reading is evident everywhere in our society. In the workplace, one must be able to read to simply fill out the application for

employment. In everyday life, being able to read a menu or a stop sign can be life-changing. In school, the ability to read is absolutely crucial. A large amount of focus is given to those with reading troubles. This project provides one answer to the problem with struggling readers. Through allowing students to choose what they read, our society can foster a child's desire to read or create situations in which children can learn to enjoy reading. This particular project has questioned the appropriateness of dystopian literature and offers a solution to the issue of what level of dystopian literature is appropriate for children. In addition, this project gives specific examples of dystopian books that can be taught in a classroom. When an educator fights for her child's right to read, the result is clear: she can create an environment that will foster reading and the ability to succeed not only in school, but in life.

Presenter(s): **Carol Winters, Susan Arnold, Kerensa Lambros, Michelle Meeker, Cheryl Riddles**
Title: NURSING INFORMATICS
Major(s): Nursing - AAS/RN
Department: Health Sciences
Sponsor: Genell Stites

Abstract: According to the Institute of Medicine's July 2006 report, "Preventing Medication Errors," medication errors harm an estimated 1.5 million people in the United States each year, resulting in upward of \$3.5 billion in extra medical costs. To address the ever-increasing challenges to prevent these devastations to patients' lives, a sub-discipline in nursing has been created called nursing informatics. This is where nursing science, computer technology, and information sciences have been combined to enhance the quality of patient care by improving communication, documentation and efficiency. To meet these criteria for patient quality, The Joint Commission has set regulations for healthcare facilities to use standardized care sets and common language through computerized means. To minimize medication errors, the Workstation on Wheels has answered The Joint Commission requirements featuring Electronic Medication Administration Record (eMAR) with Bedside Medication Verification. Patients now have armbands with identifying barcodes, as well as each medication barcode which, when scanned, must match up with the eMAR. The intent of this presentation is to showcase this modern marvel with its expanding possibilities in the medical field.

Presenter(s): **Ashley Wiseman, Melissa Asay, Amber Harrington**
Title: THE ENTERTAINMENT INDUSTRY: A FINANCIAL OVERVIEW OF THE "BIG" PLAYERS
Major(s): Business Administration - Finance
Department: Business
Sponsor: Morgan Bridge

Abstract: A financial analysis of the following three companies will be presented: Walt Disney, Viacom and MGM Resorts. The use of finance as a competitive advantage in light of the target capital structure, the use of debt, financing sources and future financing needs will be compared and contrasted for these three entertainment companies.

Presenter(s): **Kasmira Workman**
Title: GEOLOGIC SUMMARY OF THE THREE SISTERS PROPERTY
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

Abstract: The Three Sisters property is located immediately south of Grand Junction, Colorado near the Colorado National Monument. It has recently been approved for the development of a residential area. The city of Grand Junction and the Mesa Land Trust have been working together to purchase the 0.203 square mile property to ensure that the land stays in its natural state. The city then plans

to turn the property into an educational area that can be used for hiking and biking. The purpose of this research project is to compile information on the area's geology. Research will focus on the lithology of the area, geologic formations such as the Mancos Shale, Morrison Formation, Dakota Sandstone, and Burro Canyon Formation, unique structural features, evidence of ancestral rivers, and the formation of the Three Sister hills. Research information will be used to create educational signs which will be installed on the property.

Presenter(s): **Amanda Wright, Brandon Pollard, Mike Sweeney**
Title: ANCIENT EGYPTIAN MATHEMATICS
Major(s): Mathematics
Department: Computer Science, Mathematics & Statistics
Sponsor: Edward Bonan-Hamada

Abstract: The thought of Ancient Egypt gives rise to visions of pyramids, the Sphinx, tombs and temples, and other incredible structures. Rarely though, is the mathematics of this civilization required to achieve the building of these vast structures even considered. Ancient Egyptians were some of the first pioneers of multiplication, division, geometry, and algebra. This presentation will explore the various types of mathematics used by the Ancient Egyptians. Additionally, it will look at the influences and needs of the society that motivated and perpetuated the development of mathematics within the civilization. The limitations they faced and the social influences that guided the process are also examined. This presentation will also draw parallels between the mathematics done in Ancient Egypt and the mathematics that are more familiar today.

Presenter(s): **Michael Zeek**
Title: COLLECTION AND AGE DATING OF CALCITE RINDS
AND MAPPING OF QUATERNARY COLORADO RIVER
TERRACES IN SOUTHEASTERN ORCHARD MESA, MESA
COUNTY, COLORADO
Major(s): Physical Sciences - Geology
Department: Physical and Environmental Sciences
Sponsor: Andres Aslan

External Funding Source: National Science Foundation

Abstract: Mapping of Colorado River terrace gravels provides the basis for interpreting the geologic history of the Grand Valley. This information is also important for understanding river incision rates, late Cenozoic uplift/subsidence, the development of topographic reversals, and the location of river paleo-confluences. Currently, terraces mapped as Qtu on local geologic maps are poorly understood. New mapping will refine the descriptions of these terraces and, will provide insight on terraces in the Grand Valley. Terraces that are 100 m above the modern Colorado River in southeastern Orchard Mesa, Mesa County, Colorado, have no absolute ages. U-series dating involves the known decay rate of natural uranium radioisotopes, which are present in calcite that locally cements gravels of Colorado River terraces. Samples of calcite rinds within 100 m terrace and Qtu deposits will lead to accurate age dates for these units. This information will allow more detailed interpretations of the incision history of the Colorado River.

FIRST-YEAR MECHANICAL ENGINEERING DESIGN EXPO



Presenter(s): **Katelyn Adsitt, Brandon Barnhorst, Duncan Koehn, Steven Nicolas, Caleb Wyatt**
Title: BICYCLE FRAME STRESSES
Major(s): Mechanical Engineering, Mechanical Engineering Technology
Department: Physical and Environmental Sciences
Sponsor: Scott Kessler

Abstract: Stress/strain testing methods and finite element analysis (FEA) were researched for bicycle frames. An adjustable apparatus was designed and built to load multiple frames. Rosette strain gages were applied to a conventional bike frame to measure the actual strain produced during loading. Finite element analysis was performed (Solidworks, 2011) on virtual models to simulate stresses/strains. A report was composed to compare the results.

Presenter(s): **Garrett Arevian, John Bishop, Tim Kettle, Scott Taylor, Henry Tellini**
Title: ANGULAR MOMENTUM
Major(s): Mechanical Engineering
Department: Computer Science, Mathematics & Statistics
Sponsor: Scott Bevill

Abstract: Beginning with Sir Isaac Newton (1642-1727) and later Albert Einstein (1879-1955), conservation of energy and angular momentum have been viewed as mundane although there are many real world applications where they are applied. The most prominent is the gyroscope, used for internal navigation ranging from small boats to military hardware and aircraft and even projects for NASA such as the space shuttle and Hubble telescope. A gyroscope works on the simple principle that as a large rotor inside three gimbals (rings with precise bearing finishes) spins at a high rate of speed, the angular momentum of the rotor keeps the rotor upright and in that same position in space. As a result, the gyroscope will maintain a heading even though forces may be exerted upon it. With our exhibition, we will demonstrate the basic and sometimes overlooked concept of conservation of angular momentum in a manner that is conducive to understanding the topic, interesting, and overall fun.

Presenter(s): **Mark Barlow, Kenneth B. Klein, Benjamin Blandina, Adam Degemann, Vail Hall**
Title: PENDULUM WAVE
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: Pendulums are common physical devices used in applications from clocks to seismometers. It is well known that a pendulum's oscillation frequency depends on the length of the string to which it is attached. Consequently, when a series of pendulums with varying lengths are placed in a row, the result is a wave-like motion due to the complementary periodicity of each pendulum. The purpose of this project was to demonstrate the effect of pendulum length on its period of oscillation in a visually appealing way. A frame was designed with fifteen adjacent pendulums, each designed to complete one additional cycle in a 60 second period compared with the previous pendulum. A uniform release mechanism was also designed in

order to ensure all of the balls release at the same time. The frame was designed in order to allow several viewpoints of this wave effect. The frame represents an engaging demonstration that pendulum oscillation frequency is directly related to pendulum length.

Presenter(s): **James Bauer, Conner Aichlmayr, Aron Chamberlain, Isaac Koch, Tayloe McMacken**
Title: FORMATION OF GAS DRILLING WASTE INTO A USEABLE PRODUCT
Major(s): Mechanical Engineering, Mechanical Engineering Technology
Department: Physical and Environmental Sciences
Sponsor: Scott Kessler

Abstract: Drill cuttings (solid waste generated while drilling wells) are a problem that most oil and gas companies have to deal with. Currently, companies just store them onsite to be buried later, something that is neither environmentally-friendly nor cost-effective. The purpose of the project was to get first year engineering students real-world problem solving experience; while potentially coming up with an eco-friendly and cost effective solution to deal with a problem that has been plaguing oil and gas companies since they started drilling. There were two groups working on this problem: separation and formation. The goal for the formation group was to take the slurry (mixture of drilling wastes and water) and form it into a product that could be sold for profit.

Presenter(s): **Robert Benner, Austin Burns, Ryan Kawano, Zach Padilla**
Title: CHAOTIC SYSTEMS
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: Chaotic systems, or systems that have behavior that is sensitive to starting conditions, can be observed in many situations in nature. Some examples include weather patterns, adaptation of living creatures, and even how mountains are formed. One such system that is encountered in the study of dynamics is the compound pendulum. The purpose of this project was to design a chaotic pendulum system to demonstrate the principle of chaotic dynamic behavior. The pendulum was designed so that its behavior would be particularly sensitive to initial conditions. Consequently, the same oscillatory response is rarely observed twice. The designers will demonstrate the theory of chaotic systems through a chaotic pendulum. This design will capture the attention of all by showing how the behavior of the system actually works.

Presenter(s): **Victoria Chavez, Dylan Ashby, Chris Walters, Cody Warfield, Daniel Winegardner**
Title: HYDROGEN FUEL CELL - ENERGY OF THE FUTURE
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: It was documented, that in 2008, the United States released 6,924.56 tons of greenhouse gasses. With gas emissions and pollution becoming an evident problem, cleaner energy concepts were explored and a project was developed to design and construct a hydrogen generator. A hydrogen fuel cell requires distilled water to be pumped through the device; the potential between negatively- and positively- charged aluminum plates splits apart the H₂O molecule. With the hydrogen being separated from the oxygen atom, the hydrogen can be pumped into a separate container where it is pressurized and further used as a form of energy. The initial project consists of the hydrogen generator mounted in a compact, mobile station. A secondary project was developed to use the pressurized hydrogen to fuel and propel a rocket directly attached to a holding tank. The designers will

display and demonstrate the generator, as well as the rocket, to raise awareness about the possibilities of alternative energy.

Presenter(s): **Michael Fry, Jonathan Carlton, William MacDonald, Peter Skelton, Alex Wood**
Title: VAN DE GRAAFF GENERATOR
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: The Van de Graaff Generator has been a classroom favorite for years, shocking students and demonstrating electric potential from various distances. The purpose of this design was to explore the effect of an electrical discharge on several common objects. More specifically, how a car's frame can act as a faraday cage, and why lightning is drawn to a lightning rod. A small house was used, with a miniature lightning rod grounded to it. This allowed the generator to demonstrate many factors such as whether or not a lightning rod needs to be above the peak of the house, or if the lightning would strike something else metal in the house, or something else that is wet. The generator uses a rubber belt attached to two pulleys. Lying across the bottom, there is something that can hold static charge, such as a piece of fur. On top, an aluminum sphere sits with an additional piece of metal hanging close to the top pulley and belt. The bottom pulley will then be turned by an electric drill. As the belt is turned, it will pass across the fur, picking up static charge in the belt. The belt will then bring the charge up to the metal sphere where the electricity will be held and ready for some shocking fun! The results will demonstrate electric potential and how lighting is attracted to various objects.

Presenter(s): **Tyler Lindenbaum, Megan Brown, Keith DeHerrera, Damien DeLaHoz, Cole Hanson**
Title: DRILL CUTTING SEPARATION INTO A USABLE PRODUCT
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Kessler

Abstract: Natural gas is making an incredible resurgence. Stunning technology advancements and vastly more efficient processes have made accessible reserves of gas that can only be described as unfathomable. With its increasing popularity as a clean burning fossil fuel it is becoming a more attractive alternative to coal and oil. As with any advancement, there are some less attractive side effects. One of which is an excess of drill cuttings. These drill cuttings, made up of drilling mud and aggregate have thus far been a liability costing Encana up to \$5,000 per day to dispose of. This project attempts to reprocess the excess material into a useful end product that will mitigate the byproducts' environmental impact and reduce Encana's operating expenses. By forming several specimens of different mixtures of cement, cuttings, and other additives and using ASTM C 1077 and ASTM C 39/39M testing standards and procedures to realize the strength potential of these specimens, the project will find the realistic expectations for creating a useable concrete and lay out a pathway forward for scaling the procedure to meet the needs of Encana.

Presenter(s): **Gerald Romero, Eric Black, Zeth Ramsay, Brandon Walker, Matt Weiss**
Title: DRILL CUTTING SEPARATION
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Kessler

Abstract: The purpose of this project is to find ways to separate drill cuttings that are the result of drilling so far into the Earth. These drill cuttings present a problem because of the sheer volume that is present at this time. Six experiments were developed to hopefully find a process that would prove to be effective. Those six experiments were as follows: magnetic separation, changing temperature, changing

the pH, screening, pressure, and making the cuttings hydrophobic. Once the data from those six is collected it will then used to determine the most viable option. Then that process will be further explored and may be combined with another process to see if it will be able to become a more efficient option. Due to time constraints, only a few experiments will be performed and might be continued at a later time and date next year.

Presenter(s): **Taylor Rucker, Austin Dale, Aaron Howell, Deshaunte Webber, Drew Young**
Title: A STUDY IN PHOTO ELASTICITY
Major(s): Mechanical Engineering, Mechanical Engineering Technology
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: When designing and analyzing load-bearing structures and components it is useful to visualize where the largest stresses occur. The goal of this project was to develop a system to help analyze the stresses in structures fabricated out of polycarbonate plastic. One remarkable property of polycarbonate is that it exhibits birefringence under load. That is, the refractive index of the polycarbonate becomes anisotropic under load, altering the optical path length of the light passing through the specimen. This property causes vibrant colors to translate throughout the photoelastic material in relation to levels of stress at a point. This demonstration represents a small scale, visually appealing, and fun way to observe how forces on an object are translated throughout a structure. This type of testing can help ensure that a structure will safely withstand the forces that it will experience in practice.

Presenter(s): **Gregory Shover, Keegan Erickson, Dillon Knuepfer, Scott Reed, Spencer Vivian**
Title: REINVENTING THE WHEEL: POLYGONAL WHEELS AND THEIR CORRESPONDING INVERTED CATENARY CURVES
Major(s): Mechanical Engineering
Department: Physical and Environmental Sciences
Sponsor: Scott Bevill

Abstract: "Reinventing the Wheel" demonstrates how a polygonal wheel will roll smoothly along its axis by changing the shape of the surface the wheel travels over. If a point is marked on the edge of a traditional wheel as it rolls on a flat surface, the point will trace a cycloidal curve along space. Change the shape of the wheel, and the corresponding surface of the track must be changed to allow it to roll smoothly. The project designers integrated a tricycle with three polygonal wheels of equal size, and constructed a track patterned with the shape necessary for the polygonal wheels to roll smoothly along their axis. Three small scale models were also constructed, each with a unique pattern, and nine different polygonal wheels to choose from. The small scale model interactively challenges anyone to select the correct wheel for the correct track. The project designers hope to spark the interest and curiosity of all ages as they demonstrate the entertaining and educational value of catenary curves.



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