GRADUATE AND PROFESSIONAL
CREATIVE ACTIVITIES AND
RESEARCH FORUM

2017 ABSTRACTS

Student Center
Ballrooms A, B, C, & D
April 4th, 2017
“We value undergraduate participation in research and creative endeavors because it enhances our students’ critical thinking and communication skills, which better prepares them to compete in the global society. Research also stimulates curiosity, which leads of course to answers. I know from my own research when I was a faculty member the excitement of discovering new information, and the satisfaction that comes from sharing those discoveries with others. The commitment of our students and their faculty mentors is an inspiration to all of us.”

—Randy J. Dunn, SIU System President
“Our undergraduates engaged in research are among our best and most successful students. Research is problem solving—learning to ask questions and finding out how to answer them. From freshmen to seniors, these students are gaining knowledge and skills, and building collaborative relationships that will propel their lives and careers in every field and provide real advantages in their professional careers. We are very proud of their accomplishments.”

—Susan M. Ford, Provost and Vice Chancellor for Academic Affairs

“Creating new knowledge is the pulse of SIU. Our students have direct access to renowned faculty and facilities typically found at universities several times our size, leading to accomplishments in diverse places such as the laboratory, studio, and stage. Not only do our students leave SIU with a degree in hand, but also a creative mind. And with hard work and some serendipity, our graduates may also find themselves with a published article, a novel musical score, an unique piece of art, or most importantly, a fresh view of the world. At SIU, all things are within your reach.”

—James Garvey, Interim Vice Chancellor for Research

“‘Know No Bounds’ represents Southern Illinois University Carbondale without a doubt. Participating in undergraduate creative activities and research is a way for students to experience the endlessly expanding boundaries available at SIU Carbondale. This Forum is a valuable showcase for the world to see students walking in the path ‘Know No Bounds’.”

—Rodrigo Carramiñana, Director of the Center for Undergraduate Research and Creative Activities
Graduate and Professional Creative Activities and Research Forum
April 4, 2017
Southern Illinois University Carbondale

Program

Poster and Oral judging sessions: 8:30 a.m. - 12:30 p.m.
Public viewing session: 1:00 p.m. - 3:00 p.m.
Award presentations: 3:00 p.m.
  - Forum poster awards by category

CURCA Organizers
Coordinator: Masita Misdi, CURCA
Judges: Anthony Farace, CURCA
Event Manager: Maranda Brown, CURCA

Sponsors
  - Office of the Chancellor
  - The Graduate School
  - Office of the Vice Chancellor for Research
  - Office of the Provost
  - The Sustainability Council
Thank you to all faculty, staff, and graduate students who are sharing time and expertise to serve as judges at the 2017 Graduate and Professional Creative Activities and Research Forum (GPCARF). The following list is of individuals confirmed at the time of posting.

**8:30-10:30**

**Name**

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Chitambar                                 Cleary       
Cochran                                   Cooley       
Davie                                     Drake        
Fisher                                    Ford         
Holm                                      Kim          
Larsen                                    Lee          
Leonard                                   Li           
Logterman                                 Mazumdar     
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2017
ABSTRACTS
JARID2 is the founding member of Jumonji family of histone demethylases. It lacks any demethylase activity, and yet is evolutionarily conserved from Drosophila to human. Mutations in the catalytic domain, JmjC, are attributed to its inactive demethylase activity. Recently, it has been shown to be a sub-stoichiometric component of polycomb repressive complex-2 (PRC2), and is required for embryonic stem (ES) cell differentiation. Evidence suggests that JARID2 helps in targeting of the PRC2 complex. Jarid2 mutant mice exhibit various neural tube, cardiac and hematopoietic defects, and die in utero. JARID2, along with EZH2, the catalytic subunit of PRC2 complex, is overexpressed in rhabdomyosarcoma (RMS), the most common soft tissue sarcoma in children. And depletion of JARID2 and/or EZH2 in RMS cells decreased the proliferation and partially rescued the RMS cells’ ability to differentiate, indicating the role of JARID2 and PRC2 in regulation of cell proliferation and differentiation in RMS cells. Therefore, to understand the role of JARID2 during myogenesis, we depleted JARID2 in C2C12 cells, widely utilized myoblast cell model, using shRNA constructs against Jarid2. We showed that depletion of JARID2 results into impairment of differentiation, while the proliferation ability of these myoblast cells was significantly increased marked by increased DNA synthesis. The expression of positive cell cycle regulator, cyclin D1 (Ccnd1) - a crucial protein required for G1/S transition during cell cycle, was significantly upregulated. The expression of negative cell cycle regulators like p21 (cyclin dependent kinase inhibitor), retinoblastoma (tumor suppressor) were downregulated, supporting the fact that JARID2 has inhibitory effect upon cell cycle progression and is required for cell cycle exit. qChIP assay demonstrated decrease in transcriptionally repressive H3K27me3 mark on Ccnd1 promoter marked by decrease enrichment of both JARID2 and EZH2 as well, while H3K9me1/2/3 did not change. Interestingly, we also observed significant decrease in H3K27me3 status on pRB promoter but not on p21. It still needs to be investigated how p21 and pRb were down-regulated upon loss of JARID2. One possible explanation could be that, unlike cyclin D1, they are the indirect targets of JARID2. Additionally, depletion of EZH2 in C2C12 cells also exhibited similar results of impaired differentiation, increased proliferation corroborated by increased expression of cyclin D1, further supporting PRC2 dependent role of JARID2 in skeletal muscle. Taken together, we show a novel role of JARID2 in skeletal muscle proliferation and differentiation through the regulation of cell cycle progression and exit that is achieved through transcriptional repression of targets in PRC2-dependent manner.
Asma Alkabsh, Hassana Samassekou and Dipanjan Mazumdar

Department of Physics

(Author has asked the abstract to be omitted from the abstract booklet)
Nicole Allen, Nathan Henkenius, and Jun Kim

Department of Public Health and Recreation Professions

How Stress and Anxiety Levels Correlate to the Usage of Desire2Learn at Southern Illinois University Carbondale.

The purpose of this study is to determine the effect the Desire2Learn (D2L) system has on the general anxiety and stress levels of the faculty and students at Southern Illinois University Carbondale. D2L is a learning management system that is currently used for online teaching, as well as a supplement to on-campus classes. This management system has been employed by Southern Illinois University Carbondale throughout the 2016 and 2017 academic year. Recent trends indicate that most universities use, and are increasing their use of, learning management systems without assessing the learning management tools to understand the user’s perspective of the technology. Little research has been done previously on the correlation between D2L and the anxiety and stress levels experienced by the users. By assessing the user’s perspectives, universities will be able to provide an online environment that is more conducive to an effective online education that leads to lower stress levels and anxiety. This study will provide a quantitative assessment of D2L as a causal factor for anxiety and stress levels. The survey will be distributed to collect numeric data to the SIUC students and faculty by sampling convenient method, and the data will be examined by a descriptive statistical analysis in order to interpret their anxiety and stress levels associated with the use of D2L.
Nicole Allen, Namyun Kil, PhD, Robert Rados, PhD, and Jun Kim, PhD

Department of Public Health and Recreation Professions

The Effect of Nature Photographs and Music on Memory Care Residents' Level of Tranquility

Dementia is a devastating disease that is impacting the lives of millions of Americans over the age of 65, for which there is currently no cure. This disease affects the individual’s memory, behavior, and ability to perform activities of daily living. It seems to be evident that environmental factors may provide relief of cognitive impairment and encourage emotional stability. The purpose of this study is to explore the effect of media presentation on individuals with dementia by viewing a video of aesthetic landscapes accompanied by soothing, classical music. Combining a qualitative approach with quantitative data analysis, the project exposed 10 participants to a video of fascinating nature scenes with soothing music at Reflection Memory Care Center in Herrin, IL. The study findings significantly showed a decreased level of exit-seeking and an increased tranquil responses among the residents. Combined with the outcomes of a Tranquility Scale administered to the Centers’ staff observing participants’ behavioral response, the results revealed a significantly positive correlation between viewing nature scenes with soothing music and an increased level of contentment among individuals with dementia. This audio-visual intervention could be implemented as a program tool to experience tranquility for individuals residing in a long-term assisted living facility.
Magnetocaloric and magnetotransport properties of rare-earth doped Ni50Mn35Sn15 Heusler alloys

The structural, magnetic, magnetocaloric, and transport properties of Ni50-xRxMn35Sn15 (x=0, 1 and R = La, Pr, Sm) compounds has been studied through X-ray diffraction (XRD), differential scanning calorimetry, and magnetization measurements. Analysis of the XRD data reveals that the compounds crystallize in the cubic L21 austenite phase at room temperature. We have observed that the ground state magnetization (T = 5 K) and the martensitic transition temperature (TM) depended on the rare-earth ion. A drastic shift in TM by ~ 62 K relative to the parent compound (TM = 190 K) was observed for the Ni49LaMn35Sn15 compound. The compounds exhibit both inverse and normal magnetocaloric effects. Magnetic entropy change of 5.2 J/kg K (Sm), 12 J/Kg K (Pr), and 6 J/kg K (La) were found at TM for ∆H = 5T. Relative cooling power values of 267, 336, and 230 J/Kg were found at the Curie temperatures of the compounds with Sm, Pr, and La substitution, respectively. Significant magnetoresistance values were observed in these compounds, with the largest being -30% for the La substituted compounds at TM and ∆H = 5T.

Acknowledgements: This work was supported by the U.S. Department of Energy (DOE), Office of Science, Basic Energy Sciences (BES) under Award No. DE-FG02-06ER46291 and DE-FG02-13ER46946.
Said Bakkar, Anil Aryal, Stephen Hofer, and Dipanjan Mazumdar

Department of Physics

New Inverse-Heusler Materials with potential Spintronic Applications

Heusler compounds are probably the single biggest family of half-metals (100% spin-polarized at the Fermi Level) and most promising for spintronic device applications. Many newer half-metallic full Heusler compounds in their L21 form are predicted from ab-initio calculations. The inverse Heusler alloys (Y2XZ) are interesting in this respect, and also predicted to be stable. Experimentally, we successfully prepared arc-melt samples of Mn2CoGa and a new material Mn2FeSi. We study the structural and magnetic properties of inverse Heusler alloys using X-ray diffraction (XRD) and SQUID and VSM magnetometry. We found that the Mn2CoGa and Mn2FeSi alloy are single phase after annealing at 500 C for 48 hours and at 500 for 5 days respectively with single- grain microstructure. Energy dispersive spectroscopy measurements is also conducted to verify the composition of these alloys. Their ordering properties with respect to L21 structure and other possible orientations (C1b for instance) will be discussed in this presentation.
Rajesh P Balaraman\textsuperscript{1}, Chuanhong Zhou\textsuperscript{2}, and Punit Kohli\textsuperscript{1}

\textsuperscript{1}Department of Chemistry and Biochemistry, Southern Illinois University, Carbondale, IL, USA 62901

\textsuperscript{2}Vuzix Corporation, 2166 Brighton Henrietta Town Line Road, Rochester, New York 14623

\textit{(Authors has asked abstract to be omitted from abstract booklet)}
Swastik Bhandari and Ajay Kalra

Department of Civil and Environmental Engineering

Long lead-time forecasting of streamflow in the Rio Grande River Basin

Streamflow forecasting amidst global climate change has become a serious concern for water resources manager to allocate water to users efficiently and timely. The present study focusses on the capability of various statistical approach to predict April-August streamflow of Rio Grande River Basin utilizing September-November and December-February oceanic-atmospheric variability of Pacific and Atlantic Ocean for a period of 1965-2014. Sea surface temperature (SST), geopotential height (Z500), east-west wind (U500), and specific humidity (SH500) of Pacific and Atlantic Oceans were taken as the probable predictors and the linkage of these predictors with streamflow of the river was generated using singular value decomposition (SVD) technique. The SVD result showed stronger correlation of Pacific Ocean variability with Rio Grande streamflow as compared to Atlantic Ocean. The significant modes of predictor variables were weighted and screened by non-parametric approach to develop continuous exceedance probability forecast of streamflow for one and four month lead-time. The streamflow variability was better explained by Pacific SST and U500 in comparison to Z500 and SH500. A data-driven model, support vector machine (SVM), was used to predict the streamflow several months ahead. The forecasted streamflow was in good agreement with the measured flow and the performance of the SVM model was tested by various graphical and statistical measures and the tests showed satisfactory results. The improvement of streamflow forecast lead-time may aid in providing useful information to water managers for efficient planning and management within the Rio Grande River Basin.
The global climate change is expected to have significant effect on the water resources resulting from variation in rainfall pattern, intensity and temperature that have direct impact on the flow in perennial and non-perennial rivers. This study aims to analyze impact on streamflow using the downscaled climate projections in the Pajaro River watershed in central coast of California. The global climate models that adequately simulate the historical climate are selected under two Representative Concentration Pathways [RCP 4.5 (moderate emissions) and RCP 8.5 (high emissions)] to depict the future changes. The impact of climate change in the 21st century is compared with the current high flows. Historically, Pajaro River has witnessed several flooding altering the hydrologic regime of the watershed. This study used the Soil and Water Assessment Tool (SWAT) to simulate the hydrologic processes within the basin. The digital elevation model data is used to generate streams and delineate the watershed. The SWAT model divides the basin into multiple subbasins and hydrologic response units based on the watershed characteristics. The model is calibrated against the gage streamflow data at the outlet of the watershed obtained from the United States Geological Survey repository. The Nash-Sutcliffe model efficiency is used as a measure of the model’s predictive ability for the calibration and validation periods. The study aims to provide valuable information for long-term watershed management and strategies formulation considering the global climate change scenario within the Pajaro River watershed.
Analyzing streamflow changes in the arid Pajaro River Watershed

The global climate change is expected to have significant effect on the water resources resulting from variation in rainfall pattern, intensity and temperature that have direct impact on the flow in perennial and non-perennial rivers. This study aims to analyze impact on streamflow using the downscaled climate projections in the Pajaro River watershed in central coast of California. The global climate models that adequately simulate the historical climate are selected under two Representative Concentration Pathways [RCP 4.5 (moderate emissions) and RCP 8.5 (high emissions)] to depict the future changes. The impact of climate change in the 21st century is compared with the current high flows. Historically, Pajaro River has witnessed several flooding altering the hydrologic regime of the watershed. This study used the Soil and Water Assessment Tool (SWAT) to simulate the hydrologic processes within the basin. The digital elevation model data is used to generate streams and delineate the watershed. The SWAT model divides the basin into multiple subbasins and hydrologic response units based on the watershed characteristics. The model is calibrated against the gage streamflow data at the outlet of the watershed obtained from the United States Geological Survey repository. The Nash-Sutcliffe model efficiency is used as a measure of the model’s predictive ability for the calibration and validation periods. The study aims to provide valuable information for long-term watershed management and strategies formulation considering the global climate change scenario within the Pajaro River watershed.
Adolescents are spending more time inside, rather than in the outdoors. A theory of happiness builds on the evidence that adaptation and social comparison affect utility less in the nonpecuniary than pecuniary domains according to Easterlin. This research explores the level of happiness of adolescents between the ages of 14-17 in the outdoors among the Southern Illinois region. CRC Health Group stated, adolescents are spending less time in the outdoors compared to their parents. According to The Influence of Challenging Outdoor Recreation On Parent-Adolescent Communication, adolescents may not be comfortable in the outdoors, but time outside can change the teenagers’ level of happiness. Adolescents are developing a disconnect with the outdoors. There is little research to demonstrate the level of happiness of adolescents in the outdoors. The researchers will administer surveys to Carbondale Community High School students between the ages of 14-17, who volunteer to participate. The goal of the research is to assess the level of happiness of adolescents while in the outdoors.
Corrosion of roof support systems in underground mine environments could be a serious concern to ground control as it’s directly related to work force safety and production related issues. One of the common support systems used in the underground coal mines are steel rebars installed in the mine roof to avoid roof and rock falls. The most commonly used material as the rebars are ASTM A 615 steel and hence planned to investigate. An approach to determine the corrosion potential and to monitor the corrosion process of roof bolt via instrumentation has been planned and executed insitu. Since this is research in progress, only the concept and some preliminary data obtained from the field is explained. This approach of monitoring the corrosion process with time using a custom designed instrument is first of its kind when it comes to underground mining and will be a great asset to the industry in the future.
My thesis examines the intersections of race and environmental activism during the “War on Poverty” of the late 1960s to early 1970s, using Carbondale, Illinois as a lens. In my research I have found that throughout the 1960s and 1970s, residents of Carbondale consistently viewed social change through a neoliberal lens and therefore chose only to support social change where a perceived financial gain was deemed possible. Persistent racism and a climate of deindustrialization caused the failure of federal and state aid programs implemented in Carbondale as part of President Johnson’s “War on Poverty.” At the same time, these same factors undermined a budding grassroots environmental movement. Environmentalists focused on factors they believed hindered financial profit and turned a blind eye to other forms of environmental and social activism. This unwillingness to cooperate with other activist groups caused each local reform movement to fracture and collapse by the late 1970s. Rather than Carbondale becoming model of Great Society success and reform, many social conditions in Carbondale did not significantly change between 1970 and 2017.
Ja E. Claywell, Lea M. Matschke, and Derek J. Fisher

Department of Microbiology

Unraveling the Physiological Role of Cpp1, a Protein Phosphatase Type 2C from Chlamydia trachomatis

Reversible protein phosphorylation is a fundamental regulatory mechanism that mediates important cellular processes. Chlamydia spp. encode two validated Hank’s type Ser/Thr protein kinases and appear capable of global phosphorylation based on phosphoproteomic analysis. We recently demonstrated that Cpp1, a PP2C from Chlamydia trachomatis, is capable of P-Ser, P-Thr, and P-Tyr dephosphorylation and detected phosphatase activity in EB and RB lysates. While these findings substantiate the existence of a protein phosphorylation network that we hypothesize to mediate chlamydial development, the in vivo function of Cpp1 remains unknown. In this study, we further examine the enzymatic properties of Cpp1 and investigate the role of phosphorylation in chlamydial physiology. We generated seven Cpp1 point mutants and characterized their ability to dephosphorylate pNPP and various phosphopeptide substrates. Point mutants were chosen based upon Cpp1 missense mutations identified in C. trachomatis mutants displaying altered plaque morphologies. Cpp1 mutants were significantly deficient in pNPP hydrolysis and displayed differential ability to dephosphorylate P-Ser, P-Thr, and P-Tyr residues, suggesting that reduced activity of Cpp1 negatively affects chlamydial growth. Furthermore, we found that MDSA, an inhibitor of Staphylococcus aureus PP2C (Stp1), inhibited Cpp1 phosphatase activity in a dose-dependent manner. Consistent with phosphorylation playing a role in development, treatment of chlamydial EBs with MDSA significantly reduced bacterial growth in cell culture. To further query the role and essentiality of Cpp1 for chlamydial growth and development, select Cpp1 mutants will be overexpressed in C. trachomatis to create dominant negative mutants and to develop a conditional lethal genetic system. Collectively, our results support an integral role for protein phosphorylation in chlamydial physiology.
Zeolitic Imidazolate frameworks (ZIFs) are porous Metal Organic Framework materials that have zeolite-like structures. We will present the results of an adsorption isotherm study of carbon monoxide in ZIF-8. The adsorption isotherms display multiple sub-steps. Similar substeps have been observed before with xenon and O2 in ZIF-8; they have been interpreted as indicating a pressure-induced structural transition or “gate-opening” of the ZIF-8 at low temperatures. We have conducted our measurements for CO on ZIF-8 at temperatures in the range between 72K and 105K. All the isotherms measured in this range have clear sub-steps (which reflect an increase in CO loading due to gate-opening transition). We have used the isotherm data to calculate the isosteric heat of adsorption as a function of loading for this system. We found a change in isosteric heat at the loading corresponding to the structural transition; a similar feature was observed in previous experiments conducted on Xe and on O2 in the same sorbent. We have preliminary results for the sorption of neon in ZIF-8. The isotherm data for neon will be presented and compared data for other gases.
Matthew C. Geiger, Ronald F. Krausz, and Karla L. Gage, Ph.D

Department of Plant, Soil, and Agricultural Systems

Evaluation of Weed Management in Six Soybean Systems

Weed management in soybean production has become increasingly difficult because of the proliferation of weeds resistant to multiple herbicide sites of action. Knowledge of field history and the presence of herbicide-resistant weed biotypes is crucial for the selection and placement of soybean technology. Field trials in Belleville, IL and Dowell, IL were established in 2016 to investigate the effectiveness of different weed management strategies in six different soybean systems: conventional, and soybeans tolerant to glufosinate, glyphosate (1st and 2nd generation), dicamba + glyphosate, and 2,4-D + glyphosate. Weed control strategies include preemergence (PRE)-only, PRE followed by postemergence (POST), including or excluding a residual herbicide, and POST-only including or excluding a residual herbicide. Visual herbicide efficacy ratings were recorded at 14, 28, and 56 days after treatment (DAT), as well as weed counts at 30 DAT and at harvest. Results ten weeks after planting are as follows: in Belleville, PRE-only treatments controlled 50% to 60% of grass and large-seeded broadleaves, compared to 98% or higher using a PRE followed by a POST herbicide program. In Dowell, a POST-only including a residual herbicide controlled 76% of Amaranthus tuberculatus (waterhemp) and 85% of Panicum dichotomiflorum (fall panicum); the latter values were increased to 85% and 98%, respectively, with the inclusion of a PRE. Control of fall panicum with a PRE-only application was improved from 80% to 98% by the inclusion of a POST, regardless if the POST included a residual herbicide. Inconsistent control of PRE-only or POST-only herbicide programs, across both sites, suggests there is a risk associated with either of the latter herbicide programs. This research further supports the use of a soil-applied herbicide followed by a properly timed POST application.
Mohammed Hamdi, and Dr. Wen-Chi Hou
Department of Computer Science

An Efficient Data Structure for Fast Join Query Processing

In this research, we propose to store equi-join relationships of tuples on inexpensive and space abundant devices, such as disks, to facilitate query processing. We have designed a simple method to capture the equi-join relationships in the form of maximally extended tuples. A simple yet effective naming technique has been designed to group and store the equi-join relationships in tables on disks, which are collectively called the Join Core. Join queries containing arbitrary legitimate sequences of equi-joins, semi-joins, outer-joins, and anti-joins, can all be answered quickly, if not instantly, by merely merging relevant Join Core tables. While our focus is mainly on the join queries, Join Core can indeed be used to answer join queries with arbitrary sequences of set operations that include unions, differences, and intersections. Without having to perform joins, memory consumptions are dramatically reduced. The Join Core can also be updated dynamically. Preliminary experimental results showed that all test queries began to generate results instantly, and many completed instantly too. The proposed methodology can be very useful for queries with complex joins of large relations, and can be even more advantageous to distributed query processing, as there are fewer or even no relations or intermediate results needed to be retrieved, generated or transferred over the networks.
Redesigning Temporary Buildings to Promote Community Development in the Urban Fabric of Cincinnati

Urban decay is a common occurrence within Cincinnati, Ohio. It is often defined by the rise of vacant buildings and lots within low income areas. In order to promote community pride and self-interest, a partnership between local universities and impoverished inner city neighborhoods is being proposed. The university will create a temporary building that will act as a catalyst to promote positive interactions between college students and underprivileged youth.
Nicolette Hoesman, Courtney Copp, Lauren Litchet, and Jun Kim

Department of Public Health and Recreation Professions

A Study on the Effect of Hiking on Women’s Mental Health ages 18-25 at Southern Illinois University Carbondale

A growing public health concern is the high prevalence of depression in women. Mental Health America reports that women experience depression symptoms twice the rate that men do and an average of twelve million women experience these symptoms. Previous research shows a positive correlation related to hiking and women’s mental health. This research investigation will explore facets of women’s mental health, as it relates to the activity of hiking. In this study, mental health is defined as individual’s emotional, social, and psychological well-being. The purpose of this study is to examine the impact of hiking on college-aged women’s mental health, in the setting of nature. Our participant base will be women between the ages of 18 and 25 at Southern Illinois University Carbondale. Goals of this research are to identify the benefits of hiking and how it directly affects women’s mental health, however there is no research explaining the correlation between hiking and mental health among college-aged women. Methods in conducting this research will feature qualitative and quantitative data administered through the use of surveys and interviews with female hiking participants. The rates of depression and anxiety, among women, decrease with participation in leisure activities.
Ryan Holden, Aidan Smith, and Hylin Michael

Department of Psychology

The effects of nicotinamide on c-fos activation after complex cognitive tasks in juvenile rats with controlled cortical impacts

Nutrition is critical for cognitive development during childhood. Specifically, research in the adult population has indicated that vitamin B improves memory performance and overall cognitive functioning. Furthermore, B vitamins are also one of the main ingredients contained in energy drinks. Because energy drinks are commonly used in the teen and young adult population, an investigation into the impact that nicotinamide (vitamin B3) has upon complex cognitive behaviors is warranted, as it is still uncertain how vitamin B3 can impact cognitive performance in juveniles. The current study explored the effect of nicotinamide upon cognitive behavioral performance in juvenile rats in two separate complex cognitive tasks: the 16-arm version of the radial arm maze and massed Morris water maze training. Results demonstrated that while juveniles treated with 500 mg/kg of nicotinamide tended to perform better during a probe trial there were no significant differences in cognitive performance on the massed Morris water maze. In the radial arm maze, there was a significant difference in working memory behavior, such that those rats that received the largest dose of nicotinamide (500 mg/kg) showed a marked improvement in working memory. These findings suggest that nicotinamide (vitamin B3) may have a subtle impact upon normal working memory performance in developing animals. As a result, c-fos expression was quantified to determine levels of neuronal activity in the prefrontal cortex. Future studies will further examine how nicotinamide influences the development of cognitive function and what other mechanisms may be regulating these processes.
The primary uses of oil in an internal-combustion engine are to decrease wear, friction, and heat of the moving components, to aid in sealing engine cylinders, and for contaminant removal. Engine oil is typically changed based on manufacturer recommendations, but these recommendations are unable to compensate for the wide range of engine operating conditions. There is currently no accurate in-situ technique to determine the optimal intervals to replace the oil. This results in preventable, early-onset engine failure from contaminated oil, or wasted resources from removing serviceable engine oil. In this study, Fourier transform infrared spectroscopy (FTIR) was used to analyze SAE 15W-40 Diesel engine lubricating oil to determine if spectral absorption signature differences exist among the eight different levels of water contamination (0%, 0.1%, 0.2%, 0.5%, 1%, 2%, 5% and 10%), to determine the extent water can be detected in the spectral signatures, and to determine the rate at which an oil/water emulsion begins after initial free water contamination. This procedure is repeated once a week over five weeks then once every two weeks over ten weeks, and finally once every month. Preliminary indications are that water content in oil can be observed at a water absorption peak of 3400 cm⁻¹ on day 1 at a 10% contamination level and by week 5 at a 0.1% level. Principal component analysis and partial least squares regression methods will be used to analyze the results and will be compared with other suitable alternative analytical techniques such as Terahertz Time-Domain Spectroscopy.
Mental illness is a major source of disability and has long-term health consequences. In particular, internalizing symptoms are frequently reported for children. These symptoms are defined as encompassing somatic complaints as well as withdrawn, anxious, and depressed behaviors. Given the widespread pervasiveness of internalizing, further research is necessary to better understand its impact on physical health across development. The current study investigated the relationship between internalizing and health outcomes at 5 years of age and follow-up. Participants included 70 children recruited as part of a longitudinal study. At age 5, parents provided reports of their children’s internalizing symptoms and temperament. At follow-up, the youth, now aged 12-20, provided responses on their physical activity habits, self-reported internalizing, and various health outcomes. A path analysis assessing the relationship between internalizing and health outcomes demonstrated good model fit, Chi square (35) = 26.140, p = .861. Parent-rated 5-year-old temperamental negative emotionality and internalizing problems were significantly correlated. Additionally, 5-year-old internalizing significantly predicted self-reported increased days sick, BMI, and eating problem behaviors at follow-up. Similar relationships were seen at follow-up; adolescent-reported internalizing was significantly correlated with negative health outcomes (sedentary habits, emotional eating, and physical health problems). Additionally, initial investigation of sex differences suggested that internalizing significantly impacts health behaviors differently in boys and girls. These findings indicate a relationship between internalizing and health problems across development. Parent-reported 5-year-old internalizing was predictive of adolescent-reported health problem 7 to 15 years later. Furthermore, a similar pattern appeared in adolescence. These findings are especially interesting given the agreement between different informants (i.e., parent and child) at different developmental periods. Importantly, this study emphasizes the need for early intervention in preschoolers who display internalizing, as these may be indicative of a trajectory towards poorer overall health in adolescence.
A growing population has placed higher demands on agriculture productions throughout the years, and farmers are utilizing all possible lands to increase yields. This spreading of crop plantings is taking away the natural floodplains a river system previously occupied. The transition of river bottomlands from woodlands to crops impacts the flood stage of a river effecting the overland flow outside of channel banks by increasing velocities and soil erosion. The United States Government has taken notice and passed a law enacting the Conservation Reserve Program (CRP), paying subsidies to a farmer through the United States Department of Agriculture to convert parts of their land back to its natural habitat. This study focusses on Nodaway River in Missouri to analyze the flooding impact on regions within the CRP jurisdiction. Using United States Geological Survey elevation data and river gauge station readings, a 1-D flow model is created in Flood Modeller, and calibrated to accurately represent the Nodaway River hydraulic regime. Manning’s roughness coefficient is adjusted to depict the historic natural state of the floodplain in comparison to the altered river flow characteristics over the period of study. The addition of more woodland forested areas along the Nodaway River compared to the existing cultivated crops reduces damages that would occur in populated areas downstream by reducing the velocities upstream. This practice of floodplain restoration positively impacts flooding events downstream and helps restore natural ecosystems.
Gilles-Arnaud Kandissounon and Dr Ajay Kalra

Department of Civil and Environmental Engineering

Impact of increasing urbanization along the coastal cities in West Africa.

Africa’s coastal cities have been dealing with increasing problems of flooding for the past few years. Four types of flooding can typically be distinguished: urban flooding caused by inadequate water collection systems, flooding of settlements located in the built-up area of small streams, major rivers flooding, and coastal flooding which those areas are highly vulnerable to. Many of those communities are lowlands anarchically settled and growing at faster rates than they can sustain. The accelerated growth of urban areas in West Africa along with climate change-related issues have made it difficult to imagine a sustainable future for those countries. The increasing land use change due to hastened urbanization also contributed to flooding by decreasing infiltration and increasing runoff from hard surfaces. In addition, the absence of floodplain mapping in the area leaves the people and infrastructures exposed to flooding and its dramatic consequences. This study investigates the vulnerability of two African major towns to coastal flooding: Lagos and Accra. Geographic Information Systems combined with the Hydrologic Engineering Center’s River Analysis were used to established a floodplain and determine the degree of exposure of these two developing communities which are also surrounded by lagoons and rivers. Different return period flows were simulated using future rainfall projections for the area to evaluate future impacts. The results showed that the two cities are highly vulnerable to flooding due to their low elevation and underscored the urgency of implementing policies to protect the people and goods. The results from the study will aid urban planners and decision makers in implementing policies for flood protection measures in poor urban areas in developing nations.
Mohamadou Bachir Kane and Dr. Katherine I. Martin
Department of Linguistics

The Teaching of Reading in the Senegalese EFL Context

This study focuses on English instruction in Senegal, where English is taught as a foreign language (EFL) in middle schools and high schools. It investigates the reading comprehension strategies and tools used by Senegalese EFL instructors to meet national English education standards. It also compares them to best practices for teaching EFL reading comprehension. 54 Senegalese teachers completed a survey asking questions about their reading classes, their approaches to teaching reading comprehension, and their teacher training and professional development. The findings revealed that the surveyed teachers had strong educational backgrounds and were aware of basic reading comprehension concepts and strategies. However, some of the reading strategies widely recognized as most beneficial for EFL instruction are not widely used or widely known in Senegal because teachers are not well trained with them. Observations are made about the overall patterns of teacher strengths and weaknesses, and recommendations are given to the Senegalese government, teachers, and education officials about reading comprehension in EFL instruction. The study contributes to existing literature by shedding light on some of the aspects that make L1 reading different from L2 reading, reviewing the problems facing Senegalese EFL education, and depicting the prevailing instructional environment in this context. It also traces important educational changes that have impacted the country, from budget pressures to the recruitment of contract teachers and large classes.
Increasing use of composite materials in industry brings the need for newer and more practical methods to evaluate them. Widespread use of composite materials heavily depends on the manufacturer’s ability to unquestionably ensure its safety, given how much the user trusts them. Non-Destructive Evaluation (NDE) can be used to evaluate adhesive bondline health. This research employs Digital Image Correlation (DIC) method, one of the known methods in NDE, and combines it with an embedded speckle pattern in order to obtain valuable information from within the adhesive bondline. By recording the movement of the speckles and analyzing their behavior according to DIC algorithms, a strain map of the adhesive is drawn. An adhesive strain map helps find defects that might be out of sight using conventional NDE methods. By analyzing the obtained strain maps, defects within the bondline are revealed. Keywords: Digital Image Correlation, Adhesive Joints, Embedded speckle pattern, Bondline defects, Strain map
As of 2014, two out of every three Americans are overweight, so how can we combat the obesity epidemic from becoming an even larger issue? The conducted thesis research is centered around people’s health and how architecture can positively help combat obesity and food deserts, places where there is little to no access to healthy food. Through case study research, the idea of the built environment impacting the health of its users has been proven positive. Even as far back as the dark ages, infrastructure was used as an alternative option to combat infectious diseases. Currently, obesity is considered an epidemic and food insecurity is considered a multifaceted public health issue. It is hypothesized that implementing active design elements, an architecture intervention where the building encourages users to engage in physical activity, will assist the community at achieving a healthier lifestyle. As research suggested, younger children are more influential on others than adults are, therefore a school is suggested to be the best possible building typology for healthy practices to be implemented. A community center would need to coincide with the school because the adults of the community would also need an inviting facility to learn about healthy lifestyles. As the obesity epidemic becomes an even bigger issue, the built environment can assist at combating unhealthy lifestyles. With active design, architecture is hypothesized to be an alternative way for people to get healthy once again.
Yurino Kawashima
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(Author has asked abstract to be omitted from abstract booklet)
Noor Ali Kazim and Judy Davie

Biochemistry and Molecular Biology Department

**TCEA3 plays a role in the differentiation of skeletal muscle**

TFIIS is a transcription elongation factor, which has the ability to bind to the transcription motor, RNA Polymerase II, and enables RNA polymerase II (Pol II) to reactivate reading process through the transcription arrest sites. TCEA3 is the third isoform of TFIIS. It consists of three domains: conserved N- and C-terminal domains of mammalian TFIIS and separated by a linker region that is variable in sequence, which is longer than the other isoforms by 50 amino acids. What is known about TCEA3 is that it is highly expressed in mESCs and inhibits Smad2 phosphorylation by stimulating the expression of Lefty1, a regulator of Nodal signaling. Lefty1 considered as a downstream target of Tcea3 and shows in the Tcea3-Lefty1-Nodal-Smad2 pathway, its ability to control cell fate choices between differentiation commitment and self-replication. It is also known that TCEA3 expression is down regulated in ovarian cancer cells. TCEA3 has been shown to be expressed in a restricted subset of tissues including the heart, and we checked the level of TCEA3 in the muscle cells we found that the level of TCEA3 is even higher comparing to the heart. Therefore to understand the role of TCEA3 in myogenesis we checked for TCEA3 expression at the level of both protein and RNA at different time points, we depleted Tcea3 in normal muscle cells using shRNA constructs and we confirm the results by both cell lines were stained with myosin heavy chain antibodies and checking the cells growth with the cell proliferation assay and it shows that the TCEA3 could promote differentiation. Rhabdomyosarcoma is a malignancy that arises from skeletal muscle precursors. It is the most common type of childhood soft tissue sarcoma and the fourth most common pediatric solid tumor. There are two major types of rhabdomyosarcoma subtypes including the embryonal (ERMS) and Alveolar (ARMS). To understand how TCEA3 is regulated in RMS cells. We found that the expression level of TCEA3 was down regulated in RMS cells at both protein and RNA compare to the muscle cells. Our data suggested that the loss of TCEA3 in RMS cells might be responsible for the failure of these cells to differentiate, and this also supports our finding of that Tcea3 promotes differentiation. To test this, we transfected SJRH30 cells with a TCEA3 expression plasmid and perform a stable cell line which selected and screened to expressed the TCEA3 protein. To confirm that TCEA3 could promote differentiation, both cell lines were also stained with myosin heavy chain antibodies. We also confirm the effect of TCEA3 expression on cell growth with the scratch wound method and cell proliferation assay. All these data indicate that TCEA3 is highly expressed in muscle cells and promotes cell proliferation and differentiation, and the lack of TCEA3 is implicated in the failure of RMS cells to differentiate.
Belan Khalil and Matt Geisler

Department of Plant Biology

Computational Analysis of cis-Regulatory Elements in 500 base pair Upstream Regions in Arabidopsis thaliana genome.

Deciphering the regulatory regions in DNA sequence, which knows as cis-regulatory elements (CREs), is a key point to understand transcriptional gene regulation, as they comprise binding sites for trans-acting elements. Computational analysis could provide substantial knowledge and comprehensive conception about CREs. Here we present a global analysis all possible 65,536 8bp sequences, which resulted in the discovery of 1284 regulatory sequences present in the 500 base pair gene upstream region throughout the Arabidopsis thaliana genome. In addition to many previously undescribed elements, our algorithm identified many known elements like ABRE and DRE, which play critical role in abiotic stress response in plants, and evening element EVE that is related to circadian rhythm. The complexity of CRE sequences were also investigated in relationship to the complexity of their expression function. Furthermore, structural similarity and single mismatches between CREs were demonstrated to subtly or dramatically affect the expression pattern of genes carrying variant CREs. Pearson correlation of the pattern of induction and suppression enrichment was used to measure the strength of association among CRE functions. Surprisingly, CREs having similar 4bp cores were clustered together, and have similar responses to different stimuli (elicitors). Other patterns and associations involving synonyms or homonyms of CREs were also studied. This study provides a baseline of key regulatory features of promoters and allows for investigation of combinations and correlations between CREs in silico and a starting point for studying CREs experimentally.
Present day discussion of affirmative action is usually confined to its association with minority groups included in federal racial and ethnic categories. The general public is typically aware of discrimination cases against Blacks, Hispanics, and American Indians because the media and scholarship on affirmative action are dedicated to these particular groups. Only a small share of research is conducted on white ethnics and their efforts to pursue equal opportunity. Despite the general failure of the white ethnic movement, one group was able to succeed on the local level: Italian Americans in New York City. In 1976, the City University of New York (CUNY) unprecedentedly included Italian Americans in its affirmative action policy, providing them with the status of a designated minority. At the moment, CUNY is the only place where Italian Americans have gained such privileges alongside federally recognized racial and ethnic groups. This historically unique decision has significantly influenced the Italian American community in New York. Yet the question remains: have they made satisfactory progress as a group? Tracing the dynamics in their relations with CUNY authorities, today one can detect a high level of dissatisfaction among Italian American faculty. Additionally, it is not entirely clear how Italian Americans obtained the privileges of affirmative action, or why they needed this protection at the first place. This study traces the reasons for Italian Americans’ inclusion into CUNY’s affirmative action program. It also describes the development of Italian Americans’ relations with the authorities of CUNY, as well as connections of the Italian American faculty members with New York politicians. There is an additional need to investigate the employment discrimination case Scelsa v. CUNY (1994) that played an important role for the Italian American community in New York. Finally, the case of Italian Americans at CUNY should be considered in the context of recent events that illuminate the attempts of particular white ethnic groups – namely, Hasidic Jews and Arabs – to become a part of privileged local and federal programs.
Emergent infectious diseases threaten multiple taxa and ecosystem processes. Multiple factors can influence disease emergence, but environmental stressors may be a central driving factor. These stressors can influence critical disease windows, periods of development when hosts exhibit increased susceptibility to pathogens. We investigated how stress-induced alterations to host physiology affect critical disease windows using amphibian larvae and ranavirus. Larval amphibians translate environmental stressors via the hypothalamus-pituitary-interrenal (HPI) axis, which also regulates growth, development, and immune function. Because the duration and developmental timing of HPI activation matter, we exposed larval amphibians at late stages of development to chronic and acute stress treatments and monitored disease progression and survival. We found chronic corticosterone exposure increased viral replication, but did not affect survival. Acute corticosterone exposure did not affect viral replication, but did increase larval survival possibly by increasing the inflammatory response prior to infection. These findings suggest that chronic stress may lengthen infective periods of individuals and has implications for community-level disease transmission. However, individuals with high increases in endogenous CORT following ranavirus infection may have a selective advantage in areas with enzootic ranavirus. However, stress in developing animals has pleiotropic effects and it may be valuable to examine the synergy of these effects on the phenotypes of developing animals.
Emil C. Lat and Aldwin Anterola

Department of Plant Biology

Expression of Acyl-Acyl Carrier Protein Thioesterase Genes in E. coli for Production of Short Chain Fatty Acids with Potential Use as Biofuel

Due to decreasing supplies of non-renewable fossil fuel reserves, researchers are looking for possible new sources of safer, sustainable and renewable fuels. In recent years, microbial production of short chain fatty acids (SCFAs) has been actively studied for their potential as biofuel substitutes to diesel and gasoline. In this study, an E. coli strain was metabolically engineered by expressing acyl-acyl carrier protein (ACP) thioesterase genes from bacteria (Clostridium perfringens, C. scatologenes and C. kluyveri) and from a plant (Cannabis sativa) to produce SCFAs via the fatty acid synthesis pathway. To determine the conditions suitable for production of SCFAs, induction temperatures for each thioesterase genes were evaluated. Initially, the engineered E. coli strains were cultivated on M9 minimal medium supplemented with glucose at 37°C, followed by induction with IPTG at 18, 25, 30 and 37°C for 65 hours. The culture medium was centrifuged and filtered, followed by extraction of free fatty acids with diethyl ether. Quantification and identification of free fatty acids using gas chromatography revealed that the acyl-ACP thioesterase genes used in this study have specific activity towards short chain acyl-ACP substrates. This has led to production of C4 and C6 fatty acids such as butyric and hexanoic acids, which are not native products of E. coli fatty acid synthesis.
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(Author has asked abstract to be omitted from abstract booklet)
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\textit{Infrared Thermography Defect Detection within Thin Carbon/Carbon Composite Clutch Plates.}

This research discusses the non-destructive evaluation of thin carbon/carbon composite clutch plates by the use of infrared thermography techniques. The main purpose of the research is to detect and identify different possible anomalies such as cracks, delamination, porosity variation, localized increase in volume, voids due to resin flow, and inhomogeneity within the carbon matrix. Due to the unique construction and properties of thin carbon/carbon composite clutch material, common techniques of infrared thermography have been utilized to more accurately identify surface and internal flaws. The research conducted is focused on the ability of known infrared thermography methods, which have proven successful with thick carbon/carbon composite brake materials and carbon fiber reinforced polymer. Flaw existence is easily obtained using infrared thermography methods to create a complete defect identification of thin carbon/carbon composite clutch plates.
Rhabdomyosarcoma (RMS) is the most common soft tissue cancer in children. To understand these disorders and the continuously proliferating RMS cells, we used a proteomic approach to identify TBX2 which functions as an oncogene in RMS. Recently, it has been shown that in breast cancer TBX2 interacts with early growth response, EGR1, a protein factor that has been shown to have a tumor suppressor effects in most cancer types and it has a low expression level in most tumor cell lines including fibroblast, glioblastoma, osteosarcoma and lung cells. It is a nuclear phosphoprotein with three zinc finger motifs in its C-terminal portion which binds to a GC-rich regulatory elements (GCEs), in a zinc dependent manner. Evidence showed that EGR1 is down-regulated in most cancer types. EGR1 was found to be destabilized by PAX3-FOXO1 fusion protein. Although, few studies have shown that EGR1 might function as an oncogene like in prostate, kidney and gastric cancer. Thus, for this dual function as well it was important to seek for the EGR1 function in RMS.
Mahshad Mosayebi, Fouad Karimian and Tsuchin Philip Chu

Department of Mechanical Engineering and Energy Process

Non-Destructive testing, using Digital laser speckle correlation (DiLSIC)

This paper examines the feasibility of a new hybrid method which combines Digital Image Correlation (DIC) with Laser Speckle based methods, called Digital Laser Speckle Image Correlation (DiLSIC). Consequently, this method does not require any sample preparation and allows for the measurement of displacement of micro structures in addition to the large displacements. In this technique, a coherent laser beam is illuminated on the target surface to produce a fine, homogenous laser speckle pattern. Then, 2 images captured one before and the other one after applying load, to inspect the response of sample to any external load. By this technique we could measure displacement less than 30-μm with high accuracy while a 120mm × 80mm area of the surface was inspected. Also This method could achieve a good result in detecting sub-surfaces crack as well as the surface defects.

Keywords: NDT; Optical Method; Digital Image Correlation; Laser speckle pattern; strain measurement.
The Impact of Light Cycle Reversal upon Therapeutic Effectiveness of Environmental Enrichment Following Traumatic Brain Injury in Rats

Environmental enrichment (EE) is a versatile tool that affords animals the opportunity to engage in social interactions, explore novel stimuli, as well as freely explore a larger living space. The effects of EE have been shown to promote neural plasticity after traumatic brain injury and is an acceptable form of rehabilitation. The use of abbreviated EE, which is defined as access to an enriched environment for a set amount of time each day, is comparable to the rehabilitation programs performed in the clinic. These programs tend to have their patients actively working on therapy only a couple of hours per day. Proteins associated with neural plasticity peak during the day when the rats are less active, which is important for the maintenance and consolidation of long-term memories. In the present study, rats either received a bilateral controlled cortical impact (CCI) or were sham animals, meaning these animals experienced the same procedure leading up to but not including the craniotomy and CCI. Morris Water Maze (MWM) training began after 6 hours of environmental enrichment during the light phase or dark phase of the daily cycle. We hypothesized that rats given EE during their light cycle will experience recovery in the MWM when compared to rats tested in the dark cycle due to peak levels of neural plasticity proteins. The results concluded animals that received EE and MWM training during the dark phase negated the beneficial effects of EE. Further research is needed to study the cyclical effects of Glycogen Synthase Kinase-3 Beta (GSK3-Beta) and the role it plays in phosphorylating neural plasticity proteins.
Several factors contribute to morbidity/mortality the world over. While some of these contributory factors may be specific to various diseases and geographic locations, they interact variously in their determination of disease outcomes. Previous research has shown that mortality rates are higher among individuals of lower socioeconomic status. We investigated the effect of healthcare spending on the relationship between the Human Development Index (HDI) and infant (IM) and maternal mortality (MM). Sources of secondary data at the country-level (2010-2014) included the United Nations Development Program and the World Bank. A latent growth curve model (LGCM) was estimated to determine the (a) trajectory of IM/MM across the study period and (b) the effect of the HDI on IM/MM. Also, mediation analysis was utilized to determine if healthcare expenditure mediated the relationship between HDI and IM/MM rates. ESRI ArcGIS was utilized to generate a choropleth map of changes in IM/MM between 2010-2014. Results showed that many countries in Africa enjoyed decreases in IM/MM between 2010-2014, but other countries – Algeria, Libya, Sudan – made little to no improvement in these areas. The LGCM for IM, CFI = 0.956, and MM, CFI = 0.963, demonstrated good fit to the data, and showed that the HDI was negatively related to IM/MM. Mediation analysis showed that healthcare spending mediated the relationship between IM/MM in each year. Given that healthcare spending can mediate the relationship between HDI and IM/MM, increases in healthcare spending among countries with low HDI could improve IM and MM outcomes.
Narayan Nyaupane and Ajay Kalra
Department of Civil and Environmental Engineering

Urban Sustainability in built-up environments: A case study of Gowan watershed, Las Vegas, NV

Urban flooding is one of the major natural hazards in United States. The urbanization has increased the surface runoff by increasing paved surface. The increasing trend of urban population shaped more people prone to flooding. Recent studies have concluded that several of the flooding events were directly linked with climate change, which has capacity to alter the intensity, duration and frequency of precipitation. This study quantify the effect of climate change by evaluating the North American Regional Climate Change Assessment Program model data for Gowan watershed lying in semi-arid region of southern Nevada. Statistical approach was applied to identify the distribution method associated with the climate datasets. An existing HEC-HMS hydrological model obtained from Clark County Regional Flood Control District in was used to evaluate the performance of the existing stormwater facilities within the watershed. Delta change factor was used to quantify the effect of climate change on storm depth, which was applied to the model to compare the result with existing design scenario. The result indicated that some of the existing stormwater facilities may not have sufficient capacity with increasing urbanization and under the resulting design storm as provided by the climate model data output. The findings and information obtained from the statistical analysis can be utilized in the future design of flood control facilities and management of water resources within the basin.
Magnetocaloric effect in Ni-Mn-In-based alloys in high magnetic fields

Magnetocaloric effects (MCE) in Ni50Mn35In15, Ni50.2Mn34.85In14.95, and Ni50Mn35In14.25Bi0.75 Heusler alloys have been studied through direct measurements of the adiabatic temperature change ($\Delta T_{ad}$) using the extraction method for magnetic field changes up to 14 T. Both the $\Delta T_{ad}$ and the entropy changes ($\Delta S_M$) increase as the martensitic transition approaches the Curie temperature of the austenitic phase. The $\Delta T_{ad}$ increases up to a maximum value of 15 K with field and saturates at high fields. The influence of the rate of change of the magnetic field and the rate of heating to the initial temperature before applying field on the $\Delta T_{ad}$ of Ni50Mn35In14.25Bi0.75 has been studied. It has been shown that increasing the heating rate from 6 to 22 K/min results in an increase of $\Delta T_{ad}$ by about 40% for $\Delta H=10$ T. The effect is discussed in the terms of the influence of the heating rate on the austenitic phase nucleation. The obtained results on critical magnetic fields for MCE saturation and kinetic effects are applicable to any other system displaying MCE at first-order magnetostructural phase transitions.

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Sudip Pandey, Abdiel Quetz, P. J. Ibarra-Gaytan, C. F. Sanchez-Valdes, Anil Aryal, Igor Dubenko, Dipanjan Mazumdar, Jose Luis Sanchez Llamazares, Shane Stadler, and Naushad Ali

Department of Physics

Effect of annealing on the magnetic and magnetocaloric properties of Ni-Mn-In-B alloys as solidified ribbons

The structural, thermal, magnetic, and magnetocaloric properties of Ni50Mn35In14.5B0.5 melt-spun ribbons have been investigated using room-temperature x-ray diffraction (XRD), differential scanning calorimetry (DSC), and magnetization measurements. Magnetic and structural transitions were found to coincide in temperature leading to large magnetocaloric effects associated with the first-order magnetostructural phase transition. In comparison to the bulk and as-spun ribbon, both the martensitic transition temperature (TM) and Curie temperature (TC) shifted to lower temperatures on annealed Ni50Mn35In14.5B0.5 ribbons. Significant increase in magnetocaloric effect has been observed between the as-spun and the annealed ribbons. A comparison of magnetic properties and magnetocaloric effects in Ni50Mn35In14.5B0.5 as-spun ribbon, bulk, and annealed ribbon have been shown in detail. The roles of the magnetic and structural changes on the transition temperatures of the ribbons are discussed.

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Department of Civil and Environmental Engineering

Analyzing the future water demand within Las Vegas Valley under changing climate and growing population

Changing precipitation pattern and increasing temperatures due to global climate change has led to reduction in water availability in the arid and semi-arid regions of the western United States. Water supply has been diminishing while water demand has been rapidly increasing due to growing population and industrial advancement. This study investigates the impact of changing climate and growing population in water supply and demand in one of the most rapidly growing cities in the semi-arid regions of western US, Las Vegas, Nevada. In addition to assessing the water demand, the study further analyzes the demand side management using several water management policies and efficient conservation practices that can help to reduce the impact of potential water scarcity in the future. To evaluate this complex system, a system dynamics (SD) model for Las Vegas Valley (LVV) was developed with a historic period of 1989-2012 and future period ranging from 2013-2049. Climate and hydrological data projections for the future were obtained from the outputs of 16 Global Climate Models (GCMs) of Coupled Model Intercomparison Project phase 3 (CMIP3) with 3 emission scenarios and 37 GCM outputs of CMIP5 model ensemble with 4 Representative Concentration Pathways. Trending population growth and prevalent conservation practices were used as input for the model to assess future water demand. The SD model results indicated that changing climate and increasing population are increasing the stress on the available water resources and the demand side management is vital under the changing climate scenarios with the LVV. The current analysis can be very useful for the water managers and planners to predict the future water budget, plan accordingly, and make decisions to achieve water sustainability.
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\textit{Implementation of Computational model for Sound Source Recognition}

Hearing is an important part of normal human interaction, yet we understand surprisingly little about how our brains make sense of sound. The ability of a normal human listener to recognize objects in the environment from only the sounds they produce is extraordinarily robust with regard to characteristics of the acoustic environment and of other competing sound sources. Robust listening requires extensive contextual knowledge, but the potential contribution of sound-source recognition process has largely been neglected by researchers. As a stepping stone for an artificial listener, a computational model was developed to recognize isolated sound sources. The recognition process includes statistical inference and used a “fingerprinting” method in the sound source identification. This system is computer-based prototype that can lead to surveillance systems, music composing and ultimately to an artificial listener. This computational model was built on Matlab platform and Graphical user interface was developed by using Guide tool in Matlab. Since this system was born in a Personal computer it can be easily run in any common computer which has got a regular audio input facility. This project contains a brief outline about the problems faced and how the solutions were achieved.
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Fast Photo-detection in Phototransistors based on Group III-VI Layered Materials.

Response time of a photo detector is one of crucial aspect of photo-detection. Recently it has been shown that direct band gap of group III-VI materials in few layered form helps to increase absorption of light. Ternary system of Copper Indium Selenide has been extensively used in optoelectronics industry and it is expected that 2D layered structure of Copper Indium Selenide will be a key for optoelectronics devices based on 2D materials. Here we report fast photo detection in few layers of Copper Indium Selenide (CuIn7Se11) phototransistor. Few-layers of CuIn7Se11 flakes were exfoliated from crystals grown using chemical vapor transport technique. Our photo response characterization indicates responsivity of $10^4$ mA/W with external quantum efficiency exceeding $10^3$. We have found response time of few μs which is one of the fastest response among photodetectors based on 2D materials. We also found specific detectivity of ~$10^{12}$ Jones which is an order higher than conventional photodetectors. A comparison between response times of various layered group III-VI materials will be presented and discussed.

This work is supported by the U.S. Army Research Office through a MURI grant # W911NF-11-1-0362.
Understanding the relationships between acting experience, identity, and theory of mind

Theory of Mind (ToM) is a multi-faceted construct that dynamically interacts with social and cognitive variables. Apperly (2012) describes ToM as the ability to reason about mental states, such as beliefs, desires, and intentions, and to understand how mental states feature in everyday explanations and predictions of people’s behavior (p. 825). Predispositional factors that are related to ToM include personality, identity, and engagement in activities that require ToM use (e.g., acting). Emerging Adulthood is a stage of development, between 18 to 29, distinguished by identity exploration which coincides with increased consideration of empathy and multiple perspectives (Crick et al., 1999; Eisenberg & Fabes, 1998). The current study replicated actor and female advantages on a social ToM task described in previous research while finding no differences on a control task. Identity processing style significantly contributed to a model predicting performance on a ToM task, more so than measures of personality and empathy in emerging adults. Future research incorporating identity processing style and providing acting experience may serve as a method of training ToM throughout the lifespan.
Gauri Anilkumar Pitale

Department of Anthropology

Home-made Foods are they "Inside" or "Outside" Foods?: Understanding Food Indigenization in the Context of Globalization, Urbanization, and Economic Restructuring in Mumbai, Maharashtra, India.

The site of this study is the metropolis of Mumbai in the state of Maharashtra, India. India is undergoing fast-paced globalization since liberalizing its economy in the year 1991. I focus on the experience of present day Deorukhe Brahmin women (mothers and their daughters), who belong to an endogamous upper caste group. Through this paper, I examine the food consumption and food procurement patterns that are prevalent among these mothers and daughters. As India undergoes its social, economic, and culinary metamorphosis in the post-liberalization period, it has experienced an influx of western fast food chain restaurants. The newly emerged custom of taking family meals at restaurants (Indian and western) has given rise to a food category referred to as "outside" food. In this paper, I discuss the manner in which food globalization is mobilized in urban India by younger and older interlocutors strategically choosing to align themselves with different social groupings. More importantly, I examine the complexity of the local foodscape by looking at interrelationships between the notions of "inside" and "outside" foods. Through this paper, I argue that the culinary landscape of India is far more complex than the simple dichotomy of "inside" and "outside" foods. I examine the newly emerged category of "home-made" food to demonstrate that the terms "inside" and "outside" are indicative of more than just the physical placement of food but are intricately tied ideas about regional and national identity.
Lindsey G. Roberts, Jessica R. Spencer, Kaleigh C. Best, and Gretchen R. Dabbs (Associate Professor and Project Mentor)

Department of Anthropology

*A Preliminary Investigation into the Effects of Artificial Freezing on Human Decomposition*

Forensic taphonomy investigates variables impacting human decomposition, in part to assist investigators in the estimation of the postmortem interval (PMI), the length of time since death. This study examined the effects of artificial freezing on human decomposition, which is notable as a mechanism utilized by perpetrators to mislead investigators and as a research design element, since subjects may be stored in the frozen condition prior to use in forensic research. It was hypothesized previous freezing would decrease the rate of decomposition due to a reduction in viable enteric bacteria responsible for driving putrefaction, and externally visible effects of freezing in humans would be identifiable as in a similar study using pig proxies1. To understand how freezing impacts the progression of human decomposition, two comparisons were made. A previously frozen human subject deposited at the Complex for Forensic Anthropology Research on September 18, 2015 was compared to a never-frozen control deposited on the same date and to five additional never-frozen subjects deposited in the fall of 2012-2015. Total Body Score2, a scoring system used to quantify decomposition, and Accumulated Degree Days, a measure of thermal energy, were used to quantify decomposition rate. Bloat was quantified using a flexible tape measure to determine abdominal circumference. During early decomposition, the frozen subject decomposed slower than the control and fall subjects, while the frozen subject decomposed faster during later stages. Percent difference in abdominal circumference was 105% for the frozen subject compared to 123% for the control. External differences observed were consistent with those identified during previous pig research1. This preliminary research suggests artificially frozen subjects decompose differently in rate and pattern than never-frozen subjects. It is recommended the use of previously frozen subjects in forensic taphonomic research be avoided. Qualitative external differences may be useful in identifying human remains exposed to previous freezing.


Jocelyn Rothschild-Frey, William Cody Yarnell, and Juliane P. Wallace

Department of Kinesiology

*Calf Venous Compliance Differences Due to Cigarette Smoking.*

Similar to changes in arterial compliance with fitness and aging, venous compliance in the lower extremities of adults improves with higher fitness and declines with increasing age. In young adults, males have a higher venous compliance than females, a difference that does not appear related to hormonal fluctuations. Previous studies have compared smokers and non-smokers for changes in arterial wall properties. These studies showed changes in the elasticity and distensibility of the vessel walls. However, no research has studied the adverse effects on venous compliance in a smoking population. PURPOSE: To determine the calf venous compliance differences in smokers versus non-smokers. METHODS: 25 smokers and 25 non-smokers between the ages of 18 and 30 years old are being recruited for this project. Participants underwent anthropometric assessment, a submaximal graded exercise test, and assessment of calf venous compliance. Utilizing venous occlusion plethysmography, calf pressure-volume relations is determined using the quadratic regression equation \[(\Delta \text{limb volume}) = \beta_0 + \beta_1*(\text{cuff pressure}) + \beta_2*(\text{cuff pressure})^2\]. Calf venous compliance is calculated as the first derivative of the pressure-volume relation during cuff pressure reduction. Capacitance and capillary filtration volumes are determined from the increase in limb volume following cuff pressure inflation. Differences in anthropometric variables, fitness, and compliance (\(\beta_1, \beta_2, \text{and the slope of the pressure compliance relationship}\)) will be analyzed with a simple ANOVA. RESULTS: Preliminary results pending due to data collection in process. Currently, this study has collected data for ten non-smoking participants. CONCLUSION: Based on previous research, we expect that venous compliance will decrease chronically, and acutely be preserved in smokers. Changes develop from increased elasticity and decreased distensibility which preserves compliance acutely. However, chronic effects involve decreased distensibility due to plaques that begin to decrease compliance (Kim, JW et al., 2009).
Ryan Bailey
Agribusiness Economics Program

Evaluating Farm Financial Performance Measures in Illinois

The purpose of this paper is to conduct financial performance analysis of the 102 counties throughout Illinois to give a better insight of how these farms are performing at the county level. The sample area consists of farms throughout the entire state of Illinois. This research brings into picture data from the United States Department of Agriculture- National Agricultural Statistics Service (USDA-NASS) census years 1997, 2002, 2007, and 2012 to determine the profitability and financial efficiency of Illinois farms throughout 102 County-level regions to gain a better understanding of county and regional performance across the Northern, Central and Southern parts of the state. The primary objective of this research is to gain a better understanding of how farm financial measures, specifically profitability and financial efficiency look over census years 1997, 2002, 2007, and 2012. With this data and analysis, further determination of the effects of agricultural policy over the census years can better judge on behalf of growers and public policy makers, and financial experts. Based on the data: mean, variance, and multiple regression techniques will be used. The literature adds additional knowledge of information on how to improve the operations financial position and increase productivity. With just under 75,000 farms and Illinois as a leading state in exports they play a vital role in the state’s economy and help fuel the ever-growing global demand. This paper analyzes data from the Census of Agriculture years: 1997, 2002, 2007 and 2012. In the 102 counties throughout Illinois. The United States Department of Agriculture- National Agricultural Statistical Service conducts the census every five years. The focus of economic variables will be on: Income, Expense, Assets, Demographics, and Farm, Land, & Assets. Based on this data financial analysis linear regression will be completed and analyzed for further discussion and analysis. Key terms under profitability: operating profit margin, return on assets (ROA), and return on equity (ROE). While key terms under financial efficiency are: asset turnover, operating expense, depreciation expense, interest expense, and net farm income ratio.
Hassana Samassekou, Shaunie Talapatra, Aaron Walber, and Dipanjan Mazumdar

Department of Physics

*Mechanical Exfoliation and Visualization of In-situ grown Large-Area Molybdenum Disulfide (MoS2) Thin Films*

This past decade, 2D materials beyond graphene, and most specifically transition metal dichalcogenides (TMDCs) have gained remarkable attention due to their novel applications in electronics, optoelectronics, magneto-optics, and bio-medical applications. These novel materials lay a fertile ground for device engineering. Our previous works report large-area growth and characterization of structural, optical, and electronic transport properties of few down to a single layer MoS2 thin films by means of magnetron sputtering. [1][2]. However, considerable work remains in order to fully understand the quality of our MoS2 thin films. Here, we report a mechanical exfoliation technique perfected by a visualization scheme of our exfoliated MoS2 thin films which could be valuable for electronic and optoelectronic applications using MoS2 or other TMDCs.


Aidan C. Smith, Ryan C. Holden, and Michael J. Hylin

Department of Psychology

*Effects of Nicotinamide on Spatial Memory and Microglial Response in Juvenile Animal*

Following traumatic brain injury (TBI), the brain undergoes a series of neurochemical and inflammatory events to repair and promote healing of neural tissue. Prolonged inflammation results in neurodegeneration of healthy tissue and neurobehavioral deficits. Vitamin interventions have been used to limit these events following a TBI. Nicotinamide (NAM, vitamin B3) decreases neurobehavioral deficits and injury size in adult models, but is unexplored in juvenile populations. The current study explored the effects of NAM on spatial memory tasks and microglial response following a TBI in juvenile animals. Following a bilateral controlled cortical impact at PND-28, NAM was administered at 15 minutes, 24 hours, and 48 hours post-injury. Groups received either 125mg/kg, 500mg/kg, or 1000mg/kg of NAM or 1mL/Kg of saline. Behavioral deficits were tested using Morris water maze and radial arm maze. Microglia were detected using Iba-1. Animals receiving 500mg/kg of NAM had significantly lower latencies to the hidden platform than saline treated or 1000mg/kg. Consistent with the findings in adult rodent populations, we expect to find significantly fewer microglia in NAM treated animals than in saline. Furthermore, we expect to see significant reductions in microglia as time post-injury increases in NAM treated animals. Preliminary results indicate that NAM as a dietary intervention improves neurobehavioral and physiological outcomes following a TBI, which demonstrate potential clinical use of NAM as a neuroprotective agent in juvenile populations following a TBI.
Jeffrey P. Tamayo and Aldwin Anterola
Department of Plant Biology

Aptamer based assay for the detection of Aflatoxin B1 in tapioca starch

Analytical methods used for aflatoxin determination are mainly based on TLC, HPLC or ELISA. A fluorescent assay for the detection of Aflatoxin B1 (AFB1) using a fluorophore-labeled AFB1 aptamer and its partially complementary DNA strand that is covalently modified with Iowa Black T quencher was developed in this study. The whole sensing procedure is simple, rapid, and shows high specificity to AFB1, which offers great potential for on-site analysis. In the absence of AFB1, the aptamer naturally binds to cDNA, bringing the fluorophore and quencher into close proximity to induce highly efficient fluorescence quenching. After introducing AFB1, the aptamer forms an aptamer/AFB1 complex triggering the release of cDNA, which is accompanied by the increase of fluorescence. The aptamer and cDNA concentration was optimized using Response Surface Methodology and linearity was evaluated. The optimum aptamer concentration was found to be 10 nM while cDNA concentration is 15 nM. The fluorescence of the aptamer, then after the addition of cDNA and after the addition of Aflatoxin B1 was read using a Trilogy F7000 fluorometer. A plot of Aflatoxin concentration and fluorescence recovery was obtained. A good linearity was observed ($r^2 = 0.9942$). The limit of detection of the assay is 8.47 ppb with a standard curve range from 10 to 100 ppb. The assay was applied to tapioca starch. To minimize matrix background/interferences the standard addition method was used.
Ranjeet Thakali and Ajay Kalra

Department of Civil and Environmental Engineering

Analyzing the Impact of LID Techniques under Changing Climate within Las Vegas Valley Watersheds

Understanding the proper management of urban stormwater in the changing climate is becoming a crucial challenge to the present water world. The climate change is resulting in increased intense storms and further exacerbating the water issues within urban environments. In the ever-increasing pressure due to climate change, this study seeks a solution for the management of existing stormwater system under future climate scenarios. Las Vegas Valley, which is a water stressed region due to rapid urbanization and has a unique climate was selected as the case study region. The available climate models data of the study area were used to project the future climate scenario. A statistical analysis was performed in the climate model data to determine the design depth of the stormwater systems for the Las Vegas Valley. The predicted storm depths were implemented in the Storm Water Management Model (SWMM) developed by the Environmental Protection Agency (EPA). The possible Low Impact Development (LID) techniques were identified and applied to the appropriate regions of the watershed. The LID simulation results showed the reduction of the excess runoff due to projected climate. This study proposed a method that includes the climate information in the design of stormwater along with the possible remedial techniques for the flood runoff. The finding of this study would assist the water managers and decision maker for the implementation of policies to strategize the planning options.
Recent climate change has induced the variations in western U.S. snowpack which is the major source of fresh water in the region. Climate change induces the distribution of precipitation as snowfall and rain thus, imposing the change in snow accumulation. Changes in timing and peak streamflow has been witnessed in the snowmelt driven basins. The current study provides a comprehensive analysis of three snow water equivalent (SWE) datasets i.e. 1 March, 1 April, and 1 May for the evaluation of long term changes. Nonparametric Mann-Kendall and Pettitt’s test are used to analyze the changes in SWE under changing climate. Trends are the gradual change in time series data while shift are the abrupt change in data. The results indicated a decreasing pattern for majority of the SWE stations during the three time periods in the northern regions of western United States. The study also tests the variation in SWE with the phases of El Niño Southern Oscillation (ENSO). The ENSO results revealed that the trend and shift changes exhibit spatial variability during the ENSO phases (warm/cold). The current study will be useful to the managers and decision makers in addressing the issues related to the management of water resources in the western United States.
A Novel Gyroscopic Vibration Energy Harvester for Rotating Systems

This study investigates the power harvested by a novel gyroscopic energy harvester that converts the unwanted vibrations of rotating host systems into usable electrical energy for sensors and other electronics. The energy harvesting device consists of a proof mass that is supported by two elastic structures with piezoelectric layers. Piezoelectric materials generate voltages when deformed mechanically. The device has multifrequency dynamic response and harvested power due to the combined vibration and rotation of the host system. The average power harvested for one oscillation cycle is used to quantify for the performance of the device for a wide range of operating conditions. The excitation frequencies and rotation speed ranges where large amounts of power can be harvested are identified by using contour plots. In addition, the impact of resistance on the average power harvested is investigated. An exciting feature of the device proposed in this work is that high speeds are not necessary for optimized performance. The device harvests large amounts of electrical power at both low and high speeds. Gyroscopic vibration energy harvesters could be used to power the tire pressure monitoring system in automobiles. In this application, the vibration energy harvester would be attached to the wheel rim, which rotates as the car travels and vibrates due to the interactions between the wheel and road.
Knowing changes to our environment are imminent, rising sea levels are impacting coastal cities now, and will be for decades to come. Many of the cities that will feel the impact are ones that will also experience a population rise in the coming years as our world becomes increasingly urban. In order to protect these cities, including their residents and infrastructure, coastal parks will offer relief. By bringing parks to the coast, it gives residents the opportunity to reconnect with the water and increase the parkland throughout cities. By using resilient landscape and protective programs, these parks will not only protect their cities but will also offer activities for residents and visitors. On the site for this thesis, an Environmental Interpretive Center will anchor the park to offer insight into the future of the Boston area if climate change is not mitigated. By using sustainable building practices and resilient design, this park will act as a model that can be repeated throughout the world.
Temperature Dependent Photocurrent Spectroscopy of Few Layered Group III-VI materials

Group III-VI based 2D semiconductor, due to their exotic optical properties, could possibly leads to multifunctional opto-electronic applications such as tunable photo detectors. Here, we report the detailed study on temperature dependent photocurrent spectroscopy of few layer CuIn7Se11, mechanically exfoliated from crystals grown using chemical vapor transport technique. CuIn7Se11 photocurrent spectra reveals the information about the direct band gap, indirect band gap as well as the band gap variation with the temperature. Further, the gate voltage can be used to tune the wavelength dependent photoresponse nature of these materials. These key findings and comparative analysis of group III-VI based photo detectors will be discussed.
Justin Wood and Dr. James Conder
Department of Geology/Geosciences Program

Anisotropic Structure of the Wabash Valley Seismic Zone, Illinois Basin, and Ozark Plateau

Shear-wave splitting analysis is a commonly used tool to investigate deformation at depth, including seismic anisotropy, which is the dependence of seismic wave speed with direction and polarization through an ordered medium. Analysis of split shear-waves yield two splitting parameters from which mantle flow/deformation direction and the strength/thickness of an anisotropic fabric is inferred. Preliminary results from the Wabash Valley Seismic Zone, Illinois Basin, and Ozark Plateau reveal that the region’s anisotropic structure is likely less complex and deeper in the Illinois Basin than in the Ozarks where there is evidence of multi-layer anisotropy and more variable splitting orientations.
Rui Xiao, Ciara Murabito, and Bethany Rader

Department of Microbiology

*Methylation of Host DNA in the Euprymna Scolopes - Vibrio Fischeri Symbiosis*

Typically thought of as a rapid and non-specific response to pathogens, recent evidence suggests the innate immune system has the capability to differentially respond to microbes through a memory-like mechanism. Epigenetic regulation of gene expression through DNA methylation has been proposed as a mechanism through which the innate immune system can display such memory. The Hawaiian bobtail squid *Euprymna scolopes*, forms a beneficial life-long partnership with Gram negative bioluminescent bacteria *Vibrio fischeri*, in which the symbiont colonizes the light organ in the host’s mantle. Humoral and cellular components of the innate immune system of the squid are regulated by the symbiont during colonization. We hypothesize that symbiont regulated DNA methylation of the innate immune system plays a role in specificity during symbiosis. Methylation Restriction-PCR were performed on genes with predicted methylation sites, we have verified the presence of DNA methylation for both juvenile and adult squid genomic DNA. We then performed bisulfite conversion followed by methylation specific PCR and Bisulfite sequencing. All results have verified the existence of DNA methylation. Using available databases from NCBI, we identified putative DNA Methyl Transferase 1 and 3 (EsDNMT1 and EsDnmt3); Methylation Binding Domain 2 and 4 (EsMeCP2 and EsMBD4) and DNA Demethylase TET1 (EsTET1). Preliminary results showed that all predicted machinery genes can be detected via routine PCR. Among the genes, EsTET1 is expressed only when symbionts are not present. These data give us the framework for future work in identifying and characterizing symbiont regulated DNA methylation of the innate immune system.
Callose and the Spore Walls of Hornworts

Our knowledge of plant spore wall development and wall constituents are limited and sometimes contradictory. Hornworts are no exception, with conflicting reports of the presence (Beer 1904, Neidhart 1979) and absence (Ridgway 1965, Brown and Lemmon 1990) of callose associated with their spores. This study set out to resolve this dispute by testing the hypothesis that callose is associated with the spores of hornworts. To do so, we utilized fluorochemical and immunolabeling protocols specific for detecting callose. Here, we show that callose is deposited early in sporogenesis and retained through spore maturity. As sister to all land plants, the confirmed presence of callose in the spores of hornworts provide insight into the over arching functions and its evolutionary conservation of this ancient molecule.
Undergraduate Research Opportunities at SIU

REACH (Research-Enriched Academic Challenge)

This competitive program is open to SIU Carbondale undergraduate students in all disciplines, and offers approximately 20 grant awards each year to students working on independent research or creative activities with a faculty mentor. Awards consist of one-year grants of up to $1,500. Students present project results at the Undergraduate Creative Activities and Research Forum held each spring semester on the SIU Carbondale campus. For more information about the program, visit reach.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at reach@siu.edu.

Creative and Scholarly Saluki Rookies Program

This competitive program offers SIU Carbondale freshmen and sophomores the opportunity to engage in faculty-mentored, hands-on research or creative activities. Students explore their intended majors, develop relationships with faculty in their field, and gain valuable research and critical thinking skills. For more information, you may contact staff at the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at curca@siu.edu.

McNair Scholars Program

This federally funded program offers SIU Carbondale undergraduate students hailing from underrepresented groups, including minority and first-generation/low-income students, preparation for graduate school. It provides mentoring, GRE preparation, and academic support. McNair Scholars take part in a summer research institute and present research results at a campus symposium and at conferences in their discipline. For more information, you may visit mcnair.siu.edu, or contact staff in Woody Hall B139-B145, or at 618/453-4585.
Louis Stokes Alliance for Minority Participation

SIU Carbondale is a member of the Illinois Louis Stokes Alliance for Minority Participation, a statewide coalition dedicated to increasing the number of underrepresented minority students in science, mathematics, and engineering. Funded by the National Science Foundation, this program provides paid, mentored research experiences for SIU Carbondale undergraduates. For more information, visit ilsamp.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at curca@siu.edu.

Undergraduate Assistantship program

The Undergraduate Assistantship program provides a unique opportunity for SIU Carbondale undergraduate students. The program offers on-campus research and/or creative activity opportunities for full-time SIU Carbondale undergraduate students. Students selected for an Undergraduate Assistantship work directly with a faculty member or professional level staff member in a project that leads to a poster or oral presentation at the Undergraduate Creative Activities and Research Forum held each spring semester on the SIU Carbondale campus. Selected students spend 5, 10, 15, or 20 hours per week working on the project and are paid $10/per hour. The UGA program, one of the programs in the Center for Undergraduate Research and Creative Activities, a unit of the Office of the Vice Chancellor for Research, has cooperating support from Human Resources, Payroll, Office of Sponsored Projects Administration, University Honors, and the University hiring departments. For more information and eligibility requirements, visit undergraduateassistantship.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at ugrada@siu.edu.
SIU Carbondale Literary and Art Awards

The Center for Undergraduate Research and Creative Activities (CURCA) is one of the offices at SIUC that supports Grassroots and its events. CURCA provides Undergraduate Assistantships (UGA) for undergraduate students in Grassroots. In the 2014-2015 academic year, UGA positions were awarded for the editors. CURCA also finances the monetary award for the SIU Carbondale Literary and Art Awards.

All of the creative submissions accepted to be published in this magazine, the Grassroots Undergraduate Literary and Arts Magazine, are eligible for the SIU Carbondale Literary & Art Awards. Judges are chosen by the faculty advisors of Grassroots, will judge each student’s work in three categories: prose, poetry, and art/photography.

CURCA is a unit of the Office of the Vice Chancellor for Research and is a unique resource for students ready to expand their education beyond the classroom. There are different programs available designed to provide students with opportunities to discover through various hands on experiences. CURCA offers students the opportunity to cooperate with a faculty mentor on independent creative activities or research.

The greatly widespread opportunities available in CURCA have produced past grant-funded undergraduate creative activities and research.

CURCA is proud to be involved in the Devil’s Kitchen Literary Festival held in October of each year organized by Grassroots. The Devil's Kitchen Fall Literary Festival is an annual three-day festival featuring readings, panels, and book signings by writers from across the nation. The festival is held on the campus of Southern Illinois University Carbondale. The Devil’s Kitchen awards recognize one poet, one prose writer fiction and one literary nonfiction for a collection of work, a novel, or memoir published in the preceding year.

For more information visit http://grassroots.siu.edu/.