
RESIDENCY AND IMMIGRANTS

LANGUAGE SKILLS: A QUANTITATIVE STUDY OF HOW LENGTH OF RESIDENCY IN THE U.S. AFFECTS IMMIGRANTS' LANGUAGE SKILLS

STEPHANIE ALLEN, Sociology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Candan Duran-Aydintug, Sociology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

This paper analyzes the length of time immigrants reside in the U.S. and their English language skills, which include speaking, writing, and reading English. The results in this paper come from a questionnaire project my Advanced Social Science Research class conducted for the Colorado Labor and Employment Office located in Denver, Colorado. This is an important study to read to find out whether or not existing ESL (English as a Second Language) workshop programs are keeping up with immigration continually occurring in the U.S. It is also important to find out whether immigrants English language skills improve the longer they are in the U.S., and which skills they are most uncomfortable performing. The results of whether length of years residing in the U.S. affect how comfortable immigrants are speaking, writing, and reading English show that according to chi-square, there is no relationship between the length of years residing in the U.S. and how comfortable they feel speaking or writing English. However, a relationship was determined between length of years residing in the U.S. and comfort level reading in English. All three variables were tested at the .05 alpha level.

LESS THAN A DROP IN THE OCEAN

ANDRE ALMEIDA, Public Affairs Graduate School of Public Affairs

Faculty Mentor: Dr. Jennifer Wade, Public Affairs, Graduate School of Public Affairs

Activity Type: Graduate Creative Activity

Coming from Portugal, I arrived in NY in October and then in Denver in January to start my PhD at GSPA at UCD. Being a singer and songwriter (www.andredalmeida.com) it is through poetry and music that I communicate with myself and express my feelings, thoughts, ideas, and visions with others, as it happened in my previous life experiences in The Netherlands and China. "Less Than a Drop in the Ocean" is a performance comprised of two songs inspired by my social and academic experience in the US and Denver in particular. The song in English, is about the paradox of being so small in such a big country but with so many opportunities to make the difference in our lives and in the life of our communities. The song "Se", written and sang in Portuguese ("If" in English) is about the illusion of pretending or wanting to be something other than what we truly are, as if we are never satisfied with our own nature and capabilities. Being that these songs are sung in two different languages, this performance aims to add one more dimension to previous ideas: a multicultural experience using a universal language - the music.

FLUX VARIABILITY OBSERVATIONS OF HIGHLY ACTIVE BLAZARS

ANNE ANDREW, Physics, College of Liberal Arts and Sciences

TIMOTHY (WILLIAM) HATCHETT, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Alberto Sadun, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The current view of the development of the universe is that of galaxy evolution; astrophysicists have come to make a model to represent this phenomenon. It is thought that the universe began much differently than it is today, and went through many intermediate stages. Through the study of active galactic nuclei (AGN, a galactic object that has a small but dense nucleus that fluctuates in brightness), astrophysicists may develop light curves indicative of the state of evolution of the universe at large. Under the supervision of Dr. Alberto Sadun, our research group is observing a handful of AGN. The ones we have observed this past year include OJ 287, 1ES 2344+514, 1ES 1959+650, 3C 279, Mkn 421, and Mkn 501. First, Dr. Sadun receives a request from a group of collaborators to study an object in the night sky. Our research group then sends a request to an automated robotic telescope that will take images of the object. Then, we students reduce the images by analyzing them with an image processing computer program; we compile a table of the results, later to be plotted. Finally, we send the information back to the collaborators that are compiling data on that object.

OPEN SOURCE TISSUE MODELING AND IMAGE PROCESSING LAB

JOHN APODACA, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

In support of experiments on the dynamics of organized populations of cells, we have set up a laboratory for distributed computer simulation and modeling of biological systems. Our goal is to assemble a versatile suite of open source applications that can be customized to the study of cells, tissues, and small organisms. In the first phase, several individual Linux workstations have been configured and networked. This enables progress to the planned second phase which is to use cluster-computing architectures and algorithms to perform complex simulations. An important adjunct to this work is the development of image processing tools that can be applied to data as varied as microscope and astronomical images. The goal is to seek a cross-fertilization of techniques between widely varied fields that require sophisticated image processing.

FACTORS AFFECTING CHILD HEALTH INSURANCE IN SINGLE-PARENT FAMILIES: DOES CHILD SUPPORT MATTER?

HELEN BEATY, Economics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Laura M. Argys, Economics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Uninsured children often face poor health outcomes compared to children covered by health insurance. Previous research has established socioeconomic and demographic patterns in children's insurance coverage. Specifically, children in single-parent families, children of color, and children with less-educated parents are more likely to be uninsured. Many researchers have also looked at Medicaid expansions and welfare eligibility and found that these programs affect the likelihood that children have publicly or privately provided health insurance. One policy that has been neglected in prior research is the effect of child support on children's health insurance coverage. Using data on over 10,000 children from the National Longitudinal Survey of Youth 1979 we estimate a multinomial logit model to examine the effect of vigor and efficiency of state child support collection efforts on insurance for children. Our results suggest that better child support enforcement can increase health insurance coverage among children in single-parent families and move other families from public health insurance programs to coverage provided privately by parents and/or employers.

WEST NILE VIRUS PREVENTION: BOULDER COUNTY PUBLIC HEALTH'S ONE BITE, ONE LIFE CHANGED FOREVER CAMPAIGN

PENELOPE BENNETT, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Lorna G. Moore, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

In the summer of 2003 weather conditions facilitated an outbreak of West Nile virus in Boulder Co., Colorado. There were 421 reported cases, seven deaths and 53 lengthy hospitalizations due to neurological damage, some resulting in lifelong disability. Mosquitos are infected via birds, making the controllable element exposure to mosquitoes. The following year, Boulder County Public Health initiated a prevention program designed to educate the public and assist local health care providers. Disease alerts, newsletters, expert consultations, free health promotion materials, and an interactive website were developed. Fortunately, weather conditions prevented a 2nd epidemic of WNV. Objective: To evaluate the 2004 One Bite, One Life Changed Forever campaign. Methods: Phone survey of random sample of residents; Fax and mail survey of all health care provider offices in Boulder County. Results: 85% of health care providers found the materials helpful, but only 30% used the consultation services or the website. 52% of the public were aware of the One Bite campaign, and 41% practiced one or more of the recommended precautions. Discussion: Disease awareness programs more easily impact health care providers than the public, and require targeted messages over time. Outside factors may affect the urgency of the message.

ESTIMATING POPULATION SIZES OF THE GRAY JAY USING GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND HABITAT PREFERENCES

JENNIFER BERG, Environmental Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Diana Tomback, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

We are devising a Geographic Information Systems (GIS) method to estimate wildlife population sizes. When the species' geographic range, habitat preference, territory size, and social group number per territory are known, a reasonable estimate of population size is possible. We developed and tested this method using two long-term study populations of the gray jay (*Perisoreus canadensis*): the Algonquin Park population, Ontario, Canada, studied by Dan Strickland since the late 1960s, and the Fraser Experimental Forest (FEF) population, Colorado, studied by Tom Nicholls from 1982-2005. The latter study lacks habitat preference and territory size information. Without these data, our initial FEF population estimate substituted habitat and territory information from Algonquin Park. Using color-banded gray jays, we conducted field observations and ground-truthing in the FEF to determine habitat preference and territory size. We learned that gray jay habitat use extends into lodgepole pine (*Pinus contorta*) forest. Using this new information, we updated the GIS based population estimate and obtained results close to the actual population sizes based on banding data. These results suggest that GIS-based estimates can be accurate and potentially useful in monitoring species of concern, whose geographic range, habitat preference, territory size and group number per territory are known.

VULNERABILITY TO NATURAL HAZARDS: STUDY OF WILDFIRE BURNED SUBDIVISIONS IN THE WILD-LAND-URBAN INTERFACE IN THE WESTERN UNITED STATES. USING IKONOS IMAGERY AND HIGH RESOLUTION GIS DATA

UDDHAB BHANDARY, Design and Planning, College of Architecture and Planning

Faculty Mentor: Dr. Brian Muller, Design and Planning, College of Architecture and Planning

Activity Type: Graduate Research

Wildfire events and consequent loss of property and lives are increasing in the Western United States. However, research on social vulnerability to wildfire hazard is rare. Further, the application of high resolution data to study social vulnerability to other natural hazards has also begun recently. This research argues that the traditionally used socio-demographic variables with aggregate data do not reflect people's vulnerability accurately, but level of planning and design. It observes the characteristics of houses and subdivisions damaged by wildfire in Colorado and California using high resolution data. Primary sources of data are IKONOS imagery with 4 meter resolution taken before and after wildfire, elevation data at 10 meter resolution and spatial data at subdivision and parcel level. Field observation and interview with planners offer other information unavailable from the digital data. The County Assessors' parcel value is used to determine if there is a relationship between burned houses and poverty. Geographic Information System, logistic regression and case study method are applied for data analysis. The result shows that in the study area less defensible space, high slope, dense vegetation, smaller road width, and greater distance from the main road increase a chance of a house to burn by wildfire.

(This research is completed for Hayman fire, Colorado only, so the research result is at the preliminary stage)

SWITCH ACCESS FOR STUDENTS WITH SEVERE DISABILITIES: COLORADO STATEWIDE EDUCATOR TRAINING NEEDS SURVEY

ROSEMARY BOGART, School of Education

Faculty Mentors: Dr. Cathy Bodine, Physical Medicine and Rehabilitation, UCHSC
Dr. Marcia Muth, Extended Studies, School of Education

Activity Type: Graduate Research

This study was a state-wide survey of assistive technology specialists in Colorado to determine training needs for educators working with students with the most severe disabilities, using electronic microswitches in providing active learning opportunities for students with very little voluntary movement or speech. Students who cannot walk or talk due to disabilities such as cerebral palsy are at risk of sensory deprivation, problems with sensory processing, social isolation, and learned helplessness. Operating electronic devices using microswitch technology provides these students with opportunities for active learning, communication and environmental controls. The study sample was team leaders for public school district assistive technology teams. The study explored demographics, helpfulness of previous training, need for additional training, type and location of training needed, and helpfulness of additional training materials. Descriptive statistics were used to report the results.

BEYOND UNITY: APPLICATION OF A TAXONOMY OF INHIBITION AND INTERFERENCE CONTROL TO COGNITIVE AGING.

SARAH BRANNON, Health & Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Lorna G. Moore, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Declines in efficiency of inhibition and interference control may contribute to the cognitive declines often experienced by older adults, however investigations in this area have been hampered by the lack of a clear framework for inhibition, by task impurity and by the paucity of empirical research into the relationship between inhibition and interference control. A recent study by Friedman and Miyake (2004) suggests that in young people inhibition can be classified into three constructs: prepotent response inhibition, resistance to distractor interference and resistance to proactive interference. To investigate the generalisability of this taxonomy of inhibition-related-functions to an aging population ninety-four members of the community, aged between 41 and 79 years, attended individual testing sessions, completed one questionnaire and eight computer based tasks designed to tap the constructs of prepotent response inhibition, resistance to distractor interference and resistance to proactive interference. Results of Principal Component Analysis supported the existence of separable inhibition related functions similar to those proposed by Friedman and Miyake in the aging population. However further refinement of the measures of inhibition and more detailed investigation into the reasons for function separability are needed before the proposed taxonomy can make practical contributions to psychopathology or ageing research.

GROWTH AND MAINTENANCE OF DICTYOSTELIUM DISCOIDEUM AS A MODEL FOR A MEASURE OF COLLECTIVE CELL BEHAVIOR

ERIK BRAY, Mathematics, College of Liberal Arts and Sciences

ANNA HODD, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

To prepare Dictyostelium Discoideum (DD) cultures in order to have a platform for testing new instrumentation that monitors the structure and dynamics of aggregated cells with the goal of applying such instruments to diagnosis of human tissue. Particular interest is the behavior of the DD organism in the slug phase where cells are bound through a network of forces and undergo internal rearrangement.

MODELING OF CELLULAR DYNAMICS AND PROCESSES

ERIK BRAY, Mathematics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

To use computer modeling and animation techniques to simulate the dynamic processes by which epithelial tissue maintains itself (cell division, cell migration, cell differentiation, cell death, and cell removal). The particular focus is to replace the computer generated models and animation with physical models and the numerical simulations of model equations.

MEN WHO HAVE SEX WITH MEN

MANDI BROWNING, Psychology, College of Liberal Arts and Sciences

ANDREW ROSEN, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Eric Benotsch, Psychology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Previous research has documented a relationship between dissatisfaction with body image (BI) and sexual risk behavior in women receiving family planning services. The relationship between BI and sexual behavior has not been thoroughly examined in men who have sex with men (MSM), a group at elevated risk for HIV and other STDs. The present investigation examined the influence of BI on sexual risk behavior in HIV-positive and HIV-negative MSM. A total of 346 MSM attending the 2005 Denver Gay Pride celebration participated in the study. Participants completed an anonymous survey assessing demographic information, HIV status, body image, and sexual risk behaviors. Relationships between BI and sexual risk behavior were examined separately for HIV-positive and HIV-negative participants. For both groups, dissatisfaction with BI was associated with the highest risk behavior for each group. For HIV-negative MSM, BI was associated with unprotected receptive anal sex acts. For HIV-positive MSM, BI was associated with unprotected insertive anal sex acts. Both groups may be engaging in unprotected sex as a way of coping with BI dissatisfaction and affirming their attractiveness.

OPTICAL METHODS FOR VISUALIZING BREATHING FLOWS

TANYA CARLETON, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

We are using a method called Schlieren photography to visualize flows of animal and human breathing. Our first stage design uses a pair of 150cm focal length telescope mirrors to create a 10cm diameter parallel beam of laser light that passes through a test region and then focuses this light onto a knife edge. Disturbances to the air in the test region by breathing cause the light to be deflected in such a way that more or less light passes by the knife edge. In this way, a sort-of mirage pattern is created that can be photographed and used to study the structure of the breathing flow. Our goal is to explore the application of this capability to diagnosis of problems in the vocal tract and upper airway. Initial tests use other types of disturbances, such as hot air rising from a soldering iron tip, in order to prove the effectiveness of the optical arrangement.

METHAMPHETAMINE AND SEX: ATTITUDES AND BEHAVIORS AMONG MEN WHO HAVE SEX WITH MEN

KAYLENE CASE, Psychology, College of Liberal Arts and Sciences

JESSICA WALTER, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Eric Benotsch, Psychology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Background: Methamphetamine has become an increasingly widespread drug of abuse in North America. Use of this drug has been linked with sexual risk behavior in a variety of groups at increased risk for contracting HIV.

Methods: Participants (N=342) attending the June 2005 Gay Pride festival in Denver, Colorado (USA) completed a brief anonymous survey assessing methamphetamine use, attitudes associated with methamphetamine use, and high-risk sexual behavior.

Results: A significant minority of participants (27%) reported lifetime methamphetamine use. Relatively few (7%) reported using methamphetamine in the previous 3 months. Overall, around 1/3 of participants indicated that, when using methamphetamine, they would engage in sexual acts that they normally would not participate in. Participants who incorporated methamphetamine use into their sexual activity reported more total sexual partners over the previous 3 months, as well as more partners with whom they had engaged in specific risk activities including unprotected anal sex and unprotected oral sex ($p < .001$).

Conclusions: In the present sample, around 1/3 of lifetime methamphetamine users indicated a pattern of combining use of the drug with sexual activity. Future research should focus on these individuals and should further describe the motivations linking methamphetamine use to high risk activity.

A PROTOTYPE ELECTRICAL IMPEDANCE SPECTROSCOPY SYSTEM FOR CHARACTERIZING BIOLOGICAL MATERIALS

SARAH CHRISMER, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

In order to characterize organized clusters of cells and other biological substances, it is useful to understand how these systems transport electric charge. Measurement of such transport reveals internal structures, such as the relative content of membrane-enclosed spaces compared to intercellular fluid. We are designing electronic instrumentation that can measure the electric potential developed across a layer of tissue or an isolated organism in response to injecting electric current. This is done over a range of frequencies spanning 100 Hz to 10 MHz. The system will be tested on artificial materials, such as emulsions and colloidal suspensions, before application to a test organism (*Dictyostelium discoideum*). The long-range goal is to use such a system to characterize human oral mucosa (the tissue lining the mouth) as a means of detecting early transformation of such tissue into diseased states.

GROWING UP GIRL

SARAH CHRISTENSEN, Communication, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Barbara Walkosz, Communication, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The goal of this research project is to compile the memories of women regarding media and pop culture that influenced them in their adolescent years. Interviews and focus groups will be conducted with women who experienced adolescence across the decades (1950's to present) during which media became increasingly influential. Statistical data from the census bureau and other sources regarding social trends from this time period will also be collected. The project will be guided a multi-theoretical perspective including the assumptions of Cultivation Theory, Social Comparison Theory, and Piaget's work on development across the life span. The end product will be a manuscript that examines social and influential trends in media and pop culture over five decades. For example, I want to examine if a decline in abortions followed the release of the song and video for Madonna's "Papa Don't Preach," a song in which a young woman tells her father she's pregnant and is keeping her child. Juxtaposing social and mediated trends is also an interesting way to see how media and society transformed over five decades, and what types of media and which events during their adolescent years are closest to the hearts of many American women.

PHOSPHOLIPID BI-LAYER ANALYSIS

MATTHEW CLOUTIER, Finance, Business School

SHANE LANDRY, Physics, College of Liberal Arts and Sciences

ALICE MAJOR, Pre-Medical, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Novel tools have been developed to produce supported lipid bi-layer films. One technique involves dipping a slide into a lipid film deposited on an aqueous solution multiple times until the desired lipid layer thickness is achieved. This process of layer-by-layer deposition was developed by Langmuir and Blodgett, and thus resulting multi-layer films are referred to as LB films. LB films are of interest because of their physical characteristics similar to biological membranes. We will observe the in-house lipid bilayers using common optical microscopy and then attempt to observe and manipulate the samples further using near field optical scanning microscopy (NSOM). NSOM is an imaging technique that captures light in the near field, allowing optical resolution as high as ~ 20 nm. This is significantly greater than most current techniques which are limited to the wavelength of light, or roughly 250 nm. Successful production and observation of our lipid bilayers may provide greater insight to the characteristics and behavior of biological membranes and their interaction with other cellular components such as lipid vesicles.

ON THE USE OF REVERBERATION CHAMBERS TO SIMULATE A CONTROLLABLE RICIAN RADIO ENVIRONMENT

JASON CODER, Electrical Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

With the proliferation of wireless devices in recent years, there is a growing need to test the operation and functionality of these various devices in different multipath radio environments, ranging from line-of-sight environment to a pure Rayleigh (“scattering”) environment. We discuss how a reverberation chamber can be used to simulate a controllable radio environment for the testing of a wireless device. We show that by varying the characteristics of the reverberation chamber and/or the antenna configurations in the chamber, any desired Rician K-factor can be obtained. The K-factor can be defined as a ratio of “line-of sight” and “scattering” components. These components can be determined by the configuration of the chamber and/or antenna(s). Experimental results are presented to illustrate the validity of these expressions, to show how the reverberation chamber can be used to simulate different multipath environments, and to show the realization of a controlled K-factor test facility.

SHORT COURSES TO HELP STUDENTS COME UP TO SPEED ON INSTRUMENTA- TION DESIGN

JASON CODER, Electrical Engineering, Col-
lege of Engineering and Applied Science

Faculty Mentor: Dr. Randy Tagg, Physics, Col-
lege of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The design and prototyping of practical instru-
ments and technical devices requires knowledge
from many scientific and engineering disciplines.
A student involved in such a design process often
does not have the time to take a whole sequence of
regular courses in each knowledge area. Thus, a for-
mat is needed to quickly learn fundamentals of in-
strumentation design on a “just-in-time” basis. We
are developing course content and projects to serve
this purpose, with the aim of producing a library of
materials useful to students working in the Auraria
Rapid Prototyping Lab. A goal is to make this mate-
rial useful for distant learners as well, with the par-
ticular challenge of creating tutorial projects that are
technically sophisticated and yet can be performed
using readily available materials. We call this the
“Leadville Problem” because we want students liv-
ing in a remote town like Leadville, Colorado to be
able to perform the projects using materials available
from local stores.

OPTICAL PHANTOMS TO SIMULATE LIGHT GUIDING PROPERTIES OF DENSELY PACKED CELLS

RHETT COOK, Physics, College of Liberal
Arts and Sciences

ARON WOLTERSTORFF, Physics, College of
Liberal Arts and Sciences

MASOUD ASADI-ZEYDABADI, Physics,
College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics,
College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Some tissues and organisms consist of densely
packed cells. An example is the stratified epithelial
tissue of the lining of the mouth. Ray tracing calcu-
lations and macro-scale laboratory tests with arrays
of glass rods suggest that light might be guided for a
longer distance than expected through such tissue.
This light-guiding property could be a sensitive de-
tector of cellular organization. The next step is to test
this idea with an artificial structure that more closely
mimics the size and optical properties of cells. Thus
we are developing a micro-technique for fabricating
orderly arrays of thin glass fibers place side by side.
We will inject laser light into this array using well-
established methods for injecting light into optical
communication systems. Probes will measure the
scattering of light down the length of the array in or-
der to determine the length and intensity pattern of
propagation. In addition to providing test platform
for optical methods that can eventually be applied
to living organisms and tissues, we believe that mi-
cro-techniques for assembling the array of cell-sized
objects might have broader application in the devel-
opment of new biomedical instrumentation.

ISOLATION OF DETERGENT INSOLUBLE MEMBRANE RAFTS FROM XENOPUS OOCYTES

DANIEL CRONA, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Bradley J. Stith, Biology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

The membrane of a cell contains microdomains with distinct composition. These microdomains, which are enriched with high concentrations of cholesterol, sphingomyelin, and glycosphingolipids, are detergent insoluble areas of the membrane known as "rafts." Rafts exist as sperm binding domains on the surface of an egg membrane. Detergent insolubility, a high concentration of caveolae, as well as enrichment in the ganglioside GM1, distinguish rafts from the remaining constituents of the membrane. Rafts play a primary role in *Xenopus* egg fertilization due to phosphorylation of Src kinase, which occurs in the rafts. The objective was to develop a protocol to isolate membrane rafts, and provide a cell-free system in which fertilization events were analyzed. By creating a discontinuous density gradient, using cell lysate from *Xenopus* oocytes, and buffer that contained the detergent TritonX-100, raft fractions were collected after four hour periods of ultracentrifugation at 46,000rpm. The ultracentrifugation separated the detergent insoluble raft fractions from detergent soluble membrane proteins. The raft fractions were then tagged with either CTB-HRP or Cav-1 primary antibody. Dot blot tests detected the presence of GM1 gangliosides and caveolae. Subsequently, Western blot analysis further confirmed elevated levels of caveolae in the raft fractions if bands displayed at 21-24 kD.

INVESTIGATION OF AN ALTERNATE ROUTE FOR THE SYNTHESIS OF 1,4-DIAMINO-CYCLOHEXANE-1,4-DICARBOXYLIC ACID DIMETHYL ESTER

DEREK DALTON, Chemistry, College of Liberal Arts and Sciences

MELISSA AXEN, Chemistry, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Douglas Dyckes, Chemistry, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The purpose of the research is to investigate an alternative route to the synthesis of 1,4-diamino-cyclohexane-1,4-dicarboxylic acid dimethyl ester for use as an enzyme inhibitor, biodegradable plastic and cell membrane transport for drug delivery. The current synthetic route produces a bis-zwitterion intermediate that has limited solubility, resulting in low product yields. The alternate route avoids the bis-zwitterion intermediate by incorporating a protecting group function. The protecting group is added to only one side of the substrate, which allows the molecule to be manipulated unilaterally. Unilateral manipulation forms a zwitterion intermediate and the bis-zwitterion is avoided. Principal findings show that the mono-protected substrate can be generated in 50% yield. Initial findings for the Strecker synthesis of the mono-protected substrate show quantitative yields but further analysis is required. In conclusion, the principle steps of the alternative synthetic route are promising. More research needs to be done and the project will continue.

HIGH GENETIC DIVERSITY IN A RARE NORTH AMERICAN ENDEMIC: EFFECTS OF REPRODUCTIVE SYSTEM

MICHELLE DEPRENGER-LEVIN, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Leo Bruederle, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Only 6% of all flowering plant species are dioecious, a breeding system that is believed to have evolved independently numerous times. This derived breeding system, in which male and female flowers are distributed on separate plants, can be expected to alter levels of genetic diversity through obligate outcrossing. This research quantifies genetic diversity in *Carex scirpoidea* ssp. *convoluta* (Kükenthal) Dunlop in the context of the life history, geographic distribution, and recent evolutionary history of this narrow endemic and its more widespread conspecific *C. scirpoidea* Michx. ssp. *scirpoidea* using starch gel electrophoresis and allozyme analysis. *Carex scirpoidea* ssp. *convoluta* is a threatened Great Lakes endemic that is restricted to the globally rare prairie pavement barrens of Michigan and Ontario. Three populations of *C. scirpoidea* ssp. *convoluta* were sampled from Drummond Island and the lower peninsula of Michigan. Genetic diversity ($P=35.35$; $A_p=2.47$; $H_e=0.145$) was higher than other caespitose carices ($P=14.15$; $A_p=2.06$; $H_e=0.043$), and similar to rhizomatous carices ($P=41.93$; $A_p=2.23$; $H_e=0.1796$). Populations of this rare taxon are poorly differentiated ($F_{ST}=0.232$) relative to other caespitose carices ($G_{ST}=0.412$), presumably due to high levels of gene flow. Obligate outcrossing appears to be maintaining genetic diversity in this threatened subspecies, despite its rarity and recent evolutionary history.

POPULATION GENETIC IMPLICATIONS OF POST-GLACIAL MIGRATION IN *CAREX CRYPTOLEPIS* (CYPERACEAE)

NATHAN DERIEG, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Leo P. Bruederle, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Carex cryptolepis Mack. (Cyperaceae) is a widespread endemic distributed across northeastern North America. To assess the impact of postglacial migration on genetic diversity within and among populations of *C. cryptolepis* we performed starch gel electrophoresis and allozyme analysis. Eighteen putative loci were resolved, of which five were polymorphic — five populations were variable, the remainder were fixed at all loci. Measures of genetic diversity averaged across populations in *C. cryptolepis* ($P = 3.89$; $H_e = 0.007$) were low relative to other caespitose carices ($P = 14.15$; $H_e = 0.043$), as well as the putative sister taxon *C. lutea* LeBlond ($P = 21.11$; $H_e = 0.051$). Statistically significant deviations from Hardy-Weinberg Equilibrium were correlated with large positive fixation indices. Mean inbreeding within populations was similar to that observed in *C. lutea*. An observed high degree of population differentiation in *C. cryptolepis* relative to *C. lutea* may reflect minimal gene flow among populations established after the last glacial maximum; however, limited sampling of broadly distributed species can inflate observed levels. Decreased levels of genetic diversity and increased population differentiation are possible consequences of postglacial range expansion from refugial populations; determining the pattern of postglacial migration in *C. cryptolepis* will require sampling additional populations.

THE CONTEXT OF “IRRATIONAL” ANTI-BIOTIC DISPENSING IN URBAN MONGOLIAN PHARMACIES

SHARON DEVINE, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Lorna G. Moore, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Culturally appropriate, locally-responsive programs to reduce inappropriate antibiotic use are urgently needed to counter the global threat of antibiotic resistance. Although Mongolia has a policy that requires a prescription to purchase antibiotics, excessive over-the-counter access and inappropriate dispensing of antibiotics by pharmacists are commonplace. Key informant interviews (N=7), a survey of all pharmacists in the Sukhbaatar District of Ulaanbaatar (N=31), and interviews with 29 of the survey respondents were used to explore the role of pharmacists and other contextual and policy influences on antibiotic use for acute respiratory infections.

RESEARCH METHOD AND THE COMMISSION OF THE NATURALISTIC FALLACY

RACHEL DOLNICK, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Gary S. Stern, Psychology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The present investigation examined the effects of research method and saliency of appropriate causal inference on the naturalistic fallacy (NF), the tendency to infer moral prescriptions from empirical data. In a survey administered to 298 participants, half received salient information about causal inference, and half a general description of scientific method. Participants then read a summary of either a correlational or experimental study, and answered true/false content-related questions, including 4 NF items. The experimental method produced significantly more naturalistic fallacy endorsements than did the correlation. Participants were asked to identify the research method; incorrect respondents were significantly more likely to commit NF. Results were discussed in terms of the relevance of Brehm's theory of psychological reactance to NF.

PROPOSED (SIMPLIFIED) PREPARATION OF METHYL 4-AMINO-5-OXOPYRROLIDINE-2-CARBOXYLATE - A CYCLIC MONOMER PREPARED FOR USE IN HYPERCYCLIC STRUCTURES

ANN ENGLISH, Chemistry, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Douglas F. Dyckes, Chemistry, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The purpose of this work was to synthesize the molecule 2,4-diamino-pentanedioic acid dimethyl ester, which is believed to be an excellent target molecule for later cyclization studies. The study began by halogenating a dicarboxylic acid (glutaric acid) to create 2,4-dibromo-pentanedioyl dibromide. The tetrabromo compound was then converted into a methyl ester and another diacid (2,4-dibromo-pentanedioic acid dimethyl ester, and 2,4-dibromo-pentanedioic acid). Each of these two compounds was then subjected to an amination reaction. Only the effort to aminate the diacid was successful, leading to the production of 2,4-diamino-pentanedioic acid. The diamino, diacid was then successfully methylated to produce the desired compound 2,4-diamino-pentanedioic acid dimethyl ester. Compound identities were confirmed with IR and NMR spectroscopy.

RACIAL PROFILING AND POLICE PRACTICES

GILBERT ESCARCIDA, Sociology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Yili Xu, Sociology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

The focus of this study was on the significance racial background has on the likelihood a minority individual will be stopped and searched compared to his/her White counterpart. The theoretical framework used in this study is social cognition theory, which describes racial and other prejudices as the result of cognitive errors during the processing of information. This framework serves as a guide for the empirical examination of police behavior. The 1999 Police-Public Contact Survey, a nationwide supplemental questionnaire to the National Crime Victimization Survey, was examined to determine the relative influence of drivers' characteristics over police behavior during traffic stops. In addition to investigating the occurrence of traffic stops, the quantity of searches of drivers' and/or their vehicles will be assessed. The results from this study indicate race is a significant factor in being stopped and/or being searched. However, the results from this study also indicate that race is not the most influential factor in the decision to stop and/or search. In both instances, age for the decision to stop and gender for the decision to search, have a greater influence on a police officer's decision making processes regarding who to stop and to search.

FACILITATING THE ACCESS TO GIS IN K-12 SYSTEMS THROUGH WEB-BASED GIS APPLICATIONS USING OPEN SOURCE SOFTWARE

CHRISTIAN EVERHART, GIS, College of Engineering and Applied Science

Faculty Mentor: Dr. Rafael Moreno, Geography, College of Liberal Arts and Science

Activity Type: Graduate Research

Industry leaders and GIS scientists predict that the web will become the dominant medium for accessing data and geoprocessing capabilities. Accessing geographic and attribute data over the web has become common. However, offering geoprocessing capabilities over the web is still on the cutting edge of the research on the area of web-GIS. In this project I have explored an approach based on Open Source Software and Open Specifications to provide geoprocessing capabilities over the web. This approach offers advantages that are relevant in many applications such as: a) no-cost of software; b) ease of learning; c) ease of maintenance. To test these ideas I developed an application to provide GIS functionality (access to data and geoprocessing) in the context of a geography lesson for K-12 education systems. It is concluded that Open Technologies offer an alternative to proprietary solutions for the deployment of GIS functionality over the web. In particular, Open Technologies greatly facilitate the deployment of geoprocessing functions (e.g. buffer, intersect, query by feature) over the web.

METH MAKERS: THE GEOGRAPHIC DISTRIBUTION OF METHAMPHETAMINE LABORATORY INVESTIGATIONS IN NORTH METRO DENVER

AIMEE FERRARO, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Stephen Koester, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Methamphetamine (meth) is considered the fastest growing illegal drug in the United States. Meth can be easily produced in illicit, makeshift laboratories located in various environments, including private residences, motel rooms, campgrounds, rental storage facilities and motor vehicles. The increasing number of meth labs in Colorado has become headline news and epidemic in proportion. Treatment admission rates also indicate that meth use is on the rise; however, health practitioners have little understanding about where to access this hidden, highly paranoid drug-using population. Interviews and focus groups with meth users in the Denver metro area suggest that the social organization of the meth scene revolves around meth dealers and manufacturers. Therefore, the location of meth lab investigations (MLIs), while only revealing known meth labs, could provide an initial indication of the distribution of meth users in the area. Data regarding MLIs occurring between 2001 and 2004 in two counties north of Denver (N=272) were obtained and geocoded onto TIGER/Line streets data from the 2000 US Census. The resulting maps could give the County a better understanding of where to target environmental cleanup, police enforcement, drug abuse intervention programs, and risk communication to neighborhood residents.

KNOWLEDGE TRANSFER IN BUSINESS PROCESS OUTSOURCING

BISWADIP GHOSH, Computer Science, Information Systems, Business School

Faculty Mentor: Dr. Judy E. Scott, Information Systems, Business School

Activity Type: Graduate Research

Organizations are pursuing the outsourcing of business processes (BPO) to offshore locations. However, current research has shown that an organizational learning gap between the client and vendor organizations leads to less than expected benefits. While IP telephony, ERP systems, databases, networking and other distributed technologies provide a foundation for outsourcing, knowledge management (KM) can be used to bridge these gaps and create more effective BPO relationships. Knowledge transfer between the client and the vendor can be limited due to organizational factors including structure, culture and infrastructure. This research studies the use of a knowledge cultivation process to enhance the knowledge transfer between the client and vendor in a BPO. Knowledge cultivation improves the quality and availability of the needed knowledge in the relationship so that the other knowledge processes - acquisition, codification and application are more effective. The end result is a more successful KM system and a better BPO outcome.

WHITEBARK PINE REGENERATION FOLLOWING THE 1988 YELLOWSTONE FIRES: MICRO-SITES FAVORING SURVIVAL AND SEEDLING DEMOGRAPHICS

KRISTEN GROMPONE, Biology, College of Liberal Arts and Sciences

MARIO PEREZ, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Diana Tomback, Biology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Whitebark pine is at risk because of widespread infection by the exotic white pine blister rust. Our studies following the 1988 Yellowstone fires indicate which conditions facilitate survival of whitebark pine (*Pinus albicaulis*) seedlings, which could help restoration efforts. Microsites reflect seed caching preferences of Clark's nutcrackers (*Nucifraga columbiana*), primary seed dispersers for whitebark pine. We followed individual seedlings from 1990 to 1995 and in 2001, 2004, and 2005. Data were collected from 100 permanent plots, each 20m² in area, divided into "dry burned" and "moist burned" study sites, on Henderson Mountain, Gallatin National Forest. Demographic tables were constructed for both study sites: Overall seedling survival for the dry and moist sites was 56% and 43%, respectively. We compared the microsites of seedlings that survived more than 8 years with those that survived fewer than 4 years, examining presence or absence of shade-casting objects (e.g. standing snags) and surrounding herbaceous vegetation; the time of day the seedling was shaded; and, the plot cover class. Survivorship was significantly enhanced with increasing shade on the dry site, and with surrounding vegetation for both study sites. Seedling survival decreased with increasing cover vegetation for the dry site, which may result from moisture limitations.

CANCER, COMMUNITY, AND SELF

BEAU HAGBERRY, Fine Arts, College of Arts and Media

THEO MULLEN, Fine Arts, College of Arts and Media

SEAN DOLAN, Fine Arts, College of Arts and Media

Faculty Mentor: Professor Rian Kerrane, Sculpture, College of Arts and Media

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Using three approaches, we have set out to explore the idea of cancer. We have combined the visual language of large format photography and sculptural installation to communicate three unique points of view on cancer. The first objective of our research is to determine what it means to be a cancer survivor, and how cancer has an impact on society as a whole. The second approach of our research is through an investigation of the structural form of cancer and how it appears in our exterior world. The third and final stage of our exploration is an up close look at the human eye as a representation of ones personal-ity and life struggles.

LOW NOISE HIGH SENSITIVITY INTEGRATED ANISOTROPIC MAGNETORESISTIVE SENSORS

SEAN HALLORAN, Electrical Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Hamid Fardi, Electrical Engineering, College of Engineering and Applied Science

Activity Type: Graduate Research

We are designing and fabricating low-noise magnetoresistive (MR) sensor arrays for integration with custom CMOS electronics in a flip-chip package. In this work we demonstrate sensors that operate by modulating the bias on soft-adjacent-layer (SAL) biased anisotropic magnetoresistance (AMR) devices. The second harmonic (2f) readout technique allows us to move the signal above the 1/f noise regime and into a less noisy bandwidth. We have measured the noise response of these sensors and demonstrated the scalability of the noise with the volume of the sensor. Using the Johnson noise limit, we show that a sensitivity of 1 pT/√Hz is achievable in these devices at reasonable power levels. In addition, we show that the 2f detection is capable of providing high-contrast magnetic field images that reject thermal asperities. This is due to the fact that the interaction of the bias current and magnetic moment of the sensor is independent of the sign of the bias current. Sensors are fabricated by DC sputtering (80)Ni(20)Fe onto a Ta seed layer in a needle pattern with a thin (~10 nm) SiN spacer. Applications include arrays of bridges for homeland security and high-resolution scanned MR microscopy including room temperature magnetocardiograms.

TINY FOSSILS IN A TROPICAL SEA--AT 9,000+ FEET?!?

NICOLE HEIMINK, Geology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Karen Houck, Geography and Environmental Sciences, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The Kerber rock formation is what remains of an ancient sea in Bassam Park, located in southern Colorado's San Isabel National Forest. The U.S. Forest Service funded a project in which a team of CU students and faculty conducted a paleontological survey of Bassam Park and collected fossils for further analysis. They also collected rock samples so that researchers could process them for microfossils. Three rock samples were processed using a slow cooker and a special detergent that breaks down rock. Changes in the types of fossils in the rock samples show how the ancient sea changed over time. An evaluation of the oldest rock layer shows that the land was near the shoreline in a muddy lagoon that was not very hospitable. A younger rock sample yielded well over 2,000 fossils and contains a diverse assortment of marine life, including snails, clams, and brachiopods, indicating that the land was under deeper waters. The youngest rock layer contained several hundred fossils, including delicately-ornamented ostracodes, indicating that the waters deepened even more as time progressed. Many of the microfossils found in the rock samples are small—even as adults—and were not found during the actual fieldwork.

SQUID Susceptometry between 4 K and 250 mK in a Helium-3 Cryostat

BRUCE HINES, Physics, College of Liberal Arts and Sciences

KEN ANDERSON, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Martin E. Huber, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

We have instrumented a helium-3 cryostat for ultra-low-temperature measurements of Superconducting Quantum Interference Device (SQUID) susceptometers. SQUID susceptometers are used to measure magnetic properties of nanoscale samples and their performance improves as temperature is reduced. Presently, the helium-3 cryostat is operational between 4 K and 250 mK. A single low-temperature preamplifier (a SQUID Series Array Amplifier, or SSAA) is installed on the stage with temperature between 1.2 K and 4 K during system check-out. The SSAA presently operates at a higher temperature than expected, and the cause of this excess temperature is being investigated. Electrical interference from the thermal control system has been eliminated by installation of a radio frequency filter, allowing low-noise characterization of the SSAA. Installation of a second SSAA and two SQUID susceptometers will proceed after the operating temperature of the existing SSAA can be controlled in the desired range.

CAM RECORDS

JANIECE HOCKADAY, Music Business,
College of Arts and Media

Faculty Mentor: Professor Stan Soocher, Music
& Entertainment Industry Studies, College of
Arts and Media

Activity Type: Undergraduate Creative Activity

CAM Records is an independent record label run by students in the CAM Records Label Operations class. Since its inception, CAM Records has released several albums, including compilations featuring local talent, students and faculty. The label serves as a path for music students to receive hands-on experience in the music industry under the guidance of UCDHSC Music Business Professors.

A COMPARISON OF SUCCESSFUL AND UNSUCCESSFUL ADOPTION SEEKERS BASED ON A NATIONAL SAMPLE

MELANIE HOLZHEUER-GUINAN, Sociol-
ogy, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Candan Duran-Aydintug,
Sociology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Since the 1930's, researchers have conducted many investigations in order to describe the characteristics of individuals who support, consider, seek or sought and already experienced adoption. Important topics that have emerged from the previous literature relate to age, marital status, marriage, parity, education, income, race, and labor force status. This study uses data from the 1995 National Survey of Family Growth to compare the characteristics of individuals who go through the adoption process and succeed with those who do not, an area that has not been formerly studied. Results suggest that women who successfully adopt a child are more likely to be older - including their age at certain stages associated with fertility values, to have longer and more stable marriages, to desire more children, to have a higher level of education and income, to be white and they are less likely to work full-time. Although the difference in marital status is not statistically significant, other evidence suggests that this is due to the small sample size.

EMPIRICAL ANALYSIS OF ORGAN DONATION RATES

DARREN HOMRIGHAUSEN, Economics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Steven Medema, Economics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

There is a well known and well documented organ donation shortage in America today. One of the major contributing factors to this shortfall is that we do not understand the dynamic forces that may influence organ donation rates. In this paper, we examine how the rate of deceased organ donations is affected by different policy variables that may exist in each state. Using a regression framework, we can control for many different state characteristics (such as size, population, education, etc.) and examine how individual state policies can change organ donation rates. Overall, this knowledge allows for a better understanding of what policies cause organs to be donated at higher rates. In practice, this information could potentially save many thousands of lives.

STUDY OF SILICON POLYHEDRAL CAGES

SABRINA KHAN, Applied Mathematics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Robert Damrauer, Chemistry, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

One of the structural properties of silicon polyhedra is their high symmetry. Beginning with high symmetry, we are studying different properties of polyhedral cages of silicon (and other elemental polyhedra in the future) using the high level computational techniques of quantum mechanics. Here we want to see how energy/strain changes when we compare their classical symmetrical structures to some other polyhedral alternatives for $(\text{SiH})_n$ where $n \geq 4$. In this study we explore Si_4H_4 , Si_6H_6 and Si_8H_8 . We are exploring the H-bridged structures for such species as well as what happens if we add or remove an electron from these polyhedral cages.

HOPES (HOSPITAL OPERATIONS EMERGENCY SYSTEM) DESIGN AND IMPLEMENTATION

JINWON KIM, Computer Science, College of Engineering and Applied Science

Faculty Mentor: Dr. Ilkyeun Ra, Computer Science & Engineering, College of Engineering and Applied Science

Activity Type: Graduate Research

HOPES (Hospital Operations Emergency System) is designed and developed to support the HEICS (Hospital Emergency Incident Command System), a standard by which the medical community has found success and common ground in the area of disaster management. In the emergency situation, Program Administrator can make a flexible organizational chart and assign staffs to the specific jobs in the chart by using user friendly GUI. Moreover, assigned staffs can see their missions and actions they have to do under the emergency situation, and after doing the actions, the staffs can response whether they have done their actions or not. As a result, a supervisor in the hierarchy chart can monitor that his staffs have finished their jobs. This system is developed by JAVA, a platform independent language, HTML and XML, W3C standard.

WHISPERS OF CONTRADICTION

JEFF KLEIN, Multimedia, College of Arts and Media

Faculty Mentor: Professor Brian DeLevie, Multimedia, College of Arts and Media

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Whispers of Contradiction was an art installation space that was the culmination of keen observation into the inherent contradictions within both quantum physics and sacred religious scripture, and explored those contradicting narratives through the use of new media and electronics arts.

SOFT MATTER NANOPHYSICS

SHANE LANDRY, Physics, College of Liberal Arts and Sciences

MATTHEW CLOUTIER, Finance, Business School

ALICE MAJOR, Pre-Medical, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The research goal will be to encapsulate gold quantum dots within lipid vesicles, so they can be used for cell tracking purposes. Dehydrated lipid film will be hydrated via an aqueous phosphate buffer solution (P.B.S.) with a Ph of 7.4 (on par with the human bloodstream). Simultaneously, a payload of quantum dots will be mixed into the P.B.S. The mixture will be passed through the Avanti Mini-Extruder, which is a syringe with a filter that has a pore size of 50 microns. By passing the quantum dots through the filter, while the lipids are simultaneously closing into lipid vesicles, a large yield of vesicles should encapsulate quantum dots. The loaded vesicles will already be within a P.B.S. solution ready for entry to the human blood stream to be taken up by macrophages for cell tracking use. Quantum dots for cell tracking should be a significant improvement over current fluorescent approaches, since quantum dots can glow brighter, last longer, can emit a color built to order simply by controlling its diameter, and can be triggered to emit light by being exposed to the visible light spectrum (white light).

USING DECISION THEORY FOR ROBOTIC CONTROL AND SENSOR FUSION

SAWYER LARKIN, Engineering, College of Engineering and Applied Science

Faculty Mentor: Mr. Robert Grabbe, Electrical Engineering, College of Engineering and Applied Science

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

The University of Colorado at Denver robotics society is constructing an Autonomous Ground Vehicle (AGV) capable of accomplishing the Association for Unmanned Vehicle Systems International competition objectives. The design presented features the use of Bayesian Decision Theory as a way to control mobile robots by integrating multiple high data rate sensors--such as vision, and laser ranging units--using classical statistical techniques, and apriori probability information.

PERIODIC CYCLIC LOADING WITH HIGH WORK LOAD IS A RISK FACTOR FOR CUMULATIVE LOWER BACK DISORDER

PETER LE, Mechanical Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Moshe Solomonow, Orthopaedic Surgery, School of Medicine

Activity Type: Undergraduate Research

In occupations involving periods of cyclic lumbar flexion with heavy work load, epidemiological data suggests that there is an increased risk factor for the development of cumulative lower back disorder (CLBD). The results of the load magnitude for a series of cyclic lumbar flexions sequentially followed by an equal period of rest on the development of CLBD were demonstrated on an in vivo feline model. Cyclic loads at 0.25Hz and 20, 40 and 60N were applied over 10 minutes followed by 10 minutes of rest and repeated six times (total of 2 hours). During the time of cyclic flexion and rest as well as the following 7-hour recovery period, lumbar viscoelastic creep (laxity) and reflex electromyographic (EMG) activity were monitored. From the data, it was found that the creep developed during each 10 min period of cyclic flexion did not fully recover over the 10 min of rest. After the recovery phase, the 20N load displayed nearly full recovery, whereas at 40 and 60N loads residual creep was observed. Therefore, accumulation of creep over the test periods resulted in a large overall creep at the end of the cyclic work-rest session under heavy loads.

SONIC HEDGEHOG REGULATES CELL CYCLE DYNAMICS IN EMBRYONIC TASTE PAPILLAE

CASANDRA LIGGINS, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Charles Ferguson, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Shh is a protein that regulates many embryonic events, including development of taste papillae in rodents. Inhibition of Shh in embryonic tongue explants results in more and larger taste papillae (Hall et al., 2003; Mistretta et al., 2003); yet the cellular mechanism(s) underlying these morphological changes is unknown. Shh regulates cell survival and cell proliferation in the branchial arches, giving rise to the tongue epithelium and subepithelial mesenchyme, perhaps influencing mitosis and cell death in developing taste papillae. To test this hypothesis, tongue explants were cultured from embryonic day (E) 11.5, prior to papilla formation, exposed to Shh function-blocking antibody or control medium for 3 days, and processed to visualize taste papillae and cells undergoing mitosis or apoptosis. In correlation with previous reports, apoptotic cells are not seen in the developing tongue. Although, apoptotic cells are seen within cultured tongues the levels of cell death between tongues treated with Shh function-blocking antibody and control tongues is insignificant. Contrary to previous reports, sparse dividing cells were encountered within developing taste papilla epithelium. However, proliferation appears to be increased in tongue explants treated with the Shh function-blocking antibody when compared to controls suggesting Shh signaling promotes cell survival in developing taste papillae.

DIFFERENCES IN SEED MORPHOLOGY BETWEEN TWO POPULATIONS OF SOUTHWESTERN WHITE PINE

DANIEL MADDOX, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Diana Tomback, Biology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Southwestern white pine (*Pinus strobiformis*) is a little-studied five-needled white pine of the southwestern U.S. and northern Mexico. As part of a larger ecological study, we have investigated differences in seed morphology between the northern-most population (San Juan Mountains, southwestern Colorado) and a more central population (Chiricahua Mountains, southeastern Arizona). Seeds in both populations are large and wingless, and thus animal-dispersed. We collected cones from each population, and measured seed length, width, depth, total mass, kernel mass, and seed coat thickness, and constructed ratios comparing these dimensions. All characteristics were found to be significantly smaller for the San Juan population, while dimension ratios indicated no significant difference in overall shape. There are several factors that may contribute to seed size differences: Animal seed dispersers differ between the two populations (Clark's nutcracker (*Nucifraga columbiana*), San Juan population; nocturnal rodents, Chiricahua population). Furthermore, highly efficient seed predators, red squirrels (*Tamiasciurus hudsonicus*), are present in the San Juan Mountains population but are replaced by less efficient Arizona gray squirrels (*Sciurus arizonensis*) in the Chiricahua Mountains. Finally, the San Juan population overlaps with the closely related limber pine (*Pinus flexilis*), which has smaller seeds. Hybridization would produce smaller seeds in southwestern white pine.

METHODS FOR LOW COST PREPARATION OF PHOSPHOLIPIDS

ALICE MAJOR, Pre-Medical, College of Liberal Arts and Sciences

SHANE LANDRY, Physics, College of Liberal Arts and Sciences

MATT CLOUTIER, Finance, Business School

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The goal of our project is to develop artificial means to employ “nanotechnologies” already present in living systems: so-called “soft matter nanotechnologies.” Living cells use lipid bilayers to encapsulate cell interiors, cellular subcomponents, and materials for transport and secretion. In order to accomplish the project goal, we need a versatile and low-cost method to extract phospholipids from readily available supplies, such as over-the-counter health supplements. With such technical capacity, we aim to readily produce both vesicles and solid-supported lipid layers. This gives us a broad platform for exploiting phospholipids at the 10-1000 nm scale. In the initial practice run, we utilized over-the-counter phosphatidylcholine tablets, extracted the liquid from the tablet and ran the phospholipid through a column of absorbent using column chromatography, which is an inexpensive, easy, and room temperature method. Approximately 70 vials were filled with 1 cc each of product from the first column run. We selected vials from the column run that were most likely to contain lipids, and the vials have been initially viewed and the compounds re-hydrated by member Shane Landry. In consultation with Mr. Landry, the results indicate that vesicles were formed by our separation processes.

MIGHTY BITES NUTRITION EDUCATION PROGRAM

CARRIE SCHROEDER MCCONNELL, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Susan Dreisbach, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

“Mighty Bites” is an original nutrition education intervention that uses a multilevel approach to teaching preschool children and parents participating in the Head Start program about healthy eating and fitness. Behavior change is facilitated on the individual, family and policy level within the organization. The “Mighty Bites” program is designed to run for 27-weeks within the length of the 38-week preschool school year. It emphasizes USDA Food Group System and Dietary Guidelines for Americans concepts and regular physical activity through structured classroom and regular parent outreach activities. Each month, “Mighty Bites” focuses on a different food group from the USDA Food Group System. Weekly cooking, tasting, literacy, art, science, dramatic play and fitness activities emphasize the concepts of the five food groups and Dietary Guidelines for Americans while simultaneously promoting kindergarten-readiness skills for the preschool population. The program uses multi-disciplinary staff and community partnerships to achieve its goals and objectives.

TISSUE MECHANICS

ROHINTON MISTRY, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Understanding the cellular mechanics of division, migration, terminal differentiation and the respective stresses imposed by each process will be useful in the detection of cancers within oral tissues. Cells of the stratum basale within oral tissue are secured to the basal lamina by a family of transmembrane proteins called integrins. Two junctions of interest formed by these integrins, are called hemidesmosomes and focal adhesions. Other transmembrane proteins, such as cadherins—desmosomes and adhesion belts—help anchor cells to one another. Migrating cells must lose some of these connections if they are to move outward to the oral cavity. Understanding how these cells reorganize (gain or lose) their connections to one another will help in modeling the different stresses occurring as continual tissue remodeling (homeostasis) occurs. Intuitively, different force networks will exist in different layers of the epithelium and thus it is crucial to understand exactly when this reorganization occurs within the epithelium. We need to identify what sort of junctions are lost and how other cells react and structurally compensate for these migrating cells which also undergo intracellular reorganization, changing their shape—deforming and flattening out.

DIGITAL TECHNOLOGY AS A FORM OF SUSTAINABLE DEVELOPMENT

BRADLEY MORSE, Anthropology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Tammy Stone, Anthropology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

This thesis project looks at the potential of digital technology as a form of sustainable development on the Pine Ridge Indian reservation. Grounded theory and participatory research that drove this project allowed community members to identify a social concern. Dependence on bicycles as transportation has caused the death of several young people in Oglala. I was invited to help develop a film to educate the community so this problem would not continue. In 2004 I conducted filmed interviews with people close to one victim who died in Oglala. Over the course of the next academic year I edited the film to be viewed by focus groups during the summer of 2005. A collaborative document, the film *A Film Dedicated to the Memory of Nicolas Blacksmith*, describes the nature of this social issue that exists in Oglala, and is an example of how digital media can be used to empower communities.

DIVERSITY TRAINING CURRICULUM IN THE LOCAL CHURCH

CHRISTINE OLYER, Communication, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Brenda J. Allen, Communication, College of Liberal Arts and Sciences

Activity Type: Entrepreneurial Activity

This project presents a curriculum developed for Colorado Community Church, whose church body is comprised of Whites and Blacks, but few Asians, Native Americans, and Latinos. Many individuals searching for a local church to participate in worship may encounter invisible barriers – those of race and/or ethnicity. These barriers are frequently due to a lack of multi-cultural understanding, although many churches are interested in creating an environment that welcomes all races and backgrounds. This curriculum seeks to increase awareness of racial barriers to help protestant and catholic American churches facilitate interracial relationships based on a biblical imperative and academic research through informed training. Since this curriculum will be developed using the Bible as a foundation and reference, it is limited to religious organizations that see this source as credible. This curriculum is divided into six sessions that encourage discussion and self-reflection about perceptions of race/ethnicity. In session three, a video developed for the project will enhance discussion of identity. Sessions four and five cover interpersonal tools for communication. During session six, participants will discuss how to implement what they have learned. This flexible curriculum can be marketed to several settings, including home bible studies, Sunday school, and church classroom environments.

“ES MENTIRA”: LACK OF CONFIDENCE IN HEALTH SERVICES FOR PREGNANT WOMEN IN YAPACANÍ, BOLIVIA

KELSEY OTIS, Anthropology/Health and Behavioral Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. John Brett, Anthropology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

This study was conducted in coordination with public-sector health care staff in Yapacaní, Bolivia, who identified pregnant women’s lack of utilization of health services as a problem. As part of national, neoliberal economic reforms and decentralization, Bolivia has recently implemented a locally-controlled insurance program to completely cover the costs of pregnancy-related care for all women, regardless of work status. However, despite free services, many pregnant women in this small town do not access available services, and many remain home to give birth. This qualitative study conducted June-August, 2005 sought to identify the main causes for the low coverage of births in Yapacaní’s public health care sector. Results have been shared with local health care staff, who requested the study to identify recommendations for improvement of maternal health services with the goal of decreasing pregnancy-related health risk in Yapacaní, Bolivia.

GEOGRAPHIC DATABASE TO VERIFY CONSTRUCTION WORK OF LARGE PROJECTS

APOSTOL PANAYOTOV, Mechanical Engineering, GIS, College of Engineering and Applied Science

Faculty Mentor: Dr. Lynn Johnson, Civil Engineering, College of Engineering and Applied Science

Activity Type: Graduate Research

By “law” all finished projects are subject to an “as-built” survey. The as-built survey either verifies the correctness of all construction works according to published specifications or reveals possible discrepancies. In practice, it is very time consuming and tedious work to conduct an as-built survey, which involves checking and comparing thousands of measurement points in horizontal and vertical dimensions. Usually engineers compare selected parts but this does not give the whole picture if the project is very big. New methods for High Definition Surveying and GIS are applied to this problem for the runway – taxiway complex situated at Denver International Airport. There are more than 50,000 points in several layers that have to match with published construction standards. The As-Built Design Database (ADDDB) was developed using the newest surveying instrument – a High Definition Surveying Scanner - for as-built data collection and GIS for data integration and analysis processing data. Following the developed process, it is now possible to compare, verify and visualize design and as-built surfaces in three-dimensions, and to calculate the lateral and vertical deviation of every point. A 3-D visualization can be created to provide a complete picture of the existing situation. The ADDDB allows the facility managers to identify problematic areas quickly, to isolate bad surveying or design data, and to compare results with published specifications.

CHILDREN’S GUIDE TO ACTIVE LIVING: PARTICIPATORY ACTION RESEARCH

ILLÈNE PEVEC, Design and Planning, College of Architecture and Planning

DEBRA FLANDERS, Design and Planning, College of Architecture and Planning

UDDHAB BHANDARY, Design and Planning, College of Architecture and Planning

Faculty Mentor: Dr. Pamela Wridt, Design and Planning, College of Architecture and Planning

Activity Type: Graduate Research

Lack of physical activity significantly contributes to childhood obesity, a growing public health problem. Neighborhood factors often restrict the physical activities and healthy development of minority and low-income children. Our project engages fifth-graders at two Denver elementary schools in participatory action research to examine their neighborhood activities and perceptions. We aim to inform decision-makers how to direct capital investment and service provision towards safe routes to school, public parks, playgrounds and other local resources in support of physical activity. The children make maps, keep activity diaries, use pedometers, and photograph favorite and feared places. Based on their research, they will create a Child’s Play and Activity Guide to their neighborhoods. Working closely with the children, we create base maps, analyze data, conduct group discussions and interviews, and assist with production and distribution of the final guidebook. We analyze children’s input, linking it to neighborhood crime and traffic statistics to identify factors that impede or support healthy and safe physical activities for children. We expect our findings to be useful to other low-income neighborhoods.

HIGH FREQUENCY ROOM TEMPERATURE ANALOG INTEGRATOR FOR SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE (SQUID) SENSORS

DUAN PHAN, Electrical Engineering, College of Engineering and Applied Science

TRIET NGUYEN, Electrical Engineering, College of Engineering and Applied Science

SULISTIYO INDAH, Electrical Engineering, College of Engineering and Applied Science

PHUC NGUYEN, Electrical Engineering, College of Engineering and Applied Science

KEN ANDERSON, Electrical Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Martin E. Huber, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

We have designed, simulated, prototyped, and begun characterizing high bandwidth and low noise electronic consisting of 5-channel integrator. This prototyping integrator will be used, together with external high frequency pre-amplifier, as the readout electronics for SQUID Susceptometry. In order to fully utilize the SQUID frequency response, the objective of this project is to obtain a bandwidth from 100Hz to at least 30 MHz with high DC-gain (~ 120 dB). We have had designed and fabricated a high frequency printed-circuit board (PCB) on which we assembled state-of-the-art surface mount components. To broaden the range of system performance, we applied additional features (such as: offset adjustment connector, input signal differential amplifier, and output buffer amplifiers) for each channel of all 5 configurations. We report on frequency response characteristics for channel 5 of our design as measured using both low and high frequency Spectrum Analyzers. We also report on simulations using OrCAD and MATLAB of all 5 integrator configurations.

AN OVERVIEW OF THE HYDRA PPS

FRANKLIN E. POWERS, JR., Computer Science and Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Gita Alaghband, Computer Science and Engineering, College of Engineering and Applied Science

Activity Type: Graduate Research

Presently parallel architectures for computers are becoming more widespread and as a result there is a need for languages and tools that will work with these architectures that are both easy and flexible. The objective of this project was to create a new language, runtime, and compiler which would present a slightly different method of creating parallel programs from the traditional methods. This was created to work with Java and its related tools. One of the specific objectives of the project was to produce a system in which the program is not compiled to a particular parallel architecture, runtime, or instruction set before being received by the user, but compiled by the runtime. For the first version of this system, the target was to produce a language which can work with both SMP and sequential architectures. This presentation will focus on the same topics that were submitted as a paper to the 18th ACM Symposium on Parallelism in Algorithms and Architectures. This focuses on the primary constructs for the new language, as well as the relationship between the language, compiler, and runtime. A live demo of the system will be demonstrated, along with a poster that describes the overall system.

THE ROLE OF NOCTURNAL RODENTS IN DISPERSAL OF SOUTHWESTERN WHITE PINE SEEDS

ELIZABETH PRUETT, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Diana Tomback, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Nocturnal forest rodents eat conifer seeds that drop from open cones and, managers often regard these rodents as destructive pests. However, seed caches made by rodents may play a significant role in forest regeneration. Southwestern white pine (*Pinus strobiformis*, Subgenus *Strobus*), a five-needled white pine of the southwestern United States and northern Mexico, has large, wingless seeds, typically dispersed by seed-caching animals. In its northernmost range, southwestern white pine depends on Clark's nutcracker (*Nucifraga columbiana*) for dispersal. However, in the Chiricahua Mountains of southeastern Arizona, Clark's nutcracker is rare or absent, and alternative seed dispersal mechanisms are unknown. In 2004 and 2005, we tested the hypothesis that southwestern white pine seeds in the Chiricahuas are dispersed by nocturnal rodents. Our studies included live mammal trapping, fluorescent pigment tracking of seeds, and greenhouse germination experiments. Live trapping and tracking indicated that deer mice (*Peromyscus maniculatus*) are the likely dispersers in the area. From the seed tracking study, we found 28 caches (56 seeds) made by rodents on the surface of litter, rocks and soil, or buried under litter, soil or plants. Greenhouse germination experiments indicate that both surface and buried caches, like those observed in the field, will in fact germinate.

COMPUTATIONAL STUDIES OF THE ELECTRON AFFINITY OF $\text{BHF}(\text{CH}_2)_n\text{CH}_2$ AND $\text{BH}_2(\text{CH}_2)_n\text{CHF}$ RADICALS

SALLY PUSEDE, Chemistry, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Robert Damrauer, Chemistry, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

The effects of the distance of boron substitution on the electron affinity (EA) of $\text{BHF}(\text{CH}_2)_n\text{CH}_2$ (A) and $\text{BH}_2(\text{CH}_2)_n\text{CHF}$ (B) radicals ($n = 0, 1, 2, 3$) has been studied using computation methods. EAs of A and B were observed to increase as n increased. Computed EAs correspond to the energy difference between optimized radicals and anions and represent the energy change that occurs when an electron is added to a neutral molecule. Experimentally determined EAs of A and B are unavailable for comparison. The well known EA of CH_3 establishes the validity of the computational method. Anions of A and B ($n \geq 1$) cyclized to give a tetracoordinate boron. Rearrangement of the electron pair in anions of A resulted in non-cyclic tricoordinate boron species, where the same phenomenon in anions of B resulted in non-cyclic tetracoordinate boron species. Neither ring formation nor rearrangement was observed with analogous radicals. Therefore the EAs resulting from comparisons where the anion has undergone a considerable geometry change are more difficult to interpret. These interpretations will be considered in the poster.

ETHNIC STUDIES THEN AND NOW

JUNIOR REINA-TOC, English Writing, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Donna Langston, Ethnic Studies, College of Liberal Arts and Sciences

Activity Type: Undergraduate Creative Activity

On behalf of the Ethnic Studies Student Organization, I have created a video that will not only be used as a recruiting tool, but also as a way to promote the Ethnic Studies Department as well as the Ethnic Studies Student Organization. The video will educate people of the importance that Ethnic Studies courses has had on students, both present and past. I also want to emphasize that Ethnic Studies courses are for everyone and their purpose is to create a deeper understanding of ethnicity in contemporary American society.

SPACING INTEGERS ON ARBITRARY GRAPHS ACTIVITY TYPE: UNDERGRADUATE RESEARCH

ZACH RICHARDS, Applied Mathematics, College of Liberal Arts and Sciences

JENNY WARD, Mathematics, College of Liberal Arts and Sciences

CASEY MOFFAT, Mathematics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Mike Ferrara, Mathematics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

A graph G is a collection of points, called vertices, connected by lines, called edges. A function f from the vertex set of G to the positive integers is called a spacing of G if there is some set of distances D such that the vertices u and v are adjacent in G if and only if $|f(u)-f(v)|$ is in D . The spacing number of G is the minimum of the maximum vertex labels over all spacings of G . Determining the spacing number of arbitrary graphs is difficult, and few results exist in the literature. We investigate the spacing number of double stars, those trees having diameter exactly 3.

GENDER DIFFERENCES BETWEEN OUT-OF-TREATMENT INJECTORS

DEBORAH RINEHART, Health and Behavioral Sciences, College of Liberal Arts and Sciences

ELIZA LANMAN, Social Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Susan Dreisbach, Health and Behavioral Sciences, College of Liberal Arts and Sciences

Activity Type: Graduate Research

This study compared demographics, drug use, mental health status and HIV risk behaviors between male and female out-of-treatment illicit injection drug users (IDUs) in Denver. Between November 2000 and 2004, we recruited 802 participants through street outreach. The average age of participants was 39 years and 28% were female. Additionally, 50% were Caucasian, 21% African American, and 20% Latino. Significant gender baseline differences were found. Female injectors were younger, had less education and were less likely to be employed, ever arrested or homeless as compared to male injectors. While male injectors had been injecting longer, female injectors reported injecting more amphetamines. Females had significantly higher rates of interpersonal abuse as well as higher lifetime and current mental health symptoms. Almost half (40%) of female injectors reported using dirty syringes without bleaching, compared to 33% of males. In addition, 63% of females engaged in unprotected anal or vaginal sex in the last 30 days as compared to 43% of male injectors. Results from this study show that female injectors engage in higher HIV risk behaviors than men. In addition, they appear to have many co-occurring issues that need to be better understood in order to develop effective outreach and intervention techniques.

EXPLORING THE PERSISTENCE AND UNIQUENESS OF MODUS OPERANDI SIGNATURES IN REPORTED COMMERCIAL BURGLARY

DJ ROGERS, Criminal Justice, Graduate School of Public Affairs

Faculty Mentor: Dr. Mary Dodge, Criminal Justice, Graduate School of Public Affairs

Activity Type: Graduate Research

The ability to associate reported property crimes on the basis of a modus operandi (MO) signature is the foundation of criminal profiling. It allows for the conceptualization of a common offender and focuses tactical policing operations for the purpose of pattern interdiction. This process operates on an assumption, recently called into question, concerning the salience of the descriptive variables comprising an MO signature as they are employed for criminal case-linking analysis. The purpose of this research is twofold: (1) to produce an objective measure of salience, as defined by meaningful degrees of differentiation and consistency, and (2) to conduct a comparative analysis of the relative salience of each descriptive variable as compared against a background of non-associated, temporally-coincident events. The method employed is an adaptation of the Tversky-Kahneman Representativeness Heuristic. The derived measures of salience, Uniqueness and Persistence, are graphically depicted as Cartesian coordinates enhanced with an indicator for intensity. The analysis is based on a review of 465 reported commercial burglaries, representing the activity of a single jurisdiction over a contiguous two-year period, presented as MO signatures composed of 11 descriptive variables describing spatial, temporal and operant elements of the offender's conduct.

COUPLED OSCILLATOR MODELS OF ANIMAL GAITS

MOZHDEH SAFFARI-PARIZI, Integrated Science, College of Liberal Arts and Sciences

MASOUD ASADI-ZEYDABADI, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Many biological systems can be described as coupled oscillators. These include gaits of moving animals, beating hearts, neuron excitations, and populations of fire flies. In this project we have used coupled identical oscillators to simulate the neuron system thought to be responsible for the timing and patterns of animal gaits. We have use a mathematical model called the Van der Pol oscillator as a basis for generating the primary gaits: pronk, pace, bound, trot, jump and walk. The patterns emerge through sudden changes of dynamical behavior called Hopf bifurcations as the strength of coupling the oscillators is varied.

THE NESTMATE RECOGNITION BEHAVIOR OF THE PAVEMENT ANT, *TETRAMORIUM CAESPITUM*

KAZUHIRO SANO, MIS, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Michael J. Greene, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

Social insects live in closed societies from which intruders are excluded, often through aggressive interactions such as fighting, in order to protect colony resources from exploitation by less-related individuals. Workers discriminate conspecific nestmates from non-nestmates primarily using chemical cues, with cuticular hydrocarbons serving as important recognition cues in ants. In this experiment, the nestmate recognition behavior of the Pavement ant, *Tetramorium caespitum*, was studied to determine if this ant uses cuticular hydrocarbons act as recognition cues. Samples (n=50 ants/sample) were collected from field sites in Denver, Colorado. Ants were frozen and cuticular hydrocarbons were extracted from each sample. Hydrocarbon extracts were applied to cotton balls and tested in a behavioral bioassay that measured aggression at sites using the following treatments: 1) nestmate hydrocarbons and 2) non-nestmate hydrocarbons. The antagonistic behavior was scored as the cumulative number of ants exhibited biting behavior toward cotton ball divided by cumulative number of ants contacted cotton balls during a 10 minute observation period. Workers responded to nestmate hydrocarbons with significantly lower levels of aggression, 1/42 ants aggressive, than to non-nestmate hydrocarbon stimuli, 55/99 ants aggressive (t-test, $p < 0.001$). Thus, *T. caespitum* workers use cuticular hydrocarbons as a nestmate recognition cue.

A UNIVERSAL EDUCATION OF URBAN SOCIETY: HIGHER INNER PEACE HELPING OTHER PEOPLE -- A MOVEMENT OF EXPRESSION FOCUSING ON THE FOUR MAIN ELEMENTS OF HIP HOP: MUSIC, GRAFFITI, RAP, AND DANCE

VISA SENAMONTRI, Theatre, College of Arts and Media

Faculty Mentor: Ms. Elizabeth Williams, Theatre, College of Arts and Media

Activity Type: Undergraduate Creative Activity

This study of the history, culture, and continuous manifestation of HIP HOP includes the elements of diversity, music, dance, Rap, art, language, style, science, and life. The synthesis of these ideas is expressed in an art display and a contemporary form of physical expression integrating the theoretical and philosophical aspects of performance.

FIELD PROGRAMMABLE GATE ARRAYS FOR ROBOTIC CONTROL SYSTEMS

JAMES SINCLAIR, Electrical Engineering, College of Engineering and Applied Science

Faculty Mentor: Mr. Robert Grabbe, Electrical Engineering, College of Engineering and Applied Science

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

In recent years, software-based control systems--especially in the field of robotics--have advanced at astounding rates due mainly to the availability of faster and less expensive computing systems. Hardware-based control systems, however, have advanced at a much slower rate. This is in part due to the extreme amounts of time and money required for Application Specific Integrated-Circuit (ASIC) design. Recently, Field Programmable Gate Arrays (FPGAs) have become faster and more capable at very fast rates. This has opened up the possibility of creating very complex single-chip systems at a fraction of the time and money ASIC design would take. Our presentation is a proof-of-concept system which uses FPGAs to process video data at close to real-time. The system uses Linux internally and has hardware programmed into the chip to find a line in a video image. When the final system is complete, it will be used in our ground based robot to detect lines on the ground and follow them.

IS PA THE MISSING STEP IN FERTILIZATION?

JASON STAFFORD, Biology, College of Liberal Arts and Sciences

TAYLOR JUERGENS, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Bradley Stith, Biology, College of Liberal Arts and Sciences

Activity Type: Graduate Research

We provide data that suggest PA is acting as an upstream activator of Src kinase and phospholipase C α (PLC α) to stimulate calcium release from intracellular stores during *Xenopus* fertilization. First, microinjection of Fluo-4 into albino oocytes was used to verify that treatment with exogenous PA has the ability to cause a rise in intracellular calcium concentration in whole cells. Secondly, an ELISA was used to determine PA's ability to stimulate Src autophosphorylation. Similarly, Western blotting was performed to detect an increase in PLC α phosphorylation following PA addition. Finally, IP3 assays were conducted to determine PA's effect on IP3 levels. Conversely, experiments were also conducted to determine whether PA-induced Ca $^{2+}$ release depends upon the activity of Src and PLC (as measured by following IP3 production). *Xenopus* oocytes were incubated with various tyrosine kinase inhibitors to determine if Src activity was required for PA-induced calcium release. Similarly, the PLC inhibitor U73122 and IP3-receptor antagonist 2-APB were used to verify that PA is causing a rise in intracellular calcium by acting through PLC to increase IP3. The results of these experiments suggest that PA may act through Src and may also activate PLC directly to increase intracellular calcium.

ARMENIA FOREST INVENTORY USING LANDSAT DATA

RICHARD STREETER, GIS Certificate, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Rafael Moreno, Geography and Environmental Science, College of Liberal Arts and Sciences

Activity Type: Graduate Research

The forests of the Caucasian region are a hotspot for biodiversity and contain a large number of endemic plant and animal species. It is common knowledge that the extent and condition of forest ecosystems in Armenia have decreased drastically since the disintegration of the USSR in 1991. Armenia, however, has not been able to conduct a national forest inventory since the last Soviet National Forest Inventory. The most recent national forest inventory dates back to 1988. This project aims to provide the Armenian National Academy of Agricultural Sciences (AAA) with a more recent estimate of the extent of forest cover in the country. To achieve this I am using Landsat ETM+ satellite imagery from the year 2000 obtained from the Global Land Cover Facility collection (<http://glcf.umiacs.umd.edu/data/guide/technical/geocover.shtml>). I tiled the Landsat images together to cover the whole country, then performed an unsupervised classification to identify forest vegetation. The results of this classification will be sent to the AAA in May 2006 for corroboration in the field. Preliminary results indicate a high degree of accuracy in discriminating forest vegetation from other land covers.

WATER DISTRIBUTION SYSTEMS MODELING AND OPTIMIZATION IN A GIS ENVIRONMENT

KEDRIC SZANA, Civil Engineering, College of Engineering and Applied Science

Faculty Mentor: Dr. Lynn Johnson, Water Resources / GIS, College of Engineering and Applied Science

Activity Type: Graduate Creative Activity

The hydraulic modeling of water distribution systems was accomplished for an extended period using dos-based environments. Simulating each pipe in such an environment is unfeasible. Therefore, models that simulated the hydraulic response of the system was built by modeling only the main supply pipes (typically 12" and larger). Graphical user interfaces were developed to provide a visual aid when modeling these systems, but modeling all pipes remained unfeasible. New regulations are forcing most water districts to create all-pipes models. Fortunately, many districts have developed GIS databases for asset management purposes. With new tools available, hydraulic modeling is possible directly in the GIS environment. The ability to leverage GIS in creating and reviewing a water distribution systems model is critical. With GIS, all pipes in the system may be quickly incorporated into the model. Finally, GIS combined with Genetic Algorithms allow optimization of systems using criteria developed via queries. This project explores the process used and the GIS tools that simplify all-pipes modeling and optimization.

PREDICTORS IN WOMAN'S PARTICIPATION IN POLITICS

HALLY TURNER, Psychology, College of Liberal Arts and Sciences

SARAH WEAR, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Lucy McGuffey

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

The world average for women's political participation is 15.1 percent according to the United Nations. Rwanda leads the world with 49 percent while the United States falters at 14 percent. In order to address the low average of the United States, our research focused on women's attainment of and participation in the government. Based on information acquired at the Institute for Women's Policy Research (IWPR) conference, When Women Gain, So Does the World, we analyzed risk factors that would predict the total percentage of women in political office by state according to statistics compiled in 2004. The five factors by state consisted of high school graduation rates, percent of women in the work force, median income for women, portion of women with a four year degree, and the total women living in poverty. One component did not accurately predict the number of female politicians. However, this low average coincided with the presence of multiple risk factors. Based on this conclusion we opted not to interview marginalized women, defined as women living at or below the poverty line according to the US Census, because it appeared that lack of political participation afflicted all groups of women despite income or education level. This research and our attendance at the IWPR's conference granted us the ability to network with organizations that have established political leadership trainings, such as the White House Project, the Center for American Women and Politics at Rutgers, and the Bighorn Policy Center. Therefore, it is more effective to collaborate with these organizations regarding their programs as opposed to initiating and funding our own.

DEVELOPMENT OF WOMEN IN DEVELOPING VS DEVELOPED COUNTRIES

EURICA THAPA, Sociology/Communication, College of Liberal Arts and Sciences

Faculty Mentor: Professor Andrea Haar, Sociology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Women are still marginalized and often viewed as second class citizens or property in many parts of the world. Of the world's 1.3 billion poor people, it is estimated that nearly 70% are women. 840 million adults are illiterate – 538 million of them are women. In many parts of the globe women have unequal access to education, social services, and economic resources. In some countries women are not permitted to own property or seek credit – two key resources for rising out of poverty. Even in developed countries women still receive less pay than men for the same work – called the gender gap. In both developed and developing countries most women bear the double burden of working outside the home for an income and assuming the bulk of household and child-rearing duties – which they don't get paid for. And no one accounts for the incredible contribution women's household labor makes to the economic and social well-being of society. There has been greater awareness of gender issues among governments. However, equal access to higher education and labour markets continues to be a concern in some countries, negative stereotypes of women have continued to persist, both in old and in new media.

PROTOTYPE OF SOLAR POWERED REFRIGERATOR FOR MEDICAL STORAGE IN REMOTE LOCATIONS

NATAPOL THONGPLEW, Environmental Sciences, College of Liberal Arts and Sciences

SHAUNA KOCMAN, Environmental Engineering, College of Engineering and Applied Science

ERDENE BAYASGALAN GANJUURJAV, Environmental Sciences, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Graduate Research

A refrigeration system has been constructed that uses water evaporation to cool materials. The evaporation is driven by a process of adsorption into a synthetic mineral called zeolite. The system requires a vacuum condition in order to process adsorption. The system consists of an evaporator, zeolite container, and condenser. The design goal is to maintain one to two kilograms of medicine at 4 degrees Celsius in an equatorial climate. The zeolite container is designed to be baked each day in a solar collector in order to recover the adsorbed water into the condenser. This project was prepared as a component of the UCDHSC PLaCES (Participatory Learning and Creativity Education for Sustainability) Project directed by Professor Anu Ramaswami.

REINTEGRATION OF WOMEN WITH HISTORIES OF SUBSTANCE ABUSE INTO SOCIETY

NANCY VANDEMARK, Public Affairs, Graduate School of Public Affairs

Faculty Mentor: Dr. Peter deLeon, Public Affairs, Graduate School of Public Affairs

Activity Type: Graduate Research

Substance abuse among women is a social problem of sizeable scope with significant individual and societal consequences. U.S. policy toward individuals with substance abuse problems relies on stigma, discrimination, and punishment; withholding access to education, cash assistance, housing, social support, and normal social roles. Relying on the theories of reintegrative shaming and social construction of target populations, this cross-sectional study examines the predictors of deviance using a combination of logistic regression and inductive qualitative analysis with a sample of 325 women with histories of substance abuse. Results of the logistic regression analyses reveal that higher levels of instrumental support, affective support and participation in normal roles are statistically significant predictors of lower levels of criminal and drug using behaviors. Qualitative findings support the quantitative results, revealing that women perceive these variables of instrumental support, affective support and participation in normal roles of parent, employee, student, and citizen to be critical in facilitating their return to pro-social lifestyles. The study concludes that current U.S. policies toward women with substance abuse histories are ineffective and alternative policies that actively facilitate engagement of women in society by providing access to education, employment, housing, and support in caring for their children are needed.

CONSPIRACY THEORY BELIEFS AND RISKY SEXUAL BEHAVIOR

JESSICA WALTER, Psychology, College of Liberal Arts and Sciences

KAYLENE CASE, Psychology, College of Liberal Arts and Sciences

CHRISTOPHER NETTLES, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Eric Benotsch, Psychology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Previous research has documented the existence of conspiracy beliefs related to HIV/AIDS (e.g., that AIDS was produced in a government laboratory). Such beliefs are typically endorsed more frequently by African Americans than Caucasians in the United States. Belief in AIDS conspiracies has been shown to be related to lower levels of self-protective sexual behaviors, such as consistent condom use. The present research assessed conspiracy beliefs among three different ethnic groups of patients seeking STD clinic services (N=398). Participants completed measures assessing sexual risk behavior, substance use, education, and HIV/AIDS conspiracy beliefs. Conspiracy beliefs differed significantly between different racial groups ($F(2, 361) = 13.48, p < .001$). Post-hoc analyses indicated that African American participants scored significantly higher on the conspiracy belief measure than Caucasian or Latino participants. Conspiracy beliefs were negatively correlated with education among Caucasian participants. However, education was not associated with conspiracy beliefs among Latinos or African Americans. High-risk sexual behavior was associated with conspiracy beliefs among Caucasians but not among the other racial groups surveyed. In the sample as a whole, conspiracy beliefs were associated with higher levels of substance use. Future research should examine if education related to conspiracy beliefs might increase adherence to safer-sex practices.

PLACES –PARTICIPATORY LEARNING AND CREATIVITY EDUCATION FOR SUSTAINABILITY

MICHAEL WHITAKER, Civil Engineering, College of Engineering and Applied Science

MARK PITTERLE, Civil Engineering, College of Engineering and Applied Science

MIKE POSNER, Civil Engineering, College of Engineering and Applied Science

TIM HILLMAN, Civil Engineering, College of Engineering and Applied Science

SEAN GALE, Electrical Engineering, College of Engineering and Applied Science

Faculty Mentor: Ms. Anu Ramaswami, Civil Engineering, College of Engineering and Applied Science

Activity Type: Graduate Research

PLaCES is a multidisciplinary group of UCDHSC undergraduate and graduate students collaborating with faculty and professional engineers to design, build, and implement sustainable development projects worldwide. From 2005-2007, PLaCES is developing low-cost renewable energy systems for two tribal villages in the Narmada Valley, India, that presently lack electricity and water infrastructure. The objective of our research is to design, test and deploy suitable wind power systems that are simple in design, efficient in function, safe in operation, constructed from locally-available materials, and, readily comprehended, maintained and operated by the villagers. Methodology: Site assessment and participatory planning meetings were held in the villages to seek community input and support before initiating project design. For the village of Mozda, which has adequate water but lacks electricity, the team designed a horizontal axis wind turbine (HAWT) efficient in electricity generation. A 1 kilowatt HAWT was hand-constructed from local materials and installed in Mozda during a 10-day workshop held by PLaCES. For the village of Trishul where water was the critical need, a vertical axis wind turbine (VAWT) with rope pump was designed for water pumping and low-power generation. Prototypes of both turbines are being built and tested in Denver for long-term performance assessment.

SOFT MICRO-OPTICS FOR BIOLOGICAL APPLICATIONS

ARON WOLTERSTORFF, Physics, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Randall Tagg, Physics, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research

Many biological materials are transparent. Both physical and chemical processes can manipulate, often at low cost, the optical and mechanical properties of such materials. We believe there is a wide opportunity to use these materials to make novel optical devices and that some of these devices can in turn be used in medical applications. One class of materials, in particular, has a proven suitability to optical applications and to biomedical systems: hydrogels. Hydrogels are polymer networks that can swell by absorbing water. An example is common gelatin used in food and photographic film. We are developing methods to use hydrogels for optical devices by learning how to manipulate gel optical properties over small spatial scales and in complex patterns. As a first step, we have built an interferometer system to sensitively map the optical properties of gel samples.

EFFECTS OF CLOCCINAMOX AND NOR-BINALTORPHIMINE ON THE CONDITIONED PLACE PREFERENCE PRODUCED BY MORPHINE AND BUTORPHANOL

DOROTHY YAMAMOTO, Psychology, College of Liberal Arts and Sciences

KEVIN BLAUTH, Biology, College of Liberal Arts and Sciences

NANCY SCHAEFER, Psychology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Richard Allen, Psychology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Butorphanol is a mixed action (μ - and κ -) opioid receptor agonist thought to possess low abuse potential relative to morphine. In this study, we used three-compartment place conditioning apparatuses to compare the rewarding effects of morphine and butorphanol in rats, and to test the receptor mechanisms mediating these effects. Morphine produced dose-dependent increase in preference ratio (PR) up to the maximum tolerated dose (10 mg/kg). The effects of butorphanol were biphasic, with maximal PR at 0.1 mg/kg, then decreasing up to the maximum tolerated dose (10 mg/kg). The rewarding effects of 10 mg/kg butorphanol were not altered significantly following 24 h pretreatment with the irreversible κ opioid receptor antagonist, nor-binaltorphimine (1 mg/kg, i.v.). The irreversible μ -opioid receptor antagonist, clocinnamox (1 mg/kg, i.v.), slightly attenuated the preference produced by 10 mg/kg morphine but not the preference produced by 10 mg/kg butorphanol. We plan to test the effectiveness of intravenous antagonist doses against other behavioral measures to verify their effectiveness, and test higher antagonist doses against the place preferences produced in this procedure. Supported by a UCD Faculty Development Award (RMA), UCD Undergraduate Research Opportunity Program awards (DJY, NJS, KRB, CVE) and a UCD Psychology Faculty Fund for Undergraduate Research award (CVE).

ARABIDOPSIS THALIANA RESPONSE TO TOBACCO RATTLE VIRUS

CORY ZOETEWY, Biology, College of Liberal Arts and Sciences

JESSICA MARTIN, Biology, College of Liberal Arts and Sciences

Faculty Mentor: Dr. Lisa Johansen, Biology, College of Liberal Arts and Sciences

Activity Type: Undergraduate Research
2005-2006 UROP Award Recipient

Arabidopsis thaliana is a model plant for genetic studies since its genome has been sequenced. Several Arabidopsis genes have been identified that operate in the RNA interference (RNAi) pathway, which is responsible for one of the viral defense mechanisms. These genes include Dicer-like (DCL) enzymes and RNA dependent RNA polymerases (RdRp). Arabidopsis encodes four DCLs and seven RdRps. It has been shown that some of the DCLs and RdRps have a role in the defense response to certain viruses. Of the seven RdRps only rdr1, rdr2, and rdr6 have been characterized. Homozygous mutants which lack a functional RdRp have been created for rdr3, rdr4, and rdr5 to examine their possible role in viral defense. Many plant viruses encode silencing suppressors to block the RNAi defense pathway. Tobacco Rattle Virus (TRV) is an optimal model for measuring plant response since it does not encode a strong silencing suppressor. At 14 days post TRV infection, rdr3, rdr4, and rdr5 mutant lines show increased levels of TRV replication as compared to wild type Arabidopsis. In particular, rdr4 shows a significant reduction in its ability to silence TRV. This indicates that rdr4 plays an important role in the Arabidopsis viral defense pathway against TRV.