Fifth Annual Undergraduate Research & Scholarship Conference 2008

STUDENT UNION BUILDING
APRIL 14, 2008
1:00 P.M. – 4:00 P.M.

SCHEDULE OF EVENTS

Poster Session 1:00 – 4:00 p.m. Jordan and Hatch Ballrooms
Art Display 1:00 – 4:00 p.m. Bergquist Lounge
Podium Presentations 1:00 – 3:30 p.m. Alexander, Barnwell, Farnsworth and Lookout Conference Rooms
Performing Arts 1:45 – 2:15 p.m. Jordan Ballroom
Speakers and Awards 3:30 – 4:00 p.m. Jordan Ballroom
Sona K. Andrews, Provost & Vice President for Academic Affairs
Mark Rudin, Vice President for Research
Sharon McGuire, Associate Vice President for Undergraduate Studies
Welcome to Boise State's 5th Annual Undergraduate Research and Scholarship Conference. This conference provides undergraduate students at Boise State an opportunity to share their research projects and be recognized for their exceptional work.

Congratulations to those students who have been selected to present their projects at this important event. Boise State has been a place where students come first, with award-winning faculty dedicated to excellent teaching. Faculty sponsors who assist and support these students with their research should be commended for their commitment to learning and their dedication to the personal success of our students. The projects being presented span an extensive range of subjects. Each project reflects the effort of our students through academic research and exploration.

As President, I am committed to supporting the process of discovery and research. The University is transforming itself into a metropolitan university dedicated not only to an outstanding undergraduate experience, but also to the pursuit of groundbreaking research and technology. I will continue to encourage growth in research opportunities and activities as part of the undergraduate educational experience at Boise State University.

I hope you enjoy the conference and thank you for your support of this annual event.

Warm regards,
Bob Kustra, President

Welcome to the Fifth Annual Undergraduate Research and Scholarship Conference. With every passing year we see greater student participation and a continuation of the outstanding quality of their work. Our institutional strategic plan, Charting the Course, has defined student involvement in research as one of the hallmarks of Boise State University defining itself as a Metropolitan Research University of Distinction. This conference is a tangible example of progress on achieving this goal.

Our students participating in today's conference represent the diverse range of academic disciplines at Boise State University. They have each demonstrated a drive and determination that exceeds that of the average student. Through their hard work, they have gained research and presentation skills that will prepare them for the world beyond academia. It is with great pride and enthusiasm that I congratulate these exceptional students and honor them for their outstanding work.

I would also like to extend my appreciation to our faculty sponsors. Their dedication to enriching the learning environment at Boise State University is another testament to our vibrancy and growth. We know they have countless demands on their time and we thank them for their commitment to our students and for creating opportunities for scholarly achievement.

For those of you joining us today, I encourage you to visit all of the venues represented and meet with our students to learn about the research and work they have conducted. You will not be disappointed. On behalf of Boise State University, I thank you for your support and hope that you enjoy this year's conference.

Sona Karentz Andrews
Provost and Vice President for Academic Affairs
PROGRAM COVER DESIGN
UNDERGRADUATE RESEARCH AND SCHOLARSHIP CONFERENCE

College of Arts & Sciences, Department of Art
Faculty Sponsors: Stephanie Bacon and Jennifer Wood

Students in Art 204, Graphic Design Studio II were presented with a unique opportunity to design the program cover for the 2008 Undergraduate Research and Scholarship Conference. This is an example of a research project for a graphic designer. The student designers prepare themselves by researching the university colleges and many programs that are represented in the conference. Class instruction includes subjects in representation, semiotics and denotation of images as a way to present the concept for communication. Through use of peer and instructor review, each student developed their own design as a way to visually represent the conference. Some designers used metaphoric principles, others by use of a visual pun while some tried to capture the essence of the undergraduate research experience. This year’s cover design was selected by a jury of senior graphic design students, faculty and conference committee members. Congratulations to Sarah McCarthy, First Place; Andy Harl, Honorable Mention; May Hernandez, Honorable Mention; and Morgan Sorenson, Art 488 Graphic Design Studio IV Students’ Choice. All cover design submissions are displayed in the Bergquist Lounge in the Student Union Building.

THE DEEP DARK EXHIBIT AND PANEL PRESENTATION

The 2007 – 2008 First Year Read selection is Gregg Olsen’s book The Deep Dark: Disaster and Redemption in America’s Richest Silver Mine, which is about the 1972 Kellogg, Idaho mining disaster. With books in their hands after summer new student orientation, multiple classes incorporated The Deep Dark into their coursework. This session will display information on the book and disaster. A student panel will share examples of how the book was integrated into their learning. Next year’s First Year Read book is Three Cups of Tea by Greg Mortenson and David Oliver Relin.
JORDAN BALLROOM
1:45 PM – 2:30 PM

“BLACK FLOWERS”
Stephanie Frahs, Department of Theatre Arts
Faculty Sponsor: Marla Hansen

I am still fairly new to the whole choreography experience. This piece was simply an experiment for me to see how I could come up with movement to the different rhythms in music. Everything about this piece is an exploration about the music; how it makes me feel and in turn how I feel dancers could move to it. Hopefully this piece has turned out to be visually interesting with how the dancers move in relation to each other.

“JUST SAY IT”
Elizabeth Henscheid,
Department of Theatre Arts
Faculty Sponsor: Marla Hansen

When I heard the music that I’m using for this piece, I immediately started choreographing. I knew at once that this was my piece and I had to do it. I choreographed the piece with one thing in mind, human experience, and one type of experience in particular. I wanted the movement to be driven by human emotions and motives. It’s not about the dance or the movement. It’s about why I, as a human being, move the way that I do. How can I express these emotions through my movement? What emotion, what event in my life, has caused me to move in such a way? It’s not about how I came up with the movement but rather, what caused me to create THIS movement.

“LESSON LEARNED”
Jennifer Waters,
Department of Theatre Arts
Faculty Sponsor: Marla Hansen

This piece is a dramatic, physical interpretation of the song, “Lesson Learned” by Alicia Keys. Many emotions will be displayed. The audience will see the words through the motion of the dancer. The intention of the artist is to create an intense feeling of sorrow yet also show a happiness that derives from loss. When people listen to music, they are not always taking in the actual meaning of the lyrics. Hopefully the audience will leave with a better understanding of the words they hear.

“THE SECRET LIFE OF GRASS STALKS”
Josh Belville and Katie Ponozzo,
Department of Theatre Arts
Faculty Sponsor: Marla Hansen

This was my first choreography piece, first performed in the Spring of 2006. My purpose is to take the dance training I have received over the past two years to improve and enhance the quality of the piece, as well as showcasing student dance and performance for an audience that might not get the opportunity to experience dance.

“She’s Like the Wind”
Lacey VanderBoegh,
Department of Theatre Arts
Faculty Sponsor: Marla Hansen

This piece is simply the feeling of music and sound. The title “She’s Like the Wind” is the same as the title of the song, but it captures my thought of how this performance should unfold. She is moving through space like wind. I want this piece to make the audience breathe a little softer, and to get lost in the movement.
This performance piece, Road/Elements of Journey, was originally written as the final performance project for last semester’s class, Development of Theatre III: Contemporary Forms and was performed last December in its finished form. It combines spoken text, piano music, sung text, and dance into a single work. Inspiration came from the landscape drama work of Gertrude Stein. The purpose of this piece is to delve into the complexity of humanity’s road to addiction.
EFFECTS OF FINITE LAYER THICKNESS IN DOUBLE QUANTUM WELL SYSTEMS

J.J. Durrant (McNair Scholar),
Department of Physics
Faculty Sponsor: Charles Hanna

We have calculated the effects of the finite thickness of electron or hole layers in double-quantum-well systems on the complete set of differential capacitances that can be measured in double-layer electron systems, with or without separately contactable layers. We present results for the regime of negligible interlayer tunneling, zero applied magnetic field, and low layer densities, when the compressibility of one or both layers is negative.

ULTRAVIOLET RAMAN SPECTROSCOPY OF BaTiO3 ULTRATHIN FILMS AND BaTiO3/SrTiO3 SUPERLATTICES

Paul Turner, Department of Physics
Faculty Sponsor: Dmitri Tenne

Ferroelectrics, materials possessing a spontaneous, switchable electric polarization, have a high potential for various device applications. Ferroelectric nanostructures, such as ultra thin films and superlattices, are increasingly central to the field of ferroelectrics. The dynamics of crystal-lattice vibrations are essential to understanding their fundamental properties. Ultraviolet (UV) Raman spectroscopy is a novel tool in the study of ultra thin films. We applied UV Raman spectroscopy to the study the phase transitions in ultra thin BaTiO3 films and BaTiO3/SrTiO3 superlattices. Conventional Raman spectroscopy, which uses visible excitation, is not ideal because the light penetrates deeper into the sample, allowing the signal from the substrate to dominate the spectra. UV Raman spectroscopy, on the other hand, uses ultraviolet light that is absorbed by the film so the substrate contribution is suppressed. The films and super lattice structures were grown using molecular beam epitaxy. We have studied the ferroelectric phase transitions in BaTiO3 thin films and BaTiO3/SrTiO3 super lattices and how those phase transitions are affected by layer thickness and strain.

SEISMIC EXPLORATION ON BENCH GLACIER, ALASKA

Tabish Raza, Department of Geosciences
Faculty Sponsor: John Bradford

Seeing with sound is a familiar concept subma­­riines and bats do it. In darkness we can gain a sense of our space by listening to the echoes of our foot steps. Seismic reflection is a method that we use to image the interior of Bench Glacier, Chugach Mountain Alaska. During August 2007 we acquired seismic reflection data to obtain information about the structure of the ice, elastic properties of ice and basement topography. Here we present the analysis of compressional and shear wave velocity experiment on Bench Glacier. Elastic properties (such as Young’s Modulus and Shear modulus) of ice on the glacier may help understand the glacial processes such as fracturing and slip movement along the bed rock. This information can help us understand the glacial dynamics of Bench Glacier which may explain the effects of climate change on the glaciers around the world. Seismic reflection method involves the measurement of the two-way travel time of seismic waves transmitted from surface and reflected back to the surface at the interfaces between contrasting geological layers. Reflection of the transmitted energy will only occur when there is a contrast in the acoustic impedance (product of the seismic velocity and density) between these layers. The
strength of the contrast in the acoustic impedance of the two layers determines the amplitude of the reflected signal. The reflected signal is detected on surface using an array of high frequency geophones. From compressional wave data we were successfully able to image the bedrock under the Bench Glacier. Shear wave data helps us determine the glacial dynamics.

ALEXANDER ROOM
2:00 PM – 3:15 PM

Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within this session.

INTERNAL CONFLICT IN SUB-SAHARA AFRICA

Erik Person, Department of Political Science
Faculty Sponsor: Ross Burkhart

Sub-Sahara African nations have been infamous for their brutal conflicts that have taken the lives of millions of civilians, with millions more displaced. What distinguishes these conflicts is their nature of low intensity warfare, cyclically unstable state, the direct targeting of civilians, the extremely brutal nature of the killing of civilians, and the division of fighting elements along ethnic lines. Why are these ethnic conflicts so brutal and how do they sustain their level of violence for so long? Many researchers have concluded that it is due to ancient rivalries that have been in existence since primordial times. With little scholarly work having been done to study possible variables that cause these conflicts, I purpose that there are other reasons for these conflicts than just ancient ethnic hatred. This study tests using OLS regression three variables against the dependent variable which is an average score derived from the length of the conflict, number of displaced people, and the number of lives lost. Increases in political freedom, and high levels of government spending on the military are not statistically significant, with increase in urbanization, statistically significant in decreasing the intensity of conflicts. The conclusion of this research is two parts; one is that there needs to be more research done with an increase in the quality and quantity of data in all areas in all of the nation-states in Sub-Sahara Africa. My model is representational of the low quality and quantity of data that is available for researchers. The findings of these variables lead to more questions and no definitive answers, as in the case of political freedom having a positive relationship with the intensity of conflict.

HUMAN RIGHTS & MULTILATERAL DEVELOPMENT BANKS: EVALUATING RECIPIENT RECORDS & LENDING PRACTICES

Geneva Román (McNair Scholar and Honors College), Department of Political Science
Faculty Sponsor: Ross Burkhart

This study examines the role of recipient human rights records in the loan allocation of multilateral development banks. Correlating the loan amounts awarded to recipients with their human rights environments determines whether or not human rights are a substantial consideration in multilateral lending practices. By analyzing the African Development Bank, African Development Fund, Inter-American Bank and the International Monetary Fund this study also sheds light on whether international financial institutions are upholding their legally bound human rights obligations. This study uses Ordinary Least Squares and General Least Squares regression models and finds that human rights have little effect on the lending process. Human rights are not a substantial consideration in multilateral lending practices and multilateral development banks are not fulfilling their international legal obligation to advance human rights. It is up to international political institutions to ensure that they do.
GLOBALIZATION AND THE AMERICAN INCOME GAP: ASSESSING THE IMPACT OF LIBERAL ECONOMICS AND IMMIGRATION ON INEQUALITY

Simon Tu (McNair Scholar),
Department of Political Science
Faculty Sponsor: Ross Burkhart

While enjoying the most rapid economic growth of all large industrialized nations, inequalities in the distribution of income have grown faster in the United States than in most developed nations since the late 1960s. Previous empirical analysis examined the effects of increasing globalization on income inequality by employing a definition of “economic globalization” that focuses solely on the neoliberal variables of international trade and capital flows. By excluding international labor flows from the definition of economic globalization, previous studies ignored an essential factor of production and assessed the effects of globalization on income disparities inaccurately. This study assesses the impact of increasing international integration on the American income gap through an empirical examination of trade, capital and labor mobility. The research relies on ordinary least squares regression to test the relationship between the three major modes of neoliberal economic integration—trade, foreign direct investment (FDI), portfolio investment—and international labor mobility—authorized and unauthorized immigration—on an income inequality ratio for the years 1980 to 2005. Of the model’s five variables, three are statistically significant. By expanding the definition of economic globalization to include international labor mobility, this work contributes to the literature and extends the debate into the area of the demographic change in the unauthorized population in the United States.

VOTER TURNOUT IN STUDENT ELECTIONS: A MULTIPLE REGRESSION ANALYSIS OF ELECTIONS FOR THE ASSOCIATED STUDENTS OF BOISE STATE UNIVERSITY

Britton Holdaway,
Department of Political Science
Faculty Sponsor: Ross Burkhart

Rice and Lewis (2005) performed a regression analysis on student government elections held at 94 universities spread across the United States. The results of their model show significant relationships between institutional and demographic factors in voter turnout in those elections. Additionally, their model showed a possible correlation between voter turnout in local elections and student government elections. The intent of this research is to investigate whether the model developed by Rice and Lewis accurately explains voter turnout in student elections at Boise State University. This research will test whether the variables determined by their model are significant relative to the Associated Students of Boise State University (ASBSU), and it will test whether there is a correlation between voter turnout in local elections and student elections. Finally, the research will investigate if there are any other factors not included in Rice and Lewis’s model that significantly explain voter turnout in ASBSU elections. The results of this study will allow for a better understanding of student involvement in university governance, as well as give additional knowledge to voter behavior in general. The results could be useful in helping student leaders activate more students in university and community involvement, as well as add insight into how people vote as an aggregate in normal elections.
Each podium presentation will be 10 - 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session.

GENDER, COMPETITION, AND POWER IN TOY RACE TRACK COMMERCIALS

Veronica DeGiorgio, Department of English
Faculty Sponsor: Gail Shuck

As time passes, television is becoming ever-more important influence on the perceptions and identities of those who watch it. Language is a powerful tool that can be used to assert power and endorse ideologies in subtle ways, and for television, be it a soap opera, a sitcom, or even a commercial, language is its stock and trade. Humans can use language to create a sense of authority in one group and inferiority in another, of camaraderie between some groups and insurmountable differences between others. This power of language becomes especially important when discussing children, who are still developing their identities as individual human beings and as members of a larger society. This impressionability, coupled with the unprecedented amount of time that contemporary American children spend watching television, gives the medium a great amount of influence over the nation’s youths. In this discourse analysis, several commercials featured during the same young adult program were reviewed, and two in particular were selected. Both advertised similar products: a toy race track. One of the products targets young males, while the other targets young females. The language used was examined to determine which gender ideals and stereotypes are affirmed, and which are challenged. Articles on gender in television advertising, as well as sources focusing on gender and language in general, were used to gain a clearer understanding of the way that commercials portray gender and perhaps influence gender identity. The results of close analysis of the commercials, however, revealed that the situation is more complex than one might expect, and that traditional gender stereotypes for both sexes may at times be simultaneously rejected and confirmed.

SLAYING STEREOTYPES: A CONTENT ANALYSIS OF MENTAL ILLNESS IN “BUFFY THE VAMPIRE SLAYER”

James Gatfield, Department of Communication
Faculty Sponsor: Rick Moore

The mentally ill typically find themselves inaccurately portrayed in the media, as everything from “psycho monsters” to “bumbling fools.” This can encourage dangerous stereotypes about the mentally ill, hampering necessary treatment and research. In order to combat this, quality media that positively portray the subject need to be recognized. The focus of this project was to perform a content analysis on the portrayal of mental illness in the popular television series Buffy the Vampire Slayer. Prior to the research, three hypotheses were created to guide the analysis:

H. 1: Buffy contains examples of mental illness present in the characters of Angel, Drusilla, and Willow.

H. 2: Each character represents one particular mental illness: Angel-Dissociative Identity Disorder; Drusilla-schizophrenia; Willow-drug addiction.

H. 3: Buffy presents a positive representation of the mentally ill.

The characters were chosen in order to gain an accurate cross section of the material. This allowed the research to account for differences between heroes and villains, and examine varying types of mental illness. Next, they were analyzed in four areas: behavior, behavior of other characters, relationship to world, and relationship to other characters. The research found that whereas each character featured both positive and negative aspects to their portrayals, the series overall approached mental illness from a realistic perspective. Mental illness did not define characters, rather, enriched them. The mentally ill in Buffy struggled to cope with society in a manner similar to the real world. These findings suggested that Buffy, despite being frequently dismissed due to its subject matter, is filled with rich material that allowed viewers to ponder mental illness in a controlled environment that mirrors the real world.
MOTIVATIONS OF EXTENDED JAZZ WORKS WITH A VIEW TO THE ADVANCEMENT OF JAZZ

Nicolas Wynkoop (Honors College),
Department of Music
Faculty Sponsor: Mike Samball

My research focuses on the development of jazz works of extended forms. It addresses the types of motives and conditions that have historically led artists to create extended works. For example, consider economic, political, and racial factors. Jazz has been through the most trying and moving periods of tension and resolution in our country, highlighting divisions, and sometimes in breaking them down. Another motive is the technological advance in recording, and the growth of the movie industry. As technology opened doors, jazz was there to go through them. Further motives include creativity, convictions, and religion of artists, and the spark created when they collaborate. This discussion be conducted by examination of pivotal extended pieces of jazz history; pieces such as Duke Ellington’s “jazz symphony” Black, Brown, and Beige, or John Coltrane’s “jazz suite” Ascension. Particularly, I will note the development of these pieces, from composition, to project financing, to the performance setting, to its performers, and to its public reception. Special attention will be given to the blurring of divisions between improvisational soloing and composing, between arranging and performing, and between form and action. Jazz is a place where composition and solos may only differ in the time they take, where arranging and performing soar together to new heights with complex chord structures, and where action may begin by following form, but action may also begin to dictate form.

PHOTO COURTESY OF NICOLAS WYNKOOP

BARNWELL ROOM
2:00 PM – 3:15 PM

Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within this session.

MAKING IT STICK: HOW RESEARCH INFLUENCED THE VIEWBOOK FOR THE BSU SCHOOL OF SOCIAL WORK

Adrienne Martin, John Waite, Ron Youhouse, Alexis Wible, Suzanne Ivie, Laura Ball, and Tim Maxfield,
Department of English
Faculty Sponsor: Russell Willerton

A recent New York Times bestseller called ‘Made to Stick’ outlines six qualities that make a message powerful and memorable, or “sticky.” These qualities are simplicity, unexpectedness, concreteness, credibility, emotions, and stories. The School of Social Work needs to update the ‘viewbook’ that introduces its programs and faculty to people across the valley and the state. We are using an online collaborative tool called a wiki to share information about social work and to discuss what makes a message “sticky.” Our presentation will show the wiki we used, what we learned from using it, and how we applied that information to the viewbook.

PHOTO COURTESY OF NICOLAS WYNKOOP
THE CONSTRUCTION OF POBLANO IDENTITY IN COLONIAL ART AND ARCHITECTURE: TALAVERA POTTERY AND CATHEDRAL ARCHITECTURE, 16TH - 18TH CENTURIES

Vivianne Sanchez (McNair Scholar),
Department of Art
Faculty Sponsor: Janice Neri

During colonization in the 16th century both the Spanish and indigenous population underwent a dramatic cultural change that art historians constantly research. Puebla, Mexico reveals layers of identity through a different approach Spain utilized to pursue to build its society. As Mexico’s first industrialized city, it is also the first Mexican city that was not built upon existing indigenous civilization. Because of this difference in cultural assimilation, Poblanos consisted of indigenous people and Spanish encomenderos, similar to land owners, who were organized together at the turn of the 16th century. Through cathedral architecture and Talavera pottery, an ambiguous sense of identity is created. Cathedral architecture offers a window into how the Church used shared symbols of the sun and moon between Christianity and Aztec beliefs to peacefully assimilate the two cultures. This may have proven not to be the most effective method of converting the indigenous population but nevertheless offers the reader a visual method used in merging cultures. Talavera pottery in Puebla becomes a staple of the city’s art craft, which holds its roots in both indigenous and Spanish production. Underneath the European decorative style is an ancient pottery technique that conveys the message of two cultures fused together to create a distinct, Poblano identity. The same metaphor of Old World Spain wrapping itself around New World indigenous beliefs is examined in cathedral architecture. Visually, the styles are characteristic of Spanish Baroque with an underlying tribute to Mesoamerica’s ancient past. This research takes a look into the possibilities of these two art forms examining a visual bridge between two very different worlds with shared roots.

THE USE OF MULTIPLE COMPARISON WITH LONG MEMORY PROCESSES AND ITS APPLICATION TO STOCK RETURNS

Jason Arnold (McNair Scholar),
Department of Mathematics
Faculty Sponsor: Jaechoul Lee

Recent empirical results indicate that many financial time series, including stock volatilities, often have long memory dependencies in which distant observations are still highly correlated. Comparing volatilities in stock returns is a crucial part of the risk management of stock investing. The study develops multiple comparison methods for comparing individual mean volatilities of stock returns using an ANOVA (Analysis of Variance) model with long memory errors. The proposed statistics are modified versions of current multiple comparison methods based on uncorrelated error assumptions. The performance of the methods will be examined via a Monte Carlo Study. I will elaborate suggested methods with a simulation study using R or other relevant statistical software. For an exposition of the new multiple comparison procedures with long memory time series data, I will collect several stock data with long memory pattern and compare their mean volatilities by applying the proposed multiple comparison procedures. Based on their results, our goal is to more accurately assess the volatilities of stock values.
THE PUBLIC REPUTATION OF ADA COUNTY

Shira Heikkola, Department of Communication
Faculty Sponsor: Mary Frances Casper

The purpose of this case study was to explore how the public relations efforts within Ada County have portrayed the area's public reputation, and how the people of the area and nation have perceived that public reputation. Research attempts to show how public relations experts in the area have used the framing theory to emphasize the positive aspects of the county while de-emphasizing the more negative aspects. This has resulted in a positive public reputation within Ada County and the nation as a whole.

FARNSWORTH ROOM
1:00 PM – 2:00 PM

Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session.

THE FUNERAL THAT NEVER ENDS

Chad Mendenhall, Carolyn Sproat, and Meredith Borud, Department of Communication
Faculty Sponsor: Laurel Traynowicz

This study used Bakhtin’s Theory of Dialogics and Baxter’s Dialectical Theory of Relationships to examine the five communicative strategies that are commonly used among loved ones, family members and the dying, when preparing for an imminent loss or when coping with postdeath. Bakhtin’s theory suggests that a centripetal force propels everyday routines and a centrifugal force disrupts these routines, in this case, death. Baxter enhances the Dialectical Theory of Relationships with Bakhtin’s Theory of Dialogics by acknowledging dialogue as a dynamic process that regulates three specific tension clusters within relationships. The results of this study revealed five specific communicative techniques that are essential in coping with loss and bereavement within the context of professional and proletarian situations. These techniques are physical touch, frequent visits, humor, dialogue/personal narrative, and listening. Interview and survey results indicate that the five communicative techniques create a therapeutic climate and dialogue that renegotiates and adapts the ordinary patterns of life prior to a centrifugal force such as death. Data concerning dialogue and the five communicative techniques described show significant positive outcomes in regards to death and death-coping strategies.

THE CREATION OF IDAHO’S FIRST HEALTH SYSTEM: THE MERGER OF ST. LUKE’S AND MAGIC VALLEY REGIONAL MEDICAL CENTERS

David McPeak, Department of Communication
Faculty Sponsor: Mary Frances Casper

This case study looks at the merger of Magic Valley Regional Medical Center and St. Luke’s Regional Medical Center in May, 2006. This study looks at the efforts made by St. Luke’s to communicate to its publics, and is done through the lens of situational theory of communication. Research included interviews with key strategy developers and implementers, and the analyzing of internal documents and news media that reveal the key messages utilized to secure a successful outcome.

PERCEPTIONS OF BOISE STATE UNIVERSITY STUDENTS REGARDING THE STUDENT HEALTH CENTER

Kimberly Rider, Alex Servatius, and Lani Sosnowski, Department of Health Science Studies
Faculty Sponsor: Lee Hannah

Background: The researchers had heard reports from students that they were reluctant to seek care from the Student Health Center (SHC) if they had
a sensitive health issue because of confidentiality concerns (i.e. concerns about being seen by others at the SHC).

**Purpose:** To determine if SHC confidentiality is a concern for students and if the level of concern varies with age or year in school.

**Methods:** To assess student perceptions regarding the SHC, the researchers developed a one-page survey, which was tested with a small number of students for readability and understanding. Surveys were distributed to classes across campus during scheduled class times. An attempt was made to select classes at different course levels within different colleges. Students enrolled in these classes were asked to voluntarily complete the survey, which asked demographic questions, as well as questions about their use of the SHC, where they would seek care if they had a sensitive health issue, and concerns they have with the SHC. Data were analyzed using SPSS.

**Results:** A total of 406 students completed the survey, with all classes and locations having over a 90% response rate. Overall, 116 (29%) students reported having been to the SHC. Of those students, 9.5% reported being concerned about being seen by other students at the SHC, 1.7% thought that their professors could access to their personal information, and 11.2% were concerned about discussing sensitive health issues with SHC staff.

**Discussion:** This study found that a small percentage of students are concerned about using the SHC and some have misconceptions about who can access their personal information. Results will be shared with campus health center staff to improve the information given to students about the SHC.

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**PODIUM PRESENTATIONS**

**FARNSWORTH ROOM**

2:00 PM – 3:15 PM

*Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within this session.*

**DIFFICULTIES IN INTEGRATING TO DIASPORIC SOCIETIES FACED BY REFUGEE IMMIGRANTS FROM DEVELOPING COUNTRIES: AN EXPLORATORY STUDY OF SOMALI BANTU REFUGEES LIVING IN BOISE, IDAHO**

Fred Waweru (McNair Scholar),
Department of Sociology
Faculty Sponsor: Steve Patrick

This study explored the integration difficulties to the contemporary American lifestyle faced by Somali Bantu refugees resettled in Boise, Idaho. This refugee population has not become self sufficient even after being in the United States for three years, as compared to refugees from other countries who become self-supportive within as little as 6 to 8 months. The study analyzed Bantu refugee responses to a survey administered and translated in their native language. The significance of this study contributes a better understanding of the assimilation difficulties that Somali Bantu refugees face in the United States and will help resettlement agencies better serve this population.
DO SELF-ESTEEM AND PARENTAL AUTHORITY INFLUENCE SELF-REPORTED AGGRESSIVE BEHAVIORS?

Nicole Suenherud (McNair Scholar),
Department of Psychology
Faculty Sponsor: Mary Pritchard

Aggression is a primary concern throughout the United States and over the last 40 years many researchers have tried to understand how aggression manifests (Tremblay, 2002). The present study examined the relations between self-esteem, perceived parental authority, and aggression. Two-hundred sixty participants were asked about their aggressive behaviors, self-esteem, and perceptions of parental authority. Results indicated that perceived authoritarian parenting was negatively correlated with hostility and physical aggression. Self-esteem was positively correlated with perceived authoritative parenting. Individuals who reported lower levels of self-esteem also reported higher levels of anger and hostility. The present study can contribute to understanding how an individual’s perception of their parents can negatively influence their thoughts and behaviors.

OUT OF THE CLOSET OR UNDER THE RUG: AN ANALYSIS OF SAME-SEX DOMESTIC VIOLENCE IN IDAHO

Carol McHann (McNair Scholar),
Department of Criminal Justice
Faculty Sponsor: Lisa Bostaph

To date, there have been a limited number of studies that focus on the events of terror and injury, identified as domestic violence, as it occurs within the lives of homosexual couples. Through a review of academic articles and an analysis of government statistical data, this paper will address the prevalence of reported incidents of domestic violence within same-sex couples in the state of Idaho as compared to those reported nationally. The incidents of same-sex domestic violence within the state of Idaho will also be compared to incidents within heterosexual couples at the state and national levels to access the prevalence of domestic violence within same-sex couples by using heterosexual couples as the “norm”. This should enable the reader to make comparisons that enable one to understand the magnitude of domestic violence. The prevalence of such events should be evaluated to enable the enactment of programs applicable to the homosexual community that will inevitably be of benefit to all of society.
WALKING HOME ALONE:
EFFECTS OF DISCRIMINATION ON PERCEIVED SAFETY

Janie Gates (McNair Scholar),
Department of Psychology
Faculty Sponsor: Mary Pritchard

There has been a recent focus in the scientific literature on the psychological and health effects of discrimination (Broman, Mavaddat & Hsu, 2000; Jasinskaja-Lahti, Leibkind, Jaakkola & Reuter, 2006; Neblett, Philip, Cogburn & Sellers, 2006). The focus of this study was to determine if a) higher levels of perceived discrimination would experience lower levels of perceived safety, and b) the socially non-dominant populations would feel less safe. Participants were comprised of 274 students and university employees at a northwestern university. Each completed both the Perceived Discrimination Scale as well as the Perceived Safety Scale as well as some demographic information. Multiple regression found that perceived discrimination alone was the best predictor of perceived safety. However, groups' perceptions of safety did not differ significantly based on race, age, sex, weight, origin, or sexuality. This information is useful as an addition to the psychological consequences of psychology literature.

JORDAN BALLROOM
1:00 PM – 1:30 PM

Each reading will be approximately 5 to 7 minutes. Feel free to come and go within this session.

2008 PRESIDENT'S WRITING AWARDS

Winning students will read sections of their entries. (Winners to be announced in early April.)
Faculty Sponsor: Carrie Seymour

The President's Writing Awards originated over twenty years ago for the purpose of promoting and rewarding student academic writing. Over the past two decades, the contest has awarded prizes for a diverse selection of student essays in a number of different categories. Though largely funded by the English department, the contest solicits and encourages submissions from academic departments across the curriculum. Categories are carefully chosen each year to include many types of academic writing, including critical analysis, research reporting, and technical writing. We have also had specialized categories sponsored by various departments including Spanish, Business, and Education. Ultimately, the contest gives students a chance to highlight the work, both creative and research-based, that they have worked on during their academic careers in their specific disciplines. As the contest continues to grow we hope to see more and more types of research writing from as many departments as possible so that we can highlight the excellent work being done by students at Boise State University.
PODIUM PRESENTATIONS

LOOKOUT ROOM
1:40 PM – 2:35 PM

Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session. These presentations will be in Spanish.

LOS TÉLEFONOS, LOS CONTESTADORES AUTOMÁTICOS Y LOS COMAS: LA COMUNICACIÓN EN LAS PELÍCULAS DE PEDRO ALMODÓVAR?

TELEPHONES, ANSWERING MACHINES AND COMAS: COMMUNICATION IN THE FILMS OF PEDRO ALMODOVAR

Jessica Davidson, Department of Modern Languages and Literatures
Faculty Sponsor: Teresa Boucher

The characters in the films of the renowned Spanish filmmaker, Pedro Almodóvar, have the intention of communicating. They use television, telephones, and answering machines, but no word creates more clarity than non-verbal communication in the films of Almodóvar. Almodóvar makes us ask ourselves what is more important: the intention to have others listen or simply to speak? The voice can make noise or create words that carry importance and meaning. Almodóvar demonstrates that the world is full of questions, words, and phrases, but these forms of communication are not as authentic as acts of non-verbal communication. Almodóvar treats technology in terms of the disintegration of communication, while silence is converted into true communication. In our world where we have the capability to connect ourselves to whomever we please, whenever we please, we find ourselves unable to communicate sincerely and more alone than ever.

LA MATERNIDAD EN HABLE CON ELLA DE PEDRO ALMODOVAR

MATERNITY IN TALK TO HER BY PEDRO ALMODOVAR

Veronica DeGiorgio, Department of Modern Languages and Literatures
Faculty Sponsor: Teresa Boucher

La familia y el género, el sexo, son dos temas muy importantes en las películas del director español Pedro Almodóvar. Al empezar su carrera pocos años después de la muerte del dictador Francisco Franco, Almodóvar dispute las percepciones tradicionales del significado de la familia, la feminidad o la masculinidad. Representa personajes que construyen sus propias identidades, en vez de permitir que la sociedad les impongan estas identidades. Mi ensayo examina la construcción de la identidad en Hable con ella de Almodóvar y argumenta que la figura maternal más importante de la película es, en realidad, un hombre. Al examinar el papel de Benigno como cuidador contra el de su paciente completamente dependiente, Alicia,
espero probar que, en Hable con ella, la maternidad no es una cuestión de biología sino de un deseo de cuidar y proteger.

Family and gender are two very important themes in the films of Spanish director Pedro Almodóvar. Starting his career shortly after the death of the dictator, Francisco Franco, Almodóvar challenges traditional perceptions of what it means to be a family, a man or a woman, portraying characters who construct their own identities, instead of allowing these identities to be dictated to them by society. My essay examines the construction of identity in Almodóvar's Talk to Her, and argues that the most important maternal figure that appears in the film is, in fact, a man. Examining the role of Benigno as a caregiver against that of his totally dependent patient, Alicia, I hope to prove that, in Talk to Her, maternity depends less upon biology than it does upon a desire to care and protect.

LOS PERSONAJES MULTIGÉNEROS EN TODO SOBRE MI MADRE DE ALMODÓVAR

Erma Nezirevic, Department of Modern Languages and Literatures
Faculty Sponsor: Teresa Boucher

Pedro Almodóvar is not only considered a film director but also an auteur and a force for change in modern Spanish society. In his film Todo sobre mi madre (All About My Mother), Almodóvar creates various multi-gendered characters that serve as a mechanism for innovation, as well as a call for freedom of personal and artistic expression. Gender theory is expanded past specific gender categorizations. Each one takes on new meanings, and the definition of each gender becomes abstract. Transgender characters such as Lola and La Agrado represent the fluidity of gender and human sexuality, and how they influence interpersonal relationships. Even a heterosexual character like Manuela, who takes on many roles in the film, is represented in a multi-gendered manner. She acts as a mother figure as well as a spousal figure to those around her. Almodóvar shows a society that has evolved past Franco’s conservatism, and has discovered its ability to live without judgment and expectations that had masked people’s identities in the past.
PODIUM PRESENTATIONS

LOOKOUT ROOM
2:45 PM – 3:40 PM

Each podium presentation will be 10 – 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session. These presentations will be in French.

COUP DE SOLEIL COMME MARQUE DU DESTIN; LA TEXTUALISATION DU BANAL DANS LE SOLEIL DE SCORTA DE LAURENT GAUDÉ

SUNBURN AS A MARK OF DESTINY; TEXTUALIZING THE MUNDANE IN LAURENT GAUDÉ’S LE SOLEIL DE SCORTA

David Haisley, Department of Modern Languages and Literatures
Faculty Sponsor: Jason Herbeck

Situated among the olive trees of southern Italy, le Soleil de Scorta follows an impoverished family lineage marked by struggle against an unforgiving destiny. The power of the sun – and the signification of destiny – reign over a life of hardship and tension against which one must fight, and can never fight. A careful reading of Gaudé’s stylistic and lexical choices shows how the author uses a minimal style to textualize both the reality of a mundane life and the impossible ideal that refuses and embraces that very banality. The content, coded in the style, can then be addressed in regard to the implications of such stylistic choices on the flexibility of signification. It is worth considering whether the textual fixing of semantic interpretations forces the author to rely too heavily on common cliché, or if these very clichés are simply indicative of the timeless nature of his message.

UNE BREBIS DÉGUISEÉE EN LOUP / A SHEEP IN WOLF’S CLOTHING

Megan McCutchan, Department of Modern Languages and Literatures
Faculty Sponsor: Jason Herbeck

Inspired by Seuils du théoricien littéraire Gérard Genette, j’examinerai la manière dont la présentation de Parce que je t’aime [Because I Love You, April 2007] de Guillaume Musso finit par décevoir le lecteur. Quoique tous les éléments péritextuels (tout ce qui entourent le texte physiquement) du roman présente le roman comme un vrai roman de suspense, le lecteur se trouve en fin de compte trompé à la fin du livre. Pour mieux comprendre comment le péritexte influence—and qui plus est détourne—la réception du texte, on va se pencher sur cinq éléments péritextuels—l’image de couverture, le titre, la quatrième de couverture, la préface, les intertitres—and un élément textuel, la police. Comme une brebis déguisée en loup n’est pas aussi féroce qu’elle ne semble l’être, Parce que je t’aime n’est pas le grand roman de suspense qu’il paraît être à premi.
Inspired by literary theoretician Gérard Genette’s Seuils (Paratexts: Thresholds of Interpretation),
I will investigate how the presentation of Guillaume Musso’s Parce que je t’aime (Because I
Love You, April 2007) ultimately deceives the reader. Whereas each of the work’s peritextual elements (those physically accompanying the text) present the novel as a true suspense novel, the reader is sorely deceived at the end of the book. To better understand how the peritext influences—and moreover misinforms—the reader’s reception of the text, I will analyze five peritextual elements—the image on the front cover, the title, the back of the book, the preface and the inter-titles—and one textual element, the font. As a sheep disguised in wolf’s clothing is not as fierce as it may seem, so Parce que je t’aime proves to not be the great suspense novel that it first promises to be.

UNE SOCIÉTÉ ERRANTE:
UNE CRITIQUE SOCIALE DE LA DÉSORIENTATION DANS A L’ABRI DE RIEN PAR OLIVIER ADAM

A WANDERING SOCIETY: A CRITICAL ANALYSIS OF DISPLACEMENT IN A L’ABRI DE RIEN BY OLIVIER ADAM

Rhiana Quick, Department of Modern Languages and Literatures
Faculty Sponsor: Jason Herbeck

A l’abri de rien (August 23, 2007) par Olivier Adam nous offre un regard intime de la société moderne. Cette société dont les stéréotypes prédéterminées dictent les normes sociales, nous impose en plus un sens de solitude même si nous trouvons parmi des millions de personnes. Ce sont ces mêmes conditions sociales qui mènent Marie, la protagoniste, à abandonner sa famille sur un niveau émotif quand elle entreprend une quête pour retrouver le chemin d’une vie érodée de banalité. Je propose donc d’examiner cette société errante à deux niveaux. D’une part, il s’agira de Marie qui erre sans chemin précis à cause de son indifférence par rapport à la vie. D’autre part, je me pencherai sur les Kosovars, un peuple émigré d’un pays ravagé par la guerre et la violence et auprès de qui Marie s’engage comme bénévole dans sa quête pour trouver de la signification dans sa vie.

In A l’Abri de rien (Sheltered From Nothing, August 23, 2007) Olivier Adam seamlessly crafts a reflection of modern society that fosters a sense of solitude in a world surrounded by others and whose predetermined stereotypes dictate the omnipresent societal norm. This stifling climate leads the main character, Marie, to emotionally abandon her family when she embarks on a quest to find meaning in a life eroded by feelings of triteness. Consequently, I propose a two-fold discussion that delves into the very meaning of a wandering society. Marie is representative of a society that wanders because of its indifference with respect to the banality of its existence, and the Kosovars—a group of refugees to whom Marie devotes all of her time and energy in a futile attempt to reclaim a sense of meaning in her own life—represent a society that literally wanders without a country or home.
As medical advancements continue to grow the analysis of membrane proteins is becoming ever more important. The malfunction of many membrane proteins is responsible for numerous diseases, such as Cystic Fibrosis. Traditional protein separations and analysis are difficult with membrane proteins. Nonaqueous Electrical Field Flow Fractionation (EFFF) is viable alternative for membrane protein separation in which proteins retain native confirmation. The separation of two fluorescently labeled proteins, as well as design factors that effect separation were investigated. It was found that surface roughness is key to separation.

**PROBING INTERFACIAL WATER IN CONFINED SPACES WITH A NOVEL CANTILEVER BASED OPTICAL INTERFACIAL FORCE MICROSCOPE**

Thanh Tran, Department of Physics
Faculty Sponsor: Byung Kim

The study of water structures in locally confined spaces is extremely important due to the limited knowledge of the interfacial phenomena of water at nanometer scales. Water molecules adjacent to other materials will rearrange to form “interfacial water”. In confined spaces, such as in the vicinity of an interface or in a biological cell, the structured interfacial water is thought to behave differently from bulk water to a substantial degree affecting the chemical and mechanical properties of a surface. A cantilever based optical Interfacial Force Microscopy (COIFM), a newly developed novel scanning probe technique at Boise State University, is used to probe the structure of interfacial water confined between two silica surfaces. The COIFM allows direct measurement of the interfacial forces due to water between the tip and the silicon sample for all distance regimes without modulation or bending the cantilever to avoid the disruption of water layer. The thickness of interfacial water was controlled by a humidity control system developed for this specific experiment. The sensitivity of the piezotube scanner in the z-direction was precisely calibrated using the Michelson-Morley interferometry method to improve the measurement accuracy of the water structure. Preliminary data acquisition taken in an ambient environment using...
COIFM indicates that periodic ordering features of interfacial water varies depending on the thickness of water layer between two silica surfaces. The origin of the ordered feature in the “interfacial” water may come from the interaction between the hydrogen-bonded network of water and the atomically flat silicon oxide surface.

GRAPHITE INTERCALATION PROCESS IN PERCHLORIC ACID SOLUTIONS STUDIED BY ELECTROCHEMICAL-SCANNING TUNNELING MICROSCOPY AND CYCLIC VOLTAMMETRY

Travis Reynolds, Department of Physics
Faculty Sponsor: Byung Kim

Highly oriented pyrolitic graphite (HOPG) and perchloric acid (HClO₄) were adopted as a model host and a model guest, respectively, in graphite intercalation compounds. In this type of compound, the graphite layers of HOPG remain largely intact and the guest molecules of perchloric acid are located in between. We investigate the electrochemical anion intercalation process in the graphite layer by using cyclic voltammetry and electrochemical scanning tunneling microscopy (EC-STM) to understand the interaction between the host and the guest. The cyclic voltammetry data shows four peaks at the potentials of working electrode between 0V and 1.0V with respect to the silver quasi reference electrode (Ag-Qref) in a 2M solution. The data suggests that the intercalation process has four different stages in which each stage compound has different ratio between the host layer and the guest ions. Every host layer is not necessarily occupied by guest ions between two graphite layers in the graphite intercalation compound. EC-STM was performed subsequently in the same electrochemical cell to obtain topographic information for each stage. The change of step height between two terraces of the HOPG surface supports this intercalation process. Further cyclic voltammetry measurements were performed over several potential scan cycles on the graphite surface as a function of the acid concentration from 0.1 M to 6 M with varying scan rate from 10 mV/s to 1000 mV/s to see the concentration dependence and the response time for the intercalation reaction. The cyclo-voltammetry and EC-STM data of gold (Au) sample in 0.05 M solution of sulfuric acid (H₂SO₄) will be discussed as a comparison system.

THREE-DIMENSIONAL STRUCTURE OF CONOTOXIN TX3A: A M-1 BRANCH PEPTIDE OF THE M-SUPERFAMILY

Matthew Turner, Department of Chemistry and Biochemistry
Faculty Sponsor: Owen McDougal

Here we provide a three-dimensional solution structure for the m-1 conotoxin tx3a found in the venom of Conus textile. The 15 amino acid peptide, CCSWDVCDHPSCTCC, has disulfide bonds between Cys1 and Cys14, Cys2 and Cys12, and Cys7 and Cys15 typical of the C1–C5, C2–C4, and C3–C6 connectivity pattern seen in m-1 branch peptides. The tertiary structure of tx3a was determined by 2D 1H NMR in combination with the combined assignment and dynamics algorithm for nuclear magnetic resonance (NMR) applications CYANA program. Input for structure calculations consisted of 62 inter- and intra-proton, 5 phi angle, and 4 hydrogen bond constraints. The root-mean-square deviation values for the 20 final structures are 0.32 +/- 0.07 Å and 0.84 +/- 0.11 Å for the backbone and heavy atoms, respectively. Surprisingly, the structure of tx3a has a “triple-turn” motif seen in the m-2 branch conotoxin mr3a, which is absent in mr3e, the only other member of the m-1 branch of the M-superfamily whose structure is known. Interestingly, injection of tx3a into mice elicits an excitatory response similar to that of the m-2 branch peptide mr3a, even though the conotoxins have different disulfide connectivity patterns.
DEVELOPMENT OF A DEPLOYABLE URANIUM SPECIFIC SENSOR

Richard Cox, Department of Chemistry and Biochemistry.
Faculty Sponsor: Dale Russell

Present analytical techniques to characterize uranium groundwater concentrations are severely limited as they are laboratory based or require large, bulky, high voltage equipment. A field-deployable method is highly desirable to quickly ascertain uranium groundwater concentrations in applications including remote or inaccessible regions. Described is the development of a sensor that is hand-held with sensitivity at sub-ppb concentrations. Calix[6]arene has shown a high affinity for the most common species of uranium in groundwater, the uranyl ion. Optimization of sensor performance is in progress using several thiophene based semiconducting polymers. These are electrochemically deposited on a platinum electrode. Subsequent chemical modifications yield a polymer with an attached calix[6]arene group. Cyclic voltammograms are obtained at various concentrations of aqueous uranyl nitrate solutions. The electrochemical current response at the bound uranyl ion reduction potential shows good correlation versus the logarithm of the concentration.

AN AFM-FET BIOSENSOR FOR PROTEOMIC SCREENING

Joseph Holmes, Department of Physics
Faculty Sponsor: Byung Kim

The Atomic Force Microscope (AFM) and Field-Effect Transistor (FET) technology were integrated into one functioning biosensor for the use of measuring single molecular interactions between proteins. The AFM-FET biosensor has advantages over current drug screening techniques, since it is faster and records single interactions accurately. Using AFM force-spectroscopy, a flexible PEG cross-linker with the protein biotin, was attached to the AFM cantilever. The PEG cross-linker reduced steric hindrance between the biotin and its ligand called avidin, which was tightly bound to the palladium gate surface of the FET. The measurements were made by approaching the cantilever with biotin towards the avidin located on the FET. After contact, the AFM retracted the biotin and the unbinding data was recorded by AFM as force vs. distance and the FET as current vs. distance. The affinity of the receptor system was judged via chemical potential and rupture force.

HIGH-SPEED ATOMIC FORCE MICROSCOPY COMBINED WITH OPTICAL MICROSCOPY FOR BIOLOGICAL STUDIES

Edward J. Kim, Jeremy R. Bonander, and Byung I. Kim; Department of Physics
Faculty Sponsor: Byung Kim

A high-speed atomic force microscope is combined with high-resolution optical microscopy by using a transverse optical beam detection (TOBD) scheme to obtain the dynamic information of biological systems from molecular to the cellular level. TOBD allows the optical objective lens to be closer to the sample surface, thus allowing higher resolution of the optical microscope. Detailed theoretical analysis supporting this concept suggests that the deflected laser beam moves along the direction parallel to the long axis of the cantilever than the direction normal to the surface by two orders of magnitude when the cantilever is pulled downward due to an external force. A high-speed atomic force microscopy (AFM) combined with an optical microscope has been constructed using a commercially available cantilever with the integrated ZnO thin film to increase the bandwidth of the z-direction movement under force feedback during data acquisition. High-speed imaging with line-scan speed 2 cm/sec is routinely obtained on a periodic two-dimensional grating structure, showing that the line-scan speed is 100 times faster than commercially available AFM that...
employs a normal piezo-tube. We demonstrated that the integrated system can also offer high resolution topographic information at the location where the optical image is collected. Due to the excellent capability locating the tip on the desired position with precise piezo-tube, stable force - distance curves are collected locally and shows different force curves from e-coli and staphylococcus. These demonstrations suggest that the high-speed AFM in conjunction with high-resolution optical microscope provide a new opportunity for the biological studies from the nanometer scale to the cellular level through complementary information.

SYNTHESIS OF THIOPHENE-BASED MONOMERS AND CORRESPONDING POLYMERS FOR USE AS CHEMICAL SENSORS OF POLLUTANT BENZENE MOLECULES

Lisa Young (Honors College) and Matt Haga, Department of Chemistry and Biochemistry
Faculty Sponsor: Don Warner

Benzene is a toxic and carcinogenic chemical that has been found to pollute waterways and soil by its release as waste from factories, motor exhaust, and a variety of other sources. Potential chemical sensors for containment such as benzene include molecular imprinted polymers (MIP's), formed by electro-polymerization of certain monomers onto a metal surface, creating a network of conductive pi bonds and a precise pattern of pockets to attract and trap a specific molecule. When an electric potential is applied to the MIP in the presence of that molecule, a current is induced whose intensity correlates to pollutant concentration. The goal of this project is to synthesize and optimize an MIP that can specifically capture benzene molecules and allow the detection and quantification of benzene concentration in natural samples.

Fermentative Hydrogen Production from Sugarbeet Byproduct

Tina Zitlau, Chuck Cato, Kim Kreider, J.D. Ward, and Kevin Feris, Department of Biology
Faculty Sponsor: Kevin Feris

The U.S. has set a goal to reduce its usage of gasoline by 20% in the next ten years, by 2017. One means of obtaining this goal is development of alternative energy sources such as bio-hydrogen. Our research focuses on manufacturing hydrogen cleanly via bacterial fermentative metabolism using a low cost local agricultural sugar beet byproduct, concentrated separator byproduct (CSB). In the first phase of our experiment we will determine the ideal ratio of fungal enzyme extract: CSB yielding the highest quantity of fermentable sugars. Sugar content of treated CSB will be determined via high performance liquid chromatography (HPLC). In the second phase of our study we will ferment the sugars released from CSB using both a single species and mixed microbial cultures to determine which system yields the highest amount of hydrogen gas as determined via water displacement. Sugar consumption and organic acid and alcohol production will be measured to determine efficiency of H₂ generation. All experiments will be performed using batch reactors holding pH and temperature constant at the ideal values previously published. We expect our experiments to show that CSB is a viable substrate for hydrogen production on a small scale and warrants further investigation on the industrial scale.
IDENTIFYING OVERWINTERING SITES FOR WEST NILE VIRUS IN SOUTHWEST IDAHO, A SERVICE LEARNING PROJECT FOR BIOCHEMISTRY LAB

Kelly Katula, Kelly Pease, and Andrew Ormond;
Department of Biology
Faculty Sponsor: Ken Cornell

West Nile Virus (WNV) is an emerging infectious disease threat that causes West Nile Fever and West Nile Encephalitis. WNV is classified as a Flavivirus (single stranded RNA virus) related to Dengue, Yellow fever, and Hepatitis C. The virus is spread by the bite of common culicine mosquitoes and infects a broad number of species, but is primarily a disease of birds. Humans and horses are secondary hosts. Since its arrival in New York in 1999, the virus spread rapidly across the country and reached Idaho in 2003. In 2006, Idaho was the leading state in the country for WNV disease with nearly 1000 cases and 21 deaths. The disease was most prevalent in southwest Idaho. In order to better plan for future abatement measures, mosquito samples from locations around Ada and Canyon counties are being collected and analyzed for WNV to determine if there are overwintering sites where the virus can re-emerge to cause new seasons of epidemics. Preliminary results of these service learning investigations by Biochemistry laboratory students will be presented.

BIOCHEMICAL CHARACTERIZATION OF ENTAMOEBA HISTOLYTICA MTA NUCLEOSIDASE

Daniel Quapp and Emily Barnhart,
Department of Chemistry and Biochemistry
Faculty Sponsor: Ken Cornell

Entamoeba histolytica is a protozoan parasite that causes amebiasis, an enteric dysentary that afflicts approximately one quarter of the worlds population. Of these, some 260 million cases do not respond to current therapies. As with other parasitic protozoans, Entamoeba histolytica is unable to synthesize its own purines or methionine, and thus has developed unique salvage pathways to obtain and recycle these compounds. In order to develop new and better therapies for treating amebiasis, the gene encoding the central salvage pathway enzyme, 5’ methylthioadenosine nucleosidase (MTN) was identified, cloned, and expressed as a recombinant protein in E.coli. Purified recombinant Entamoeba MTN was biochemically characterized and the actions of a number of substrate analogs examined for their potential to inhibit this enzyme. Several inhibitors were potent inhibitors of the enzyme and are potential lead drugs to treat amebic dysentery.

IN VITRO FORMATION OF NOVEL DNA-PROTEIN CROSS-LINKS BY AN UNSUBSTITUTED, SYNTHETIC AZIRIDINOMITOSENES

Katherine M. McHail and Emma Mcinturff,
Department of Biology
Faculty Sponsor: Don Warner

Aziridinomitosenes, a class of synthetic compounds, have been shown to form DNA interstrand cross-links and DNA-protein cross-links (DPCLs). The occurrence of these DNA adducts are significant for three reasons. First, aziridinomitosenes were previously known for the formation of less toxic DNA monoadducts. Second, DPCL formation has been unobserved in any of the mitomycins and related compounds. Finally, the observed biological activity of aziridinomitosenes is very similar to that of mitomycin C, a naturally occurring antitumor compound that forms DNA interstrand cross-links that lead to cell death. The cytotoxic effect of DPCLs relates to their ability to obstruct DNA-associated protein complexes and disrupt key biological processes. Research pursuing cellular DNA repair suggests DPCL lesions are less likely to be restored and consequently, may have
increased therapeutic importance. DPCL activity will be investigated by treating DNA with a combination of each of the mitosenes and a cellular protein, the latter potentially acting as a nucleophile towards any electrophilic site(s) present in employed mitosenes. Specific attention will be paid to various DNA-minor groove-binding proteins. Additionally, the reactivity of mitosene analogs towards linearized duplex plasmid DNA will be explored. The proposed experiments will further investigate interactions occurring between aziridinomitosenes and the cellular genome, provide insight into the hypothetical mechanism by which aziridinomitosenes are proposed to cross-link DNA and/or protein, and assist in the development of a more effective cancer-targeting pathway.

COMPARING THE BIOPHYSICAL PARAMETERS OF TYPE XI COLLAGEN AND BETA CRYSTALLIN USING ANALYTICAL ULTRACENTRIFUGATION AND MULTI ANGLE LASER LIGHT SCATTERING

Luke Woodbury, Julia Oxford, and Kirsten Lampi; Department of Chemistry and Biochemistry Faculty Sponsor: Julia Oxford

Analytical Ultracentrifugation (AUC) and Multi Angle Laser Light Scattering (MALLS) are important techniques to determine the biophysical properties of molecules in solution. AUC provides information on molecular mass, stoichiometry, sedimentation properties, frictional ratios, and thermodynamic properties of macromolecules. MALLS provides information on molecular mass and the root mean square radius of macromolecules. These two instruments will be employed to characterize the biophysical parameters of Type XI Collagen and Beta Crystallin. Type XI Collagen is a minor constituent of the extracellular matrix of many tissues and is essential in the regulation of collagen fibril assembly and diameter. Beta Crystallin is a highly ordered oligomeric structural protein that plays a key role in eye function. By characterizing the biophysical parameters of these diverse proteins a better understanding of the equipment and methodology will be achieved. Type XI Collagen and Beta Crystallin were expressed in *Escherichia coli* and purified using nickel affinity chromatography and size exclusion chromatography, respectively. Sedimentation velocity and sedimentation equilibrium experiments were run to determine the frictional ratio, sedimentation coefficient, and molecular mass of Type XI Collagen and Beta Crystallin. Size exclusion chromatography MALLS experiments were run to determine the molecular mass and root mean square radius of Type XI Collagen and Beta Crystallin.

DEVELOPMENT OF A FIELD PORTABLE SENSOR FOR AQUEOUS ARSENIC SPECIES

Matthew Caylor, Department of Chemistry and Biochemistry Faculty Sponsor: Dale Russell

The US EPA lowered the allowed amount of arsenic in public drinking water within the past two years, from 50 ppb to 10 ppb. This impacts on many public water supplies. For example, about 48% of wells in the Treasure Valley have arsenic above the new limit. Arsenic occurs in ground and surface water mostly because of naturally occurring geology of the region. It is also due in part to human activities including past mining. This project focuses on the design and development of a field portable electrochemical sensor to detect and quantify arsenic contamination in water. A polymer has been designed and synthesized to have arsenic-binding sites on its surface. This polymer is coated on a metallic electrode. Arsenic binds into the polymer on contact with arsenic contaminated water, and the presence of arsenic in the polymer is then detected by an electrochemical signal that is proportional to the amount of arsenic present in the water.
AFFORDABLE COFFEE AT ITS BEST

Briana Flaherty and Konrad Billetz,
Department of Chemistry and Biochemistry
Faculty Sponsor: Mike McCormick

This study involved a multi-variable experiment that probed the effects of manner of preparation on coffee quality. Variables included volume of coffee grounds, volume of water, time that beans were ground, number of filters, and temperature of beans prior to grinding. Coffee was tested and judged by Boise State University professors and staff based on flavor, body, aroma, and acidity to determine which quantities yield the best cup of coffee. The concentration of caffeine in the best coffee was then determined by means of high performance liquid chromatography.

COMPUTATIONAL CHEMICAL ANALYSIS OF THE MANGANESE CATALYZED DISMUTATION OF HYDROGEN PEROXIDE

Scott Lee (Honors College), Bryan Martin, and Sara Hartje; Department of Chemistry and Biochemistry
Faculty Sponsor: Jeffrey Peloquin

While efficient, the metabolic processes of living cells generate reactive oxygen species such as hydrogen peroxide, superoxide and hydroxyl. If these compounds are allowed to accumulate they will cause significant damage to cellular materials such as membranes and DNA. In an effort to design compounds which can be used to aid in the regulation of the concentration of these reactive oxygen species, we have performed a series of computational experiments to elucidate the role hydrogen bonds can play in determining the mechanism of the manganese catalyzed dismutation of hydrogen peroxide.

EFFECT OF MTN GENE KNOCKOUT ON QUORUM SENSING DEPENDENT EVENTS

Tony Martinez and Andrew Crawford,
Department of Chemistry and Biochemistry
Faculty Sponsor: Ken Cornell

The enzyme 5'-methylthioadenosine/S-adenosylhomocysteine nucleosidase (MTN) catalyzes a unique metabolic step in the salvage of methionine and purine that also supplies direct precursors for bacterial autoinducer 2 (AI-2) synthesis. AI-2 is a universal signal used by bacterial species as a “quorum sensing” molecule to indicate overall population levels and govern such events as biofilm formation, nutrient metabolism, and the secretion of virulence factors. In this study we present evidence that MTN gene deletions in E. coli alter growth rates, eliminate AI-2 production, and decrease the synthesis of autoinducer dependent biofilms. Further, transformation of E. coli MTN knockout strains with plasmid encoded MTN reconstitutes AI-2 production and lost growth phenotypes.

HUMAN BREAST CANCER CELL METASTATIC POTENTIAL IS REDUCED BY THE COMBINATION OF OSM AND A HIF1 ALPHA INHIBITOR

Ryan Fox, Amanda Bruesch, and Cheryl Jorcyk; Department of Biology
Faculty Sponsor: Cheryl Jorcyk

Oncostatin M (OSM) is a cytokine belonging to the interleukin-6 (IL-6) family of cytokines and is produced by immune cells and tumor cells. Previous research suggests that OSM reduces the proliferation of breast cancer cells. Hypoxia-inducible factor 1 alpha (HIF1α) is a transcription factor that is important during hypoxia. HIF1 targets the promoter of vascular endothelial growth factor (VEGF) in response to hypoxic conditions, leading to increased angiogenesis and hematopoiesis. Our
lab has recently shown that OSM upregulates HIF1α expression in breast cancer cells. Here we demonstrate that human breast cancer cells treated with combinations of OSM and a HIF1α inhibitor (HIF1α-I) show a significant reduction in metastatic potential and size of metastases. MDA-MB-231 human breast cancer cells were cultured for 72 hours in the presence of 1) OSM (25 ng/ml), 2) HIF1α-I (1 nM), 3) OSM + HIF1α-I, or 4) no treatment. The cells were injected into the tail vein of severe combined immunodeficient (SCID) mice. The mice were sacrificed after 8 weeks and the tissues were collected and prepared for histological examination. The lungs were examined under a dissection scope and visible metastases were quantified. Mice injected with untreated control cells averaged 23.2 metastases/mouse, while mice injected with cells treated with OSM alone, HIF1α-I alone, and OSM + HIF1α-I yielded 9.4, 5.6, and 2.6 metastases/mouse, respectively. The mice injected with cells treated with both OSM and HIF1α-I showed an 88.8% reduction in metastases, as compared to the control group. Histological examination of lung sections confirmed the reduction in size and quantity of metastases. This data suggests that HIF1α may be an effective target for anti-cancer therapeutics.

TEMPERATURE EFFECTS ON FERMENTATIVE HYDROGEN PRODUCTION USING A MIXED CULTURE AND FOOD WASTE

Alice De Payne, Rachel Shinn, Brian Dies, Orion Christensen, and Kevin Feris; Department of Biology
Faculty Sponsor: Kevin Feris

Exploring carbon neutral fuel sources is of paramount importance as the world’s dependency on fossil fuel is the main contributor to climate change. Producing hydrogen from microbial fermentation of low cost biomass feedstocks, such as food waste, is promising to be a cost effective, sustainable alternative to conventional fuel sources. Reaction temperature can greatly influence the efficiency of bacterial hydrogen production. We constructed 1 liter fermentative batch-reactors to explore how temperature affects hydrogen production by mixed microbial communities using food waste as the feedstock. The reactors were inoculated with "Clostridium" and naturally occurring (native) organisms found in the feedstock at a 1:1 ratio. Hydrogen production was evaluated at 32°C, 40°C, 50°C, and 60°C. Previous studies determined that this pH tended to reduce competition between "Clostridium" and the native ssp. Reactions were run for seven days. The systems were analyzed at 48 hour intervals for hydrogen production, carbon utilization, pH, and byproduct accumulation. It was predicted that the highest level of hydrogen gas production would occur at 50°C, as this temperature should select for organisms that use a hydrogenase pathway and away from metabolisms that will produce inhibitory byproducts.

SYNTHESIS OF TRANSITION METAL DOPED CHALCOGENIDE GLASSES FOR USE IN NON-VOLATILE MEMORY DEVICES

Cliff Csizmar (Honors College), Shan Lyons (Honors College), Morgan Davis and Kris Campbell; Department of Chemistry and Biochemistry
Faculty Sponsor: Jeffrey Peloquin

The next generation of electronic memory devices for use in satellites and space vehicles will need to be both low-powered and resistant to radiation. A number of transition metal doped chalcogenide glasses have been synthesized that are capable of undergoing a crystalline to amorphous phase transformation in the presence of an electrical field. The two phases thus represent the standard ‘1’ and ‘0’ bits, respectively. Since the phase transformation can only be reversed by a subsequent application of a second electrical field, the final devices will not lose their information if electrical power is lost. In this study, we characterize the relative contributions of a metal’s coordination environment and redox properties to the system’s ability to undergo a phase transformation and the electrical properties of glass when deposited as a thin film.
DEVELOPING THERAPEUTIC APPROACHES FOR PARKINSON’S: ANALYSIS OF \( \alpha \)-CTX MII ANALOGS

Andrew Ormond and Matthew Turner, 
Department of Biology 
Faculty Sponsor: Owen McDougal

Parkinson’s Disease (PD) is caused by loss of dopaminergic neurons in the brain, and affects an individuals’ motor skills. Neuronal nicotinic acetylcholine receptors (nAChR) in the brain regulate dopamine release and have been implicated in PD. It is the \( \alpha 6\beta 2 \) subunit combination in the pentameric nAChR that controls neurotransmitter release. \( \alpha \)-Conotoxin MII (\( \alpha \)-CtxMII) is a semi-selective probe for the \( \alpha 6\beta 2 \) and the closely related \( \alpha 3\beta 2 \) subunit receptors of nAChRs. The E11A analog of \( \alpha \)-CtxMII selectively binds to the \( \alpha 6\beta 2 \) ligand binding domain while maintaining the potency of native \( \alpha \)-CtxMII. Additional mutants have been proposed based upon known ligand to receptor interactions in an attempt to increase both selectivity and potency. Here we propose how these analogs will be analyzed at Boise State University for their efficacy by structural analysis and binding studies.

CARBONYL REDUCTASE INHIBITION AS A MEANS TO INCREASE ANTHRACYCLINE EFFICACY

Christopher Ewing, 
Department of Chemistry and Biochemistry 
Faculty Sponsor: Henry Charlier

Carbonyl reductase (CR) has been implicated in drug resistance and cardiotoxicity associated with anthracycline treatment. Inhibiting CR during anthracycline treatment may reduce the incidence of the associated drug resistance and cardiotoxicity. Several biphenyl CR inhibitors have been identified, one of which has a Ki of 220 nM, represents one of the most potent inhibitors reported. Other structurally related biphenyl inhibitors were identified that have Ki values ranging from 10-21 \( \mu \)M. Treatment of cancer cell lines with biphenyl inhibitors during anthracycline cell killing studies were shown to reduce IC50 values by as much as four-fold. One particular biphenyl inhibitor also exhibited anti-cancer activity, thereby warranting further studies to address whether or not the combination of anthracyclines and inhibitor act additively or synergistically in cancer cell killing. (NIH/P20RR016454)

HIJACKING PHOTOSYNTHESIS: A NEW FRONTIER IN MICROBIAL FUEL CELLS

Mariona Nadal-Ribelles, Pamela Hess, and Kevin Feris, 
Department of Biology 
Faculty Sponsor: Kevin Feris

Increasing costs, diminished confidence in oil reserve quantity and availability, and concern about greenhouse gases and global warming have sparked an unprecedented interest in alternative energy production. Microbial fuel cells (MFC) emulate natural bacterial systems, but harvest energy by encouraging the transfer of respiration-generated electrons to an anode in a circuit rather than customary electron acceptors, allowing conversion of bacterial energy to electricity. MFC energy production is limited by the capacity of electricigen (microorganisms that can directly transfer electrons to electrodes) to shuttle electrons to the MFC’s anode electrode, the surface area of the electrode, fouling of the electrode by precipitates, and electron donor availability. We intend to mediate these technologic difficulties biologically. We will utilize photoautotrophic cyanobacterial metabolism to lessen the need for external (or exogenous) electron donors. These free-floating bacteria do not form biofilms so are less influenced by the surface area of the electrode. We will genetically modify the cyanobacterium \textit{Synechocystis} ssp. to directly link phototrophic electron production...
to electricity generation by disabling the hydrogenase gene and the cytoplasmic ferredoxin in photosystem I to block existing routes to electron acceptors. We will then provide a novel route for electron transfer to the environment by inserting a soluble cytochrome or suite of cytochromes from a metal-reducing bacterium (Shewanella ssp. or Geobacteraceae ssp.). This will allow direct transfer of photosynthetic electrons to the electrode. The utilization of photosynthesis as an energy source avoids generation of greenhouse gases, and may be the basis of a new, clean energy source.

**EFFECTS OF LONG-TERM HEAVY METAL STRESS ON HYPORHIC MICROBIAL COMMUNITY STRUCTURE OF THE CLARK FORK RIVER, MT**

Mariona Nadal-Ribelles and Kevin Feris.
Department of Biology
Faculty Sponsor: Kevin Feris

Heavy metal contamination in lotic ecosystems is a major health and environmental concern worldwide. The persistence of metal pollutants in the environment suggests that a long-term model is needed in order to assess contaminant impacts on organisms present in the ecosystem. Current ecotoxicological models fail to explain the long-term effect of heavy metal stressors on ecosystems. The heavy metal contaminated Clark Fork River supports a diverse microbial community with reduced metabolic respiration rates, suggesting an adaptive strategy for microflora colonizing metal contaminated sites. This study attempts to understand how chronic metal stress affects the structure and function of the local microbial communities.

We employ molecular microbial community analysis to assess differences in prokaryotic community composition over a 550 km reach of the Clark Fork R. to determine patterns of microbial community structure in response to heavy metal concentration. We created a 1000 member clone library of 16rDNA and 18rDNA genes to develop a quantitative and qualitative understanding of the community. Relatively abundant members of the clone library will be targeted for additional analyses to elucidate genetic properties allowing survival under chronic metal stress. Results from this work will improve understanding of adaptive strategies that have evolved in response to chronic heavy metal contamination and impacts of chronic stress on ecosystem function.

**OPTIMIZATION OF FLAVOR AND ECONOMIC VALUE IN A CUP OF COFFEE**

Richard Cox and Lindsay Ward,
Department of Chemistry and Biochemistry
Faculty Sponsor: Mike McCormick

The coffee industry in the United States is an 18 billion dollar industry with nearly 50% of adults drinking at least one cup daily. It is estimated that Americans spend $164.71 per year on coffee. As this represents a large industry much work is spent determining what makes a better cup of coffee both from a taste and economical standpoint. This balance is paramount for any company to realize a profit in the industry. Four variables (grind size, water to coffee ratio, grind reusability, and cost) have been identified in the balance between taste and cost. In this experiment each variable is tested. Each sample was rated on a scale of ten by several individuals. The optimum cup was then identified and characterized by high performance liquid chromatography.
NOVEL PHOTOHETEROTROPHS 
AND BIOLOGICAL H₂ 
PRODUCTION FROM POTATO 
WASTEWATER

Patrick Sorensen and Araya Keilbert, 
Department of Biology 
Faculty Sponsor: Kevin Feris

H₂ fuel technology offers an alluring alternative energy option. H₂ utilization produces no greenhouse emissions, can substantially reduce our dependence on foreign oil, and poses virtually no risk to the environment. Biological production of H₂ represents a viable source of significant quantities of carbon free or carbon neutral H₂. Nitrogenase, a microbial enzyme evolved for fixing atmospheric N₂, produces H₂ at high efficiencies under the appropriate conditions. Wastewater from agricultural processing plants is rich in organic material and along with light provides the necessary substrates for photoheterotrophic metabolism and nitrogenase-based biological H₂ production. We have isolated a suite of photoheterotrophic microorganisms collected from acidic peat bogs in Montana, Idaho, and Alaska. Over 70 different nitrogen-fixing isolates have been grown anaerobically. We are characterizing their ability to use agricultural wastewater as an organic growth substrate to produce H₂ in hope of finding an organism or group of organisms capable of efficiently producing substantial yields of H₂ from this low cost feedstock. Further, these organisms remove potentially harmful organic acids, decrease levels of ammonium, and raise the pH of the wastewater. Thus photoheterotrophic metabolism represents an inexpensive treatment option for agricultural wastewater while simultaneously producing valuable hydrogen gas. The H₂ produced can be harvested as a self sustaining energy source for the wastewater manufacturer as well as a clean, renewable source of H₂ for growing hydrogen fuel cell technologies.

OPTIMIZATION OF ENZYMATIC DIGESTION FOR PROTEOMICS

Benjamin Davis, Department of Biology 
Faculty Sponsor: Julia Oxford

Mass spectrometry has been widely used in chemical analysis since the early 20th century. Traditionally, it has been employed to verify sample content and structure of small molecules through fragmentation patterns and mass-to-charge ratios of subsequent ion products. Proteomic work requires the characterization of large, complex molecules, necessitating the development of sample specific preparation protocols. In particular, extra cellular matrix proteins pose novel problems due to post-translational modification and difficulties encountered in digestion by enzymes traditionally used in sample preparation, such as Trypsin. While these difficulties present obstacles to integration of mass spectrometric analysis in proteomic work, if appropriate protocols can be established, mass spectrometry presents a potentially reliable and efficient mechanism for quality control and characterization. Samples of recombinant Collagen IX isoforms from Escheria coli, at various stages of the purification process, were digested using five different enzymes and processed in a Thermo Finnigan Deca LCQ XPplus© ESI/MS system. The resulting spectra and peptide sequences were compared to those generated theoretically from DNA sequence databases in order to optimize in-gel and in-solution preparations. Optimization of sample-specific preparation protocols for extra matrix proteins is essential for effective integration of mass spectrometry into proteomic work focusing on these species. Determining the effects of the various digestive enzymes on the integrity of data provided valuable insight while establishing these protocols. Funding and instrumentation has been graciously provided by the NIH/NCRR grant #P20RR016454 to INBRE of Idaho.
ENERGY TO THE PEOPLE: SELF-SUSTAINING AND AFFORDABLE BRIQUETTES

Seth Eidemiller, Dana Moracco, Blake Stanhouse, Paige Fetzer, and Ben Parker
Department of Chemistry and Biochemistry
Faculty Sponsor: Owen McDougal

The two goals of this fuel briquette project are to: 1) reduce organic landfill waste, and 2) provide an economical, sustainable fuel source for low income Idahoans. In 2006, each person in the United States produced an average of 4.6 pounds of waste per day. Recycling has increased over the years, but currently 48% of paper products and 38% of yard wastes still end up in landfills. Additionally, Idaho has 32,483 households that receive federal energy assistance. Many of these homes rely solely on fire wood, fuel pellets, or charcoal for heat in the winter; ignoring a fuel source found in their own trash cans. These combustible fuel sources can be combined to form a product that accomplishes the above stated goals and is easily produced at home. Fuel briquettes made from shredded office waste paper, sawdust and lawn waste can be burned in conventional wood stoves to supplement or replace traditional fuel sources such as wood, charcoal and wood pellets due to their similar combustion properties. Briquettes composed of such materials and similar weights of wood, wood pellets and charcoal were burned in a modified Weber Chimney starter topped with wire mesh and a saucepan containing 500 mL of water. The change in water temperature was measured with Vernier Logger Pro 3 software interfaced to a temperature probe positioned in the middle of the cooking pot. Oxygen bomb calorimetry tests indicated lower energy content for the briquette material than traditional fuels but burn tests demonstrate that biofuels can achieve temperatures of 5-10 degC above charcoal, which is comparable to wood and wood pellets.

USING siRNA TO MODIFY THE EXPRESSION OF OSM IN MAMMARY CANCER CELLS IN VITRO

Jeff Redshaw, Patrick Aranda, Kelly Katula and Cheryl Jorcyk; Department of Biology
Faculty Sponsor: Cheryl Jorcyk

Oncostatin M (OSM) is an interleukin-6 (IL-6) family cytokine produced by several cell types, including many cells of the immune system and some tumor cells. While OSM has been shown to inhibit breast tumor cell growth in vitro, it is hypothesized that OSM may actually increase the metastatic potential of mammary cancer cells in vivo through the upregulation of vascular endothelial growth factor (VEGF) and hypoxia-inducing factor 1 alpha (HIF1α). Interference RNA (RNAi) technology is a method for post-transcriptional gene silencing in response to the introduction of short double-stranded RNA sequences. Small interfering RNA (siRNA) sequences regulate mRNA expression by activation of the RISC complex, a normal cellular gene regulation program that degrades cytoplasmic mRNA. RNAi can be used in theory to reduce the expression of any gene through design of different siRNA sequences that are complimentary to the mRNA of interest. In order to evaluate the role of OSM on tumor growth and metastases in vivo, mammary cancer cells modified by RNAi to have reduced OSM expression levels will be injected into OSM (-/-) knockout mice. The ability of the mouse mammary tumors cells to metastasize will be analyzed in an almost OSM-free environment. In this work, two commonly used metastatic mouse mammary tumor cell lines, 66c14 and 4T1.2, were modified using RNAi. Both cell lines were stably transfectected with three different siRNA constructs and transfectants were selected in G418 for neomycin resistance. The presence of siRNA constructs in the cells was confirmed by polymerase chain reaction (PCR). Resulting colonies were screened by reverse transcriptase-PCR (RT-PCR) to evaluate relative OSM expression of cells harboring the siRNAs compared with that of the wild type cells.
THE INTERNET REVOLUTION AND THE GROWTH OF THE BOISE METROPOLITAN AREA

Justin Hardaway, Jenny Kniss, Lindsey Shean and Danny Ryan; Department of Economics
Faculty Sponsor: Samia Islam

In 1991, the world saw the beginnings of what would be one of the largest social revolutions this generation had ever seen: the rise of the Internet telecom industries, and effectively, the birth of the Information Age. This sociological/technological revolution changed the way we do business, our access to information, our inter-personal communication methods, our mobility, and our autonomy as individuals. The period between 1995, just four years after the Internet went mainstream, to 2000 is now known as the Dot Com era. Unfortunately, in March of 2000 that revolution suffered a major setback with the bursting of what's called the 'Dot Com bubble'. Our proposed project will examine how that revolution and subsequent bubble burst affected the growth rates of the Boise Metropolitan Area. We will focus on the growth of housing markets, the changes type and numbers of businesses/firms as well as changes in population and other local area demographic characteristics. We will try to control for some exogenous factors affecting growth, including but not limited to average population growth, inflation and travel costs, and average housing costs throughout the nation. In order to correlate our data to the rise of the Internet & telecom industries, we will focus on the years 1980 to current. We expect to find major changes and shifts in the data around the periods of 1991, 1995, and March of 2000. We do expect to see some degree of urban flight post-September 11th, 2001 as well. We hope that our findings will afford new insight into how the sociological/technological revolution had a substantial impact on the Boise Metropolitan Area.

THE ECONOMIC IMPACTS OF GLOBAL CLIMATE CHANGE: AN ANALYSIS OF IDAHO’S TREASURE VALLEY

John Van Dyke and Robert Kabel,
Department of Economics
Faculty Sponsor: Scott Lowe

National, regional, and local scientists have begun to address the impacts that global climate change will have on environmental conditions in southern Idaho. The primary impacts of climate change will reveal themselves in the form of changes in the quality and quantity of precipitation across the state. In turn, altered precipitation patterns will perturb the quality, availability and timing of drinking water supplies, hydroelectric water sources, agricultural water sources, air quality, and human health. This research project analyzes the potential costs and benefits associated with global climate change in the Treasure Valley. In particular, we focus on the additional costs and benefits generated through energy use and precipitation-driven changes in water consumption. By utilizing historical weather and temperature data retrieved from Ada and Canyon counties, as well as pricing, water availability, and hydroelectric production data obtained from Idaho Power and United Water Idaho, we are able to provide estimates and predictions of the economic impacts of climate change in the Treasure Valley. We expect to find dramatic fluctuations in costs for Treasure Valley residents resulting from relatively small changes in temperature.

IS POWER EVERYTHING?

Craig Marley, Caitlin Cusack, Chris Gonzales and Richae Swanbeck; Department of Economics
Faculty Sponsor: Samia Islam

In the Northwest region of the United States urban development has increased the demand for electricity. To expand capacity and meet this demand, Local economies are researching various
methods of power production. Climate change and potential carbon caps have aroused new interest in non-green house gas emitting power sources. Technology has increased in several fields of alternative energy production that have a potential to meet the increased demand. One resource that provides a carbon-free source of energy capable of powering modern urban economies is nuclear power. In southern Idaho, a nuclear power plant has been proposed to meet expanding energy needs. The construction and operation of a nuclear power plant will have specific economic impacts on the surrounding area. This research centers on the expected impacts of increased power capacity, in southern Idaho. Specifically, our focus is on how potential power production increases will augment Boise area firm births. The analysis will draw on historical data collected from economies of similar scale to the Boise area, before and after power supplies increased. The ultimate goal is to forecast Boise area firm births, resultant of expanded power capacity.

BOISE CITY BUS TRANSPORTATION

David Bugni, Narciso Lansdown, Jake Deskins and Marcus Miller; Department of International Business
Faculty Sponsor: Samia Islam

As the city of Boise continues to grow, public transportation is starting to become a major issue for people to get to and from home, school, work, shopping, etc. But according to “Blueprint Boise,” while vehicle travel continues to grow, transit travel is not growing. In fact, there was a decline in the number of workers who commuted by mass transit between 2000 and 2006. This project will examine why public transportation is struggling to maintain ridership. Our goal is to look at ways in which we can improve city bus transportation. To do this, our group will use available statistics and data. We will also conduct a survey, should it be needed, to get an idea to determine if major improvements to the bus transit system will get more people to use the bus. In particular we will focus on the number of bus stops, time intervals, and amount of routes available. We expect the research to show that improvements to the bus system can impact ridership more than the current bus system. We feel the results will also conclude that yes, many would use an improved transit system and although potentially very expensive to implement, the payoff is worth the cost.

CLIMATE CHANGE AND LOCAL FISH POPULATIONS

Craig Marley, Department of Economics
Faculty Sponsor: Scott Lowe

The global climate has experienced an increase in average temperature over recent decades. Scientists predict that the average temperature will continue to increase in the years to come. As a result, major weather patterns are predicted to change. In southern Idaho, changes in the weather patterns are predicted to increase the volume of precipitation, but alter the timing and type. Changes in the type, quantity and timing of precipitation can have drastic effects on local ecosystems. This research focuses on the impacts that climate change will have on fish populations in southern Idaho. Specifically, I focus on the potential costs and benefits associated with climate-driven changes in the Boise River’s South Fork fish populations. The analysis will draw on the geosciences literature to predict changes in water quality; biology and ecology literature will provide estimates of how specific changes in water quality, quantity and the timing of precipitation will impact fish populations. In turn, prior economic analyses of fresh water fisheries will be used to forecast costs and benefits of climate change on Boise River’s South Fork.
BOISE CITY TRANSPORTATION CRISIS

Robert Kabel, David Anderson, Kyler James and Devin Easley; Department of Economics
Faculty Sponsor: Samia Islam

Public transportation has been a growing concern amongst politicians and residents of Boise. This project will show that a transportation crisis is on the horizon and will summarize the current problems and possible solutions to Boise's public transportation needs. Summaries will draw from the comprehensive plans of larger cities in the Treasure Valley, like the 1997 Boise City Comprehensive Plan and Blueprint Boise. Solutions will include those of the current city planners and some put forth by the project researchers. The group expects to show that the current mass transportation system is inadequate, that cities of similar size, like Portland, OR, have viable mass transportation methods in place, and a fixed/light rail system could help solve Boise's mass transportation shortcomings.

EVALUATING THE ADEQUACY OF BOISE'S DRUG REHAB PLANNING

Blake Hopkins, Miriam Baumgartner, Andrew Perkins, Daniel Bow, and Michael Lipshultz; Department of Economics
Faculty Sponsor: Samia Islam

Our project focus is to analyze the Valley's drug rehabilitation programs and treatment facilities. Our intentions are to compare and contrast the area's current efforts and future planned efforts to those of similar cities in regard to demographics and projected growth. The issue is important because it directly contributes to the state's rising homeless and prison populations. Empirical evidence also exists on the correlation between drug use and urban crime. By studying this issue and comparing the areas' current plans to other similar areas, we will be able to assess and evaluate if current legislation will be adequate to deal with the current and growing problem.
A POSITIVE LEARNING ENVIRONMENT FOR STUDENTS AND TEACHERS

Katelyn Conner, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jennifer Snow-Gerono

I am currently in my final semester of student teaching. As I spend more time in the classroom, I feel myself continue to grow more comfortable as a teacher. I feel confident in planning effective lessons, foreseeing potential misconceptions, and in redirecting lessons if they aren't working. However, throughout my student teaching experience, I still struggle with knowing when and how to discipline students who are disrupting the learning environment. Not only do I have difficulty knowing when it's appropriate to discipline students for negative behavior, but I also struggle with knowing what appropriate and effective consequences are for students who are misbehaving, that don't interrupt the flow of learning in the classroom. Hence, I wonder; what are effective consequences for students that minimize behavior problems? The nature of my research included observations in other primary level classrooms, interviews with teachers both new and veteran, as well as interviews with administrators and other colleagues. Journal articles and other reading materials were also be referenced as a means to support the outcomes.

GRADING & EVALUATION IN THE PUBLIC SCHOOLS

Anna Kreiger, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jennifer Snow-Gerono

The purpose of my action research project is to determine the function, efficiency, and effectiveness of the current grading system in public schools. My main focus will be to answer the question: Why do we, as educators, assign grades? As a student, I learned early on to judge myself and my school experience based on the grades I received. Working from the assumption that many students have the same experience, educators must ask: What purpose do grades serve? Do they provide students the opportunity or motivation to re-learn material they have not 'passed'? Do they account for student diversity, individuality, and growth? How are students internalizing grades and how are they affecting their self-perception? Are there other ways to determine and communicate student success? We need to answer these types of questions in order to develop multiple evaluation tools that are accurate, observable, measurable, and justifiable. We need to look at why grading emphasizes certain skills more than others, namely reading and writing proficiency over other types of intelligences. What we turn back to students marked with a grade certainly shows them what we value of their time, effort, and selves, as well as what we value in schools. Must we put so much time, energy, and focus on grading and numerical scores rather than the process of learning? Is learning measurable? My research project first elaborates on the difference between grading (evaluation) and assessment. I am gathering information through interviews, classroom observations and document analysis of graded work.
2007 REACH HEALTH FAIR

Kelsey Fries and Jessica McDonald,
Department of Kinesiology
Faculty Sponsor: Caile Spear

The 11th Annual REACH Health Fair was organized by the senior Health Promotion majors and was held on November 14, 2007 at the Boise State University REC Center. The 2007 theme was, “Activate Wellness, No Membership Required.” This free event was open to students, staff, faculty, vendors, and all community members. The students organized the entire event in less than 10 weeks. Their responsibilities included assessing, planning, implementing and evaluating a health fair for the entire Boise State University campus and surrounding community. Students created and conducted a needs assessment of BSU students, staff, faculty, and community members. The needs assessment helped determine what type of health services and information to include in the Health Fair. Students also used the data to develop and implement an advertising campaign. The 52 vendors provided valuable health services including flu shots, glucose screenings, hearing tests, fitness assessments and financial planning. Each of the 720 participants received a “goody bag” containing health information, healthy snacks, recipe cards, and free coupons for healthy activities in the area. Raffle prizes were donated from various vendors and local businesses. Participants and vendors completed an evaluation. The results were positive; participants gained valuable health information, vendors felt the fair was well organized and most liked the new venue. The REACH Health Fair was a great way to bring the community together. Health Promotion students interacted with multiple health-related community agencies and found services to meet the participant needs, the agencies interacted with participants by providing health information and services, and the participants provided valuable feedback.

DEVELOPING MATHEMATICAL THINKING: FIFTH GRADE DIVISION UNIT

Adam Johnson, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jonathan Brendefur

The purpose of this research was to determine the current level of understanding and efficiency that fifth grade students have in the area of division and to increase these specific levels through a specialized division unit. Other goals were to make connections between multiplication and division, and to enjoy the process and have fun. A pretest was conducted to provide insight to current student knowledge and understanding. Results revealed that student understanding of division was limited. A common theme for solving pretest problems was the use of elementary strategies that demonstrated little to no understanding of division. Based on these results, a tentative plan was devised for a division unit that would be taught. Flexibility needed to remain in order to adjust and adapt to the specific needs of the students throughout the unit. Instruction was based on research and it involved student led discussion, inquiry, practical application, and practice while also introducing and building on more advanced, efficient strategies to solve division problems. Posttest results revealed that nearly all students moved away from the basic strategies and towards successful, effective, and accurate implementation of more advanced strategies. Comparing pretests to posttests, twenty-four of the twenty-five students either increased or could not do any better in terms of correct answers. Thirteen of the twenty-five students at least doubled their number of correct answers. The posttest also revealed that many of the incorrect answers from student work were a result of computational error only. This is significant because students showed conceptual understanding despite an incorrect answer. In addition, student interest and motivation to succeed and learn was through the roof.
WHAT HAPPENED TO BEING A KID AND NOT JUST A DIAGNOSIS?

Krista Silva, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jennifer Snow-Gerono

The goal of this research was to investigate the changes between diagnostics of behavioral issues such as ADHD (Attention Deficit Hyperactivity Disorder), ADD (Attention Deficit Disorder), and autism as compared to ten years ago. Why does it seem that so many more children are afflicted with these ailments presently? Are there actually more and more cases or just better diagnostic tests? I came upon this question while sitting in a group setting with a few other teachers of different grade levels. Many were speaking of how many more children are affected with these different behavioral issues than there were approximately ten years ago. Many of the teachers were concerned that their students did not need the prescribed medication and were merely having other problems overlooked. To conduct this action research, I am interviewing teachers, reviewing research articles and asking diagnostic professionals about the different tests that are done to confirm these behavioral issues. I will also research the emotional affects on children such as the way some students will use their diagnoses as a proverbial “crutch.” Many students I have encountered use their diagnosis as an excuse for any other problems that may occur. For instance a student in one of my classes who has been diagnosed ADHD usually says, “I didn’t take my meds today” if asked where a homework assignment is or why he is not applying himself. Even if the medication may have an affect, I still believe students should give their all, especially if they have obstacles to overcome. Therefore, this research will highlight diagnosis trends over time as well as student responses to diagnoses.

HOW DOES BUILDING COMMUNITY IN A CLASSROOM INFLUENCE ACADEMIC AND SOCIAL LEARNING FOR STUDENTS?

Deja Harrison, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jennifer Snow-Gerono

I believe that school should be a safe place for all. We need to teach children to be independent, compassionate, resourceful and good decision makers. In order for this to happen, I feel that students must have a sense of community. By community, I mean a connection to larger purposes of the classroom, education, and a democratic society. Through an action research project in the school within which I teach, I will examine how building community in the classroom influences students’ academic and social learning. I am collecting data through field observations in the classroom and by interviewing teachers and students about their experiences. I anticipate that the results of this investigation will demonstrate that community in the classroom is key to students’ academic and social learning success. Students who have a stronger sense of community should have more positive self-images as well as a sense of collective good for society.
HOW DOES BULLYING REFLECT SELF-ESTEEM – OF BOTH THE VICTIM AND THE BULLY?

Kaylyn Brennan, Department of Curriculum, Instruction, and Foundational Studies – Elementary Education
Faculty Sponsor: Jennifer Snow-Gerono

As an elementary school student I was a victim of bullying. I had trouble with my own self-confidence, and my self-esteem was low as a child in school. I believe victims and bullies are affected by the experience. I believe self-esteem lowers, and this should be a concern for schools, education, and society. I believe this because of research, personal experience, and observation. Research shows that bullies and their victims have low self-esteem. It also proves that bullies themselves have been witness to violence and anger outside of school. Although all bullies are different, there is not a checklist to define a bully or a victim. According to research, bullies find victims that they believe are different from them, whether that is the color of their skin, eyes, hair or their clothes, hair cut, shoes. Victims are commonly quiet, shy, and reserved, not likely to stand up for themselves. Knowing this from research articles, I am conducting my own action research on how bullying influences self-esteem, of both the bullies and their victims. I am collecting data through classroom observations, interviews with teachers and a school counselor, personal experience through journaling, and the scholarly research. At this time, I have found that self-esteem is low for bullies and their victims. My research is being conducted in one elementary school site so this case study should provide valuable information to the educators and students in this school. I hope to uncover insights, such as strategies for community-building in the classroom, to help educators work with all of their students, including bullies, in order to preserve self-esteem and positively influence student learning.

FIT AND FALL PROOF PROGRAM

Allison Tsuchida, Department of Kinesiology
Faculty Sponsor: Caile Spear

Approximately one in three older adults fall each year. Nearly one-fourth of those who fall receive moderate to severe injuries, leading to reduced mobility, reduced independence, increased admission to long-term care facilities and premature death. Risks for falling include lower body weakness and problems with walking and balance. Muscle-strengthening exercises can reduce the risk of falling and fracturing bones and can improve the ability to live independently. The Senior Fit and Fall Proof Program has been designed for older adults who want to improve their health and reduce their risk of falling. Through a free low impact exercise program, using trained volunteers as class leaders, most seniors increase flexibility, strength, balance and endurance. Research being conducted includes starting up a new site at the Garden City Senior Center, monitoring attendance, teaching a six week class and reporting on results for the 3-meter timed “Up and Go” tests. This test is administered at the beginning and the end of each six week session. The test is designed to measure improved function through exercise. Classes are held for a minimum of 30-45 minutes, twice a week, during a six week block. Instructors lead the class members through a variety of sitting and/or standing, low impact exercise, with and without therabands. I will monitor the results by testing my own site at the Garden City Senior Center, as well as helping to test and monitor the 8 sites in Health District 4. The total number of participants in Health District 4 and their test score outcomes will be reported.
PHASE CHANGE MEMORY DEVICES WITH STACKED GE-CHALCOGENIDE/SN-CHALCOGENIDE FILMS

Christopher Anderson (Honors College),
Department of Electrical and Computer Engineering.
Faculty Sponsor: Kris Campbell

Phase-change memory is one of the most promising candidates for future electronic memory. Phase-change memories define the state of the bit through the resistance of the material in at least two different phases. Switching between the resistance states of a phase change material is achieved by Joule heating through the application of an electrical current. Phase-change memory offers several advantages over the existing memory technologies: (1) the memory is not susceptible to the radiation damage, making it ideal for space applications; (2) the power requirements are low; and (3) the devices are scalable and thus allow for denser memory arrays. The reduction in power requirements and the immunity to radiation damage offered by phase change memory are critical to the reliable operation and longevity of spacecraft, such as defense satellites and long-range space exploration vehicles. Our research involves fabricating and testing phase change memory devices based on the use of two layers of chalcogenide material. Using two layers rather than the more common single-layer ternary alloy device (i.e. Ge2Sb2Te5), we hope to decrease the operating power, increase the switching speed, and maintain a high level of switching endurance.

References:

BUILDING A GREEN HOSPITAL

Jennifer Lanzetti and Tim Beardmore,
Department of Construction Management
Faculty Sponsor: Rebecca Mirsky

As part of the 2008 Associated Schools of Construction Region 6 Competition, McCarthy Construction presented a problem statement to the Boise State Construction Management student Design-Build team. The proposed project involved designing, scheduling and estimating a 200,000 SF patient tower. Our goal was to design and construct this patient tower for the least amount of cost in the least amount of time, while still keeping the impact on the patients and the environment to a minimum. We believe that for a hospital to be a true healing environment it needs to be designed and built with green materials and methods. Our research approach was divided into three phases, (1) Design, (2) Pre-Construction and (3) Construction. During the design phase our greatest source of information came from ‘The Center of Health Design®’. This institute has a venture called ‘The Pebble Project’, whose research offers constructors evidence-based design principles that: (1) Improve the quality of care for patients, (2) Attract more patients, (3) Recruit and retain staff, (4) Increase philanthropic, community, and corporate support; and (5) Enhance operational efficiency and productivity. Pre-construction can be summed up as the planning period; where the transition of design leads into the collection of materials (we used as much indigenous and green qualified material as possible), hiring of subcontractors (majority is local trades) and schedule creation (using a fasttrack system). The important construction period aspects we focused on were phasing the site plan and material delivery to have the least amount of impact on the patients and staff. The result was a hospital that met U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) standards, was estimated to fit the budget and constructed in the needed time period.
THE THREE-DIMENSIONAL N-BODY SIMULATION

Mark Stewart, Department of Computer Science
Faculty Sponsor: Gang-Ryung Uh

The N-Body Simulation is an attempt to understand gravitational movement and inertia for a set of n particles, or bodies. These particles can be a set of celestial bodies or even microscopic in nature. To perform the calculations, the traditional method compares every particle against each other one, which is a lengthy process known as the "brute-force" method; as the simulation becomes large, time grows quadratically. In fact, powerful supercomputers have been built to study celestial bodies using this method, but regardless of their sheer power, relatively small simulations can take days to compute. However, to bring the wonder of this tool to the ordinary PC, we used a prudent algorithm that estimates the gravity for large distances. Despite a negligible loss in purity, an incredible gain in speed is achieved, and thus the problem is reduced from quadratic to semi-linear. We achieve this by recursively dividing our three-dimensional universe into cube-shaped octants (eight parts) until each body is in a separate octant. Next, the computer checks the bodies against every section in order to calculate its movement. When the distance between the body and the center of mass of the section is not large enough, individual bodies are then compared and gravity is calculated accordingly. Now the program could function in a text-based mode, where the position of each body is displayed on the screen. However, for a simple 500-body simulation, the program would generate 50 pages per second, unreadable to a normal human. Therefore, to handle the data appropriately, we chose to display them in a graphical format. Furthermore, for appeal, we developed it as a cross-platform web applet having user-friendly controls and a comfortable interface that enriches the experience.

THE OPTIMIZATION OF PROCESS PARAMETERS FOR ANODIC ALUMINA FILMS

Patrick Price, Matt Reinhold (McNair Scholar), and Austin Johnson;
Department of Materials Science and Engineering
Faculty Sponsor: Brian Marx

Sealed anodic alumina films are a durable corrosion resistant coating often used in industrial applications. This project investigates the corrosion resistance of these films. The work involves collaboration between NxEdge, a company who manufactures engineered coatings, and a senior design team from the Materials Science Department at Boise State University. The purpose of this project is to maximize the corrosion resistance of sealed anodic alumina films manufactured by NxEdge. A Box-Behnken design of experiments (DOE) was created which varied 3 of the manufacturing process parameters of the anodic alumina films in a total of 15 experiments. The bath temperature, bath current, and ramp time of the maximum current were chosen as process variables and each parameter was assigned a high, low, and midpoint value. The seal time of the anodic films was held constant at 3-hours throughout the experiments. The experiments were carried out at NxEdge and the samples were characterized at Boise State University. Characterization methods used include HCl bubble corrosion resistance testing, scanning electron microscopy (SEM), and electrical impedance spectroscopy (EIS). The HCl bubble test was used to
quantitatively characterize the corrosion resistance of the films and determine the optimal manufacturing process parameters. The EIS and SEM characterization methods were used to correlate physical properties of the anodic film to the corrosion resistance performance. The results of the DOE and any conclusions of relating physical properties to performance are presented in this poster.

HIGH TEMPERATURE DEFLECTION OF LOW TEMPERATURE CO-FIRED CERAMIC

Arturo Gutierrez (McNair Scholar),
Department of Materials Science and Engineering
Faculty Sponsor: Amy Moll and Donald Plumlee

The monopropellant micro-nozzle which is geared toward satellite adjustments is currently built using Low Temperature Co-fired Ceramic (LTCC). The device decomposes hydrogen peroxide into water vapor and oxygen near a temperature of 1029K and at pressures near 3MPa. Because the channels in these devices undergo high pressure and loads at high temperature during the decomposition of hydrogen peroxide, it is necessary to characterize the structural integrity of LTCC due to high temperature and loads. This work is focused on the development of a model that will allow the prediction of LTCC behavior at high temperature and loads. In the development of this experiment, DOE guidelines and software were used to ensure that all possible contributing variables were considered. LTCC parts were fabricated and sintered before being placed under loads at high temperature. Each sintered part was taken to different peak temperatures under known loads to allow deflection. Deflection on sintered parts was measured using an optical comparator before and after LTCC parts were taken to peak temperatures. One screening run was done to determine which of all the variables were most affecting the LTCC behavior. A subsequent run was done testing the most influential variables. Analysis of the data collected on both experimental runs was done using existing models. Our hypothesis is that the behavior of LTCC under high temperature and load is of several variables. Further considerations for experiments with the same focus as this piece of work are discussed. The design, experimental results and analysis of the current experiment are reported in this paper.

MOOSE LODGE SUBDIVISION DEVELOPMENT PROJECT FOR PAUL, IDAHO

Kaleb Jones, Ryan Camp, Marc Danley, Jess Kuening, Ted Moyer, and Tanya Wales
Department of Civil Engineering
Faculty Sponsor: Molly Gribb

This project is the design of a new residential and commercial development on a 23-acre tract recently rezoned by the city of Paul in Minidoka County, Idaho. The development includes three common lots, one commercial lot (with a commercial office building and storage units for residents), and approximately 48 residential lots. The design meets all pertinent governmental requirements with regard to environmental concerns, water supply and sewer service, roadway design, and building codes. Deliverables include an environmental impact statement; a geotechnical evaluation; local, arterial, and access roadway design; typical pavement sections; water and wastewater pipe layout; storm runoff management (grading plan); pressurized irrigation design; and structural design of commercial building and storage units with accompanying construction drawings.
FLORENCE, ARIZONA ROADWAY DESIGNS

Jayson Buchholz, Tim Gaskins, Justin Stoffel, Ryan Flamm, and Garrick Nelson
Department of Civil Engineering
Faculty Sponsor: Molly Gribb

This is a roadway project for the design of two intersecting roads near Florence, Arizona. The first is a newly constructed road called Merrill Ranch Parkway; the second is a redesign of existing Felix Road, which will be realigned and widened. To address local concerns, the improvements to Felix Road will minimize congestion and increase safety. Based on a geotechnical report, a drainage report, and a traffic impact study provided by an outside firm, a roadway alignment was selected that is cost effective and meets safety requirements. A trip generation report to show the increase in local traffic has been taken into consideration for design of the roadways. Roadway thicknesses were designed by the City of Scottsdale Standards and Design Manual. A box culvert drainage crossing is incorporated into the roadway design for post-development storm water runoff based on the 100-year 6-hour storm duration.

WITCO SHREDDING SYSTEM

Brian Hritsco, Jack Reines, and David Miles; Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Rudy Eggert

Western Idaho Training Inc. (WITCO) provides employment and training opportunities to mentally and physically disabled workers. Participants develop skills in various work service programs such as trophy fabrication, pop-corn production and IRS document destruction. Our team is working to redesign the shredding system used for WITCO's contract for destroying IRS documents. Employees currently work in a group using various items including six commercial shredders, plastic buckets and trays. Each worker, in a sitting position, bends over to pick up handfuls of paper out of a large bucket, place them into a lap tray then carefully feeds them through the shredding machine. When the shredder output bin is full, the worker then empties the plastic bag into a larger barrel/bin. The work tasks are fatiguing and result in modest shredding throughput quantities. Our work includes designing a hopper, cart, and new disposal system. Using our redesigned system of fixtures and bins, the worker fatigue will be reduced and throughput increased to the maximum allowed by the shredding machines. The employees will work more comfortably and earn more since their pay is based on throughput.

MOBILE ENVIRONMENTAL SENSING STATION

Chris Anderson (Honors College), Ben Anderson, and Jon Bills; Department of Electrical and Computer Engineering
Faculty Sponsor: Sin Ming Loo

The FAA has sponsored a collaborative research effort between several universities to collect air quality data in commercial airliner cabins during flight and analyze the results. Dr. Loo's contribution to the project has been the design and development of the sensor units' hardware and software. This work is focused on expanding the existing platform to incorporate GPS data to determine the precise locations of every data point and that the unit be mounted to a bicycle or bicyclist for data collection. In addition to the sensors currently implemented in the system—CO₂, noise, pressure, temperature, and humidity—we have been advised to expand the system to incorporate a carbon monoxide sensor and a 3-D accelerometer. The 3-D accelerometer will provide a finer measurement relative to movement than the GPS device. It will be used to compliment the coarse coordinates of the GPS device. Expanding the existing platform for additional applications will provide further opportunities for research and better evaluations of air quality around the area in which we live and play.
ZERO-FIELD-SPLITTING BASED NON-VOLATILE MEMORY DEVICES

Shan Lyons (Honors College), Cliff Csizmar (Honors College), Morgan Davis, and Kris Campbell; Department of Computer Science
Faculty Sponsor: Jeffrey Pe loquin

One of the problems with current computer memory DRAM devices is that when the power is removed the devices lose their information. Non-volatile memory devices based on FLASH technology are slow relative to DRAM and are therefore not suitable for use as a main memory. We have synthesized a number of transition metal doped chalcogenide glasses with the unique property their electronic transition are split in the absence of a magnetic field. This splitting is called the Zero-Field-Splitting (ZFS). If the coordination environment or redox state of the transition metal is perturbed then its ZFS properties will also be perturbed. In this study, we report our initial efforts to harness these differences in zero-field-splitting to create a non-volatile memory device.

WIND TUNNEL EXPERIMENT

Benjamin Murphy, Shane Stetz, and Eran Sorensen; Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Rudy Eggert

Boise State Mechanical and Biomedical engineering students and faculty would like to use the wind tunnel to gain experience in wind tunnel operations and to conduct verifiable, repeatable experiments. The project involved interviewing students to obtain recommendations for user-friendly laboratory equipment and data acquisition. Wing/section experimental models are being designed and fabricated. Test instruments are being designed, and assembled. Experiments will be conducted to refine the data acquisition equipment and calibrate the equipment. A lab experiment will be written to ensure verifiable data is collected.

STUDY OF MG ALLOY CONVERSION COATINGS IN HIGH PH SOLUTIONS AND IN HIGH PH DOPANT SOLUTION

David Thomsen, Department of Materials Science and Engineering
Faculty Sponsor: Darryl Butt

Magnesium alloys are attractive for high performance engineering applications because of their high strength to weight ratio. However, due to magnesium’s susceptibility to corrosion, its applications are limited to mild environments which do not corrode the surface. One improvement of the corrosion resistance of magnesium alloys have been through chemical conversion coatings. The quality of the chemical conversion coatings is dependent on the characteristics of the passive oxide layer. The characteristics of the passive layer formed on Mg are inherently dependent on the pH of the solutions being 12 pH or greater. The research presented in this poster analyzes the passive film formed on an AZ91E magnesium alloy in solutions above 12 pH (NaOH) and other conversion coating (for example V and Mo) made in the past research but now made in a solution of 12 pH instead of low pHs. The passive films were analyzed using electrochemical impedance spectroscopy (EIS), potentiodynamic and potentiostatic methods, and X-ray diffraction (XRD). The EIS plots revealed a bi-layer structure, comprised of one layer of high electronic resistance and another less electronic resistance layer. The passive layer, made NaOH, was identified as MgO and MgOH$_2^+$ (brucite), as indicated by XRD. The results indicate that the MgO layer is responsible for the high electronic resistance of the film which directly relates to the corrosion resistance of the film. Therefore, chemical conversion methods, which use “dopant” additives, such as V, Mo, Sn, and Cr, to improve the corrosion properties of the passive films on Mg needs to focus on forming the films in aqueous solutions at pH higher than 12, where the oxide films are stable.
USING YOUR OIL’S POTENTIAL

Cole Smith, Department of Materials Science and Engineering
Faculty Sponsor: Darryl Butt

A current effort to produce “smart vehicles” has pushed for the development of advanced sensing equipment. The concept of a “smart vehicle” is a vehicle that can monitor its performance and systems as well as alert the driver when one of these is not working properly. The purpose of this research in the Advanced Materials Lab is to develop a sensor for aircraft to help monitor and prolong lifetime as well as save costs by performing maintenance as needed, not simply at scheduled intervals. The materials for this sensor must perform under the harsh environment in which they will be implemented but also accurately perform precise sensing measurements. A jet engine is subjected to high pressures, high temperatures and severe atmospheric conditions such as corrosive environments. The sensor will reside in the engine body and the basic design consists of a ceramic substrate with inert circuitry hermetically joined to a metallic body. Currently a procedure for creating the sensor substrate and circuitry has been written and several prototypes have been built. The next stage of research is testing the sensors and addressing the materials issues related to joining the ceramic substrate to a metallic mount. It is envisioned that this technology can be translated to the every-day consumer and installed in the common automobile. With this sensor the integrity of the oil and other lubricants can be monitored and through diagnostic testing the driver can be alerted to any immediate problems or even something as simple as when to change their oil.

EFFECTS OF SILVER PASTE APPLICATION ON EMBEDDED CHANNELS IN LOW TEMPERATURE CO-FIRED CERAMICS

Douglas Kellis, Department of Materials Science and Engineering
Faculty Sponsor: Amy Moll and Don Plumlee

Boise State University is currently developing a monopropellant micro-propulsion device fabricated in low-temperature co-fired ceramics (LTCC). This device requires the fabrication of internal catalytic channels; however the process for consistent channel construction is still under development. A wide range of variables affect the channel integrity including lamination process and the presence of silver paste. The primary focus of this research is the characterization of the process to apply silver paste to the upper and lower surfaces of embedded channels within a ceramic test device. Application of silver pastes to the upper and lower channel surfaces has been shown to alter the final shape of the channels. Upper and lower surface deflection into the channel area is discussed and characterization of this phenomena is illustrated as a function of channel width and process parameters.

NIFC PRESCRIBED BURN APPARATUS

Jeff Garner, Tyson Dietz, David Thomsen, and Chris Curran;
Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Rudy Eggert

For our design problem we will be working with the National Interagency Fire Center (NIFC), located in Boise, Idaho. The NIFC is the nation’s support center for wildland firefighting. There are eight different agencies and organizations that are part of the NIFC. One of the programs involves prescribed burning, which is a carefully managed, closely supervised treatment of a predetermined
area to restore plant and animal habitats. The prescribed burning also reduces the likelihood of large, destructive wildfires. Two types of equipment are typically used to ignite the undergrowth. An ATV mounted drip torch and a trailer mounted apparatus which mixes gelled fuel are used to dispense the ignited gelled fuel. A 2002 independent, hazard assessment study identified a variety of potential safety issues that needed reengineered and implemented to comply with OSHA, NFPA, and FM codes. Our group has decided to redesign the trailer mounted apparatus that dispenses the mixed gelled fuel. The wand which attaches to the end of the 20 foot long hose will be focused upon for our design problem. The current status of the wand is a modified pressure washer that would be typically found at a car wash. Our design problem involves formulating a design that is intended for gelled fuel use and improves the overall safety of the dispensing of the gelled fuel.

**WIND TURBINE POWER IMPROVEMENT**

*Ronald Royce, Mark Reinhold, and Brian Welshimer.*
*Department of Mechanical and Biomedical Engineering*
*Faculty Sponsor: Rudy Eggert*

PowerWorks Inc. and its affiliate, Pacific Winds Inc., are privately-held companies, focused upon the development, acquisition, and operation of clean, renewable, wind and solar power projects. They currently own and operate four wind power projects, consisting of over 900 wind turbines, totaling 95,000 kilowatts, located in Altamont Pass, near Livermore, California. In addition, they are developing several other wind and solar projects across the nation. We extended the length of PowerWorks Inc.'s existing rotor blades by 12 inches to improve the output power generated by its turbines. The plastic rotor tips should add 3-5% more power. In addition, the project required engineering and testing of attachment methods and materials for connecting the tips to the existing blades.

**A NOVEL TECHNIQUE IN THE FABRICATION OF BIOLOGICAL NANOWIRE ELECTRICAL TEST STRUCTURES**

*Patrick Price, Jason Brotherton, David Araujo, Jonathan Henderson, and Kendra Coonse*
*Department of Materials Science and Engineering*
*Faculty Sponsor: Bill Knowlton*

With potential uses in electrical device and sensor applications, biological nanowires offer the chemical functionality of biomolecular structures at the nanometer scale. In order to electrically connect the nanowires to the "outside world", metal electrical contacts, or electrical test structures, are typically used. The purpose of this work is to develop electrical test structures with nanometer scale features. This process requires the creation of a pattern using resist and electron beam lithography (EBL), the sputter deposition of metal into the pattern, and a lift-off technique to remove resist and unwanted metal. Previous work has shown that the isotropic nature of sputtering leads to poor yield and undesired topography of structures caused by the bridging of metal between the test structure and the metal on the surface of the resist. A novel process has been developed at Boise State University, which uses a buffered oxide etch (BOE) process to eliminate bridging when using an isotropic metallization technique. The BOE is used to etch a pattern 120 nm deep into a 500 nm layer of SiO2. After the BOE process, 120nm of metal is sputter deposited onto the substrate, bringing the surface of the metal nearly flush with the surface of the silicon dioxide. The flush topography allows a nanowire to lay flat across the electrodes instead of having to follow the contour of raised electrodes. The BOE process produces an undercut at the resist-oxide interface, creating a physical discontinuity between the unwanted metal on the resist and the metal forming the electrical test structure. The BOE process has substantially reduced failure of the electrical test structures during the lift-off process and has reduced the lift-off time from up to 4 hours to 60 seconds.
BRAKE CABLE IMPROVEMENTS

Dustin Gorseth, Vance Hansen, and Jason Squire
Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Rudy Eggert

Jo DuPont is a Boise based manufacturer of top-end bicycle control cords that replace the heavier traditional steel wire rope cables. Years of researching, testing and teaming up with synthetic fiber manufacturers resulted in PowerCordz, the highest quality product possible. The innovative brake cable uses light weight synthetic fibers covered in a polymer sheath. In some applications, the systems weak spot is at the clasp which secures one end of the control cords. This project's goal is to design a new clasp that is strong and reliable that lengthens the life cycle of the product by securing the cable to the brakes. A clasp was designed that was able to withstand the cyclic loading and tensile forces accrued by the demands of life cycle usage of the brake. The design was inspired by the mechanics of the Chinese finger cuff in which the cable can be threaded through a path in one direction but is restricted to move in the opposite direction due to the clasp tightening on the clasp as well as creating friction to help hold the cable in place.

SYNTHESIS OF BULK NANOCRYSTALLINE NICKEL BASED ALLOYS

Kimo Wilson and Nikki Kucza,
Department of Materials Science and Engineering
Faculty Sponsor: Peter Mullner

Nanocrystalline metals have grains on the order of 10-100nm in size. These nanocrystalline alloys possess favorable mechanical properties, such as a combination of high strength and good ductility. Their magnetic and electric properties are also favorable. It has been shown that Nickel based alloy systems can produce these nanocrystalline size grains. Minority elements migrate to the nickel grain boundaries, and keep them from growing. These small grained structures are usually formed through electro deposition, which is slow and expensive. We want to develop a process to produce large quantities of a nanocrystalline binary nickel based alloy Ni-M (M being Fe and Al), with a microstructure stable at room temperature, and a reduction of production costs. We are developing a process of cold-rolling and folding cycles, with short heat treatments, that diffuse the alloying element M into Nickel. To date we have shown that the rolling and heating of two metals induces diffusion bonding. Currently research is focused on the initial processing, which includes sample preparation, processing tools and minimal heat treatments, to illustrate that grain boundary refinement can be attained through the process of repeated cold-rolling and annealing.

THE EFFECTS OF COMPRESSION LOADING ON NI-MN-GA MICRO PILLARS

Matthew Reinhold (McNair Scholar)
Department of Materials Science and Engineering
Faculty Sponsor: Peter Mullner and Bill Knowlton

Ni-Mn-Ga is a ferromagnetic shape memory alloy that deforms by twin boundary motion. Deformation can be induced through a mechanical load or through a suitable magnetic field. Two micro pillars were machined from a sample edge using a dual beam Focused Ion Beam (FIB). Each pillar was compressed with a different load by a micro indenter. Atomic Force Microscopy (AFM) and Magnetic Force Microscopy (MFM) were used to characterize the twin structure and magnetic domain pattern of each pillar before machining and after compression. The mechanical results indicate that both pillars underwent deformation by twinning. Upon unloading, the strain in pillar 1 is permanent and twins are found in the deformed pillar. In contrast, the strain of pillar 2 recovers almost completely and no traces of twins are found in the unloaded pillar.
CONCEPTION AND ENGINEERING OF HOIST FOR AUTOMOTIVE FUEL CELL POWER PLANT

Jason Hesse, Muhidin Delic, Felipe Brinkmann and Michael McNally; Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Rudy Eggert

Nissan Technical Center North America (NTCNA) is responsible for blending technology and engineering to create cars that deliver total customer satisfaction. This process involves interaction and cooperation among all technical departments, which results in "total vehicle development." In addition to NTCNA’s proving ground facility located on 3,050 acres in Stanfield, Arizona, it operates a fleet of fuel cell automobiles out of their Sacramento, California offices. Currently, each vehicle's fuel cell power plant is removed from the chassis for routine maintenance and inspection using a temporary hoist. Nissan would like to have a custom hoist designed and fabricated for these vehicles. Design recommendations are also desired for a hoist to be used on upcoming production vehicles.

A PRELIMINARY STUDY OF TEMPERATURE DEPENDENCE OF TiN/3NM HfO2/1.1NM SiO2/Si GATED MOSFETS

Justin Reed and Richard Southwick III, Department of Electrical and Computer Engineering
Faculty Sponsor: Bill Knowlton

Increased metal oxide semiconductor field effect transistor (MOSFET) performance and down scaling requires the gate dielectric oxide capacitance to increase. Increased gate capacitance has required the gate dielectric to decrease in thickness. Continued thickness reduction of SiO2 has caused unacceptable gate leakage current increasing power consumption and heat generation in computers. The dielectric oxide HfO2 is an alternative material being investigated to increase gate capacitance while reducing gate leakage current. The growth of HfO2 on Si produces a SiO2 interfacial layer (IL) resulting in a multilayer dielectric gate oxide. For HfO2 to be successfully incorporated into tomorrows MOSFETs, the oxide defects, degradation and dielectric breakdown mechanisms need to be understood and the role the interfacial layer plays in breakdown. A detailed analysis of the traps and defects inside the HfO2/SiO2 gate stack need to be understood to determine their effects on MOSFET performance and reliability. Low temperature measurements can reduce thermal noise and effects that sharpen the Fermi energy distribution thereby reveal and enhanced carrier transport mechanisms. This study analyzes the characteristics of a TiN/HfO2/SiO2/Si multilayer dielectric gate stack using variable temperature measurements ranging from 5.5K to 300K.

AMBERNIGHTS FIRE PIT CONTROLLER

Joshua Bishop, Jason Durand, Riley Thomas, and Harsh Mantri; Department of Electrical and Computer Engineering
Faculty Sponsor: Scott F. Smith

The purpose of this project is to create a controller that can safely and efficiently turn a fire pit both on and off. It is intended as a final project and must be professional in appearance, mesh with current technology, and be easy to build. We also have to find the most cost effective solutions without sacrificing quality or dependability. Inherent in these aspects will be the design of both a power and control system. This will be evident in providing the correct voltage and meeting power requirements for the differing devices and then creating a controller to make sure the system is easy to use while maintaining a high level of safety. Also involved will be interfacing an LCD touchscreen to allow for a pin or password required ignition and adding to the visual appeal.
Ming Solar Lighting Pole System - Mesh Network

Tim Golo, Josh Bohrn, and Lance Shores;  
Department of Electrical and Computer Engineering  
Faculty Sponsor: Robert Hay

Our society heavily relies on fossil fuels to provide energy for us for our everyday needs. Recently, there is a concern that the continuous burning of fossil fuels harms our environment and endangers the future of our planet. Therefore, we started searching for alternative sources to produce energy such as hydro, wind or solar energy to reduce the burning of fossil fuels and to reduce the harmful effects it causes to our environment. Therefore, a Boise local company called Ming Solar started developing solar powered lighting poles. These poles rely on sunlight to produce its electricity. The pole structure is covered with photovoltaic film which converts light into electricity. Light passes through the transparent material that covers the photovoltaic film so that it can be converted into electricity and stored in a battery for later use. The pole is equipped with a photocell which switches the light on during nighttime hours and switches it off during daytime hours. These poles use Light Emitting Diodes (LED) as its light bulbs instead of the traditional High Intensity Discharge (HID) lighting. LED is becoming more efficient, consumes less power and requires less maintenance than HID. Currently, the maintenance on the poles requires a worker to travel to the location of the pole and check on its performance data for that particular day. Performing the maintenance on the poles requires an extensive amount of time, effort and labor from the company. Therefore, the company developed a communication board for the pole so that the performance data of each pole is uploaded to a website. Our team is responsible for developing a mesh network for the pole lighting system. Mesh networking will allow the poles to communicate with each other. The goal is to have a primary pole upload all performance data of each pole in the network to the website.

Accessing the performance data on a website reduces the company’s time, effort and labor to maintain the pole lighting system.

Novel Material and Processing System for Coating Ceramic Thermistors

Matthew Luke and Mitch Lecertua,  
Department of Materials Science and Engineering  
Faculty Sponsor: Brian Marx

Quality Thermistor Inc. (QTI) of Boise has been producing high quality thermistors for the past thirty years. QTI engineers thermistors for an assortment of applications ranging from high reliability military grade electronics to spa temperature probes. In addition, QTI manufactures a wide range of surface mount thermistors. QTI desires to improve upon their current materials system to increase yield and throughput while maintaining high reliability in its components. After performing a materials selections process, two materials that meet QTI’s design criteria were selected as prime candidates for the coatings: borosilicate glass and alumina. Experimental results showed that alumina is not suitable as a coating for this system. Process selection for borosilicate glass showed a variety of possibilities with dip coating being the most cost effective process. Dip coat experiments were performed using both a soluble and mechanical mask with a glass ink. Both mask types showed promise as a method for masking cube ends but the mechanical mask is incompatible with dip coating. Dip coating also gave very poor edge coating in all cases due to surface tension. Equipment already in place at QTI could incorporate an automated mask process that coupled with an automated spray could meet production needs. Further research into compatible application techniques with a mechanical mask could also reduce cost and increase reliability and output.
EFFECTS OF APPLIED MAGNETIC FIELDS ON FERROMAGNETIC MATERIALS DURING LIQUID PHASE SINTERING

Jason Brotherton and Doug Kellis;
Department of Mechanical and Biomedical Engineering
Faculty Sponsor: Brian Marx and Peter Mullner

This research focuses on the effect magnetic fields have on the Liquid Phase Sintering (LPS) process, with a focus on the densification behavior and the resulting crystallographic texture of and LPS material. The ability to control a material’s microstructure through processing is important for the development of high performance materials. Sintering, and in particular LPS, is a process that allows great flexibility in microstructural control because many parameters can be modified (selection of constituent materials and sintering aids, materials mixing ratios, sintering atmospheres, temperatures, and pressures). Recently, it has been shown that the application of magnetic fields during sintering alters the microstructures and properties of the material. These results where obtained without liquid phase. Because LPS substantially reduces sintering temperatures and times while producing high density components, it greatly reduces costs as associated with other high temperature processing routes such as casting and hot pressing. Applying magnetic fields to materials during sintering has resulted in increased rates of densification, and also has been shown to suppress pore nucleation. These characteristics may not only cut costs of sintering processes by greatly shortening sintering times, but may also provide higher density components with improved properties than current sintering methods. If magnetic fields, applied during LPS, are shown to affect the finished microstructure of the material, the results could have a substantial influence on applications in the areas of grain boundary engineering, superconductors, and the processing of ferromagnetic materials.

USING PC AUDIO FOR DIGITAL DATA COMMUNICATION

Jason Peterson and Brandon Chestnut,
Department of Electrical and Computer Engineering
Faculty Sponsor: Jake Baker

This is an Electrical and Computer Engineering Senior Design project proposed by Zilog. Thanks to Joshua Nekl at the Zilog Idaho Technology Center. Many personal computers are being manufactured and sold without a low cost communications port. Historically, most PC’s included a serial RS-232 port which utilized a protocol that could be inexpensively implemented with limited resources on a microcontroller. This low cost system allowed devices to communicate with, and be programmed by a PC while keeping the device cost low. The RS-232 port is being replaced by the Universal Serial Bus or USB port on most PC’s. The USB protocol is more expensive to implement, and the cost is inhibiting the features of devices that traditionally used RS-232. The use the PC audio port is investigated as an alternative digital communication channel. The PC audio output is characterized to determine the best use of the channel including, frequency response, output impedance, and general digital signal quality. Once the channel is characterized a communications system is designed and tested to optimize the data throughput. The system includes a PC software encoder, a hardware interface on the device end, and a microcontroller based decoder. This is a one way protocol and the major challenge is making sure that the data received by the device is the same data that was sent by the PC. If successful devices that once used RS-232 to could now use the PC audio port as a low cost serial port.
UPGRADING A VIBRATING SAMPLE MAGNETOMETER WITH NEW POWER SUPPLY, COMPUTER AND SOFTWARE

Adrian Rothenbuhler, Mike Hagler, and Nikki Kucza;
Department of Electrical and Computer Engineering
Faculty Sponsor: Peter Mullner

If old hardware that is difficult and expensive to replace breaks down, it is often tricky to imply new and more sophisticated devices in order to fix machines and keep them running. The Vibrating Sample Magnetometer (VSM) in HML 103 presents such a case: An old, expensive power supply that was directly controlled by a gauss meter was replaced by a new one that doesn’t have the outdated communication bus anymore. After replacing and using the power supply in manual mode, we found that the magnetization hysteresis curve seemed to have an unknown spike that was somehow related to the new hardware. After further investigation of that matter, we discovered that when the power output was set manually to a lower setpoint, the magnet power was reduced in an uncontrolled manner. The signal spike was simply the self-induction of the magnet. To solve this problem, we developed a new software interface in LabView, that controls both the gauss meter and the power supply over the GPIB bus, reassuring that the ramp-up and ramp-down process is smooth and controlled. The new software is more accurate and offers a much higher flexibility.

BIOMOLECULAR TRANSISTORS AND SIMPLE IC’S- DEVELOPMENT AND CHARACTERIZATION

Hieu Bui and Dency Daniel,
Departments of Materials Science and Engineering and Electrical and Computer Engineering
Faculty Sponsor: Bill Knowlton

As CMOS dimensions continue to decrease, the traditional silicon dioxide (SiO2) insulating layer on silicon in today’s Metal-Oxide-Semiconductor Field-Effect-Transistors (MOSFETs) have reached unacceptably high gate leakage currents. Alternative insulating materials have been investigated, and a dual dielectric of hafnium oxide (HfO2), a high-k (high permittivity) material, combined with SiO2 on silicon has been chosen as a solution to is scaled down. As the silicon transistors are scaled down to the nanometer-scale level, these devices are unable to sustain the square-law or short channel approximation because of fundamental physical limitation in the transistor materials. Innovative and original approaches to novel devices are required to continue downscaling. The self-assembly properties of biomolecules offers one approach. Molecular self assembly of biomolecular nanometer scale devices provides device fabrication control from the bottom-up. In this study, self-assembled biomolecules will be investigated for use as semiconductive materials in transistor and simple ICs configurations. Biomolecular and polymer nanostructures have been deposited on these electrical test structures for sensor applications. The biomolecules include both polypeptides and DNA. They will be used in conjunction with Au electrodes fabricated at the micron-meter and submicron-meter scale in gated configurations. Both DC and time domain measurements will be used to electrically characterize the devices and simple circuits. Optical microscopy and atomic force microscopy (AFM) will be used to characterize the topology of the electrodes and biomolecules and possibly the electrical and structural aspects of the biomolecules.

THE IMPLEMENTATION OF LOW NOISE SPECTROSCOPY AT BOISE STATE UNIVERSITY

Christopher Buu (Honors College) and Ross Butler,
Departments of Electrical and Computer Engineering and Materials Science and Engineering
Faculty Sponsor: Bill Knowlton

As CMOS dimensions continue to decrease, the traditional silicon dioxide (SiO2) insulating layer on silicon in today’s Metal-Oxide-Semiconductor Field-Effect-Transistors (MOSFETs) have reached unacceptably high gate leakage currents. Alternative insulating materials have been investigated, and a dual dielectric of hafnium oxide (HfO2), a high-k (high permittivity) material, combined with SiO2 on silicon has been chosen as a solution to
continue CMOS scaling at a reduced penalty of gate leakage current. Compared to SiO₂, HfO₂ contains more defects and traps. Several different electrical tests are available to characterize possible defects and assist in characterizing the dual dielectric gate stack. This research presentation focuses on the implementation of one such non-destructive electrical characterization technique, low noise spectroscopy. Low noise spectroscopy allows for deep trap probing in the IL and high-k layer compared to other techniques such as charge pumping. As current flows in the silicon between the source and drain of a MOSFET, a small number of electrons are trapped/detrapped from defects in the HfO₂ giving rise to noise in the drain current. The deeper a trap is located from the silicon, the longer the electron takes to be trapped and detrapped. By measuring the frequency component in the noise associated with the drain current, current fluctuations can be correlated to traps in the gate dielectric. This research technique will provide a powerful method to identify defects in the HfO₂/SiO₂ gate stack.

**CONTINUOUS FLOW POLYMERASE CHAIN REACTION DEVICE FABRICATED IN LOW TEMPERATURE CO-FIRED CERAMIC**

_Hope Weston, Department of Mechanical and Biomedical Engineering_  
_Faculty Sponsor: Amy Moll and Don Plumlee_

Miniaturization of a biological sensor in the field environment is needed for detection of Anthrax, E-bola, or West Nile Virus. Polymerase Chain Reaction (PCR) is the part of the sensor that exponentially amplifies a specific DNA sequence. Three temperature regions of 94°C, 55°C, and 72°C are required to achieve the amplification. Each sample needs to be passed continuously through the cycle approximately thirty times. The device contains resistive heaters, isolated thermal zones, and surface mounted thermocouples. It is critical for the sample, when in a particular region, to be as close to the corresponding temperature as possible. If the sample is overheated it will be destroyed and unusable for testing. Prior to fabrication, a thermal model was developed to correctly size the channels and heaters, as well as to verify the design. Low Temperature Co-fired Ceramic (LTCC) is a robust and low cost material used to fabricate the PCR device presented.

**OPTIMIZING CHEMICAL-MECHANICAL PLANARIZATION OF THICK COPPER FILMS BY MODIFYING MICROSTRUCTURE**

_Mariela Bentancur, Patrick Andersen, and Megan Frary_  
_Department of Materials Science and Engineering_  
_Faculty Sponsor: Megan Frary_

Large through-wafer interconnects may be required for high current applications or novel devices like backside connected solar cells, and chemical mechanical planarization (CMP) may be used in processing these structures. In this work, we study how copper microstructure (e.g., grain size and grain orientation) affects the chemical mechanical planarization process. Copper film plating parameters and subsequent thermal treatments are varied, causing a change in microstructure. These different microstructures result in different removal rates, surface roughness, and microscopic surface features. To quantify microstructural parameters such as grain size and crystallographic texture, electron backscatter diffraction is used, and correlated with Optical Profilometry, and Atomic Force Microscopy. Results show that microstructure has a significant impact on CMP outputs, and may affect the success of subsequent processing steps. By understanding how microstructure affects CMP, one can process accordingly. The results of this work could be applied to optimize CMP of copper films and through-wafer interconnects.
HARDWARE DISPENSER FOR ARC

Barbara Bailey, Jason Darst, and Ron Bray; Department of Mechanical and Biomedical Engineering Faculty Sponsor: Rudy Eggert

The ARC provides employment for physically and mentally handicapped individuals. The workers fill contracts that include placing small pieces of hardware, i.e. washers, nuts, into plastic bags. Due to worker limitations, some of the hardware is very difficult for the workers to pick up and place in the bag. This group has developed a dispenser that will dispense different types of hardware, one type at a time, with the push of a button. A hopper holds the hardware to be dispensed. The hopper leads into a funnel with a long tube, specifically designed for the hardware in the hopper. The operator depresses the lever to dispense one piece of hardware. When a dispense is successful, a visual cue alerts the operator. Since many of the operators have full or partial use of only one hand, the dispenser can be operated with either hand. In addition, the force required to depress the lever will be set to the minimum value that allows the dispenser to work. The first prototype for the dispenser has been started and tests will be performed. The tests include proof-of-concept and consistency of operation. Once the prototype has been developed, a working system will be delivered to the ARC for their use.

BI-DIRECTIONAL BRUSHED DC MOTOR CONTROLLER

Jon Glauser, Curt Lake, Sahar Ghafari, and Sangthong Phothong; Department of Electrical and Computer Engineering Faculty Sponsor: Said Ahmed-Zaid

The Power Lab in the department of Electrical and Computer Engineering possesses part of an electrical machines demonstration system. This system is used to demonstrate and perform experiments on electric machines on a hands-on lab tool for undergrads, graduates, and professors. However, this equipment is missing a major component, preventing it from being useful. Our mission is to build an appropriate motor speed controller that can be used in this system. The difficulty lies in the level of power required which is around half a kilowatt. We will design a robust circuit that can efficiently control a motor of up to half a horsepower at high direct current (DC) voltage. This control will then be integrated with the rest of the existing system to become a very valuable tool for other students. In addition to this basic speed and direction control, we will attempt to add features such as acceleration control, closed loop speed feedback, and over current protection. These features might make a good project for future students to improve on based on our original circuit.

MICROSTRUCTURAL STABILITY OF GRAIN BOUNDARY ENGINEERED COPPER

Sharla Hopkins, Department of Materials Science and Engineering Faculty Sponsor: Megan Frary

Grain boundary engineering (GBE) is a thermo-mechanical process in which sequential straining and annealing cycles are used to increase the fraction of special, low-energy grain boundaries (with $\Sigma \leq 29$ according to the coincidence site lattice model). In the present work a cubic face-centered...
pure copper material was processed by GBE. In addition, a conventionally-processed sample was processed with a single strain step, equal to the total strain in the GBE sample. The thermomechanically-processed samples were subjected to elevated temperatures for varying times. The conventionally processed and GBE samples had similar grain size and fraction of special boundaries before being subjected to grain growth. The GBE samples exhibited a resistance to change in the fraction of special boundaries and grain size (as determined by Orientation Imaging Microscopy (OIM)), while the conventionally-processed samples experienced abnormal grain growth. GBE processing through cyclic deformation provides a more stable and predictable microstructure than conventional processing. Future work will compare the length fractions and number fractions of the special boundaries. If microstructures produced during GBE are more stable at high temperatures, materials resistant to grain growth can be engineered.

**MICROSTRUCTURAL EVOLUTION DURING GRAIN BOUNDARY ENGINEERING OF STAINLESS STEEL 316L**

Ben Albiston, Department of Materials Science and Engineering  
Faculty Sponsor: Megan Frary

Grain boundary engineering (GBE) is a method for controlling the microstructure of a metal in order to gain better macroscopic properties in the material. In GBE, the goal is to reduce the interconnection of general grain boundaries and to increase the number of “special” boundaries in order for the material to perform better against deterioration methods like fatigue and corrosion. The objective of this project is to both reduce the number and interconnection of general boundaries in stainless steel 316L using GBE. In order to achieve this, a series of cold working and annealing steps are used to modify the microstructure of the metal; electron backscatter diffraction (EBSD) is then used to characterize the results. The base material used in this project had 50% special boundaries and the final GBE-processed material had 80% special boundaries. This project shows that GBE processing was successful in reducing the number and interconnections of general boundaries. In future work this processed material will be mechanically tested to determine how the increased number of special boundaries affects the high temperature deformation of the material.

**IMPLEMENTATION OF SOFTWARE CONTROL PANELS FOR HP LASERJET EMULATORS**

Daren Wolverton, Clair Manning, David Knight, and Lincoln Bollschweiler;  
Department of Electrical and Computer Engineering  
Faculty Sponsor: Nader Rafia

Hewlett Packard manufactures and develops LaserJet printers; however, due to cost considerations it is impractical to provide a LaserJet to every development engineer associated with a product line. As a solution to this problem lower cost emulators are used as development tools. These emulators were produced by interfacing a product formatter board to a computer and attaching a control panel to the formatter. To further reduce the cost of the emulators it was suggested that the hardware control panel could be replaced by software. By adding additional code to the existing interface firmware we were able to implement a virtual control panel in the computer software, potentially resulting in considerable cost savings for HP.
FABRICATION OF A SI SOLAR CELL WITH BACKSIDE CONTACTS USING THROUGH WAFER INTERCONNECTS

Austin Johnson, Peter Miranda, and Amy Moll; Department of Materials Science and Engineering Faculty Sponsor: Amy Moll

Boise State has developed a process to create through wafer interconnects (TWI) in a silicon wafer with 10:1 aspect ratio. In this project, TWI's are utilized to develop a solar cell with improved efficiency. Traditional solar cells use a frontside contact grid to carry charge away from the cell. By moving the topside grid to the backside, a larger surface area is exposed to sunlight and nearly all shadowing effects are eliminated. In addition, a backside contact grid allows for a reduced travel time for charge carriers, lowering the recombination rates of holes and electrons. These factors combined produce a more efficient solar cell that can be used wherever traditional solar cells are used. A prototype solar cell was created. A BOSCH etch process was used to create the TWI's. The n-type regions were doped using a spin-on diffusant. This prototype solar cell has been electrically tested to confirm functionality.

HUMAN POWERED VEHICLE

Gus Engstrom, Hope Weston, Aaron Coulter, and Tommy Smith; Department of Mechanical and Biomedical Engineering Faculty Sponsor: Rudy Eggert

Human Powered Vehicles are aerodynamic, highly engineered vehicles that may be for use on land, in the water or the air. ASME sponsors the Human Powered Vehicle Competition in hopes of finding a design that can be used for everyday activities ranging from commuting to and from work to going to the grocery store. The point of the competition is the elegance and ingenuity of the design, including presentation, practicality and safety. All areas of engineering problem-solving are addressed - it's not as simple as it appears to design and build these vehicles. And the competition itself is great fun for the team. The vehicles are judged on design, safety and performance. The first stage of the competition is the preparation of a comprehensive design report. The second part of the competition includes design presentation and performance events, held over a weekend where the vehicles race against one another in time trials and an endurance event.

HEYBURN, IDAHO MUNICIPAL WATER SUPPLY EXPANSION

Brandon Duncan, Bill Lynch, Mohamed Oudrhiri, Wes Rood, Jason Taylor, and Dave Voloshen; Department of Civil Engineering Faculty Sponsor: Molly Gribb

This project is a design for the Heyburn, Idaho municipal water supply expansion. Heyburn's demand is growing due to a growing population and expanding commercial usage. The system primarily consists of a water tank and booster pump station. A demographic analysis was used to predict future water needs. The tank and pumps will be located approximately 500 feet due west from the Snake River, south of 7th Street, and east of Villa Drive in Heyburn, Idaho. The design includes a chlorination system for disinfection of water supplied by the storage tank, and an emergency generator for power outages. A building was designed to house the pumps, disinfection system, and generator. Foundation design is based on analysis of geotechnical data supplied for the project. Also included is site development and access road design. The expanded system has been designed to meet the needs of the city for the next 20 years.
IMPACT ASSESSMENT OF TREASURE VALLEY AIR QUALITY ON SCHOOL CHILDREN WITH ASTHMA

Leah Arnold, Department of Community and Environmental Health
Faculty Sponsor: Uwe Reischl and Dale Stephenson

Purpose: The purpose of the study was to evaluate the impact of Treasure Valley air quality on the ability of school children with asthma to engage in physical outdoor activities.

Methods: Treasure Valley air quality conditions reported by the Idaho Department of Environmental Quality (DEQ) over a 9-year period were grouped into six EPA AQI health categories. The newly developed DEQ Asthma Slide Rule was referenced to determine the physical activity limitations associated with each air quality category. Restrictions for children exhibiting severe, moderate, and controlled asthma symptoms were considered.

Results: Data revealed that during the nine year measurement period, a total of 2,579 days were classified as “good”, 743 days were classified as “moderate”, 49 days were classified as “unhealthy for sensitive children”, while only 3 days were classified as “unhealthy”.

Analysis: Using the DEQ Asthma Slide Rule recommendations, school children with daily asthma symptoms should not have been allowed to engage in any vigorous outdoor physical activities during the 9-year period, should not have been permitted to engage in moderate physical activities during 759 days, and should not have engaged in light outdoor physical activities during 3 days.

Conclusions: Treasure Valley air pollution has a measurable health impact on the well-being of school children with asthma and other respiratory health problems. As air quality conditions continue to deteriorate in the Treasure Valley, the physical activity limitations imposed on school children with asthma will continue to increase.

EVALUATION OF CONTINUOUS POSITIVE PRESSURE DEVICES WITH PRESSURE RELEASE OPTION

Shandi Woodland and Lisa Johnatakis, Department of Respiratory Care
Faculty Sponsor: Lutana Haan

Background: Traditional CPAP machines deliver a continuous set pressure during inspiration and expiration. Newer machines that allow for a decrease in pressure at the onset of expiration are now being used; the algorithm for this pressure change varies by manufacturer. This decrease in pressure was evaluated on two different machines, each set at three different CPAP levels and each of the optional pressure release levels. The Respirronics Remstar Pro C Flex (C Flex) has a pressure drop at the start of expiration based on expiratory flow and the C-Flex setting. ResMed S8 Elite with EPR (EPR) uses three comfort levels to determine the degree by which pressure will drop, in cm H2O, throughout expiration.

Method: The C Flex and the EPR were attached to the Hans Rudolph Electronic Breathing Simulator (HR 1101). HR 1101 settings: resistance 10 cm H2O/L/sec; compliance 20 mL/cm H2O; respiratory rate 12 breaths per minute; amplitude 5 cm H2O; target volume 3000 mL. EPR and C Flex settings: CPAP 5, 10 and 15 cm H2O with C Flex and EPR settings of 1, 2 and 3 at each CPAP setting. The low pressure was averaged over 5 breaths.

Results: Pressure changes varied between the two machines.

Conclusion: The two CPAP machines resulted in different averaged low pressures during the expiratory phase despite the test settings being the same. The differences may be due to the way the two different algorithms respond.
EFFECTS OF ONCE WEEKLY ROSUVASTATIN FOR PATIENTS WITH HYPERCHOLESTEROLEMIA AND PREVIOUS INTOLERANCE TO STATIN MEDICATION

Sara O'Connor, Department of Nursing  
Faculty Sponsor: Kathy Reavy

Purpose: The purpose for this replication study is to validate published findings that once weekly rosuvastatin dosing for patients with hypercholesterolemia (high cholesterol) is an acceptable alternative to daily statin dosing in patients with previous intolerance to statin medication.

Background: A prominent cardiologist in a regional medical center in Idaho has successfully prescribed rosuvastatin once weekly for patients who have trialed and failed other statin medications due to undesired side effects. A recent publication by Backes, Moriarty, Ruisinger, and Gibson (2007) in the American Journal of Cardiology found that once weekly dosing of rosuvastatin in place of daily dosing achieved lower LDL cholesterol levels by 30% to 40%, in addition to providing significant cost savings for patients. The sample size in the study, however, was only 8 patients. Because the Idaho cardiologist noted increased patient compliance with medication and lower LDL cholesterol levels with patients on once weekly rosuvastatin dosing through the original study, he requested and supports this replication study to validate the findings by Backes, et al., and will be prescribing rosuvastatin and evaluating patients on this regimen from October, 2007 to June 2008.

Methodology: Data is collected from retrospective chart reviews of patients previously non-compliant with prescribed daily statin medication. Charts are reviewed between October 2007 and June 2008. Information from lab tests of cholesterol levels and liver function tests drawn before dosing change and 3 and 6 months post dosing change are entered into an Excel sheet and will be statistically analyzed using SPAA 15. Demographics, disease diagnosis and side effects of medication are also collected.

Timeline and Findings: Data will be collected until the end of July. Validation or rejection of Backes, et al.'s study will be evaluated at that time based on statistical analysis of new data.

POSITIVE IMPACT: A PHYSICIAN-NURSE COLLABORATIVE APPROACH FOR IMPROVED PATIENT CARE

Mary Randall, Department of Nursing  
Faculty Sponsor: Kathy Reavy

AIM: To prove the effectiveness of a physician-nurse team approach regarding titration of Carvedilol, a beta blocker, for treatment of patients with cardiac failure complicated by co-morbidities, such as diabetes, asthma, and reactive or obstructive airway disease.

METHODOLOGY: A quantitative, non-experimental design was used. Data from retrospective chart reviews were collected over a 6-month period. Recommendations for prescribing Carvedilol frequently omit patients with cardiac failure complicated by reactive and/or obstructive airway disease. However, a cardiologist in Boise, Idaho, has successfully titrated Carvedilol over a 2-month period for such compromised patients. Patient outcomes improved because of successful nurse-physician collaboration in caring for these patients. This study examined patient outcomes and nurse-physician standard of care in the titration process from low dose to standard dose of Carvedilol.

RESULTS: The initiation of Carvedilol, a beta blocker, with smaller medication doses than recommended by the pharmaceutical company was extremely beneficial for patients as evidenced by improved left ventricular ejection fractions. Data from this study supported the titration method as well as the collaborative nurse-physician standard of patient care. Quality of life for patients was improved and sustained over longer periods of time. This practice should be considered in cardiology and internal medicine clinics.
POLICY AND RESOURCE DEVELOPMENT FOR DISRUPTIVE AND THREATENING STUDENT BEHAVIORS IN HIGHER EDUCATION

Christopher Miller, Department of Nursing
Faculty Sponsor: Cynthia Clark

Disruptive and threatening student behaviors in higher education are serious concerns and minor acts of academic incivility can escalate into destructive and violent behaviors. Preventing this from occurring is essential to the safety of the campus community. Therefore, it is important for universities to craft and disseminate policies that govern disruptive student behaviors and to support policies with educational and training resources for all campus personnel. In Fall 2007, a 22-item survey was used at Boise State University to 1) gather campus personnel's perceptions of disruptive and threatening student behaviors, 2) inform the 'Policy Governing Student Disruptive Behaviors' and 3) determine the most effective training/educational resources needed to instruct campus personnel regarding disruptive and threatening student behaviors and how to respond safely and effectively. 21% (n=737 of ~3500) of campus personnel responded to the survey. Approximately 31% of respondents indicated that 'incivility' is a moderate problem on campus. Twenty percent stated they were aware of threats being made by students against faculty and 11% indicated that students had made statements about having access to weapons. Nearly half (48%) of the respondents stated that they avoided dealing with uncivil or threatening student behaviors because they have not received training. If training were offered, the majority of respondents preferred 1-2 hour 'live' training sessions with group discussions (87.9%) in combination with interactive web-based training tools (53%). Hundreds of campus personnel shared their experiences with student incivility. This poster session highlights the role of an undergraduate research assistant in conducting this study.

PARTICIPATION IN A JOURNAL CLUB AT A COMMUNITY HOSPITAL FOR THE PURPOSE OF IMPLEMENTING EVIDENCED BASED PRACTICE

Cynthia Reed, Department of Nursing
Faculty Sponsor: Kathy Reavy

Background: Benefits of participating in a hospital based journal club is a concept supported by an Idaho community hospital. Participation in a journal club has the potential to increase participation in utilizing research, thereby providing improved quality patient care based on best available evidence. Published articles and anecdotal evidence, however, find that journal clubs are initially supported but are not sustained.

Purpose of the Study: The purpose of this study is to examine characteristics of point-of-care hospital nurses who might be interested in participating in a journal club over an extended period.

Design: A qualitative participatory action research design is used for this study. The sample consists of point-of-care nurses on a medical-surgical unit in a community hospital. The nurses received information about journal clubs and are interviewed as to whether or not they will participate. Because the design is participatory action research, the primary investigator is a “researcher-as-instrument” and actively participates in the journal club while evaluating the characteristics of those who choose to join and have sustained participation, and those who do not.

Data Collection: Audio recordings of interviews with point-of-care nurses and written field notes are used to collect data and create an audit trail.

Analysis: Themes are extracted from the interviews and field notes. Theme analysis is ongoing and validated by a second researcher.

Timeline: This research is currently in progress and ongoing. Preliminary information will be available by April 2008.
IMPACTS OF MOISTURE AND TEMPERATURE ON STORED SEEDS IN SUBTERRANEAN PITS

Susan Hawkins, Department of Anthropology
Faculty Sponsor: Mark Plew

The ethnographic record has served archaeologists as a way of interpreting archaeological data. The Western Snake River Plain subsistence practice has been described as relying mostly on fishing supplemented by hunting, root and seed gathering. It has been suggested that winter storage was an important part of the subsistence strategy. However, recent comparisons of archaeological sites show little evidence of storage which fails to support the assumption of storage in the ethnographic record. Previously replicated storage facilities were evaluated on the impact of fungal contamination on green and processed seeds and established that storing seeds in underground pits through the winter months resulted in near immediate fungal contamination. It suggests that fungal contamination impacts the duration of storage and implies a short term caching strategy of the type commonly associated with highly mobile foragers. It also provides a possible explanation for the archaeological absence of storage facilities or features. Two underground conditioners, moisture and temperature, may influence fungal contamination and impact how long stored food will last. The objective of this project is to measure moisture and temperature levels of subterranean stored seed using Lascar EL-USB-2 Relative Humidity (RH), Temperature and Dew Point Data Loggers to determine if these factors influence the growth of fungi and how it relates to short term storage. Seed samples will be wet mounted on slides with lactophenol; a stain intended for use in the examination of plant fungi. The results demonstrate that fungi development occurs almost immediately upon storage when moisture levels have increased in the pits limiting storage to a short-term caching strategy.

COLLEGE STUDENT PROBLEM DRINKING: FACT OR NOT

Mike Albiston and Leah Kalk, Department of Psychology
Faculty Sponsor: Susan Esp

College alcohol use is a growing problem that causes both primary and secondary effects on university campuses nationwide. While alcohol use in adults is decreasing across the nation, 15 to 24-year-olds continue to increase their alcohol consumption and 62-80% of college students drink, with 40-50% of these students participating in heavy episodic drinking. Findings have shown that individualized feedback regarding drinking behavior may change the drinking patterns. I am referring to the electronic Check-up to go (e-Chug), a Student Affair Administration in Higher Education (NASPA) recognized evidence-based, on-line alcohol intervention and personalized feedback tool that focuses on personalized feedback regarding current drinking patterns and normative feedback on how students drinking compares with other students on campus. The purpose of this study was to compare the impact of e-Chug on students in various levels in the education process (freshmen, sophomores, juniors and seniors) and four separate disciplines of study (English, art, engineering, and math). The study indicated significant differences between years in school on attitudes about alcohol after taking the e-CHUG evaluation, F (3, 48) =10.59, p< .05. The trend was for awareness of alcohol intake to decrease as years in school increased. Also there was a significant difference between majors
regarding their attitudes about alcohol after taking the e-CHUG evaluation, \( F(3, 48) = 20.65, p < .05 \). This showed that those in the more technical disciplines were more responsible with their drinking throughout their education career compared to those in the other disciplines. Finally, there was not a significant interaction between majors and years in school and attitudes about alcohol after taking the e-CHUG evaluation.

**LEADERSHIP AND WOMEN. TO APPEAR AS CHAPTER 6 IN THE PSYCHOLOGY OF WOMEN AT WORK: CHALLENGES AND SOLUTIONS FOR OUR FEMALE WORKFORCE, VOL. 1: CAREER LIB**

*Karen Duff-McCall, Department of Psychology  
Faculty Sponsor: Will Schweinle*

This literature review covers some of the historical and empirical information about women as leaders, focusing on leadership in the workforce. The two most widely recognized and researched styles of leadership, transactional and transformational, are discussed within different contexts: gender roles, agency and communality, and the interactions between leadership roles and expectations with gender roles and expectations. Transactional leadership can be viewed as the traditional style of leading and contains many masculine characteristics, like assertiveness and aggression. Gender roles and expectations for women are different and feminine qualities are not congruent with transactional leadership. Utilizing transformational leadership, with its communal attributes, allow women to lead effectively without rejecting societal gender norms – as did Queen Elizabeth I. Historically, leadership has been transactional, which is familiar to both leaders and followers. Research on the effectiveness of leadership style is mixed; some findings show that transactional leadership is more effective, while others insist transformational leadership is more effective. Eagley and Johnson (1990) suggest that there is no statistically (or practically) significant difference in the ultimate efficacy of the two leadership styles. The primary conclusion of this work is not an argument for one leadership style over another; it is an argument for matching leadership style to situations and people. Women utilizing transformational leadership qualities are better received by subordinates and less likely to face rejection because it is congruent with societal expectations of women. This work ultimately implies that the efficacy of leadership is dependent on many leadership and contextual variables.

**THE IRAQ WAR: MEDIA PORTRAYALS AND AMERICAN PEOPLE**

*Jody Phillips, Taylor Neal, Theresa Horn, Mitch Coffman, and Matt Patterson;  
Department of Communication  
Faculty Sponsor: Laurel Traynowicz*

This study has investigated how the communicative messages of different broadcast news networks affect the public’s opinion regarding the Iraq war. Opinions were compared between three separate populations: Treasure Valley residents, Boise State University students, and soldiers who have served in Iraq. We investigated the possibility that the ideological and political persuasion of the public may influence which news channel they watch. Our research indicated that the majority of respondents from all three sample populations felt that TV news broadcast a negative view of the war, and many reported that they have negative ideas toward the Iraq war. Generally, respondents did not believe that their political or ideological persuasion affected their choice in news channels; however, there was a correlation between favoring a political party and choosing a news channel.
HISTOMORPHOMETRIC ANALYSIS OF FOSSIL PROBOSCIDEANS

Sean Prall, Margaret Streeter, and Christopher Hill; Department of Anthropology
Faculty Sponsor: Margaret Streeter

The bones of large mammals are characterized by remodeling which is manifest in the production of Haversian systems or osteons. In humans, osteon size and density (number per area) has been used to estimate the rate of bone remodeling. Previous histological studies on Pleistocene megafauna focus on mineralization processes in broad comparisons with other mammals. However, until now only one study has examined the rate of osteon remodeling in these extinct mammals. Using histological techniques developed for human bones, we analyze the bone formation rate in several proboscideans and compare our results with other published data.

BONE REMODELING RATES IN A SAMPLE OF ADULT HUMAN FEMURS

Angela Kezele, Department of Anthropology, Boise State University; Sam D. Stout, The Ohio State University, Columbus, Ohio.
Faculty Sponsor: Margaret Streeter

The rate of bone remodeling in human bone is known to vary with age and sex. Here we assess a sample of adult human femora taken at autopsies and from forensic cases at the Boone county Missouri Medical examiners office. Mean osteon size, and secondary osteon density (number per area) are employed in the determination of dynamic bone remodeling rates and to evaluate the accuracy of the age at death estimation method developed by Kerley and Ubelaker (1978).

WHAT COMPONENT OF WORKING MEMORY PREDICTS HIGHER COGNITIVE FUNCTIONING?

Kevin Ross, Department of Psychology
Faculty Sponsor: Heather Thompson and Patt Elison-Bowers

Working memory (WM) is the ability to simultaneously process and store information (Baddeley, 1986). WM also involves executive functioning; this is the integration of information currently in attention with information stored in long term memory. WM has been associated with higher cognitive functioning (HCF) such as reading ability (Budd, Whitney, & Turley, 1995), reading comprehension (Daneman & Merikle, 1996), verbal ability (Engle, Cantor, & Carullo, 1992), problem solving (Adams & Hitch, 1997) and following directions (Engle, Carullo, & Collins, 1991). Furthermore, strategy training has been shown to enhance WM performance and strengthen the relationship between WM and HCF (Turley-Ames & Whitfield, 2003). However, depending upon the type of HCF measure utilized, the learned strategies impact the relationship between WM and HCF differently (i.e., reasoning or reading comprehension; Thompson & Turley-Ames, 2006). The question becomes why is the relationship between WM and HCF dependent upon the type of HCF measure used? Why are some tasks more dependent on the processing component, while others on storage? Therefore, the purpose of the present study was to determine if processing or storage mediates the relationship between WM and HCF dependent upon the HCF measure (i.e., reasoning and reading comprehension). Specifically, it was hypothesized that processing would mediate the relationship between WM and reasoning, whereas storage would mediate the relationship between WM and reading comprehension. Results indicate that it is neither processing nor storage alone that accounts for the relationship between WM and HCF, but rather both types of HCF measures rely on executive functioning.
PROGRAM COVER DESIGN COMPETITION

First Place: Sarah McCarthy
Honorable Mention: Andy Harl and May Hernandez
Art 488 Graphic Design Studio IV Students' Choice: Morgan Sorensen
All cover designs are displayed in the Bergquist Lounge.

OUTSTANDING ACHIEVEMENT AWARDS

All entries in the Undergraduate Research and Scholarship Conference have been juried by their College and selected for presentation. Entries will be judged by each College to identify the Outstanding Achievement Awards. The award winners will be named and presented a plaque at the ceremony. In addition, each Dean will make a “Dean's Choice Award” that will also be presented at the ceremony.

FACULTY MENTOR AWARD

As noted in each abstract in this program, students' projects have a faculty sponsor. Students also work with faculty in labs, on creative projects, and scholarship that result in mentoring relationships. Students nominated Outstanding Faculty Mentors of which one faculty member was selected to receive this award which will be presented at the ceremony.

SIGMA XI AWARD

Sigma Xi, an international honor society of science and engineering, has nearly 60,000 members from around the world selected based on their research potential or achievements. The Boise State University Chapter is one of 500 Sigma Xi chapters, whose membership includes undergraduate students, graduate students, researchers, faculty, and community members. For the first time this year, Sigma Xi is proud to be part of the Boise State University Undergraduate Research Conference. At the conference, student posters in the sciences and engineering will be judged, and a 'Best of Show' Poster will be selected for an award sponsored by the Boise State University Chapter of Sigma Xi.
**SPECIAL THANKS**

*Special thanks to the following individuals and groups who made this conference possible:*

**Conference Director:** Sharon McGuire  
**Conference Organizer:** Judy Wauer  
**Conference Planning Committee:** Jeri Bigbee, Janet Callahan, David Hall, Craig Hemmens, Helen Lojek, Sharon McGuire, Sian Mooney, Mark Rudin and Judy Wauer  
**Abstract and Conference Judging Coordination – Associate Deans:** Paul Bahnson, Janet Callahan, Helen Lojek, Pam Springer, Sarah Toevs, Laurel Traynowicz and Ross Vaughn  
**Art Department:** Stephanie Bacon and Jennifer Wood  
**Program Cover Design:** Sarah McCarthy  
**Program Cover Design Judging:** Students from Art 488 Graphic Design Studio IV, Jeri Bigbee, Seth Grigg, David Hall, Craig Hemmens, Helen Lojek, Sharon McGuire, and Judy Wauer  
**Program Cover Design Art Display:** Holly Gilchrist  
**Performing Arts Coordination:** Marla Hansen  
**Office of Research Compliance:** Judie Mayne  
**Organizational Assistance:** Seth Grigg  
**Speakers:** Provost Sona K. Andrews, Vice President for Research Mark Rudin, and Associate Vice President for Undergraduate Studies Sharon McGuire  
**Student Union Conference Services Coordinator:** Tamara Hodge  
**Printing:** Boise State University Printing & Graphics  
**Signage:** Boise State University Sign Shop  
**McNair Scholars:** Jason Arnold, J.J. Durrant, Janie Gates, Arturo Gutierrez, Carol McHann, Matthew Reinhold, Geneva Román, Vivianne Sanchez, Nicole Svenkerud, Simon Tu, Fred Waweru and David Hall, Program Coordinator  
**Honors College:** Christopher Anderson, Christopher Buu, Cliff Csizmar, Scott Lee, Shan Lyons, Geneva Román, Nicolas Wynkoop, Lisa Young, and Craig Hemmens, Director.

**Financial support for this conference was provided by the following:**

- **President**  
- **Provost & Vice President for Academic Affairs**  
- **College of Business and Economics**  
- **College of Engineering**  
- **College of Social Sciences and Public Affairs**  
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**SAVE THE DATE**

**THE 6TH ANNUAL UNDERGRADUATE RESEARCH AND SCHOLARSHIP CONFERENCE WILL BE HELD ON**

**MONDAY, APRIL 20, 2009**