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College of Science and Mathematics (CSM)

present their

7th Annual Science and Mathematics Student Research Symposium

along with students from the university-wide Summer Undergraduate Research Program (SURP)

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%= Project SEED Student
Enhancing Biodiesel Production by Acidification and Esterification of Fatty Acid Soaps

Ms. Chevaun Glover*, Ms. Olga Ivasheva *, Ms. Amanda Anaya* and Dr. David Dillon

Department of Chemistry

Research Project #1 – ABSTRACT

Biodiesel is an important renewable fuel made primarily by transesterification of plant oils producing glycerol as a significant by-product. Most small-scale biodiesel operations use base-catalyzed transesterification reactions resulting in co-production of variable quantities of soap by-products as contaminants in the glycerol. These soaps correspond to long carbon-chain fatty acids. We have investigated the recapture of the fatty acid portion of soaps accompanying glycerol by-product from canola seed biodiesel production. Our process involves acidification of crude glycerol, and subsequent methyl esterification of the free fatty acids to produce additional biodiesel. Based on preliminary experiments, additional biodiesel amounting to roughly 20% of the glycerol volume can be obtained from soaps in the crude glycerol by-product. This soap-derived biodiesel will be compared with production grade biodiesel on the basis of color, clarity, cloud point, density, viscosity, and IR. We hypothesize that the process described here can be used to increase commercial biodiesel production.
Involvement of the Rab5 Endocytic Pathway in the Regulation of MCT1 by 8brcAMP in Rat Brain Endothelial Cells

Ms. Chevaun Glover*, Ms. Leigh Harrel*, Ms. Olga Ivasheva*, Mr. Drew Koch*, Mr. Adam Vega*, Mr. Kevin Darcy^, Ms. Allison Haar^, Ms. Amy Uhernik^ and Dr. Jeff Smith

Department of Biology

Research Project #2 – ABSTRACT

Monocarboxylic acid transporter 1 (MCT1) is located in cerebral microvascular endothelial cells where it is the only known facilitator of lactic acid transport across the blood brain barrier. During stroke, brain injury, and certain other brain diseases, lactic acidosis is a fundamental precursor of brain cell damage, therefore understanding factors that regulate MCT1 function could lead to new therapeutic approaches for these diseases. In our study, cAMP analogs, such as 8-brcAMP, were shown to regulate MCT1 function either positively or negatively depending upon the post subculture recovery period, however, the mechanism for this bimodal effect is unknown. Previous kinetic studies showed that MCT1 regulation by cAMP analogs affected $V_{\text{max}}$ but not $K_M$ suggesting that cell surface and cytoplasmic trafficking may be part of the mechanism. Therefore, we hypothesized that MCT1 would colocalize with the marker of vesicular trafficking, Rab5, and that its pattern of expression and colocalization with Rab5 would change with 8-brcAMP dependent regulation of MCT1 function. Rab5 is a small GTPase that is localized at the plasma membrane and early/sorting endosomes where it plays a vital role in the regulation of vesicular trafficking during endocytosis. Dual immunostaining of rat brain endothelial cells, subcultured for either 3 or 24 hours, showed extensive MCT1-Rab5 colocalization at the plasma membrane and in cytoplasmic puncta consistent with early/sorting endosomes. The patterns of expression and colocalization changed with 8-brcAMP in both subculture groups suggesting that endosomal trafficking of MCT1 may be part of the regulatory pathway.
Fabrication of Free-Standing, 3-D Metal Microstructures via Laser-Induced Aggregation

Mr. David Bemis* and Dr. Rick Farrer

Department of Chemistry

**Research Project #3 – ABSTRACT**

Current lithographic techniques, although capable of creating two-dimensional structures with extremely high resolution, struggle to create a significant third dimension. We have investigated the use of metal nanoparticles as building blocks for the fabrication of three-dimensional microscopic structures. These microstructures are created through linear excitation of the plasmon band of the nanoparticles. The fabrication is completed in the solution phase with no supporting matrix. The free-standing structures are conductive. At this time, we have investigated this process using gold nanoparticles to create gold structures.
Acute regulation of MCT1 function in cerebrovascular endothelial cells by cAMP dependent vesicular

Ms. Amy Uhernik^, Ms. Bonita Nuanez^, Mr. Kevin Darcy^, Dr. Jeff Smith, M. Sneve, Z Liu, and L.R. Drewes

Department of Biology
and
University of Minnesota School of Medicine – Duluth

Research Project #4 – ABSTRACT

Monocarboxylic acid transporter 1 (MCT1) is located in cerebral microvascular endothelial cells where it is the only known facilitator of lactic acid transport across the blood brain barrier. Recent evidence strongly suggests that normal development of the neurovascular unit (NVU) and rapid regulation of blood-brain transport of short chain carboxylates (lactate, pyruvate, ketones) by the brain endothelial MCT1, require specific signaling pathways involving the cAMP/protein kinase A-dependent signaling. In our study of rat brain endothelial cells, RBE4, short term treatment with cAMP analogs, such as 8-Br-cAMP, regulated MCT1 function either positively or negatively depending upon the post subculture recovery period; however, the mechanism for this bimodal effect is unknown. Previous kinetic studies showed that MCT1 regulation by cAMP analogs affected V_max but not K_M suggesting that cell surface and cytoplasmic trafficking may be part of the mechanism. To examine more closely this potential mechanism of MCT1 regulation, the plasma membrane surface of RBE4 cells was isolated by biotinylation or phosphoprotein binding and quantified by immunoblot detection. Brief treatment with cAMP caused rapid dephosphorylation of MCT1 and a decline in membrane localization. These results indicate that MCT1 transporter activity is regulated by its plasma membrane location and may be dependent on its phosphorylation state. Dual immunostaining of RBE4 cells, subcultured for either 3 or 24 hours, showed extensive MCT1-Rab5 co-localization at the plasma membrane and in cytoplasmic puncta consistent with early/sorting endosomes. The patterns of expression and co-localization changed with 8-Br-cAMP in both subculture groups. Taken together, our surface biotinylation and immunofluorescence results suggest that endosomal trafficking of MCT1 is a key part of its regulatory pathway. MCT1 expression and activity may be relevant to stroke, brain injury, changes in glycemic status (diabetes), brain drug delivery, and certain other brain diseases in which lactic acidosis is a fundamental precursor of brain cell damage, therefore understanding factors that regulate MCT1 function could lead to new therapeutic approaches for these diseases.

(Supported by the American Heart Association and NIH AREA grant 1R15NS062404-01A2)

Key words (3 only): MCT1, blood-brain barrier, regulation
The Effects of a Synbiotic Diet on Bone Density and Composition in Hindlimb Unloaded Rats

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University of Notre Dame, Notre Dame, Indiana
Colorado State University – Pueblo, Department of Biology and
Idaho State University, Department of Health and Nutrition Sciences

Research Project #5 - ABSTRACT

The effects of a synbiotic diet and hindlimb unloading on bone density and composition in the humerus, femur, and tibia were studied in 40 adult male rats. Rats were divided into four groups that received either a synbiotic diet or a control diet and were either loaded, with all four limbs on the ground, or unloaded, in which rats were suspended by their tails, just relieving the hindlimbs of any weight bearing. Following unloading for 14 days, rats were allowed 14 days of recovery. Using a volumetric system and an Archimedes’ scale apparatus, the density of each whole bone and cortical bone shaft was measured. Results showed decreased volumetric density in the whole bones of the unloaded femur and tibia, but no effect of the synbiotic diet to prevent the decrease. Bone shafts of the femur showed a decreased volumetric density in unloaded rats, but no effect of the synbiotic diet to prevent the decrease. Using a gravimetric method, the bones were dried, defatted, and ashed to obtain the percent water, fat, organic matter and mineral. There were no apparent differences between the four groups regarding percent composition. Overall, the results suggest that hindlimb unloading causes bone deterioration, a short-term synbiotic diet does little to prevent this deterioration, and a recovery period of two weeks of reloading seems to allow for adequate restoration of bone mineral content.
Characterization of exocellular fungal hydrolases from non-glucose media *Penicillium spinulosum* cultures

Ms. Monica Dupler* and Dr. Sandra Bonetti

Department of Chemistry

**Research Project #6 — ABSTRACT**

*Penicillium* fungi are versatile eukaryotic organisms that produce enzymes which breakdown various complex polymers. Like all fungi, *P. spinulosum* particularly prefers to utilize carbon in the biosphere. To break down complex polysaccharides like wood and other complex carbohydrates, the fungus produces glycohydrolase and phosphohydrolase enzymes. The latter degrade phosphate esters that may be attached to carbohydrates, while the former degrade polysaccharides. Last year our research focused on examining the activities of glycohydrolases and phosphohydrolases in *P. spinulosum* liquid-shake cultures grown in glucose-rich media, where glucose functioned as the major fungal nutrient, carbon. This year we examined the same activities in cultures grown on galactose instead of glucose as the carbon source. Enzyme activities were assayed from 1 to 24 days in filtered culture media.

This research was supported by the American Chemical Society's (ACS) Project SEED, the Colorado ACS Section, and the Department of Chemistry at Colorado State University.
Algebras and Minimal Constructible Families

Mr. Tyler Bongers* and W.D. Morales (California State University – Bakersfield)

Department of Mathematics REU at California State University Channel Islands

Research Project #7 – ABSTRACT

Given an initial family of sets, we may take unions, intersections and complements of the sets contained in this family in order to form a new collection of sets; we may then continue this process recursively in order to continue a construction process. Problems encountered in this research include the termination of the construction process, as well as a characterization of constructed sets. In this poster, we define a class of simple families which do not contain any elements that are constructible in \( n \) steps from the other elements of the family; we call this property \( n \)-minimal constructibility. We prove a number of new results about \( n \)-minimal constructible families; one major result is that every finite algebra of sets has a generating family which is \( n \)-minimal constructible for all natural numbers \( n \in \mathbb{N} \). This work has a number of possible applications, particularly in the fields of economics and computer science.
Isolation of Malate Dehydrogenase from Yeast Extracts

Mr. José Trujillo^, Mr. Josh Galvin**, Dr. Sandra Bonetti and Dr. Dan Caprioglio

Departments of Chemistry and Biology

Research Project #8 – ABSTRACT

The primary aim of this research is to isolate the enzyme malate dehydrogenase (MDH) using a Tandem Affinity Purification (TAP) tag. MDH is the enzyme needed for the conversion of malate into oxaloacetate in the Citric Acid Cycle. This fusion technology was developed by Dr. Erin O’ Shea and Dr. Jonathon Weissman from the University of California San Francisco. The technique of isolating this protein of interest by way of affinity purification, results in the characterization of the yeast extract MDH. The initial DNA purification step utilizes Polymerase Chain Reaction (PCR) to amplify the specific sequence from the target with the TAP fusion. Agarose gel electrophoresis was used to identify which strains of yeast extracts had the correct gene construct. Isolation protocols of MDH involves two column chromatographies; an IgG agarose column and a calmodulin agarose column. Upon the successful isolation of MDH, it is necessary to quantify the amount of protein isolated using the bicinchoninic acid (BCA) protein assay and the MDH enzyme assay.
The Future of Crude Glycerol: Recycling the Carbon in Carbon Dioxide

Ms. Amanda Anaya* and Dr. David Dillon

Department of Chemistry

Research Project #9 – ABSTRACT

Strategies for capture of CO$_2$ from point sources or from ambient air are receiving considerable attention as means of mitigating greenhouse gas increases and providing a carbon-neutral fuel source. Solid and various non-aqueous sorbents have been investigated with their efficiency documented by others. Aqueous sorbents for capturing CO$_2$ have received less attention. We hypothesize that a low-vapor pressure alkaline solution with low freezing point could effectively capture CO$_2$ from bubbled ambient air in outdoor settings. Crude glycerol, a low-value by-product of biodiesel production, is low in volatility and freezing point and high in pH. Preliminary results in our lab show that bubbling room air through 60-80% glycerol-water mixtures for 48-96 hours captured approximately 1 mole CO$_2$ per liter of solution. A continuation of this project will involve construction and optimization of a catalytic reactor to convert captured CO$_2$ to methanol or other reduced carbon compounds.
Investigation of Synthesis, Modification and Properties of Substituted Tetrazines and Their Polymers

Ms. Catherine Birch* and Dr. David Dillon

Department of Chemistry

Research Project #10 – ABSTRACT

Polymerization of tetrazines is an active area of research. In our 3-phase project, we will construct subunits including thiadiazoles and tetrazines for polymerization. Characterization of all intermediates may lead to applications in our undergraduate 2nd semester organic teaching laboratory as well as in other polymer-related research in our group.
Using Willow (*Salix spp.*) and Cottonwood (*Populus spp.*) as Biomonitor for Atmospheric Mercury

Mr. William Christman*, Mr. Jim Carsella, Dr. David Lehmpuhl and Dr. Brian Vanden Heuvel

Department of Chemistry

Research Project #11 – ABSTRACT

Atmospheric mercury can be a significant source of mercury to surface water systems, especially in pristine locations. Routine measurements of atmospheric mercury at multiple locations can be time consuming, difficult and expensive, driving the development of simpler and less expensive biomonitor. Here, we use leaves from willow (*Salix spp.*) which absorbs mercury in a predictable pattern and compare it to cottonwood (*Populus spp.*) leaves to see if cottonwood leaves could be a possible additional biomonitor. Leaves were collected throughout the 2011 growing season at two-week intervals from three sites along Fountain Creek, CO that are part of an ongoing water quality study. Samples were dried, homogenized and microwave digested in Teflon containers using 0.375 ml HNO₃, 0.375 ml DI water, and 0.75 ml 30-35% H₂O₂ prior to analysis via inductively coupled plasma mass spectrometry (ICPMS). Willow leaf mercury concentrations at all three sites increased linearly at the start of the growing season starting 5.68±0.74 ng/g before leveling off at approximately 16.61±0.89 ng/g which is consistent with data collected the previous year. The cottonwood leaf mercury concentrations exhibited a less predictable and reliable trend which could indicate that cottonwood may not be a suitable biomonitor, and in fact multiple plant species may need to be investigated to determine the most suitable candidate. Work is in progress translating leaf mercury concentrations into integrated atmospheric mercury concentrations.
Regulation of MCT₁ in RBE₄ cells by cAMP dependent vesicular trafficking

Ms. Jeanette Cortez*, Mr. Cale Soole*, Mr. Micah Velasquez*, and Dr. Jeff Smith

Department of Biology

**Research Project #12 – ABSTRACT**

Previous work in our lab has shown that in cerebrovascular endothelial cells (RBE₄ cells), the function of Monocarboxylic Acid Transporter 1 (MCT₁) is regulated by the adrenergic pathway which signals through adenylyl cyclase dependent cAMP production and Protein Kinase A. To extend this work, we hypothesized that cytoplasmic protein trafficking of MCT₁ in the RBE₄ cells would be part of the mechanism of cAMP-dependent regulation. MCT₁ was identified by expressing an MCT₁-mCherry fusion construct which was visualized in living RBE₄ cells by fluorescence video microscopy. To test the functionality of the MCT₁-mCherry fusion proteins we used internally controlled BCECF imaging experiments to show an increased rate of lactate transport in cells that expressed the construct. Video imaging experiments revealed the presence of the MCT₁-mCherry fusion proteins on the plasma membrane and within numerous cytoplasmic vesicles. After treatment with cAMP analogs, the cells appeared to contract and the vesicles appeared to migrate to a centralized area within the cell. These results are consistent with the interpretation that MCT₁ function is regulated by a cAMP-dependent pathway that stimulates its vesicular transport to and from the plasma membrane. Further investigation will aim to define specific trafficking routes that participate in this pathway.
Isolation of a gene for a *Penicillium* cellulase

Ms. Jennifer Foster*, Dr. Dan Caprioglio and Dr. Sandra Bonetti

Departments of Biology and Chemistry

**Research Project #13 – ABSTRACT**

Cellulases are enzymes produced by some organisms, such as fungi, that are able to break down the glycosidic linkages of cellulose. Cellulose waste, including paper and crops, could potentially be processed into biofuels like ethanol with the use of cellulases to initiate depolymerization of the polysaccharide structure. The main objective of this research was first to isolate the gene for cellulase from the fungi *Penicillium spinulosum*. The other was to be able to insert the isolated gene for cellulase into a vector that could be expressed in *Escherichia coli*. Isolation of the gene for cellulase began by obtaining peptide sequences of cellulases purified from *Penicillium spinulosum*. BLAST searches were used to compare those sequences to other known enzymes. The BLAST searches revealed that the purified peptide sequences had high homology to both cellulases and an alpha-1, 2-mannosidase. Primers were designed using the homologous peptide sequences and were used to perform the polymerase chain reaction that was crucial to the isolation and optimization of the gene for cellulase. *Penicillium spinulosum* was prepared in standard growth media and allowed to grow for use in DNA purification procedures to prepare the fungal DNA for the PCR. PCRs were performed using both the degenerative primers and the fungal DNA. The PCR determined the optimal temperature of PCR optimization when an electrophoresis gel was run using the PCR products. Optimal temperature of the polymerase chain reaction was 50°C. Two bands were identified from the PCR; one at 280 base pairs and the other at 1000 base pairs. The PCR products will be sequenced and eventually cloned for expression in *E. coli*. Eventually, cellulase could be synthesized in the laboratory for commercial production in order to break down cellulose. In the future, using cellulases for the conversion of cellulose into bioethanol could be a less expensive and more efficient alternative than fossil fuels.
Uptake of Human Pharmaceuticals by Wisconsin Fast Plants (Brassica rapa) and Cabbage (Brassica rapa var. pekinensis)

Mr. Jonathon Bailey*, Ms. Cheryl Holling^, Mr. Patrick Herklotz*, Mr. Prakash Gurung^, Mr. Steven Witt*, Dr. Brian Vanden Heuvel and Dr. Chad A. Kinney

Departments of Chemistry and Biology

Research Project #14 - ABSTRACT

Pharmaceuticals and personal care products are frequently present in wastewater end products, biosolids and treated effluent (reclaimed water), which are commonly applied to agricultural fields where crops are grown for human consumption. A three part study was conducted to determine the potential for four human pharmaceuticals (carbamazepine, salbutamol, sulfamethoxazole and trimethoprim) to accumulate in plants. In controlled hydroponic studies, in which all four pharmaceuticals were added to a Hoagland’s nutrient solution fortified to an initial concentration of 232.5 µg L⁻¹ each, all four pharmaceuticals were detected in Wisconsin Fast Plants and cabbage grown in this solution. Mature plants of each species were harvested and separated into components such as roots, leafs, stems, and seedpods. The maximum wet weight concentrations of the pharmaceuticals were detected in the cabbage roots at 98.87 ng g⁻¹ carbamazepine, 114.72 ng g⁻¹ salbutamol, 138.26 ng g⁻¹ sulfamethoxazole, and 91.33 ng g⁻¹ trimethoprim. Carbamazepine and salbutamol were detected in the seedpods of the Wisconsin Fast Plants, while all four of the pharmaceuticals were detected in the leaf/stem/root of these plants. Phloroglucinol staining of root cross-sections confirmed intact endodermis, suggesting that the pharmaceuticals found in the plants were transported symplastically. In the second component of the study, cabbage plants were grown in the greenhouse in an organic carbon rich soil fortified with the pharmaceuticals at initial concentrations ranging from 0.29 – 5.42 ng g⁻¹, which is representative of the pharmaceutical concentration in surface soils amended with an agronomic rate of biosolid. All four pharmaceuticals were detected in the root and stem/leaf samples of cabbage. The greatest accumulation in the stem/leaf samples was observed for carbamazepine (219.6 ng g⁻¹ wet wt) and sulfamethoxazole (212.7 ng g⁻¹ wet wt). A second greenhouse study was conducted in which cabbage was grown in control top soil or a top soil amended with an agronomic rate of biosolids or biosolids further fortified with the four pharmaceuticals (equivalent to 660 ng g⁻¹ dry wt each). Carbamazepine, salbutamol, sulfamethoxazole, and the disinfectant triclosan, originating from the native concentrations present in the biosolids, were detected in the plant tissue. Three of the compounds in the soil amended with the native biosolids were detected in the cabbage stem/leaf (edible portion of the plant), carbamazepine (368.7 ng g⁻¹ wet wt), salbutamol (19.3 ng g⁻¹ wet wt), and triclosan (47.3 ng g⁻¹ wet wt). Trimethoprim was detected in the cabbage grown in the soil amended with the fortified biosolids.
On the Development of Delay Predictors for Customer Service Systems: A Simulation Based Study

Mr. Kenneth Morrison*, Mr. Emre Kirac*, and Dr. Leonardo Bedoya-Valencia

Department of Engineering

Research Project #15 - ABSTRACT

In this work, a preliminary study of analytical models was carried out. The purpose of the models analyzed is to predict delays, i.e. the expected service time, for a service system. Of particular interest in this work was the analysis of Emergency Departments (ED). Some complexities arose when developing the simulation model for a local ED as part of a master thesis. From the literature, we have drawn similarities to the real ED and have been able to address some of those complexities, i.e. variable rate of patient arrival when exponentially distributed. Variable number of parallel servers and different type of customers are complexities still to be addressed. We demonstrated the functionality of the proposed approach by analyzing a queuing system with a variable rate of arrival as observed in the local ED described by exponential distributions and a fixed number of parallel servers s with exponentially distributed service time (M/M/s queuing system).
Electroencephalographic (EEG) Measures of the Effect of Mindfulness Meditation Instruction: A Pilot Study in Progress

Ms. Morgan Forsyth* and Dr. Barbara Brett-Green

Department of Psychology

Research Project #16 - ABSTRACT

Objectives: Currently, the use of meditation is becoming more and more common among Western psychologists and psychiatrists for the treatment of stress and psychological disorders such as depression and anxiety. Although the popularity of meditation has increased, little is known about the neural mechanisms underlying meditation. Several studies have shown that meditation is associated with specific changes in certain spectral frequency bands of the electroencephalogram (EEG); however, the majority of these studies examined only the effects of focused or concentrative meditation techniques and transcendental meditation, using expert meditators. Much less is known about the neural mechanisms underlying other types of meditation, such as mindfulness based techniques, or about the effects of meditation instruction in non-expert or novice meditators. The potential beneficial effects of mindfulness meditation for people and families dealing with the aforementioned psychological disorders, as well as others, such as autism, suggest there is a need for more rigorous investigations of its basic neurophysiology. The purpose of this pilot study is three-fold: 1. to conduct a preliminary review of the literature on the neurophysiology of mindfulness meditation (and its' possible application to autism), 2. to establish the feasibility of conducting EEG research on college students using the Biopac physiological recording system, and 3. to examine the acute effects of “mindfulness” meditation instruction on the EEG of non-expert meditators.

Methods: Literature searches were conducted to prepare the theoretical and experimental background for this study. In addition an IRB application has been prepared. The Biopac physiological recording equipment has been tested on internal volunteers, and an experimental procedure has been defined. EEG will be recorded from two frontal scalp locations, one each side of the head, for 5 minutes while participants are awake but at rest with eyes open, and for 5 minutes while participants are listening to taped meditation instructions, as well as during two 3-minute baseline eyes closed conditions. This experiment uses a within subjects design where participants will serve as their own control. Spectral power (µV²) in the alpha (8 – 12 Hz), theta (3 – 8 Hz), delta (0.5 – 3 Hz) and beta (12 – 24 Hz) frequency bands will be examined across the different conditions and electrode sites. One channel of the Biopac system will also be used for recording electrodermal activity (EDA), which provides a measure of sympathetic nervous system function, and has also been shown to be affected by meditation. We hypothesize that there will be bilateral increases in theta power at the two electrode sites during the meditation instruction condition only at both electrode sites, as well as a decrease in sympathetic activity.

Results: To date only internal preliminary testing has occurred. No analyses have been conducted.

Discussion: This pilot project is intended to determine the feasibility of conducting basic EEG research on the effects of meditation instruction in college students. In the future, we hope to obtain funding to conduct similar electrophysiology research on individuals with neurodevelopmental disorders, such as autism.
Will I Fit?

Helping Job Applicants Assess an Organization’s Culture

Mr. Luke Poole*, Dr. Brad Gilbreath and Dr. Lori Matthews

Hasan School of Business and Regional Access to Graduate Education (RAGE)

**Research Project #17 - ABSTRACT**

Person-environment fit is essential for job effectiveness and employee satisfaction. More specifically, employees who are not a fit for their work environment will be less successful and experience a lower level of well-being. One powerful aspect of work environments is *organizational culture*, "the specific collection of values and norms that are shared by people and groups in an organization and that control the way they interact with each other and with stakeholders outside the organization" (Hill & Jones, 2001). However, it is often difficult to get a good “read” on an organization’s culture without spending a significant amount of time in the organization, which generally is not possible for job applicants. The goal of this research project was to develop a means by which job applicants can gain insight into whether they are likely to be fit for an organization’s culture. We developed a questionnaire and a series of open-ended questions that applicants can use to assess their preferences and then use during their time with organizational “insiders” (e.g., interviewers) to assess fit and gain deeper understanding of an organization’s culture before they make an employment decision.
Impact of Media Messages on Young Girls’ Perceptions of Sex and Relationships: Toward Developing a Set of Teen Pregnancy Predictors

Ms. Monique García* and Ms. Leticia Steffen

Department of Mass Communications

Oral Presentation #1 - ABSTRACT

Teen pregnancy continues to be an issue that plagues Pueblo, Colorado. Efforts to lower local teen pregnancy rates have met with mixed results in the past. This study examines trends related to media use and perceptions of sex, relationships and teen pregnancy. Interviews with seven pre-teen-aged female students enrolled in public elementary and middle schools in Pueblo found that respondents have similar ideas about when and why young people start entering into serious relationships and becoming sexually active. Findings suggest that the more media use reported by the subject, the more likely the subject thinks that people become involved in serious, sexually active relationships at younger ages. Findings also indicate that in spite of respondents’ willingness to ask their parents about sex and in spite of their reported media use, they all felt like they did not know much about sex.
Comparing and Benchmarking the Performance of Credit Unions in Southern Colorado

Mr. Todd Ruder* and Dr. Seong-Jong Joo

Hasan School of Business

Oral Presentation #2 - ABSTRACT

To be sustainable in the market, firms need to understand their current performance. Especially, it is critical to a firm for understanding its performance in relation to competitors in the same market. We select credit unions in Southern Colorado and analyze their performance for benchmarking using data envelopment analysis. Using the results of analysis, we suggest managerial implications for the credit unions. This study can be used applied to similar areas with slight revisions.
Carbon Nanotube Manufacturing and Characterization

Mr. Richard Chaparro* and Dr. Nebjosa Jaksic

Department of Engineering

Oral Presentation #3 – ABSTRACT

This project involved production and testing of carbon nanotubes. We used a scanning electron microscope (SEM) that was recently refurbished. The main goal was to compare images of carbon nanotubes with and without special preparation for SEM imaging. Namely, some of the produced carbon nanotubes are conductive and others are semi-conductive. Without preparation an SEM can image conductive specimen only. We investigated properties of various specimen-preparation devices; vacuum coaters or sputters used to prepare nonconductive SEM samples. In these studies we identified an appropriate sputter for SEM sample preparation. However, since the Department of Engineering already owns such a device, we assisted in the refurbishing process for the departmental vacuum coater. The coater was used a few years ago only to create a vacuum environment to test projects from NASA-supported undergraduate projects. For this process, the coating assembly was removed. For the current project, the coating assembly needed to be installed. However, this reinstallation of the coating assembly was prevented due to some missing parts. We are currently fabricating these parts. Also, we identified new (and used) sputters that can be purchased for the purpose of this research in the event that the current sputter cannot be adequately prepared.

During preparation of the carbon nanotubes for imaging a mortar and pestle were used to pulverize the nanotube-rich substrate. This was identified as another obstacle in achieving a uniform distribution of nanotubes for imaging purposes. Other researchers mostly use ball mills to prepare a nanotube-rich powder. So, we investigated a number of current ball mills for laboratory use. This research is ongoing and is expected to continue, especially since a graduate student just joined our research group.
The College of Science and Mathematics is proud to announce their 7th Annual Science and Mathematics Student Research Symposium
guest speaker

Michael Tamkun, Ph.D.
Professor, Department of Biomedical Sciences
Director, Neuroscience Division
Colorado State University

Friday, September 23, 2011
2:00 p.m., Room 109 in the Library and Academic Resource Center

Topic:

Kv2.1 membrane corrals: Plasma membrane structures involved in ion channel regulation, membrane trafficking and ER-cell surface communication

Everyone is welcome to attend the event!!!