STUDENT RESEARCH POSTER SESSION

February 14, 2007
State Capitol Rotunda
Pierre, South Dakota

Co-sponsored by the South Dakota Board of Regents,
South Dakota NSF-EPSCoR Program,
and the South Dakota Academy of Science

#1 KAYLA CARSTENS, WES ROBERTSON, MADDY DUFFY
Education
The University of South Dakota
Faculty Sponsor: Tsu-Yi Hsu, The University of South Dakota
Prospective Teachers' Perceptions of Taking an Introduction Technology Class

This research project investigates prospective teachers' perceptions of taking an introduction technology class as part of their teacher preparation program. The state of South Dakota used to mandate all college students complete a basic computer class. University students are no longer required to take basic technology courses. It is important to understand how prospective teachers perceive the policy change. Our hypothesis is that the introduction level computer courses help prospective teachers be better equipped with technology skills for personal and professional uses. Results of this project would help educators and administrators understand the importance of college students completing basic technology courses.

#2 JOY GIBBONS
Veterinary Science
South Dakota State University
Faculty Sponsor: Christopher Chase, South Dakota State University
Effect of Bovine Viral Diarrhea Virus on the Chemokine Production of Macrophages

Bovine viral diarrhea virus is an important cause of respiratory and reproductive disease. BVDV is immunosuppressive and the mechanisms responsible have not been determined. In this project, four chemokines, important mediators of inflammation and innate immunity were measured using a BVDV *in vitro* infection model. Bovine macrophages were isolated, cultured, and infected with three different strains of BVDV. The infected cells were harvested at 4 hrs and then total RNA was extracted. The RT-PCR analysis was used to determine the effect of BVD strains mRNA chemokine production of CCL-3 (MIP1-a), CCL4 (MIP-1b), CCL-5 (RANTES) and CCL-11 (eotaxin) from macrophages. The results of these assays are presently being analyzed. Chemokine production is likely to be modulated by BVDV infection.

#3 ANGIE HAYES
Computer Science
Augustana College
Faculty Sponsor: Daniel Swets, Augustana College
Storing and Reading Data

This project investigated two methods for storing massive amounts of data. An *array-of-structures* stores data for all the different aspects of a particular object in adjacent memory locations, replicating this for each of the objects under consideration. A *collection-of-arrays* stores data about a particular aspect for all the different objects in adjacent memory locations, replicating this for each of the different stored aspects. Because of the expected cache advantages inherent in an array-of-structures, I obtained an unexpected result in that a collection-of-arrays used approximately ¼ the time required by array-of-structures to process our application data's mathematical sequences.

#4 CHRISTOPHER HAYES
Computer Science
The University of South Dakota
Faculty Sponsor: Carol Lushbough, The University of South Dakota
Development of a Decision Tree Based Ad Hoc Query Wizard

The approach that the USD Bioinformatics team has taken to help researchers understand what data is available in the Iowa State PlantGDB database, and learn how to pose meaningful questions using the TableMaker, is by creating a query wizard. Through the use of a decision tree classification system, the wizard starts from a set of common general "requests" and based on the user's selection, intelligently leads the user down a specific branch of the tree and presents a set of common sub-requests. This wizard does not provide requests for all possible uses of PlantGDB but serves as a useful guide.

#5 KALUB HAHNE
Chemistry
South Dakota School of Mines & Technology
Faculty Sponsor: David A. Boyeles, South Dakota School of Mines & Technology
Synthesis of High Aspect Ratio Aromatic Polyformals

Aromatic polyformals are a class of high performance materials well-known for applications requiring thermal stability. The aromatic structure imparts heat-resistance, and the incorporation of flexible carbon-oxygen linkages within the polymer chains provides for lower softening, improved solubility, and processability. In order to enhance properties beyond those of currently available materials, polyarylated bisphenols are among the best choices for modification in mechanical properties owing to their higher carbon-oxygen ratio. A convenient synthesis of polyformals has been reported by researchers at General Electric using a dihalomethane under conditions promoting an electrophilic displacement of halogen. Our synthesis of new polyformals from novel bisphenolates uses this method. High aspect ratio tetraarylbisphenol A (TABPA) and asymmetric bisphenol A (AsBPA) synthesized previously in our research group by the Suzuki reaction were converted to the required TABPA/AsBPA bisphenolates and reacted under anhydrous conditions with dibromomethanes. Products and polymers were characterized by melting point, FT infrared spectroscopy, proton nuclear magnetic resonance, and differential scanning calorimetry where applicable.

#6 CASEY BROWN
Biology
Dakota State University
Faculty Sponsor: Donna Hazelwood, Dakota State University
Effect of Leaves of Different Colors on Growth of Selected Bacteria

Recent studies in our laboratory have indicated that leaves of different color may affect the growth of selected bacteria. Leaves from trees and shrubs were collected before and after they changed color. Samples were then dried, ground, and measured amounts added to nutrient agar before autoclaving. Bacterial suspensions were then plated on the agar amended with leaves. Nutrient agar served as the control. Samples were recorded as positive if colonies of bacteria were observed. If colonies were not visible, transfers were made to nutrient broth and then observed for growth. Results for selected bacteria-leaf combinations will be discussed.

#7 RISTON HAUGEN
Biology
Black Hills State University
Faculty Sponsor: David Siemens, Black Hills State University
Evolution of Defense and Competiveness: Transcript Profiling in a Close, Wild Relative of *Arabidopsis thaliana*

Plants in the wild are attacked by herbivores and pathogens and often grow next to other plants that represent potential competitors. Therefore, in some cases one would expect the simultaneous evolution of defense and competitive ability. However, the optimal defense hypothesis, currently the best framework we have to understand the simultaneous evolution of defense and competitiveness, predicts a tradeoff between these factors. In contrast to the optimal defense hypothesis, some recent studies have found evidence that some plant species may be able to simultaneously compete and defend effectively. One hypothesis for this result is that some defensive traits, such as toxin concentration, have dual functions in defense and competition. In two growth room experiments in which we examined transcript profiles of *Boechera stricta*, a close wild relative of *Arabidopsis thaliana*, we tested (1) whether neighboring plants elicit defense responses and (2) whether there was overlap in gene expression patterns between herbivory and competition treatments. In one experiment involving three treatments (herbivory, competition, control), we observed significant differential gene expression amongst treatments and evidence that competition elicited genes with known function in defensive pathways.

#8 CHAD CLITES
Computer Science
The University of South Dakota
Faculty Sponsor: Carol Lushbough, The University of South Dakota
Identifying Relationships in Disparate Ontologies

The field of bioinformatics has provided tools and databases to process the explosion in available genomic and proteomic data. One of the current obstacles to effective research is that different terms are often used to represent the same entities. Ontologies can be used to help resolve these differences. Using the Gene Ontology (GO) as a foundation, and other ontologies such as TAIR, CHeBI, and SwissProt, terms have been mapped against each other to identify relationships based on degree of similarity. Using this ontology mapping, and with the aid of hyperbolic navigation, researchers will be able to discover data previously unknown to them.

#9 SARAH HANSON
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Xiangming Guan, South Dakota State University
Evaluation of the Effect of G0026, a Novel Glutathione Reductase Inhibitor, on Doxorubicin Induced Cardiotoxicity

Cancer resistance to doxorubicin is a significant problem. Additionally, doxorubicin causes cardiotoxicity through the production of damaging free radicals. Data obtained from this laboratory indicate that G0026, a glutathione reductase inhibitor, can enhance the anticancer activity of doxorubicin in ovarian cancer by augmenting doxorubicin induced oxidative stress. The objective of this project was to evaluate the effect of G0026 on doxorubicin induced cardiotoxicity. Using the combination that exhibited the best synergistic effect in ovarian cancer, no additional cytotoxicity was observed from the combination as compared to doxorubicin alone. This demonstrates that glutathione reductase inhibition is an effective tool for increasing cancer sensitivity to doxorubicin without enhancing the cardiotoxicity.

#10 ELIZABETH HOARTY
Music
The University of South Dakota
Faculty Sponsor: David Moskowitz, The University of South Dakota
Hildegard von Bingen: *Symphony of the Heavens*

Hildegard von Bingen was a 12th-century Benedictine abbess, visionary, composer, writer, scientist, medic, and diplomat. My project deals mainly with the forms, inspiration, and style of her compositions, namely *Scivias, Ordo Virtutum*, and *Symphonia Armonie Celestium Revelationum*. Her accomplishments are highly unusual, not only because they are multi-disciplinary, but because she accomplished everything in spite of being a woman in a male-dominated world. She was largely uneducated, but her visionary abilities aided her in her tasks - all her works stem from the grace and knowledge given to her by heavenly visions she received.

#11 KINDRA BAAN HOFMAN
Education
Dakota State University
Faculty Sponsor: Jennifer Gross, Dakota State University
Reading Attitudes of DSU Students

College faculty often assign textbook readings. However it is unclear how this expectation is perceived by students. This research project will investigate attitudes of undergraduate students towards reading textbooks. To accomplish this goal, survey data was collected from 200 undergraduate students at Dakota State University. The survey responses will be analyzed and statistically compared to determine whether or not students believe they are provided with meaningful rationale to read textbooks, and with an explanation of how text information will be further used in the class. The overall goal of the study is to improve students' experiences with reading textbooks.

#12 RACHEL HOFF
Biology/Chemistry
Mount Marty College
Faculty Sponsor: Curt Kost, The University of South Dakota
Captopril and the Effects on High Blood Pressure

High blood pressure (hypertension) results in cardiovascular disease, the leading cause of death in the U.S. Spontaneously hypertensive rats (SHR) are a genetic model of human hypertension. Our studies show that early treatment with a class of antihypertensive drugs known as ACE-Inhibitors prevents the development of hypertension in SHR and produces a long-term blood pressure (BP) reduction that persists after treatment is withdrawn. The mechanism for the persistent BP reduction is unknown but may involve altered kidney function. This study was designed to evaluate the effect of ACE-Inhibitor treatment and its withdrawal on BP and kidney function in SHR.

#13 BRETT KEARIN
Computer Information System
Dakota State University
Faculty Sponsor: Justin Blessinger, Chris Olson, Dakota State University
Systems for Debate

Systems for Debate by Kearin (SDK) is an innovative computer program created by DSU student Brett Kearin to assist High School Forensic tournament directors. SDK streamlines the process to pair debate rounds and power rounds; it assigns judges and rooms and provides a printable, detailed results summary of the tournament. A key component not offered by competing software is a supplemental program for SDK that offers a paperless debate ballot that allows a tournament judge to record a decision and provide comments to the debater electronically, rather than using the current system of hand-written, carbon copy ballots.

#14 LUKE HOFKAMP
Division of Basic Biomedical Sciences
The University of South Dakota
Faculty Sponsor: Barry Timms, The University of South Dakota
Region-Specific Growth Effects in the Developing Rat Prostate Following Fetal Exposure to Estrogenic UV Filters.

The aim of this project was to study the effects of endocrine disruptor compounds on prostate growth following *in utero* exposure. Two ultraviolet (UV) filters with known estrogenic activity were examined in this study. Pregnant Long Evans rats were fed diets containing doses of 4-methylbenzylidene camphor (4-MBC) and 3-benzylidene camphor (3-BC) that resulted in average daily intakes of 7.0 and 0.24 mg/kg body weight respectively, corresponding to effective doses in prior studies. Volumetric analysis of the prostate was performed using digital images and a 3-D surface rendering program (Winsurf®). Results show an increase in prostatic ducts following prenatal exposure.

#15 CARL FELLBAUM
Biology
Nothern State University
Faculty Sponsor: Jodie Ramsay, Northern State University
Ponderosa Pine Management in Pickererl Lake State Recreation Area

Pickerel Lake State Recreation Area in South Dakota is currently experiencing a fungus infestation of their Ponderosa pines due to the drought and age of the trees. This project was designed to study the extent of the infestation and determine a plan of action to manage the fungi. Samples of pine needles were collected from a cross section of the recreation area. The results showed that trees sampled were infected with *Diplodia pinea* and/or *Dothistroma* needle blight. For the management of the fungus, a conventional approach should be taken to improve the hardiness of the Ponderosa pines.

#16 JOSHUA KOFFORD
Chemistry/Biochemistry
South Dakota State University
Faculty Sponsor: Brian Logue, South Dakota State University
Evaluation of Dye Molecules Capable of Probing Electron Transfer in Dye-Sensitized Photovoltaic Cells

A relatively new type of solar cell called a dye-sensitized solar cell (DSSC) involves a thin nanoparticle semiconductor layer (typically TiO_2) that has a light sensitive dye (sensitizer) attached. Many current sensitizers absorb visible light over a wide wavelength range. The current project involves characterizing a sensitizer that absorbs light and transfers energy over a small wavelength range to probe electron transfer. Methyl red was identified as a sensitizer candidate that may work well for this project. It was evaluated and compared to a typical sensitizer (ruthenium dye N-719). Further evaluation will determine if this is a suitable sensitizer.

#17 ZELJKO DVANAJSCAK
Biology
The University of South Dakota
Faculty Sponsor: Robert Morecraft, The University of South Dakota
Localization of Arm Representation in the Cerebral Peduncle in the Rhesus Monkey

Motor deficit severity and the potential for recovery in patients with brain injury depend upon the integrity of descending corticofugal projections. Clinical assessment of this requires a comprehensive understanding of the organization of the damaged brain regions. We examined the organization of corticofugal fibers in the midbrain cerebral peduncle (CP) originating from the six cortical arm representations in the rhesus monkey. Our findings indicate that projections from the frontal and cingulate motor areas are widely distributed in an organized manner across the medial three-fifths of the peduncle and this widespread distribution may account for the favorable levels of motor recovery that accompany subtotal midbrain injury.

#18 MARK HOFACKER
Mechanical Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Thomas Durkin, South Dakota School of Mines & Technology
Sandwich Composite Intertank Optimization

This poster describes my work with composite materials during a summer internship at NASA-Marshal Space Flight Center. Specifically, it shows the process of researching, testing, and analyzing combinations of composite material to create a low-weight intertank. The intertank is a cylindrical structure that will connect the liquid oxygen and liquid hydrogen tanks on the upcoming crew launch vehicle. The poster shows how materials were manufactured and tested with both destructive and non-destructive analysis. It also describes how the results of these tests were compared to failure analysis using genetic algorithm optimization.

#19 ADAM BRUNS
Arts and Sciences/Liberal Arts
Dakota State University
Faculty Sponsor: John Nelson, Dakota State University
Philsophical Morals in *As I Lay Dying*

Morality could arguably be the main focus of literature. One of the most widely read books, the Bible, is the paradigm of textual morality. And before the authoring of the Bible, many of the Greek and Roman myths elaborate on morality and its value throughout multiple texts. My project examines morality in a 20th century novel by William Faulkner: *As I Lay Dying*. The project applies philosophical ideals, as defined by Immanuel Kant, concerning the definition and attributes of morality to the characters of *As I Lay Dying*, defining the characters' operations in relation to the death of their mother and the obstacles they must overcome. I have also utilized Lawrence Kohlberg's *Stages of Moral Development* to reiterate the characters' actions. Faulkner's technical treatment of the novel provides the reader with insight into the characters' thoughts and actions. Faulkner clearly understands how his characters operate and how their actions relate to each other. With a philosophical definition and the psychological development of the characters' morals, I will demonstrate how competing moral views interact within the text.

#20 GARETT HOWARDSON, ASHLEY ARENS, AMANDA KJELDEN, JESSICA JOHNSON
Psychology
The University of South Dakota
Faculty Sponsor: Frank Schieber, The University of South Dakota
Assessing the Visual-Spatial Workload Demands of Simulated Automobile Driving

Rapid advances in the complexity of automobile instrument panel interfaces (e.g., route guidance systems, internet-in-the-car) compete for the driver's cognitive resources often at the expense of driving safety. Techniques are needed to better understand the mental workload demands of multitasking while driving. A novel subsidiary-task (the "clock task") was developed to assess driver mental workload requirements while negotiating different segments of a curve. Consistent with expectations, results revealed that reaction time performance on the subsidiary-task increased while driving in curves and decreased in straight road segments. Although statistically significant, the effects observed may be too small for practical applications.

#21 GARETT HOWARDSON, LINDSAY THOMPSON, AMY DUBA, MADISON OSLUND, ASHLEY ARENS
Psychology
The University of South Dakota
Faculty Sponsor: Gemma Skillman, The University of South Dakota
Facebook and Disclosure of Sensitive Information in Online Social Networks: Exploring the Role of Social Anxiety

It is not clear as to what psychological mechanisms may be at play that may increase the likelihood of college students' disclosure and sharing of personal information. The purpose of this study will attempt to identify one variable that may contribute to the disclosure of college students' private information in social network websites, specifically social anxiety. The knowledge gained will help provide an understanding of the role of social anxiety in computer mediated communication disclosures and provide some clarity to why people are more willing to post information online compared to interacting with people in an electronic world.

#22 KRISTEN KRAMER
Pre-Pharmacy
South Dakota State University
Faculty Sponsor: Omathanu Perumal, South Dakota State University
Investigating the Use of α-Santalol as a Skin Permeation Enhancer

Skin is an attractive site for drug delivery due to its easy accessibility and high patient compliance. However, at present only a handful of drugs are delivered through skin as transdermal patches. To expand the number of drugs delivered through skin, there is a need to identify safe permeation enhancers. The objective of our research is to investigate the use of α-santalol, a naturally occurring component of sandalwood oil as a skin permeation enhancer using 5-fluorouracil as a model drug. The research study is expected to demonstrate the potential of α-santalol as a skin permeation enhancer.

#23 CHRISTINE MAGEE
Biology
Mount Marty College
Faculty Sponsor: Carlos Telleria, The University of South Dakota
Newly Synthesized Bicyclic Quinones as Potential Anti-Ovarian Cancer Agents

Doxorubicin, used to treat ovarian cancers that develop resistance to standard carboplatin-paclitaxel chemotherapy, was first shown to have antitumor activity in the 1960's. Doxorubicin, however, is cardiotoxic. Three approaches are being followed in our laboratories to improve doxorubicin efficacy: (1) combining doxorubicin with the chemosensitizing agent Mifepristone (RU486) that may allow doxorubicin to achieve similar cytotoxicity with a smaller dose; (2) synthesizing new diquinones with anti-cancer properties; and (3) generating quinones-porphyrin conjugates for photodynamic therapy. Experiments involved treating ovarian cancer cells with doxorubicin, with quinone compounds intended to be attached to a porphyrin moiety, and with a combination of RU486 and doxorubicin. Doxorubicin was found to be highly cytotoxic to OV2008 ovarian cancer cells. Quinone compounds #4-7 were found to be good candidates for linkage to a porphyrin moiety. In OV2008 ovarian cancer cells, pretreatment with RU486 followed by doxorubicin exposure is more effective at causing cell death than RU486 alone, doxorubicin alone, or co-treatment of RU486 + doxorubicin.

#24 LAURELIN COTTINGHAM
Science
Black Hills State University
Faculty Sponsor: Brian E. Smith, Black Hills State University
Genetic Variation in the Smooth Green Snake, *Opheodrys vernalis*, in South Dakota

The smooth green snake is a wide-ranging species found in the northeastern U.S. and southeastern Canada with scattered populations throughout the U.S. It is declining throughout much of its range. There has been taxonomic debate over genus and subspecies classifications. We are using out-group specimens from other parts of the range to examine variation among the isolated populations in South Dakota and the Bear Lodge Mountains of Wyoming. An enriched microsatellite library has been developed, and markers have been isolated. Sequence data obtained from four mitochondrial genes and microsatellite markers will be used for a genetic comparison of these populations.

#25 MITCHELL A. RODRIGUEZ
Mechanical Engineering/Materials and Metallurgical Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Shawn P. Decker, South Dakota School of Mines & Technology
BET Characterization of Nano-Sized Zeolite Particles for the VOC Concentrator

In this systematic study, the BET characterization of nano-sized zeolite particles has been accomplished towards use of zeolite in VOC (Volatile Organic Compound) concentrators. The specific surface areas of the zeolite particles were ascertained, and the relationship between surface area and adhesiveness of the zeolite particles was analyzed. Variables studied included the single-point and multi-point surface areas of the zeolite samples. The zeolite particles were found to vary greatly in their relative surface areas. In particular, those zeolite particles that appeared, upon casual inspection, to adhere better to the substrates had much smaller surface areas than those that did not.

#26 DOMINIC HULL, KYLE BORMANN
Physical Science/Computer Science
Dakota State University
Faculty Sponsor: Steve Graham, Dakota State University
DSUsed

This project centers on finding out if and how DSU students will utilize a website, called DSUsed. DSUsed is essentially like online classifieds for students, where they can buy and sell textbooks, furniture, video games, or nearly anything else. The main focus of the project will be to discover student interest in the site and also discover how students will use it, in terms of how frequently as well as the items they will buy and sell. We will also research the effect, if any, on the DSU bookstore that may come from the textbook portion of the site.

#27 LAURA DOSHIER
Physics
Augustana College
Faculty Sponsor: Eric Wells, Augustana College
Probing the Dynamics of Bond Rearrangement in Small Polyatomic Molecules

Withdrew

Coincidence time-of-flight spectroscopy was used to study fragmentation of both ammonia and methane induced by 19 MeV F^{7+}. The time-of-flight of up to three fragment ions was recorded relative to the pulsed ion beam on an event-by-event basis. Contrary to earlier electron-impact and photoionization studies of NH_3, we observe the formation of H_3^+ ions. Using the deuterated isotopes (ND_3 and CD_4) allowed examination of bond-rearrangement as a function of dissociation time. Isotopic effects in the fragmentation branching ratios do not follow a general trend, leading us to conclude that the specific ionic potential energy surfaces strongly influence the dissociation dynamics.

#28 ALISON EGGE
Psychology/Biology
The University of South Dakota
Faculty Sponsor: John Swallow, The University of South Dakota
Dimorphism and Walking Turn Kinematics in Stalk-Eyed Flies that Differ in Eye Span

Stalk-eyed flies are identified by lateral head stalks bearing the eyes. Using high-speed video, we recorded turns of two species, the dimorphic *Cyrtodiopsis dalmanni* (Cd) and the monomorphic *Cyrtodiopsis quinqueguttata* (Cq). Average turn rate, maximum turn rate, turn duration, turn amplitude, and maximum angular acceleration were compared between species and sex. Preliminary results suggest that female Cd achieve a maximum angular speed two fold faster than the speed of males, while male and female Cq turn at a similar rate. These results match hypothesis of similar values between sexes in the monomorphic Cq and disparate values in the dimorphic Cd.

#29 EMILY SNYDER
Microbiology
South Dakota State University
Faculty Sponsor: Bill Gibbons, South Dakota State University
Volatile Fatty Acid Production Using Whole Stillage

The objective of this study is to convert whole stillage (a byproduct of corn ethanol production), into a mixture of volatile fatty acids (VFAs). These VFA's will subsequently be converted to polyhydroxyalkanoate via *Ralstonia eutropha*. We have acclimated a mixed rumen culture to produce more VFAs and less gas when grown on whole stillage. Acclimation was carried out by repeatedly subculturing the rumen consortium on whole stillage that contained low levels of ionophores (Rumensin, Bovatec, and Cattlyst) which repressed gas producing microbes. After several such transfers, the rumen culture maintained low production of gas even when the ionophores were no longer added. Unfortunately, this acclimation also resulted in the reduction or loss of cellulase producing microbes, which can also be inhibited by ionophores. To increase cellulose digestion and VFA production, we will evaluate various pretreatments and/or addition of commercial cellulase enzymes or microbes that produce cellulase. Initial trials evaluated a group of four commercial hydrolytic enzymes, obtained from Novozyme, at recommended and 10X recommended rates. Saccharification trials were conducted at 50° Celsius for 72 hours, with routine HPLC analysis. Results indicated that the enzyme, NS50012, at the recommended rate was the best for increasing VFA production based on sugar concentration after 72 hours. Subsequent trials will evaluate combinations of the best enzymes at the recommended rate. Pretreatments to be evaluated will include hot cook and near critical water treatments, in which temperature is the primary variable. We also plan to explore the feasibility of re-introducing cellulase producers into the acclimated rumen consortium.

#30 ABBY HURLBURT
Computer Science
The University of South Dakota
Faculty Sponsor: Joe Reynoldson, The University of South Dakota
Implementing an Asynchronous Bioinformatics Web Application

In 2-d gel electrophoresis, a sample produces images with hundreds of identified proteins. Sharing the data from just one sample would be tedious without an electronic means of organizing and displaying the data. For a project filling this need, usability and efficiency are important features. The Internet as a sharing community makes a Web-based application a natural choice; and by using cutting-edge Web technologies, one moves away from the page-by-page processes toward an entire application on just one Web page. This approach improves usability and efficiency by eliminating waiting time between tasks while data and files are downloaded and uploaded.

#31 KIRSTIN CARL, TRAYAN ILKOV, BARBARA KAUL
Biology
Nothern State University
Faculty Sponsor: Jodie Ramsay, Northern State University
Reasons for Declining Fish Populations in Mina Lake

Mina Lake is a man made lake located in northeastern Edmunds county, South Dakota. In 2003 there was a dramatic decline in the fish population which has not rebounded. Water samples were collected compared to water samples from Richmond and Wylie Lakes. Several parameters were tested, including pH, hardness, and nitrates. Information on soil tests and mineral levels were collected and topographical maps were acquired from the NRCS. Information on native fish habitat was gleaned from reports and journals published by the South Dakota Department of Game, Fish, and Parks.

#32 LIZ REYNE
Business and Information Systems
Dakota State University
Faculty Sponsor: Josh Pauli, Dakota State University
Sales Tax on E-commerce Purchases

As the rate of internet purchases continues to rise, there has been much attention paid to the tax laws related to this type of buying. We provide a survey of the current taxation laws across the United States and revenue statistics from the past 20 years. This timeframe is especially important because it covers tax implications from the 'before the internet' and 'after the internet' perspectives. We are not attempting to influence legislation related to online purchase taxation, but instead are investigating adopted online taxation approaches in a factual manner.

#33 EVIE JOHNSON
Music
The University of South Dakota
Faculty Sponsor: David Moskowitz, The University of South Dakota
Pilgrimage to Guthrie

The music of Woody Guthrie has had a profound affect on me as a singer and songwriter. After studying Guthrie’s life and works, I have written songs in the manner that Woody Guthrie would have. Currently I am in the process of applying for a national grant at the Woody Guthrie Archives. This grant would allow me to live in New York City and study the Woody Guthrie Archives, as well as play in many of the same places and venues as he. Presenting at the state level would be an excellent venue to display research that the College of Fine Arts and the National Music Museum have supported me with and highlight the life and works of Woody Guthrie.

#34 SARAH KRUSE
Visual Arts
South Dakota State University
Faculty Sponsor: Michael Steele, South Dakota State University
Graphic and Typographic Design

This research project deals with original typographic designs. My research is based on personal mythical reference designed into an original typeface, poster, and book. I started my research with ancient script, then proceeded chronologically to nontraditional typefaces and studied nomenclature to understand design principles associated with type practice. My own original hand drawn typeface entitled 'Parting Cut' was then digitized using vector software. Parting Cut is intended to express the emotive qualities of a personal myth in visual form.

#35 JAKE MORTENSON
Economics/Political Science
The University of South Dakota
Faculty Sponsor: Raymond Ring, The University of South Dakota
South Dakota Education: Spending and Policies of Successful School Districts

The goal of my research is to determine what effect various areas of spending/policy at the district level has on test score results using multiple variable regression analysis. My research examines the relationship between the *allocation* of resources and how those allocation decisions shape school district and individual attendance center performance on standardized tests. The findings of my study could provide useful information to state and federal policymakers attempting to comply with or modify current policy, specifically No Child Left Behind.

#36 RYAN HAJEK, TRAVIS PTCEK, RYAN ESSER
Chemistry
Mount Marty College
Faculty Sponsor: Dr. Choony, Mt. Marty College
Synthesis of 3-methyl-4-(1-methylethenyl)pyrrolidine on a Solid Support

An attempt was made to synthesize the cycloadduct 3-methyl-4-(1-methylethenyl)pyrrolidine involving an intramolecular ENE cycloaddition reaction on a solid support polymer bound triphenylchloromethane resin which acted as a steric buttress. After it was made on the resin, it was isolated from it by deprotection with a dilute acid. This cycloadduct is a constituent of many neuroactive compounds and hence can be used as a template in the pharmaceutical industry. After characterization of the end-product, it was reasonable to conclude that the desired product was formed on the solid phase.

#37 STEVEN SCHNABEL
Mechanical Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Jon Kellar, Lidvin Kjerengtroen, Bill Cross, South Dakota School of Mines & Technology
Production and Uses of Zirconium Tungstate Filler Material

This research demonstrates a method to produce zirconium tungstate (ZrW_2O_8) filler material. These fillers are incorporated into lightweight polymers to form a composite material with enhanced mechanical and thermal properties. The main property zirconium tungstate affects is the expanding and contracting property, which is referred to as the coefficient of thermal expansion. The experimental procedure to manufacture the particles will be explained along with an examination of the material, performed by SEM (scanning electron microscopy), X-ray diffraction, and Microtrac S3000 particle sizing. Finally, a brief explanation will be given of the affects different production methods have on the morphology and size of the particles.

#38 REBECCA MACA
Elementary Education/Special Learning
Dakota State University
Faculty Sponsor: Tim Fiegen, Dakota State University
Satisfaction within Special Education Programs

The main objective is to determine the satisfaction of parents who have children with special needs involved with special education. Interviews were conducted with these parents from the Spring of 2001 to Summer 2006 that included over 200 parents. Three questions were considered: 1, how effective is the SPED program; 2, how flexible is the SPED program in meeting the needs of your child; 3, what problems have you had with the school? These three questions are analyzed and reported.

#39 KIRBY MYERS
Physics
The University of South Dakota
Faculty Sponsor: Dongming Mei, The University of South Dakota
Majorana Project

The goal of the Majorana project is to study neutrinoless double-beta decay which establishes the absolute mass of the neutrino. Majorana intends to utilize germanium detectors to search for rare decays at a sensitivity level of 45 meV neutrino mass. The key to success in low-energy neutrino detection lies in the ability to reduce intrinsic radioactive background to unprecedented low levels and to adequately shield the detectors from external sources of radioactivity. In particular, fast neutrons and cosmogenic radioactivity from muon-induced processes are background matter that must be eliminated for underground experiments in pursuit of double beta decay.

#40 TRACY KOBBERMANN
Biology
Black Hills State University
Faculty Sponsor: Daniel Bergey, Black Hills State University
Novel Alternative Splicing of a Tomato Calmodulin Gene Variant, Exon Shuffling, and the Evolution of New Genes in the Solanaceae Plant Family

We have cloned and sequenced the tomato calmodulin gene family and determined that one calmodulin gene is alternatively spliced to produce two different mRNA products that encode two CaM protein isoforms. One product is a standard, cytosolic calmodulin; the other contains a C-terminal consensus nuclear localization signal peptide (NLS). Genomic sequencing confirmed the two exons (NLS and CaM domains) are separated by a 2,100 bp intron. This experimental system is being used to study and gain insight into exon shuffling, the role of alternative splicing in regulating gene expression, and the evolution of genes in related plant families.

#41 CHAD RIEDEL
Visual Arts
South Dakota State University
Faculty Sponsor: Tim Steele, South Dakota State University
Typographic Research

My research includes the development of typography integrated with personal mythical form. This study began with Gutenberg's Bible, Egyptian hieroglyphs and modern typographic works. After analyzing typestyles, use, and proportion, I created a new typeface called Roots based upon prairie myth and family lore. Originally the font was hand drawn and then scanned. Then by using two computer programs, I created a more exact representation of my concept that is now ready for application.

#42 JANA PRASEK
Psychology
The University of South Dakota
Faculty Sponsor: S. Jean Caraway, The University of South Dakota
Parent-Child Relational Stress and Child's Social Competence in Relation to Anxiety in a Head Start Sample

Anxiety disorders are very costly to both individuals and society, yet little has been done to examine how anxiety symptoms develop in young children. The purpose of this study is to examine variables associated with anxiety in a sample of preschool children in the rural Midwest. Parent-child relational stress and child-social factors were investigated. Results indicated that higher levels of stress within the parent-child relationship and lower levels of child social competencies were associated with increased levels of anxiety symptomology. Additional results of this study were also discussed.

#43 MATTHEW PAULSON
Business and Information Systems
Dakota State University
Faculty Sponsor: Wayne Pauli, Dakota State University
Determining the Characteristics of Strong UNIX and Linux Passwords

UNIX and Linux based systems have become the de-facto standard for computer servers in the information age. Each of these servers contains a necessary file called “shadow” which is a list of password hash sums that brute-force cracking tools can make use of to reveal the master or root password of a server. If a server is compromised, all sensitive information on that system can be stolen which often has huge financial consequences. The goal of this research project is to determine the characteristics of a sufficiently strong password which cracking tools cannot guess in any useful amount of time.

#44 AMANDA SEDLACEK
Biology/Psychology
The University of South Dakota
Faculty Sponsor: Doug Martin, The University of South Dakota
Expression of Endogenous Sex Steroids on Renal Soluble Epoxide Hydrolase

Androgens and soluble Epoxide Hydrolase (sEH) are implicated in hypertension. We hypothesized that removal of androgens would decrease blood pressure and sEH amounts. Juvenile male and female spontaneously hypertensive rats (SHR) underwent sham operation, castration, or ovariectomy and were studied 20 weeks later. Blood pressure was measured and Western blot was used to determine sEH protein expression in the kidney. Castration decreased blood pressure, however, ovariectomy had little effect on blood pressure. The level of sEH did not correlate to high blood pressure. We conclude that androgens and sEH affect blood pressure independently.

#45 ANTONIO DAWKINS, JESSICA FOX, TODD MULSKE
Health and Physical Education
Nothern State University
Faculty Sponsor: Kathie Courtney, Northern State University
Fitness for Life

We used the Health Belief Model as a foundation for the creation of a health promotion plan to increase physical activity in a sedentary population of adults over the age of 45. Lack of physical activity within the older population contributes to the development of hypokinetic diseases. The goal of our program is to increase quality of life, years of healthy living, and reduce health disparities within the older population. South Dakota is eighth in the nation in the percent of people over the age of 65.

#46 DUSTIN SCHRADER
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Chandradhar Swivedi, South Dakota State University
Inhibition of Cell Proliferation and Induction of Apoptosis of Human Colon Cancer, CACO-

Studies have shown the chemopreventive effects of dietary flaxseed meal on colon tumor development in rats. The objective of this investigation was to study the effects of mammalian lignans (EL and ED), metabolites of SDG and alpha-linolenic acid, components in flaxseed meal on cell proliferation and apoptosis in human colon cancer, CACO-2 cells. EL significantly decreased the cell proliferation at all time periods tested whereas enterodiol decreased only at 48 H and 72 H. ALA significantly decreased cell proliferation from 400-1000 micro molar concentrations. Combination of ALA with ED or EL provided additive effects on cell proliferation.

#47 GABE POOLER
Business and Information Systems
Dakota State University
Faculty Sponsor: Mark Moran, Dakota State University
Patterns of Depreciation in Prices of Computer Technology

All technology becomes obsolete, but the way in which different types of technology depreciate varies. While most technology becomes obsolete when new models or methods come out, computer hardware is unique because it depreciates on a continuous rate based on time more so than on new technologies. It depreciates because the hardware is consistently increasing in speed and capacity. There seems to be patterns in computer hardware depreciation. If a buyer uses these depreciations patterns properly, he or she can pay a lot less then some one who bought the same part six months to a year.

#48 JASON SPAANS
Physics
The University of South Dakota
Faculty Sponsor: Dongming Mei, The University of South Dakota
Neutron Evaluation for the Proposed mini-CLEAN Detector

A study by the National Academies on the Physics of the Universe purports the identification of mysterious “dark matter” as one of the most important pursuits in modern science. A compelling explanation requires physics beyond the Standard Model in a form of Weakly Interacting Massive Particles (WIMPs) that could be directly detected as they recoil from massive and ultra-pure detector targets operating deep beneath the Earth’s surface. However, neutrons are naturally produced by the inherent radioactivity of materials and recoil exactly like a WIMP. This project attempts to evaluate neutron background for the proposed Mini-CLEAN ton scale detector.

#49 NATASHA SWIER
Biology/Chemistry
Mount Marty College
Faculty Sponsor: Alexander Erkine, The University of South Dakota
Tagging of Heat Shock Factor for FRET

Dr. Erkine and I investigated the function of heat shock factor (HSF) by tagging it. For our research, I would tag the HSF with the fluorescence protein for future FRET experiments. In order to do this I first had to amplify by PCR the tagging cassette from the plasmid. Next, I would transform the existing strain with this DNA cassette. Finally the colonies obtained after transformation were analyzed by PCR, and the product went through gel electrophoresis to verify the results of our tagging. We got positive signals from some of our colonies after transformation, but later it turned out to be a result of transient transformation not stably inherited by cells.

#50 KARA BECVAR, CHRIS FRY
Chemistry
Augustana College
Faculty Sponsor: Duane Weisshaar and Gary Earl, Augustana College
The Kinetics of Trioctylmethylammonium Methyl Carbonate

Quaternary ammonium compounds (quats) are widely used; for example, in fabric softeners, hair conditioners, and cleaners. Quats are produced in industry using environmentally hazardous methylating agents. We have developed an eco-friendly route for the methylation of tertiary amines to form the quat using dimethyl carbonate (DMC). Our goal was to verify the reaction rate obtained previously, which we did. But we also discovered that the previous studies need to be repeated at more temperatures to improve the reliability of those results.

#51 JENNIFER SIXTA
Education
Dakota State University
Faculty Sponsor: Vicki Sterling, Dakota State University
Preparation and Research for Reading Clinic to be Held on DSU Campus

A summer reading clinic will be proposed within the College of Education at Dakota State University. With this clinic, area teachers and future teachers will be able to work with students struggling with reading ranging from Kindergarten through 12th grade. The emphasis of this grant is to incorporate technology with reading, keeping in mind research-based practices with the remediate students. Useful Internet sites, software products, creative ways of using word processors and spreadsheets are being explored. Technology based assessment will assist in the areas of fluency, comprehension, phonemic awareness, phonics/word attack, and vocabulary. Technology is a powerful, motivating tool which provides quick reinforcement in the teaching of reading skills.

#52 JONI STOCKLAND, JENNIFER CASTOR
Elementary Education
The University of South Dakota
Faculty Sponsor: Tzu-Yi Hsu, The University of South Dakota
Prospective Teachers Perceptions of Their Preparation from Teacher Education Program to Teach in a Virtual School

This proposed study investigates prospective teachers' perceptions about the preparation they receive in their teacher education program for teaching in virtual schools. This research focuses on prospective teachers currently enrolled in teacher preparation programs in South Dakota. The goals of this research are to determine: (1) teachers' perceptions on how the teacher education program has prepared them to create curriculum for teaching in virtual schools and (2) teachers' perceptions on how their teacher education program has prepared them to use technology for teaching in virtual schools. The results could be used to revise the curriculum or policies of teacher education in South Dakota.

#53 ERIK RODNE
Visual Arts
South Dakota State University
Faculty Sponsor: Tim Steele, South Dakota State University
Research in Graphic Design & Typography

My original research began with typographic study of Old Style, Transitional, and Modern typefaces. Emphasis was on historical letterform, type character, ideal proportion, and optical relationships. I then identified various components of individual letterforms and carefully analyzed them. These visual references date back to the Greeks and Romans and were then coupled with personal mythical references allowing a new type-form to be designed which is both emotive and expressive while visually integrating historical elements. The new typeface was initially hand drawn and then digitized using powerful software programs.

#54 KEENAN THOMAS
Physics
The University of South Dakota
Faculty Sponsor: Dongming Mei, The University of South Dakota
Homestake Ultra Low Background Counting Facility

Homestake offers large shielding effects for underground experiments against cosmic-ray muons. However, the proposed experiments for DUSEL also require ultra-low background counting and pure materials in reducing natural radioactivity for very sensitive detectors. Therefore, an ultra-low background counting facility at Homestake is a crucial aspect of DUSEL operations. In addition, an ultra-low background counting facility could support itself after completion through clients elsewhere in the scientific community. The future of DUSEL depends upon an ultra-low counting facility that also provides many benefits for collegiate research, local occupations, scientific outsourcing, and, of course, the actual operations of DUSEL itself.

#55 BERT MANNHALTER
Chemistry
South Dakota School of Mines & Technology
Faculty Sponsor: Haiping Hong, South Dakota School of Mines & Technology
Disperse the Carbon Nanotube and Polymer for Reinforce Membrane Application

The single wall carbon nanotubes are believed to be ideal mechanical reinforcements for lightweight systems. They have been known to have an elastic modulus of up to 1 Tpa and a tensile strength close to 60Gpa. These values are five and ten times greater than those for steel, respectively, at just 1/6 the weight. To make good dispersion of the SWNTs into the polymer matrix and form the excellent quality of thin films are the key challenges to the success of the project. In this poster, we report our efforts to disperse the carbon nanotube and three different polymers (Poly-vinyl alcohol, Poly-methyl methacrylate and Epon 828 epoxy polymer). We found controlling viscosity and concentration of polymer solution is crucial to form the uniform and stable polymer fluid containing the carbon nanotube.

#56 JAKE MILLER
Science
Black Hills State University
Faculty Sponsor: Cynthia Anderson, Black Hills State University
Genetic Population Structure of the Finescale Dace, *Phoxinus neogaeus* and Their Hybrids

The finescale dace (*Phoxinus neogaeus*) is a small minnow (Family Cyprinidae) that occurs in small, weedy streams or ponds from northwestern Canada to New England, south into northern Minnesota, Wisconsin, Michigan and New York. In the Black Hills region isolated populations have been reported from Niobrara County in Wyoming and in only a single lake in South Dakota. The goal of this project is to develop nuclear DNA markers by constructing a microsatellite enriched genomic library. Microsatellite markers will be utilized to assess population structure and divergence between Black Hills populations and the more prevalent eastern populations.

#57 JEFF SWETT
Business/Arts and Sciences
Dakota State University
Faculty Sponsor: Richard Christoph, Dakota State University
Whole Life vs. Buy Term/Invest the Difference: A Mathematical and Technological Approach

This project will attempt to first create a mathematical model to show the different cash values and death benefits for either of two options: buying whole life insurance or buying term and investing the difference. After the model has been created, Microsoft Excel will be used to create a program whereby the user can input values and receive the results of the choices in chart or spreadsheet format. This addresses the often asked question in the financial services industry of whether a person should buy whole or term life insurance.

#58 ZACHARY PARSONS
Physics/Mathematics
The University of South Dakota
Faculty Sponsor: Dongming Mei, The University of South Dakota
Background Study for Majorana Double-Beta

With the discovery of neutrino oscillations in both solar and atmospheric neutrino experiments, we now know that neutrinos have mass and that mixing occurs in the lepton sector. Although very little is known about the general properties of neutrinos, the neutrino does play a key role in elucidating the physics beyond the standard model of elementary particles and in the quest for a grand unified theory of nature. Of particular fundamental interest is to understand the absolute neutrino mass scale, mass hierarchy and character (Dirac or Majorana) of the neutrino. The next generation experiments are intended to address these fundamental questions utilizing low energy neutrinos. Majorana is designed to achieve a sensitivity of about 10^{27} years half life for ^{76}Ge. The infrequency of decays increases the importance of controlling the background noise, which could interfere with experimental results. The most important sources of background are muon-induced neutrons and natural radioactivity decays. Muon-induced neutron background has been studied using the neutron-beam at Triangular University Nuclear Laboratory (TUNL) and the Los Alamos Neutron Science Center (LANSCE). We show the data analysis results. Natural radioactivity is controlled by an ultra-low background counting facility. We show some Monte Carlo simulation results about the sensitivity of ultra-low background counting facility that is being proposed at Homestake.

#59 SIRI ANDERSON
Visual Arts
South Dakota State University
Faculty Sponsor: Michael Steele, South Dakota State University
Research in Graphic Design & Typography

My research in typography and graphic design revolved around the construction of an original typeface based upon a personal family myth. The research incorporates aspects of the myth along with the visual elements to create an original typeface. Research involved studying fonts from all different time periods and styles as well as historical designs that involve spatial organization. Along with the typeface, I created an original poster and a book that included the typeface and the myth. This work is meant to represent the emotional and experiential aspects of the myth in a coherent, visual format.

#60 AMANDA WEBER
Chemistry
The University of South Dakota
Faculty Sponsor: Ranjit Koodali, The University of South Dakota
Europium Modified Titania Aerogels and Xerogels as Photocatalysts

Photocatalysis has emerged as an advanced oxidation process in recent years enabling water treatment at lower pollutant concentrations. Mesoporous TiO_2 is doped with lanthanide ions (Eu^{3+}) to increase photocatalytic activity. The gels are dried at ambient conditions or super critically dried to form xerogels and aerogels respectively. The calcined materials are characterized by powder X-ray diffraction, nitrogen adsorption and transmission electron microscopic studies. Photocatalytic experiments using salicylic acid as a model pollutant show that europium doped titania degrade the pollutants more efficiently than titania alone. Using different lanthanide ions, we seek to improve the photocatalytic efficiency in the mesoporous nanomaterials.

#61 ALLISON WEGLEITNER
Biology
Nothern State University
Faculty Sponsor: Jodie Ramsay, Northern State University
Impact of 2006 Drought on Pioneer Corn Hybrids in Northeastern South Dakota

The goal of this study was to measure the impact of the 2006 drought in Northeastern South Dakota on Pioneer brand corn crops. Corn from twenty fields were tested and analyzed from six locations in Brown and Day counties. Measurements of the plant and ears were taken and a soil sample was collected from each site. Precipitation information was tabulated based on the NOAA website's archives (NOAA, 2006). Two weeks following the harvest of samples, moisture and weight measurements were obtained. The final results indicate a distinct correlation between soil type and precipitation levels with corn production levels.

#62 BRANDI TRUDEAU
Biology/Chemistry
Mount Marty College
Faculty Sponsor: Chun Wu, Mount Marty College
Preliminary Study for Giardiasis Drug Development

Giardiasis is the most frequent cause of non-bacterial diarrhea and currently there is no FDA approved medicine available. Class II Giardia Fructose-1, 6-diphosphate aldolase is one of the key enzymes associated with pathogenic microbe Giardia lamblia, the direct cause of giardiasis. The goal is to develop tight binding, reversible inhibitors of Giardia aldolase in Giardia lamblia for alternative treatments of giardiasis. This poster reports on the rational design of Gardia aldolase inhibitors and the synthesis of major intermediates of those candidates. A novel active site filling model is applied.

#63 FAWN KILLION
Arts and Sciences
Dakota State University
Faculty Sponsor: Richard Bleil, Dakota State University
Mathematical Model of Molecular Containers

Inclusion compounds are molecular containers in the general forms of cages, nanotubes and lattices. The "host" container does not molecularly bind to the "guest" molecule placed inside it. It is this unique property which makes inclusion compounds highly sought after in medical, industrial and ecological applications. In our research we are exploring the physical properties of these molecules and developing a mathematical model describing all inclusion compounds. Until now pairing the right "host" molecule with a "guest" molecule has been a matter of trail and error. With a universal mathematical model researchers will greatly reduce their time, effort and cost.

#64 EMILY WHITNEY
Business Administration
The University of South Dakota
Faculty Sponsor: Ralph Brown, The University of South Dakota
An Economic Study of the African Nations: Namibia, South Africa, and Zimbabwe

The problem this thesis addresses is why African countries lag behind in the developing and developed world, and also why certain African countries are progressing better than other African countries. The objective of this project is to quantitatively analyze the economic factors involved in the development (or lack of) of the countries of Namibia, South Africa, and Zimbabwe. This study explains how these countries are developing and what factors appear to encourage or discourage development. Discussion points include histories of each country, economic growth and productivity rates, social and economic indicators, and regression analyses.

#65 JOEL BORDEWYK
Mechanical Engineering
South Dakota State University
Faculty Sponsor: Zhong Hu, South Dakota State University
Up-Conversion of Light

An up-conversion material used in partnership with a solar panel increases the solar panel’s efficiency. Using two photon absorption, these materials can convert two low energy photons into one high energy photon. The newly created photon is now able to be accepted by the solar panel and creates added electricity. This project attempts to converge upon a method to identify this nano-process through computer software. The energy, excitation, and orbital levels of the photons as well as the shape of specific compounds are modeled and manipulated in an attempt to witness this phenomenon within the software output data.

#66 JILL BRINK, TRESA SCHERR
Psychology
The University of South Dakota
Faculty Sponsor: Frank Schieber, The University of South Dakota
Role of Goal-Guided versus Stimulus-Driven Mechanisms in the Conspicuity of Fluorescent Colored Stimuli

Past research suggests that fluorescent colored stimuli are more visually conspicuous than non-fluorescent stimuli. However, little is known about the psychological mechanisms which mediate this advantage. A series of experiments were conducted using a visual search paradigm to examine the relative contribution of top-down cognitive versus bottom-up stimulus-driven mediators of visibility. Results indicated that fluorescent colors did not automatically recruit the focus of attention in a bottom-up fashion. Unexpectedly, fluorescent colored targets were not easier to find when top-down guidance mechanisms were employed. These findings have important implications for fluorescent color marking schemes used in safety applications.

#67 BOBBIE LAURENZ
Chemistry
South Dakota School of Mines & Technology
Faculty Sponsor: David Boyles, South Dakota School of Mines & Technology
Novel Crosslinked Biobased Resins: Synthesis, Cure Characteristics, and Properties

Epoxidized triglyceride plant oils have been used in a variety of applications and are appealing as synthetic petroleum substitutes since they are a single synthetic step away from natural oils. One such material is epoxidized linseed oil (ELO) which is easily derived in commercial quantities from linseed oil, produced from extrusion of the seeds of the flax plant, *Linum usitatissimum*. Long appreciated by civilization, linseed oil applications have included oil paints, coatings, the original “linoleum” for flooring, and oil cloth. The use of linseed oil for structural plastics (rather than coatings, admixed composites, or stiffeners) is relatively unknown, however, and its use in resin materials which are entirely biobased and contain no petroleum additives is a unique advance and a potential market niche previously unknown before our work. In this work new bio-based materials were formulated from ELO in conjunction with other solely bio-derived materials, one of which has been featured in a recent U.S. federal government report as among the top 10 commodity biochemicals from agricultural production having potential to reduce reliance on petroleum sources. The formulations have been cured from liquid pre-resins to solid and sturdy thermoset resins by both thermal and light exposure. These resins have been characterized chemically and mechanically by available techniques to ascertain their degree of reaction, with comparative mechanical properties of different cure methods and composition measured using dynamic mechanical analysis to ascertain glass transition, storage, and loss moduli of the materials.

#68 DAVIS BOOS
Information Systems
Dakota State University
Faculty Sponsor: Josh Pauli, Dakota State University
Classroom Connections Security Policy

The 2006 Classroom Connections Initiative's goal was to distribute TabletPCs and laptops for every faculty and student in grades 9-12 in 20 schools across the state. A major part of this project was implemented by the technology coordinator(s) in each school district. Each technology coordinator spent two weeks on DSU campus during summer 2006 to learn the implementation details involving all aspects of device deployment. I propose to determine how and why the Classroom Connections distributed machines security was implemented. The details of the implementation and rationale behind it will be investigated.

#69 MICHELLE BRANDSRUD
Biology
The University of South Dakota
Faculty Sponsor: Kaius Helenurm, The University of South Dakota
Genetic Variation in a Rediscovered Population of *Coreopsis gigantea*

Coreopsis gigantea is a perennial plant that is found primarily on California's Channel Islands. *C. gigante*a was presumed extinct on San Clemente Island until a population was rediscovered in 2001. All 120 individuals in the rediscovered San Clemente Island population were sampled, and genetic variation was assayed using six microsatellite loci. Although microsatellite loci generally reveal high levels of genetic variation, even in rare plants, no genetic variation was observed in this population. Genetic variation for these six microsatellite loci was also observed for populations on San Nicolas and Santa Cantalina Islands but only limited divergence was observed.

#70 AMY BIGGE
Biology
Mount Marty College
Faculty Sponsor: James Bowers, Mount Marty College
Localization and Function of Alpha-1 Adrenergic Receptors

The alpha-1 adrenergic receptor (α1-AR) is a class of G protein-coupled receptors that is a target of the catecholamines. Recent evidence suggests that the subtype α1A-ARs are required for both normal growth and development of the heart and myocardial adaptation to stress. There is also some evidence to suggest that α1A-ARs may have a protective role in the heart. The objective of this research is to localize the α1A- and α1B-AR in adult mouse cardiac myocytes. Methods included viral construction, cell infection, binding assay, IP3 assay, and confocal microscopy. It was found that the ARs are localized in the perinuclear region in HeLa cells and adult cardiac myocytes.

#71 BING ZHU, BIN QI
Natural Science
Nothern State University
Faculty Sponsor: Richard Faflak, Northern State University
A Statistical Analysis of Marsh Sediments from Northeastern South Dakota

This study employed moment statistics to derive statistical parameters pertaining to marsh sediments extracted by coring from sites in portions of Brown, Day, Clark, Codington, Hamlin, and Brookings counties, South Dakota. Of particular interest in this study were the aerosol-sized particles because of their potential influence upon ecosystem dynamics. The sediment's statistical parameters of sorting, kurtosis, and mean size in phi units were determined and plotted on an X, Y, Z grid. Preliminary results appear to indicate that aerosol-sized particles are more abundant in the upper levels of marsh deposits. This implies that factors such as agricultural and other human activities, may have had a recent impact on local sedimentation rates. Furthermore, chemical weathering of the feldspar fraction in the sediments could influence the pH of the marsh environment, leading to potential ecosystem feedback.

#72 WEI CHEN
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Xiangming Guan, South Dakota State University
Determination of the Ratio of Total Thiols and Disulfides – an Index of Intracellular Oxidative Stress

Thiols (glutathione, cysteine, and protein thiols) play important roles in maintaining an intracellular reducing environment and detoxification of oxidants. Thiols can be oxidized to disulfides under various oxidative stress conditions. The ratio of thiols over disulfides has been used as an index of oxidative stress. This study describes a modified methodology by which the concentration of the total cellular thiols as well as their disulfides can be reliably measured. This method was validated by determining intracellular oxidative stress created by inhibitors of glutathione reductase and glutathione biosynthesis in an ovarian cancer cell line and monkey kidney cell line. The experimental procedures and results will be presented.

#73 JED BRICH
Materials and Metallurgical Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Jon Kellar, South Dakota School of Mines & Technology
Characterizing Fine, Ultrafine and Nano-Powders; Testing their Performance in Thermoplastics

A method of measuring physical properties of mineral fillers is presented. Research is based on a natural muscovite type mica local to the Black Hills of South Dakota. Mineral particles are often used as reinforcement, modifying the mechanical properties of thermoplastics to create a more desirable composite material. Physical properties like particle size, surface area, and aspect ratio have significant effects on the mechanical properties of filled thermoplastics. Several challenges are encountered when measuring physical properties of fine particles. Developing a standard method of measuring physical properties of fillers is crucial when working to compare their effects in thermoplastics.

#74 PATRICK ENGEBRETSON
Business and Information Systems
Dakota State University
Faculty Sponsor: Kevin Streff, Dakota State University
Multifactor Authentication: The Evolution of Internet Banking

In October of 2005, the Federal Financial Institution Examination Council (FFIEC) issued new guidance in respect to internet banking. The heart of this fundamental change requires financial institutions to move away from the current single-factor “user name” and “password” format into a more secure “multifactor” environment for accessing financial information over the internet. Full implementation of the guidance will result in a profound change for all users who access their banking information electronically. According to the guidance (FDIC: FIL-103-05, 2005) a simple username and password is no longer considered adequate protection against today’s onslaught of e-banking specific attacks. The objective of this project is to provide the audience with a deeper understanding of this imminent and encompassing change. I will present some of the specific details of FIL 103-05 and also examine how this guidance will impact current and future internet banking customers.

#75 KRISTINA MATEO
Veterinary Science
South Dakota State University
Faculty Sponsor: David Francis, South Dakota State University
Effect of Heat-Labile Enterotoxin Expression on the Ability of Enterotoxigenic *Escherichia coli* to Colonize the IPEC-J2 Porcine Epithelial Cell Line

This study was designed to further investigate the contribution of enterotoxigenic *Escherichia coli* (ETEC) heat-labile toxin (LT) to ETEC adherence on intestinal cells using the IPEC-J2 cell line as an *in vitro* model. Our preliminary findings indicate that ETEC strains lacking LT are inhibited in their ability to attach to IPEC-J2 cells; LT+ strains bind to IPEC-J2 cells with higher affinity than LT- strains; receptor-positive ETEC strains can prevent adherence of wild-type ETEC only when they express LT, and secretory activity does not seem to be essential to LT's enhancement of colonization to cells.

#76 TERRAN ELLIOTT
Materials Engineering and Science/Chemical and Bilogical Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Sookie S. Bang, South Dakota School of Mines & Technology
A Novel Biosealant: Organic and Inorganic Microbial Byproducts

A recombinant microorganism capable of inducing calcite precipitation and producing an extracellular polymer substance (EPS) was developed for enhanced crack remediation. A new plasmid pUBU, was constructed with the sequences from pBU11 and pUCP18. pBU11 contains urease genes of *Bacillus pasteurii* and pUCP18 is a shuttle vector for *E. coli* and *Pseudomonas*. This new plasmid harbors genes encoding urease, the enzyme needed for calcite precipitation. pUBU was inserted through electroporation into *Pseudomonas aeruginosa*, which produces a large amount of EPS. This work includes the construction of pUBU, transformation of pUBU into *P. aeruginosa* 8821, and characterization of *P. aeruginosa* 8821(pUBU).

#77 TERESA SEEFELDT
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Xiangming Guan, South Dakota State University
Increased Oxidative Stress via Glutathione Modulation as a Novel Approach to Enhance Cancer Sensitivity to Chemotherapy

Drug resistance is a major cause of cancer treatment failure. Mechanisms of increasing oxidative stress produced by anticancer agents such as doxorubicin could increase the sensitivity of cancer cells toward these medications. Modulation of oxidative stress through glutathione reductase (GR) inhibition is a novel approach to increase cancer sensitivity to chemotherapy. In this project, inhibition of GR by G0026 in combination with doxorubicin has been used to increase oxidative stress in a human ovarian cancer cell line. G0026 has been shown to significantly increase the sensitivity of OVCAR-3 cells to doxorubicin. The findings indicate that increased oxidative stress produced via GR inhibition can increase response to chemotherapy.

#78 JAMES HULKA
Atmospheric Science
South Dakota School of Mines & Technology
Faculty Sponsor: William Capehart, South Dakota School of Mines & Technology
MODIS Captures the 2005 Atlantic Hurricanes

During the summer of 2006, I had the unique opportunity to work as an intern at NASA Goddard Space Flight Center in Greenbelt, Maryland. My job there was to process remote sensing satellite data for an informative website called the Goddard Earth Sciences (GES) Data and Information Services Center (DISC) Hurricane Portal. The poster shows still images of all 15 hurricanes from 2005 along with captions and other atmospheric data.

#79 VENKATA KASHYAP YELLEPEDDI
Pharmacy
South Dakota State University
Faculty Sponsor: Srinath Palakurthi, South Dakota State University
Survace Modified PAMAM Dendrimers as Gene Carriers

Polyamine uptake was reported to be rapid in actively growing cells such as cancer. We hypothesized that as the polyamines are taken up by metabolism dependent transport, polyamine-conjugated dendrimers will be transported by facilitated transport resulting in high transfection efficiency and cancer cell specificity. In the present study, surface modified PAMAM dendrimers were prepared by conjugation of the dendrimer with ornithine, putrescine and their precursor, arginine, and their gene transfection efficiency was tested in 293 T cells. The arginine modified dendrimer showed improved gene expression in 293 T cells. The results suggest that these surface modified dendrimers could be developed as potential vectors for gene delivery. Studies on the effect of the generation of the dendrimers and the degree of polyamine conjugation on the transfection efficiency are in progress.

#80 JIA YU
Business and Information Systems
Dakota State University
Faculty Sponsor: Omar El-Gayar, Dakota State University
A Prototype of Service-Oriented Architecture for Distributed Decision Support Systems (DDSS)

The project constructs a prototype of service-oriented architecture (SOA) supporting distributed decision support systems (DSS) with an emphasis on model sharing and reuse. It is based on service-oriented design principles and is designed in MS.NET/ASP.NET environment. The seven service models are: Decision support client, Discovery Service, DB Service, SMML model proxy, Translator service, Environment proxy, and Solver proxy. The communication among these models and the input/output are based on XML. They are hosted on a web server and accessed by clients on the Internet. This project demonstrates the interaction of the various services and proves the usefulness of Web service for DSS.

#81 YI GAO
Materials Engineering and Science
South Dakota School of Mines & Technology
Faculty Sponsor: Hao Fong, South Dakota School of Mines & Technology
Preparation, Structure and Properties of Dental Resin Nanocomposites

This study investigates the effects of inorganic fillers: modified FS; organic fillers: electrospun, M-NBR—acrylonitrile-butadiene rubber) on dental materials (matrix: Bis-GMA /TEGDMA). For the preparation of modified FS-Bis-GMA/TEGDMA composites, three different mixing processes are adopted, and the composite prepared by using mixing process C possessed the maximum flexural strength, as well as elastic modulus. At a lower filler level, the introduction of FS can improve the mechanical properties of composites and has no effect on index and toughness. Cross-linked M-NBR fiber is added to the matrix to improve the toughness of the brittle resin.

#82 XIOYING ZHANG
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Chandradhar Dwivedi, South Dakota State University
Effects of Sarcophine-diol on Cell Proliferation and Apoptosis in Human Epidermoid Carcinoma A431 Cells

The objective of this study was to determine effects of sarcophine-diol (SD) on cell proliferation and apoptosis in human epidermoid carcinoma A431 cells. The results showed that SD treatment at concentration of 100μM-400μM resulted in concentration- and a time-dependent decrease in cell proliferation, 50μM-400μM of SD treatment induced a strong apoptosis, and 400μM of SD treatment can significantly ($p < 0.05$) increase the level of caspase 3 in human epidermoid carcinoma A431 cells. These results suggest that SD could be effective as a chemopreventive agent for skin cancer by decreasing cell proliferation and inducing apoptosis though caspase dependent pathway.

#83 SAGI SRIRAMARAJU
Materials Engineering and Science
South Dakota School of Mines & Technology
Faculty Sponsor: Hao Fong, South Dakota School of Mines & Technology
Fabrication and Characterization of Electrospun SiO_2 and TiO_2 Nanofibers

Ceramic (SiO_2 and TiO_2) nanofibers were fabricated by electrospinning the solutions of their alkoxide precursors mixed with poly (vinyl pyrrolidone) using DMF as the solvent, followed by high temperature pyrolysis. The electrospun ceramic nanofibers were characterized using SEM, TEM, TGA, XRD and FTIR. The prepared ceramic nanofibers were thin (diameters of approximately 300 nm), uniform (small variation in diameters among the same and/or different nanofibers) and smooth (without beads and/or beaded nanofibers). SiO_2 nanofiber was amorphous with the refractive index of approximately 1.45, while TiO_2 nanofiber was polycrystalline with predominantly anatase phase (>90%). The amorphous SiO_2 nanofiber is expected to find important application as the novel dental filler material, while the photo-catalysis studies of TiO_2 nanofiber are in progress.

#84 YONG ZHAO
Pharmaceutical Sciences
South Dakota State University
Faculty Sponsor: Xiangming Guan, South Dakota State University
Increase in Oxidative Stress via Glutathione Modulation as a Novel Approach to Enhance Cancer Sensitivity to Radiotherapy

The main obstacle in treating cancer by radiation is resistance leading to treatment failure. Developing novel approaches to increase cancer sensitivity to radiation is an ongoing research effort. This project investigates whether increased oxidative stress via glutathione (GSH) modulation can increase cancer sensitivity to radiation. Human ovarian cancer cells were treated with G0026, a glutathione reductase (GR) inhibitor, or a combination of G0026 and buthionine sulfoximine (BSO), an inhibitor of GSH biosynthesis. Our results show that G0026 provided a significant increase in the sensitivity of OVCAR-3 cells to radiation. A more profound increase in sensitivity was achieved by the combined inhibition. The experimental procedure and results will be presented.

#85 JIE YU
Business and Information Systems
Dakota State University
Faculty Sponsor: Xinwen Fu, Dakota State University
Measuring and Improving Anonymous Network Performance

Anonymous communication has become more and more popular on the Internet. Anonymity is righteous and necessary in many scenarios such as protecting user privacy and securing military communication. *Tor* is a practical anonymous application popular on the Internet. However, because of its design principle, *Tor* suffers from low throughput performance. For example, *Tor* makes web browsing much slower. In order to solve this dilemma, we will analyze the *Tor* network, pinpoint the source of the problem, and then propose schemes to improve the throughput of *Tor*. The deliverables of this research project will be an academic paper on Tor performance and a prototype system improving *Tor* performance.

#86 BRIAN WRIGHT, DUSTIN THOMAS
Materials Engineering
South Dakota School of Mines & Technology
Faculty Sponsor: Haiping Hong, South Dakota School of Mines & Technology
Thermal Conductivities of Nanofluids Containing Carbon Nanotube and Other Particles in the Polyalphaolefin Oils.

Nanofluids have attracted great interest recently because of reports of significantly enhanced thermal performances. Carbon nanotubes are chosen as additive due to their super thermal conductivity (2000 – 6000 W/m.K.). In this presentation, we report our work to successfully disperse carbon nanotube and other particles in the polyalphaolefin oils. The curve of thermal conductivity (TC) versus time indicates that initially TC decreases with the time, then TC stays flat. We are now exploring more samples to understand the mechanism inside. For the time being, we believe that viscosity of the oil is the cause of this interesting phenomenon.

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