Program
1st Graduate and Professional Student Research Conference
Friday, April 4th, 2014
College of Design
10am – 6pm

Registration

All attendees should register for the meeting in advance. Attendees who preregister for the conference will have a name tag ready for them when they arrive. Preregistration is required for complimentary lunch.

https://iastate.qualtrics.com/SE/?SID=SV_1zdKT77Nr7nKExT

Location

Constructed in 1978, the College of Design is located on the west side of the Iowa State University campus. It features five stories of classrooms, a 250-seat auditorium, branches of the university library and university bookstore, and Design Café.

Parking

There are several metered visitor parking located near the College of Design. Please read the signs and time limits on the meters carefully.

- Lot 9 (distance: 59 yd)
- Lot 10 (distance 95 yd)
- Lot 14 (distance 97 yd)
- Lot 21 (distance 124 yd)
- Lot 11 (distance 125 yd)
- Lot 13 (distance 139 yd)
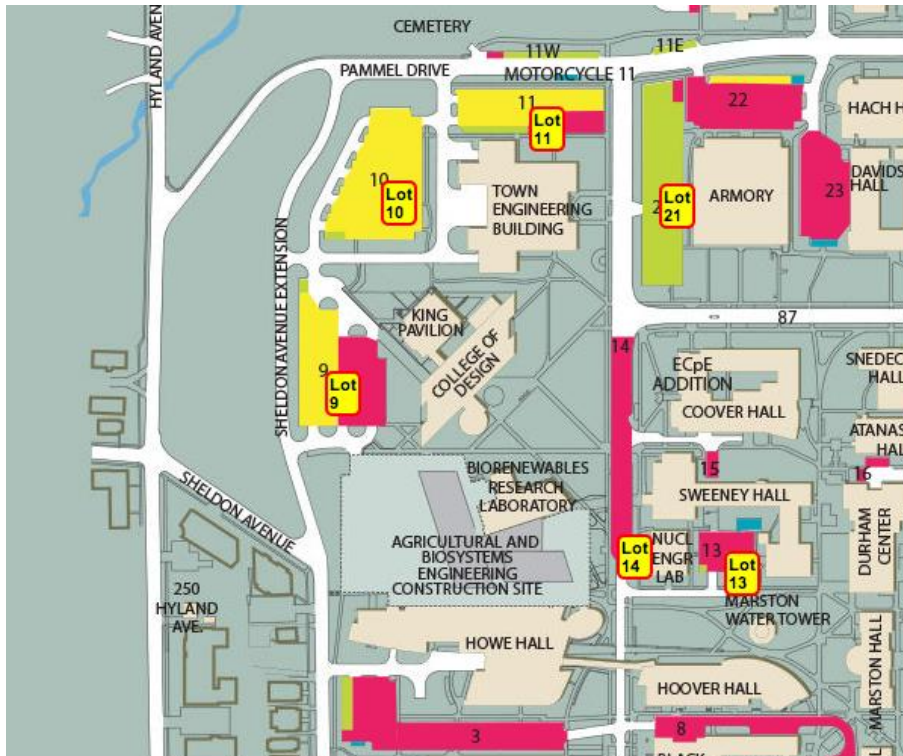
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GPSS thanks all colleges and the Office of Senior Vice-President and Provost for their financial support of this year's event. The chairs thank Iowa State University Post-Doc Association for their assistance in preparing the materials and finding judges and Dr. Rajan for her help to find panelists for the graduate panel.

Corporate Sponsors

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Schedule of Events

9:30AM
Registration opens in the atrium of the College of Design

Graduate Workshops
10:00AM – 10:50AM

Workshop I
Room: 77 Design
Identifying and Connecting with Funding Opportunities: Campus Resources
Speaker: Sue Shipitalo, Research and Training Coordinator, Vice President for Research

Learn about some of the resources available to help ISU faculty, staff and students connect with funding opportunities. COS Pivot is available through the Vice President for Research website and The Foundation Directory Online is available at the Parks Library. Both of these grant-seeking research tools include a wealth of information in addition to their comprehensive databases of grant opportunities. Learn how easy it is to access these databases and use the tools effectively.

Workshop II
Room: 130 Design
How to Write Your Cover Letter
Speaker: Karen Bovenmyer, Program Coordinator, Center for Excellence in Learning and Teaching

Learn how to use a job ad, a five paragraph essay format, and specific examples of your own experience to get that interview!

Poster Presentation
11:00AM – 11:50AM

Room: College of Design atrium
Over 100 poster presentations by graduate and professional students. Audience will vote on their top posters.

Student Panels
12:00PM – 12:50PM

Graduate/Professional Student Panel
Room: 262 Design
Academia vs. Industry. What is right for me?
Panelists: Dr. Lisa Lorenzen, Dr. James Oliver, and Dr. David Grewell

Come to hear from ISU faculty and staff about the difference between academia and industry.

Undergraduate Student Panel
Room: 077 Design
What Is Graduate School Like?
Panelists: ISU graduate students

Come to hear from ISU current graduate students about the graduate school.

Lunch
1:00PM – 1:50PM

Room: College of Design atrium
Lunch (pre-registration is required)

Oral Sessions (Session I – VI)
2:00PM – 3:00PM

Session I
Room: 307 Design
Moderator: Liz Boyer
Judges: Dr. Yashdeep Phanse, Dr. M. R. Hadimani, and Dr. Amit Diwadkar

2:00PM
Agency and Structure in Agricultural Innovation in Fair Trade and Organic Coffee Cooperatives in Southeast Mexico
Presenter: Saul Abarca-Orozco
Major: Sustainable Agriculture
Adviser: Jan Flora
This study identifies the ongoing debate about agency as the capacity of individuals and groups to act independently and to make their own choices vis-à-vis the structural changes that influence or limit the choices and opportunities available. Particularly important is to address the issue of how coffee cooperatives and small farmers innovate and adopt, as well as how they measure the outcomes of those innovations in the coffee production-marketing systems. Innovation occurs from the organization to individual farmers or bottom-up from farmers to the cooperatives. Under conditions of the declining role of the state in agricultural areas, new actors have entered the coffee production and marketing systems. The private sector has become the dominant organizing entity of that system. An emerging alternative is the growth of Fair Trade and organic coffee systems. A comparison of those two systems is useful for understanding both technology adoption and innovation processes, and ultimately the impacts on cooperatives in the Cordoba-Huatusco region of Veracruz, Mexico. Unlike prior research that argues that Fair Trade and organic markets are by default developing collective and individual agency for coffee cooperatives in developing countries, we argue that coffee cooperatives in Mexico are engaging in different amounts and kinds of innovation from participating in the alternative coffee market. The level of innovation varies based on the level of integration and organization achieved over time and the way cooperatives deal with structural barriers. The results suggest that the more innovative cooperatives participating in organic and Fair Trade networks have learned how to be more successful using their scarce resources and combining their skills with the relationships established with other cooperatives, NGOs, certifiers, credit institutions as well as local and international traders; other cooperatives have stagnated.

2:15PM

The Effect of Adding Different Level of Tannic Acid on the Storage Stability and Quality Characteristics of Ground Chicken Meat
Presenter: Marwan Alhijazeen
Major: Meat Science
Adviser: Dong UK Ahn
The objective of this study was to determine the effect of tannic acid (TA) on the storage stability of ground chicken breast meat. Five different treatments including 1) control (none added), 2) 2.5 ppm (TA), 3) 5 ppm (TA), 4) 10 ppm (TA), and 5) 5 ppm butylatedhydroxyanisole (BHA) were added to boneless, skinless ground chicken breast meat, used for both raw and cooked meat studies. For raw meat study, ground chicken breast were packaged in oxygen-permeable bags and stored at 4 ℃ cooler for up to 7 days. For the cooked study raw meat samples were packaged in oxygen-impermeable vacuum bags and then cooked in-bag to the internal temperature of 75 °C before transfer to the oxygen permeable bags for storage. Both raw and cooked meats were analyzed for lipid and protein oxidation, color, and volatiles at 0, 3, and 7 days of storage. Both raw and cooked chicken breast meat added with 10 ppm of tannic acid had significantly ($P < 0.05$) lower lipid and protein oxidation than other treatments during storage. In addition, TA at 10 ppm level maintained the highest color a*- and L*-values during storage. Both raw and cooked chicken breast meat added with > 5 ppm TA had significantly ($p < 0.05$) lower amounts of off-odor volatiles than other treatments. Among the volatile compounds, the amount of hexanal increased rapidly during storage for both raw and cooked meat. However, meats added with > 5 ppm TA showed the lowest amounts of hexanal and other aldehydes related to lipid oxidation, indicating a strong antioxidant effect of TA in ground chicken breast meat. Therefore, TA at > 5 ppm can be used as a good natural preservative in ground chicken meat to improve its quality during storage.

2:30PM

Re-mapping the Curriculum: Design Solutions for Blended Undergraduate Courses
Presenter: Pinar Arpaci
Major: Education
Adviser: Ana-Paula Correia
Blended learning is an evolving pedagogical model for online delivery of courses. Online teaching and learning specialists speak enthusiastically about online education in that it caters to a wide kaleidoscope of learning styles. However, developers of online-learning resources neither explore nor exploit the unique differences in learning styles. Faculty members also struggle with the design process of blended courses. They oftentimes ask about "the formula" for a blended course. For example, the ratio of what is maintained online versus that of kept in the classroom time is treated as if a mathematical constant, whereas that ratio should be determined taking into account the individual learning styles of the particular body of students. And the impact of the course on students is calculated in a deterministic fashion, before the course begins and student feedback is obtained. Such open-loop approach to blended learning can lead to an ineffective teaching strategy. In this novel study of blended teaching philosophy we have applied Fink's taxonomy of significant learning to an undergraduate blended course. Application of Fink's taxonomy to a blended course is an innovative way of designing a course by using a backward design process. Furthermore, such a practice urges faculty to create learning-centered courses, as opposed to content-centered courses. Our presentation will show how to implement successful blended course strategies, factors impacting design and decision points in the design and why they succeeded. While a universal answer to perennial questions of blended course design does not exist, the faculty, advisers, curriculum development teams, and instructional designers can learn from strategies we incorporated into a successful blended course.

2:45PM
Horticultural Evaluation of Swamp Tupelo (Nyssa biflora Walt.)
Presenter: Frank Balestri
Major: Horticulture
Adviser: William R. Graves
The genus Nyssa Gronov. ex L. comprises several woody species with traits valued by horticulturists, but only Nyssa sylvatica Marsh. (black gum) is prevalent in the horticultural market. We hypothesize that Nyssa biflora Walt. (swamp tupelo) can be a useful tree for managed landscapes because, like other species indigenous to waterlogged soils, it possesses strong resistance to both drought and flooding. Experiments will be designed to quantify responses of N. biflora to root-zone moisture treatments; seed germination, and cold hardiness will be evaluated in additional experiments. Dry-matter partitioning, water potential, and photosynthesis will be determined for potted seedlings exposed to moistures in the root zone ranging from extreme desiccation to inundation. Germination values for seeds (depulped drupes) and whole fruits (intact drupes) will be determined after various durations of cold, moist stratification. The viability of stem segments exposed to low temperatures in a glycol bath will be assessed to gain information on cold requirements and hardiness limits. Results will represent the first evaluation of N. biflora as a tree for horticultural use.

Session II
Room: 411 Design
Moderator: Nadia Jarmaillo Cherrez
Judges: Dr. Arjun Pathak, Dr. Yu Xiaoqing, and Dr. Olayide Obidi

2:00PM
Development of an Instrument on Conceptual Problems in Chemical Stoichiometry
Presenter: John Baluyut
Major: Chemistry
Adviser: Thomas Holme
The understanding of stoichiometry is indispensable for the subsequent comprehension and use of other fundamental principles in chemistry. Stoichiometry is deeply rooted in the principle of conservation of matter. However, it has been observed that while students may have success in solving algorithmic problems on stoichiometry, many do not possess conceptual understanding of these principles. Faculty from different areas of chemistry have identified "conceptual understanding" as one of the two most important learning outcomes for chemistry students, the other being the development of "reasoning skills," which lets students use fundamental concepts to solve problems. This emphasis on concepts has led to increased demand for assessments that embody a conceptual structure. An online instrument consisting of six problems divided among three different chemical contexts was written and conducted among students in three different general chemistry courses. Each problem included a given amount of reactants, the relevant balanced chemical equation, and a diagram of the particulate representation of the given reactants and a proposed product mixture. Students were asked to evaluate the accuracy of each diagram in terms of depicting the concepts of excess and limiting reactants, and yield. Students in the advanced general chemistry performed better than engineering or science majors. Engineering students performed better than science majors. The instrument revealed statistically significant differences in performances across two of the given chemical contexts (combustion of methane and production of ammonia from nitrogen and hydrogen), despite the supposed familiarity students have with these from textbook and classroom examples. These point to important differences in the ways students are looking at diagrams and how students interpret them with respect to both the information given in the text of the problem and the balanced chemical equation.

2:15PM
Performance of Modified Milk Protein Concentrates in Model High-Protein Nutrition Bars
Presenter: Justin Banach
Major: Food Science and Technology
Adviser: Buddhi Lamsal

Milk protein concentrates (MPC) are produced by concentration and drying skim milk proteins. The nutritional content and flavor make MPC desirable for use in high-protein nutrition bars. However, rapid hardening and crumbly texture upon incorporation limit its use. MPC with 80% protein (MPC80) was extruded or toasted to improve performance in bars. MPC80 was twin-screw extruded at two ramped temperature profiles, dried, and ground back to powder. MPC80 was toasted at 75 or 110°C for 4 h in a convection oven. Model protein bar dough (30% protein, 22% glycerol, 19% palm kernel stearin, 12% maltitol syrup, 10% high-fructose corn syrup) was sealed in cylindrical molds and water activity sample cups, and stored at 22, 32, or 42°C. Bar texture, water activity, and color change were measured over 42 days. Disulfide bond formation in bars was studied with SDS-PAGE. Sample means were compared with Tukey's adjusted p-value ($P < 0.05$). Bars prepared with toasted MPC80 had texture similar to control MPC80. Bars prepared with MPC80 extruded at 65°C were significantly softer than bars made with control MPC80. Significant difference in hardness and fracturability between bars formulated with MPC80 extruded at 120°C and those prepared with control MPC80 was intermittent. Water activity of the bars increased slightly during storage, but remained less than 0.65, which assured shelf stability. Total color change was limited at 22°C, but increased significantly at 32°C and 42°C. Reduced and non-reduced SDS-PAGE suggested disulfide bond formation in extruded MPC80 before bar manufacture. Toasted MPC80 did not have improved performance, whereas extruded MPC80 produced bars that became less firm during storage. Hardening was slowed in bars produced with extruded MPC80 because free sulfhydryls were oxidized to disulfide bonds prior to incorporation. Low temperature extrusion may improve MPC80 functionality in protein bars.

2:30PM
High-Quality, Real-Time 3D Video Streaming to Head Mounted Displays
Presenter: Tyler Bell
Major: Human Computer Interaction
Adviser: Song Zhang
Two-dimensional (2D) video streaming technologies, such as Skype, are used to connect people around the world for business and recreational purposes. As the trend continues in which society conducts itself in online environments, improvements to telecollaboration and telecommunication technologies must be made as current systems have about reached their limitations. These improvements are to ensure that interactions are as natural and user-friendly as possible. The solution to the limitations imposed by 2D video streaming technologies is to stream 3D video to users in a virtual reality head mounted display (HMD). With three-dimensional data many things can be done such as eye-gaze correction, obtaining a natural angle of viewing and more. One common advantage to utilizing 3D in lieu of 2D is that when a viewer moves around their computer screen in physical space the streamed 2D image remains the same on the monitor. However, via the use of a head mounted display, the user can view their partner in virtual space in three dimensions almost as if they were sitting directly across from them. With these improvements increased user perception and level of immersion in the digital world has been achieved. This allows users to perform at an increased level of efficiency in telecollaboration and telecommunication environments due to the increased ability to communicate naturally with another human being. We will present our findings which support the notion that users better perceive their environments and also have a greater sense of interpersonal communication when immersed in a 3D video scenario as opposed to a 2D video scenario. This novel technology utilizes high-quality and real-time 3D scanning, processing, and live-streaming over a network which in turn allows the user to experience a realistic reconstruction within a virtual reality head mounted display.

2:45PM
High-Resolution, Real-Time 3D Shape Measurement for Particle Motion Capture
Presenter: Bhaskar Bhattacharya
Major: Human Computer Interaction
Adviser: Eliot Winer
The paper presents a method for accurately capturing and tracking particles whose rapid motion cannot be captured by conventional off the shelf cameras. The approach presented will encompass the techniques used for high speed particle capture and how these particles are tracked and visualized. These particles move in very fast, complex and unknown trajectories, they have no specific shape and size and they easily succumb to issues like sticking to each other, splitting apart and overlapping. Tracking them is the challenge. Most tracking algorithms are able to handle particle datasets where each particle's initial position is known. This constraint was mitigated in the proposed algorithm by using a novel approach to identifying each separate particle mid-stream (in turn complex interactions like particle sticking or splitting were also handled) and backtracking these results to the first frame of capture. A prototype implementation of the entire system was made where target particles were captured at 2 KHz and post-processed to provide proper visualization of their position and trajectories. Results of experiments and final visualizations of the system are provided.

Session III
Room: 77 Design
Moderator: Akshit Peer
Judges: Dr. Parbhakar Venkateswaran, Dr. Ataur Katebi,
       and Dr. Charlie Kostelnick

2:00PM

Modeling and Simulation in Strain-Induced Phase Transformations in a Diamond Anvil Cell
Presenter: Feng Biao
Major: Engineering Mechanics
Adviser: Valery I. Levitas

The main processes in a quai-static high pressure physics and mechanics are compression of a thin sample in a diamond anvil cell (DAC) to high pressure and producing high pressure phases in it. Plastic strain-induced phase transformations (PTs) in a sample under compression in DAC are investigated in detail, by applying finite element approach. A large-strain model for coupled PTs and plastic flow is developed, which includes micromechanically based strain-controlled kinetics. Finite element algorithm and procedure is developed and implemented in the ABAQUS. Cases without and with deformable gasket are considered. An extended version of the Coulomb and plastic friction model for multiphase material with evolving concentration of phases is developed and implemented in ABAQUS to model contact interaction between diamond anvils, gasket, and sample. It includes large contact sliding and variable contact surface with and without gaps. Detailed analyses of the coupled plastic flow and PTs are studied during loading, unloading, and reloading for various ratios of the yield strengths of the low and high pressure phases, kinetic parameters, and friction parameters. For the lower yield strength of high pressure phases, coupled strain and phase localization is revealed. Various experimentally observed effects are reproduced and interpreted. Obtained results revealed difficulties in experimental characterization of strain-induced PTs and suggested some ways to overcome them.

2:15PM

Inverted Substrate Preferences for Photochemical Heterolysis Arises from Conical Intersection Control
Presenter: Alexander Buck
Major: Organic Chemistry
Adviser: Arthur Winter

Heterolytic bond scission is a staple of chemical reactions. While qualitative and quantitative models exist for understanding thermal heterolysis of carbon—leaving group bonds, no general models connect structure to reactivity for heterolysis in the excited-state. CASSCF conical intersection searches were performed to investigate representative systems that undergo photoheterolysis to generate carbocations. Certain classes of unstabilized cations are found to have nearby, low-energy conical intersections, whereas stabilized cations are found to have high energy, unfavorable conical intersections. The former systems are often favored from photochemical heterolysis. These results suggest the possibility that the frequent inversion of the substrate preferences for non-adiabatic photoheterolysis reactions arises from switching from transition state control in thermal heterolysis reactions to conical intersection control for photochemical heterolysis reactions. The elevated ground-state surfaces resulting from generating unstabilized or destabilized cations, in conjunction with stabilized excited-state surfaces, can lead to productive conical intersections along the heterolysis reaction coordinate.

2:30PM

A Maximum Likelihood Analysis for VERITAS Observations of the Cygnus Cocoon

Presenter: Joshua Cardenzana

Major: Astrophysics

Adviser: Amanda Weinstein

Cosmic rays are charged particles with energies above 10^9 electron volts (eV) which typically originate from outside our solar system. The energy spectrum of cosmic rays exhibits a distinct "knee" feature around energies of 10^{15} eV, below which they are thought to primarily originate from within our galaxy. VERITAS is an array of four 12-meter Imaging Atmospheric Cherenkov Telescopes (IACT) sensitive to very high energy gamma rays from 10^{11} eV to $10^{13.5}$ eV. These gamma rays can be produced when cosmic rays interact with interstellar material. Observations by VERITAS of supernova remnants (SNRs) have shown that SNRs are capable of accelerating cosmic rays to energies of at least 10^{13} eV. However, whether SNRs can accelerate cosmic rays up to 10^{15} eV and whether they are the primary source of cosmic rays at these energies remain open questions. Recent observations by the Fermi-LAT from space reveal a highly extended cocoon of gamma-ray emission in the Cygnus constellation, potentially the result of recently escaped cosmic rays interacting with material in the interstellar medium. Studies of this cocoon could shed light on how cosmic rays diffuse into the interstellar medium and help connect the observed cosmic ray energy spectrum below 10^{15} eV to cosmic ray accelerators within our galaxy. I will report on an advanced maximum likelihood analysis of VERITAS observations, and on the potential for using the results to study the connection between this cocoon and nearby cosmic ray accelerators.

2:45PM

The Contributions of College Attainment, Major Choice, and Narrowing Wage Differences within Majors to Narrowing Gender Wage Gaps, 1967-2011

Presenter: Nicole Caviris

Major: Economics

Adviser: Peter Orazem

Women are paid less than men in the workforce, although the explanations for this vary. It is often noted that, despite the fact that women are graduating from college in greater numbers than men, the pay gap still persists. Of course, occupational choice has a major role in determining an individual's earnings and is usually closely related to college major choice. Using data from the United States Government's Integrated Postsecondary Education Data System (IPEDS) and the National Association of Colleges and Employers (NACE), I use a Tornqvist approximation to a shift-share analysis to examine how changes in the gender wage gap are affected by changes in wages within majors and changes in the distribution of men and women between majors. This paper addresses these differences and provides insight on how decisions men and women make during their college careers can impact on their earnings beginning from the moment they enter the workforce in the context of historical trends.

Session IV
Room: 262 Design
Moderator: Liang Tian
Judges: Dr. Jana Byars, Dr. Eunjin Bang, and Dr. Anna Wolc

2:00PM
Detection of Requirement-Violation in Cyber-Physical Systems
Presenter: Jun Chen
Major: Electrical Engineering
Adviser: Ratnesh Kumar
Many cyber-physical systems, such as building automation systems, automotive vehicles and smart power grids, can be modeled as stochastic systems with mixed continuous and discrete dynamics subject to disturbance and noise, whose behaviors are monitored and controlled by networked (digital) control systems. This work studies the requirement-violation detection of discrete-time stochastic systems (physical systems) with linear-time temporal logic (cyber monitor) as correctness requirement. The temporal logic allows the system correctness properties to be specified compactly and in a user-friendly manner, and supports automatic translation into other formal models such as automata. We introduce the notion of input-output stochastic hybrid automaton (I/O-SHA) to model the stochastic cyber-physical systems, and provide algorithms to recursively estimate the probability distribution over discrete and continuous system states. An online detector is proposed, which recursively computes the likelihood of no-fault, a statistic that is employed for the purpose of fault detection, and issues detection decision then the statistic falls below a threshold. The performance of the detector is measured in terms of false alarm (FA) and missed detection (MD) rates, and the condition for the existence of a detector to achieve any desired rates of FA and MD is captured in form of Stochastic-Diagnosability, a notion that we introduce here for the first time. The work is illustrated by a room heating system example.

2:15PM
Iowa's Walk-in Hunting Program: A Landowner's Perspective
Presenter: James Crain
Major: Wildlife Ecology
Adviser: Rebecca Christoffel
In states with little public land such as Iowa, the majority of hunting takes place on a decreasing amount of "hard-to-gain-access-to" private land. In response to this shortage of accessible private land, the Iowa Department of Natural Resources (IDNR) initiated a private lands hunter walk-in program in 2011. The Iowa Habitat and Access Program (IHAP) opened 41 privately owned properties (7,511 acres) to public hunting in 2011 and 2012. Strong relationships with willing landowners were critical to IHAP's beginning, and IHAP's future may depend on continued good relations among hunters, landowners and the IDNR. During July and August of 2013, in-person interviews were conducted with participating landowners about their experiences with IHAP. Landowners were asked to evaluate IHAP based on: (1) reasons they joined IHAP, (2) their interactions with Iowa DNR personnel, (3) necessary program procedures, and (4) their perceptions of IHAP hunters. Overall, participating landowners were satisfied with IHAP. Landowners enjoy IHAP because the program reduces their costs in managing their properties, and provides habitat for wildlife, which they can share with others. IHAP landowners expressed satisfaction with the professionalism of agency staff as well as the behavior of hunters. Landowners indicated that more and different hunters were using their properties than before IHAP. Such new interactions may be beneficial for improving hunter-landowner relations.

2:30PM

African American Women's Use of Cosmetics Products in Relation to Their Attitudes and Self-Identity

Presenter: LaPorchia Davis

Major: Apparel, Merchandising, and Design

Adviser: Mary Lynn Damhorst

The purpose of the study was to explore African American women's attitudes toward cosmetics, how they use cosmetics, and how use of cosmetics is related to self-confidence and perception of appearance. Despite their ample expenditures on cosmetics, African American women's use of and attitudes toward cosmetics has been studied very little in scholarly research. Interviews were conducted with 18 African American women, ages 20-29, who resided in Iowa or Arkansas. Recruitment was conducted via advertisements through a Minority Students Office and a regional African American professional listserv. Participants were asked to reflect on their experiences wearing and purchasing cosmetics. In-depth, face-to-face interviews were conducted with each woman individually. Inductive, constant comparative analysis of the data was conducted. A second coder checked all coding, with 97% agreement in assignment of themes. Major themes were (a) memories of first use, (b) shopping experiences, (c) self-enhancement and self-confidence, (d) brand preference, and (e) media sources of information. Many of the women started to wear cosmetics during childhood, and in young adulthood place high importance on cosmetics to enhance appearance and self-confidence. Use of cosmetics was considered fashion and artistic expression. Lack of local availability of appropriate and good quality cosmetics for darker skin was mentioned by most of the Iowa women. The internet was one strategy to avoid the lack of inclusivity in mainstream media. The study provides an understanding of the role of wearing cosmetics in the lives of young adult African American women.

2:45PM

What is the Destiny of Most Popular Crop Rotation (Corn-Soybean) in Iowa?

Presenter: Hamze Dokoohaki

Major: Agronomy – Crop Production and Physiology

Adviser: Fernando Miguez

Census reports reported that that corn-soybean rotation is most widely used crop rotation in all over Iowa State for long time. According to these reports Iowa has been one of top 5 states in production of corn and soybean. These statistics make us think that we need to be prepared for upcoming impacts of future climate change to keep this trend up. In the first step, nine different stations widely spread in whole Iowa State was considered with aim of assessing the impact of future climate change on corn-soybean rotation. Past time period (1980-2000) weather and soil properties data was downloaded from NWS COOP network and USDA web soil survey respectively for these nine stations. In the next step, data simulated from HADCM3 AOGCM model with A1 (most pessimistic) and B2 (most optimistic) CO_2 emission scenarios was downscaled with LARS-WG model in order to generate the future (2080-2100) weather parameters. In final step APSIM model, with calibrated genetic coefficients for corn and soybean was run for past (1980-2000) and future (2080-2100) time period, in all nine station and two emission scenarios. Our preliminary results showed that, by applying the same management practice in past and future time period there would be substantial decrease in simulation of average biomass of both corn and soybean in all stations. This reduction was statistically significant based on t-test on $\alpha=0.01$ level. Stations located in central north and north east were subjected to higher reduction for corn and in the same way stations located in north west, south west and central west were subjected to higher reduction in soybean. Even though always there is high amount uncertainty on future climate change researches, results of this research recommends more preparations for upcoming future events.

Session V
Room: 416 Design
Moderator: Matt Jefferson
Judges: Dr. Carlos Lopez, Dr. Heather Simmons, and Dr. Mack Shelley

2:00PM
Characterization of Information Automation on the Flight Deck
Presenter: Rachel Dudley
Major: Mechanical Engineering and Human Computer Interaction
Adviser: Michael Dorniech
This paper summarizes the results of analyses to identify characteristics of flight deck information automation systems which can lead to potential human factors issues. Information automation systems are responsible for the collection, processing, analysis, and presentation of information to the flightcrew. Information automation systems can pose human factors issues and challenges particular to this type of automation. This paper presents a formal definition of information automation and identifies characteristics and associated human factors issues in the domain of aircraft flight deck systems. A method was developed to identify a set of consistent and independent characteristics of information automation, a set of properties or attributes which describe its operation or behavior, and can be used to identify and assess potential human factors issues. This effort lays the groundwork for developing recommendations and guidelines specific to different characteristics of information automation.

2:15PM
Enantioselective Hydroacylation as a Route to Annulated Indoles
Presenter: Avipsa Ghosh
Major: Organic Chemistry
Adviser: Levi M. Stanley
Chemical reactions that couple C-H bond activation with carbon-carbon bond formation and those that generate nitrogen heterocycles from simple starting materials are two of the most important classes of reactions in modern organic, medicinal, and materials chemistry. Intramolecular hydroacylation of alkenes in the presence of transition metal catalysts is a well-known process that couples C-H bond activation with carbon-carbon bond formation to form synthetically valuable ketone products. Here, we report catalytic, enantioselective intramolecular hydroacylation of N-vinylindole-2-carboxaldehydes. These hydroacylation reactions occur in the presence of a readily accessible rhodium catalyst and form chiral, non-racemic 2,3-dihydro-1H-pyrrolo[1,2-a]indol-1-ones in high yields with excellent enantioselectivities. To our knowledge this study represents the first report of enantioselective alkene hydroacylation to generate chiral, non-racemic nitrogen heterocycles. Chelating functionality within the substrates or introduced through additives is not required to achieve high yields and enantioselectivities. In addition, catalyst loadings can be lowered to 0.2 mol % with only modest impact on the yield and no impact on the enantioselectivity of the hydroacylations. Also, these reactions encompass a broad range of N-vinylindole-2-carboxaldehydes bearing a variety of aryl and alkyl substituents on the olefin moiety and substitution throughout the indole core. The dihydropyrroloindolone products are readily transformed to dihydropyrroloindoles that are core structures present in a variety of natural products and biologically relevant compounds. The utility of these reactions is illustrated in a straightforward, enantioselective synthesis of the dihydropyrroloindole core that maps to the carbon skeleton of the phytoindole alkaloid yuremamine. The enantioselective hydroacylations presented in this work serve as the key step to enable rapid installation of the three contiguous stereocenters present in the yuremamine core.

2:30PM
Narcissism: What Is It, Really?
Presenter: Anne Herlache
Major: Social Psychology
Adviser: Zlatan Krizan
The concept of narcissism has become muddled overtime. There are competing viewpoints, and the landscape is littered with pet theories. This project sifts through the multitude of conceptualizations to get at the core of narcissism while also distinguishing between two key themes (grandiosity and vulnerability) within this personality type. Data were collected from two studies. The first study, conducted online (n = 303), included 30 narcissism scales as well as measures of individual differences in paranoid thinking. In the experimental second study (n = 117), subjects were either in a condition to fail or succeed at a spatial reasoning task in the presence or absence of a two-way mirror. These participants had completed measures of narcissism in a previous session. The data from the first study were factor analyzed, revealing a three factor structure to the narcissism measures: grandiose narcissism, vulnerable narcissism, and the commonalities between them. The second study indicated expected behavioral differences between the types of narcissism. Only individuals prone to vulnerability (not grandiosity) were especially likely to feel they were being watched, but only when they were failing. Similarly, they were especially likely to feel judged by others (who were not physically present), but only when they were working on the difficult task or when the mirror was present. The results distinguish among the features of narcissism and suggest self-involvement induces paranoid thought in vulnerable narcissists. This leaves the academic psychological community with a fuller understanding of one of the "dark triad" of personality features, while also better equipping clinicians in their quest to promote subjective well-being in their clients.

2:45PM
Structural Performance of a Bridge with UHPC Waffle Deck
Presenter: Ebadollah Honarvar Gheitanbaf
Major: Structural Engineering
Adviser: Sri Sritharan
The AASHTO strategic plan in 2005 for bridge engineering identified extending the service life of bridges and accelerating bridge construction as two of the grand challenges in bridge engineering. This study was carried out to investigate the feasibility of utilizing UHPC waffle slab deck, thereby contributing to accomplishing the AASHTO strategic plans. Following laboratory evaluation of the waffle deck and its connections, a full-scale, single span, 60 ft long and 33 ft wide prototype bridge with full depth prefabricated UHPC waffle deck panels was constructed. This paper will present the results from field evaluation of the bridge established by subjecting the bridge to static and dynamic truck loads. A 3D ABAQUS finite element model of the bridge was used to help interpret the results of load testing, estimate strains due to dead load, compute ultimate load, and examine live load distribution, which also be presented to show the close correlation between measured and expected results. Finally, an optimization of the deck configuration was explored with an intention of reducing the deck cost, which will also be summarized.

Session VI
Room: 362 Design
Moderator: Hussam Saleem
Judges: Dr. Martino Harmon, Dr. C. Lee Burras, and Dr. John Pleasants

2:00PM
A New Strategy for Alkene Hydroacylation
Presenter: Kirsten Johnson
Major: Organic Chemistry
Adviser: Levi Stanley
Strategies to activate carbon-hydrogen bonds and to activate carbon-carbon are among the most studied reactions in modern organic chemistry. Processes that couple these two elementary reactions are particularly attractive to modern organic synthesis. / Hydroacylation of alkenes is one such process that has been extensively investigated over the past 40 years as a direct route to ketones from simple starting materials. Despite the importance of ketones as synthetic building blocks and the potential of these starting materials as an entry to complex chemical architectures, the hydroacylation of alkenes remains underdeveloped and underutilized as a synthetic tool. The primary reason for the lack of practical hydroacylation reactions is catalyst stability and efficiency. The most efficient catalyst systems rely on coordination of functional groups to stabilize the active metal catalyst. Excellent potential exists to develop these types of reactions as a platform for the synthesis of biologically active compounds, but in order to do so, the requirement of functional group coordination must be eliminated. / We have developed a catalyst system that eliminates the need for the coordination of a stabilizing functional group and still achieves high yields and selectivities in synthetically useful ketone products.

2:15PM
Dynamic Decay of Rocking Precast Concrete Members
Presenter: Dimitrios Kalliontzis
Major: Structural Engineering
Adviser: Sri Sritharan
During severe earthquakes of the past, seemingly unstable structures such as water towers, free-standing equipment and ancient monuments that were not firmly attached to the ground successfully withstood the ground excitation and sustained little or no damage. Their survival was anecdotally attributed to their base undergoing a rocking motion as they could freely uplift and rock from one corner to the other. These observations have triggered researchers to consider rocking as a potential mechanism for structures to withstand earthquake motions. However, the danger of an imminent overturning, as a structure begins to rock at the base caused concerns regarding the use of this concept in design practice. The introduction of post-tensioned allows members to rock, creates a self-centering capacity and partially eliminates the aforementioned instability concern. Furthermore, the use of supplemental damping to provide an additional hysteretic energy dissipation option facilitated rocking structural systems for seismic applications. Looking at the design specifications for rocking structures, it is evident that the current approach to designing these systems uses energy dissipation mechanisms conservatively because of the limited knowledge about the amount of damping provided by the rocking mechanism. Given that this topic has not been systematically investigated, understanding the decay of motion due to rocking is of paramount importance in order to ensure accurate predictions of the rocking response, minimize the use of supplementary hysteretic damping and create more economical design solutions. This study aims at quantifying the energy dissipation mechanisms of rocking of both free-standing and post-tensioned members, improving the existent modeling techniques and enhancing the current design process.

2:30PM
Ammonia Gas Mitigation Using Microalgae
Presenter: Juhyon Kang
Major: Food Science and Technology
Adviser: Zhiyou Wen

Ammonia gas emission from animal manure decomposition is a major concern in animal housing operations. Excessive ammonia gas volatilization will affect both animal and worker health and can also cause significant environmental concerns. Current ammonia gas mitigation methods are based on physical, chemical, biological, and dietary treatments, but the costs are high and the performances are not stable. In this project, we proposed an algae-based method for removing ammonia gas generated in animal housing operations while producing a biomass with high protein content which can potentially serve as high-value animal feed products. The green algae Scenedesmus dimorphus was used for evaluating its ability to mitigate ammonia gas in a flat panel based photobioreactor under continuous operational mode. Different conditions were tested for optimal algal growth: 17, 42, 60, and 72 ppm of ammonia gas concentration; 5, 6, 7, and 8 of pH; and 5, 10, and 20 days of hydraulic retention time (HRT). The nitrogen mass balance was calculated for each case and results showed that almost 60% of nitrogen was assimilated by algae biomass at optimal condition (60ppm, pH 7, and 10 days of HRT). The amino acid profile of the biomass was also analyzed in application of algae as a source of animal feed. This experiment implies two benefits. One is economic benefit: cost down ammonia gas removal and algae growth, the other is a new algae market: animal feed.

2:45PM
Summer Cover Crop Influence on Vegetable Yield and Quality
Presenter: Ray Kruse
Major: Horticulture
Adviser: Ajay Nair

Weed control is one of the top problems that face commercial vegetable farmers in the state of Iowa. With many of the clientele' of Iowa's vegetable farmers being environmentally conscious as well as increased problems with weed resistance among herbicides the possibility of using cover crops as a means of suppressing weeds is going to be studied as a viable solution to this problem. The goal of this proposal is to see what advantages exist in Iowa's climate conditions for four cover crops to satisfy farmer's goals. This project will focus on the advantages that summer cover crops have being planted in advance of a fall vegetable crop planting on the vegetable planting itself including weed suppression, plant health following field planting, vegetable crop soil health following planting, and overall marketable vegetable crop yield. This study will start by establishing a cover crop during the summer season. At late summer the cover crop will be terminated and incorporated into the soil. Lettuce and cabbage will be planted as the response crops to measure the impact of the preceding cover crops. The long-term goal of this project is to start providing a base of advantages and disadvantages of four summer season cover crops in Iowa's climate and soil conditions for Iowa's vegetable farmers to incorporate into their growing systems. The hypothesis I am testing is will the cover crop that offers the most weed suppression have an increased or decreased effect on marketable yield and quality of the fall vegetable crop. At the conclusion of this project Iowa's vegetable farmers will have a knowledge base of the advantages and disadvantages of four summer cover crops that they can incorporate into their fall vegetable crop rotations.

Oral Sessions (Session VII – XII)
3:10PM – 4:10PM

Session VII
Room: 307 Design
Moderator: Kirsten Johnson
Judges: Dr. Joseph Burnett, Dr. Veronica Dark, and Dr. Ashokkumar Sharma

Investigating Effects of Surrounding Landscape Makeup and Diversity on Populations of Japanese Beetles in Iowa Soybean
Presenter: Cody Kuntz
Major: Entomology
Adviser: Matthew O'Neal

The landscape around a field can influence the abundance and diversity of the community of insects within it. Understanding the relationships between surrounding landscapes and pest abundance can inform management decisions by determining which fields may be at greatest risk for a pest outbreak. For example, soybean aphids, Aphis glycines Matsumura (Hemiptera: Aphididae), have both a lower abundance and a higher occurrence of biological control in soybean fields within high diversity landscapes. Unlike A. glycines, Japanese beetles, Popillia japonica Newman (Coleoptera: Scarabaeidae) are highly polyphagous and have relatively few native natural enemies. Therefore, the relationship between their abundance in soybean fields and the surrounding landscape may be different than that of A. glycines. In 2012, we initiated a study to determine the effects that surrounding landscape diversity may have on the seasonal abundance of this pest in soybean. To evaluate this relationship, we sampled Japanese beetles in soybean fields surrounded by landscapes with a high degree of diversity (>50% non-crop habitat) and fields surrounded by landscapes with lower amounts of diversity (<10% non-crop habitat) within a 2 km buffer around each field. During the 2012 and 2013 field seasons, we identified fields within each type of landscape in three separate Iowa counties. The seasonal abundance of Japanese beetles was determined by direct observation and sweep net sampling. Results of this sampling showed that significantly higher seasonal abundances occurred in soybean fields surrounded by high diversity landscapes than in fields surrounded by low diversity landscapes.

3:25PM
Anion Exchange Capacity of Biochar
Presenter: Michael Lawrinenko
Major: Soil Science
Adviser: David Allen Laird

Use of biochar as a soil amendment has been demonstrated to enhance various soil properties. Some biochars have been shown to have significant levels of anion exchange capacity (AEC), which may reduce leaching of anionic nutrients when these biochars are applied to the soil. However, little is known about the nature of AEC sites on biochar surfaces. Our goal in this study was to determine what chemical functional groups contribute AEC to biochar and the effects of feedstock properties and pyrolysis temperature on biochar AEC. We employed chemical analysis, BET-surface area, particle density and Fourier transform infra-red (FTIR) spectroscopy to characterize the various biochars. For the studied biochars, AEC values ranged from 0.602 to 27.76 cmol Kg-1 and increased with decreasing pH (pr(F) < 0.0001) and increasing pyrolysis temperature. Surface area and particle density did not influence AEC values. The cellulose biochar was composed almost entirely of C, H, and O but still exhibited significant AEC even at pH 8, suggesting that O containing functional groups contribute AEC. FTIR spectroscopy indicated negligible hydroxyl O, relatively small amounts of carbonyl and carboxyl O, and a prominent peak at 1590 cm-1, which we attribute to C-O+=C stretching in O-heterocycles. We conclude that AEC in the studied biochars is primarily due to oxonium functional groups formed during pyrolysis.

3:40PM
Learning Design Solutions (LearnDS): A Novel Approach to Instructional Design Education
Presenter: Tera Lawson
Major: Education, Higher Education, Leadership, and Learning
Advisers: Barb Licklider and Ana-Paula Correia

This proposal presents a reflective case of a novel approach to instructional design education. It describes a unique opportunity for graduate students to practice and sharpen their instructional design, leadership, professional, and entrepreneurial skills while giving them the chance to apply academic theories and concepts to diverse real-world educational technology projects through a student-led service center, Learning Design Solutions (LearnDS). LearnDS is located within the Center for Technology in Learning and Teaching, in School of Education at Iowa State University. LearnDS consults with clients who are both internal and external to ISU, and offers educational technology consulting services. This presentation will detail what LearnDS does, how it operates, what roles students play in the organization and what benefits they derive. These are the results of a systematic reflection and discussion among the group focusing on LearnDS practices and procedures. The presentation will conclude with lessons learned from the implementation of this novel enterprise-based learning and teaching approach since the the organization was established in 2008. Students involved with LearnDS reported gaining valuable experiences which lead to the development of leadership approaches, project management, organizational communication, business-acumen, and a deeper understanding of the instructional design process and other professional practices. The skills students are developing include communication, collaboration, customer relations, critical thinking, problem-solving, and technical awareness. Students also described the benefits of continuously reflecting on their own education, career goals and professional practices.

3:55PM
Genotype by Environment Interaction of Sorghum Flowering Time
Presenter: Xin Li
Major: Plant Breeding and Genetics
Adviser: Jianming Yu

Flowering time is a complex trait that controls adaptation of plants to their local environment. Flowering time in sorghum is controlled by multiple genes. To date, only two of these genes (Ma1 and Ma3) have been cloned. The objectives of this research are to investigate the genotype by environment (G × E) interaction of sorghum flowering time, and to identify the underlying QTLs controlling flowering time in sorghum. The experiment was carried out in three years (2011 to 2013) at three locations (Guayanilla Puerto Rico, Manhattan Kansas, and Ames Iowa). Flowering time was measured on a sorghum recombinant inbred line (RIL) population with 250 entries. This RIL population was genotyped with genotyping by sequencing (GBS). About 10K SNP markers were used for linkage map construction and QTL analysis. Photoperiod-sensitive genotypes flower early in tropical region but significantly late in temperate region. Photoperiod-insensitive genotypes, however, flower late in tropical region but early in temperate region. Two major QTLs control flowering time in this RIL population. The two QTLs show QTL-by-QTL interaction (epistasis). The QTL located on Chromosome 6 has large effect. The functional allele of this QTL suppresses the effect of the QTL on Chromosome 10 such that the effect of the Chromosome 10 QTL can only be observed when the Chromosome 6 QTL is in nonfunctional form. A third QTL on Chromosome 8 was only detected in tropical environment. This QTL likely controls flowering time by responding to the ambient temperature. Flowering time in sorghum shows significant G × E and epistasis is one of the mechanisms behind this phenomenon. This study shed light on how plants adapt to their local environments, and how epistasis plays an important role in regulating flowering time in plants.

Session VIII

Room: 411 Design
Moderator: Punit Tulpule
Judges: Dr. Jimena Carrillo-Tripp, Dr. Carlos Lopez, and Dr. Hartanto Wibowo

3:10PM

Improving the Comprehensibility of Nonnative Speakers of English through an Online Pronunciation Tutor
Presenter: Edna Lima
Major: Applied Linguistics and Technology
Adviser: John M. Levis
Pronunciation is a crucial component of second/foreign language proficiency. It is impossible to speak without pronouncing. In many instances in which grammar and vocabulary are correct, below a certain level of pronunciation communication cannot take place effectively as poor phonetic control and prosody can distract the listener and hinder comprehension of the message. Although researchers highlight the importance of pronunciation and advocate that it become part of ESL/EFL curricula, there is a lack of substantial research connecting theory to practice. As a matter of fact, pronunciation is often ignored in second language teaching, especially in EFL contexts, because teachers lack support, lack preparation and training, have difficulty in establishing goals, have difficulty in defining pedagogical priorities, and have difficulty in deciding on effective approaches to teaching. In response to these issues, an online pronunciation tutor focusing on English suprasegmentals (word stress, rhythm, and intonation) has been developed to improve the comprehensibility of English as a second/foreign language speakers. This presentation will address four major considerations in the development of the online pronunciation tutor: 1) the importance of suprasegmentals on speaker intelligibility and comprehensibility; 2) the potential that an online tutor offers to address basic principles leading to effective pronunciation instruction (e.g., access to multiple models, opportunities for large amounts of practice, and self-determined pace); 3) the importance of pronunciation feedback and its different modality in online instruction; and 4) the effectiveness and usefulness of online instruction.

3:25PM

Asymptotic-Preserving Semi-Lagrangian Discontinuous Galerkin Schemes for a Class of Relaxation Systems
Presenter: Anna Lischke
Major: Applied Mathematics
Adviser: James Rossmanith
We consider in this work a class of singularly perturbed hyperbolic balance laws that admit a diffusive limit. Such systems arise naturally in radiative transport applications if one starts with a Boltzmann description and expands the distribution function in spherical harmonics (i.e., the Pn approximation). One key difficulty in solving such systems is that standard numerical schemes have maximum time-step restrictions that vanish in the singular limit. Several approaches have been proposed in the literature that overcome this difficulty, many of which are based on splitting the equation into stiff and non-stiff pieces and using appropriate semi-implicit time-stepping methods. In this work we employ a different strategy in order to achieve asymptotic-preservation. We develop a scheme using a discontinuous Galerkin semi-Lagrangian scheme. Several numerical test cases are used to validate the proposed scheme.

3:40PM

On a Non-Linear Investigation of an Electrospinning Model under Combined Space and Time Evolving Instabilities

Presenter: Saulo Orizaga

Major: Mathematics

Adviser: Steven L. Hou

We study the nonlinear problem of axisymmetric electrically driven jets with applications to electrospinning. In our investigation we consider the model based on the governing electro-hydrodynamic equations (Melcher and Taylor 1969) that unifies the two types of instabilities that occur during the fine fiber production due to spatial and temporal growing disturbances. The model is approached from a classical stability point of view in the early stage and then it is treated with a weakly nonlinear wave theory of certain dyad resonance mode that later involves the use of Newton's Method to solve a dispersion relation and finally the Method of Lines (MOL) to solve a system of PDEs that governs the combined time and space evolving amplitude instability functions. We found, in particular, that for certain parameter values of the jet flow system, there are some resonance modes that can dominate the jet for its temporal and spatial evolution. We were able to detect nonlinear properties in our investigation that allowed a change in the dynamics of the jet flow from a thickening to a thinning jet. Our model was able to uncover new parameter regimes for both spatial and time modes in which instabilities were significantly enhanced and jet radius was reduced approaching to nano-scale size, which is the desired mechanism in the electrospinning process.

3:55PM

Magnetic Ordering and Metal-Atom Site Preferences in CrMnAs

Presenter: Laura Lutz

Major: Material Science and Engineering

Adviser: Gordon Miller

Chromium manganese arsenide, CrMnAs, is an antiferromagnetic compound, one of a class of transition-metal arsenides that exhibit a variety of magnetic properties, despite having similar structure and chemistry. Their magnetic properties arise from each compound's magnetic ordering, the pattern of magnetic moments on individual atoms. These arsenides have a tetragonal structure with two inequivalent metal sites. Previous diffraction studies on CrMnAs have found one metal site to be preferred by Cr and another by Mn, but there is a significant degree of mixing between the two sites. CrMnAs thus presents a "coloring problem," the question of how the two types of metal atoms are distributed between the two types of metal-atom sites. This research investigated the interaction between such "coloring" and magnetic ordering in stoichiometric CrMnAs. Computational methods based on density functional theory were used to simulate three possible metal-atom colorings and 15 distinct magnetic ordering patterns of CrMnAs. The Stuttgart Tight-Binding, Linear Muffin-Tin Orbital (TB-LMTO) program and the Vienna Ab-initio Simulation Package (VASP) were used to calculate the electronic structure and total energy of each scenario. The lowest-energy scenario was antiferromagnetic but with a different antiferromagnetic ordering and coloring than were previously observed in CrMnAs. For most other antiferromagnetic scenarios, the observed coloring was preferred. The energy differences between antiferromagnetic scenarios were small, suggesting that multiple magnetic orderings and colorings might co-exist at reported annealing temperatures. The computational results did not predict the observed ground state, but they suggested that magnetic ordering and coloring are strongly interdependent in CrMnAs. It is possible that previous observations of CrMnAs reflect an entropy-driven mixture of magnetic orderings and colorings, rather than a single electronic ground state. This work was supported by the National Science Foundation, Materials World Network (NSF DMR 12-09135).

Session IX
Room: 77 Design
Moderator: OP McCubbins
Judges: Dr. Yuba Kandel, Dr. Dawn Bratsch-Prince, and Dr. Lyric Bartholomay

3:10PM
Teaching Aviation English in Korean English as a Foreign Language (EFL) Context
Presenter: Moonyoung Park
Major: Applied Linguistics and Technology
Adviser: Carol Chapelle

Aviation English can be defined as a comprehensive but specialized subset of English for Specific Purposes (ESP) related broadly to aviation which consists of both the plain language and aviation phraseologies for radiotelephony communications. A decade of research exploring aviation English in radiotelephony communication has highlighted the limitations of the non-native English speaking air traffic controllers' and pilots' poor command of English as a possible threat for aviation safety. Hence the International Civil Aviation Organization (ICAO) policy requires non-native English speaking air traffic controllers and pilots to bring their English to an appropriate standard. Responding to urgent needs for aviation English training, this study aims (1) to identify phonetic and semantic characteristics of aviation language between English and Korean through contrastive analysis of aviation English and Korean; and (2) to present a possible approach to aviation English training more suitable to the non-native English speaking air traffic controllers and pilots in Korea. The present study is based on the two sources of data: (1) 90 episodes of radiotelephony discourse recorded in air traffic control centers in Korea exemplifying routine air traffic control situations involving native English speaking pilots and Korean English speaking air traffic controllers, and (2) a focus group and individual interviews with selected Korean aviation personnel eliciting their interpretations of these episodes and of issues in aviation English communication more generally. Findings suggest that first language influences for communication problems in aviation English are distributed across non-native English speaking air traffic controllers. Implications are drawn for the effective aviation English communication training of non-native English speaking aviation personnel in Korean context.

3:25PM
Nano-photonic Organic Solar Cell Architecture for Advanced Light Trapping with Dual Photonic Crystals
Presenter: Akshit Peer
Major: Electrical Engineering
Adviser: Rana Biswas

It is critical to achieve broad band harvesting of solar photons to enhance the efficiency of thin film solar cells. Organic solar cells have shown remarkable progress recently, but still only absorb less than 50% of the solar spectrum. P3HT-PCBM cannot effectively absorb red photons (λ>600 nm) and deep blue photons (λ<480nm) because of the long photon absorption lengths in these wavelength ranges. Similarly, the absorption of photons is very weak in PTB7 beyond 700nm. To increase the broad band absorption of light, we design periodically textured organic solar cells that can be experimentally realized. These periodic structures strongly diffract light resulting in waveguide modes, and in addition demonstrate plasmonic concentration of light. We utilize rigorous scattering matrix simulations where Maxwell's equations are solved vectorially. Our optimum nano-photonic solar architecture consists of multiple photonic and plasmonic crystals. The cathode is periodically textured with a periodic array of nanoparticles that both strongly diffracts light and generates plasmonic concentration of light intensity. In addition, there is a polymer lens on the glass side that focuses light on the nanoparticles at the absorber layer cathode interface, and enhances further the plasmonic effects. This nano-photonic architecture with pitch 500-600 nm leads to very large absorption enhancements of 48% and current enhancements of 56% relative to the flat cell, with the usual 100-190nm P3HT-PCBM thicknesses. This architecture is experimentally feasible since it does not require spin coating on corrugated surfaces. Moreover patterning the organic layer before cathode deposition has been demonstrated in recent experiments and lens arrays on glass are routinely developed. The proposed configuration is more feasible than patterning the entire organic solar cell. This architecture is a unique way to control the interaction of light with nanostructures, and has the potential to achieve >12% efficient single junction organic solar cells.

3:40PM
Choices in Rhetorical Presentation: The Display Audience or Direct Mass Address
Presenter: Victor Perry
Major: Rhetoric and Professional Communication
Advisers: Ben Crosby and Dave Roberts

Media of instant mass communication allow well-positioned rhetors to address unseen audiences with simulated intimacy. For example, Franklin D. Roosevelt's "Fireside Chats" of the 1930s are an early and archetypal model for this kind of presentation, the name suggesting thousands of individualized domestic interactions, each one between the President and a handful of listeners in their home. Yet many mass rhetorical communications are not delivered in this manner. Instead, a rhetor is shown addressing a physically present audience - defined here as a display audience - whose presence and reactions become part of the rhetorical artifact. For example, the fame as well as the meaning of John F. Kennedy's "Ich bin ein Berliner" speech of 1963 is inseparable from the broadcasts of his delivery of the speech to a huge crowd in Berlin and their ecstatic responses. For the mass audience, the broadcasted reactions of a physically present audience constitute a display audience that influences their own reactions. Rhetorical theory, much of which long predates mass media, has lacked a vocabulary to discuss the differences that these variable settings could make to mass audiences and to the analysis of their responses; rhetoricians have generally been more likely to analyze the audiences implied by rhetorical texts. Delivery, a part of the classical rhetorical canon that often fades to the background because of the dominance of textual rhetorical analysis, is also foregrounded through this approach. The primary purpose of this presentation is to define and explore the rhetorical differences made by the broadcasted presence - or absence - of a display audience on the production and reception of rhetorical appeals.

3:55PM
Factors Associated with Parent Concern for Child Weight and Parenting Behaviors
Presenter: Karissa Peyer
Major: Kinesiology
Adviser: Greg Welk

A parent's perception about their child's overweight status is an important precursor or determinant of preventative actions. Acknowledgement of, and concern for, overweight may be moderated by the parent's own weight status while engaging in healthy behaviors at home may promote healthy weight status. It is hypothesized that normal-weight parents are more likely to engage in healthy behaviors and acknowledge overweight in their own children while heavier parents may report more concern about child weight. 1745 parents of 1st through 5th grade students completed a questionnaire assessing reactions to a school BMI report and perceptions about BMI issues. Specific items included perceptions of child's weight status, concern for child weight status and preventive practices. Parents also provided information about their own weight status. Relationships between measured child weight, perceived child weight, parent weight, parent concern and healthy behaviors were examined. Overweight parents were more likely to identify overweight in their child and to report concern about their child's weight. Concern was higher for parents of overweight children than of normal-weight children. Normal-weight parents and parents of normal-weight children reported more healthy behaviors. Results support the hypothesis that normal-weight parents are more likely to engage in healthy behaviors and that overweight parents are more likely to report concern about child weight. However, overweight parents are also more likely to acknowledge overweight status in their own child. Future research should examine links between parent concern and actual pursuit of weight management assistance.

Session X
Room: 262 Design
Moderator: Fei Wang
Judges: Dr. Christina White, Dr. Fan Yang, and Dr. Mazin M Al-Zou'bi

3:10PM
Presentation of Crime Data on Interactive Maps
Presenter: Angela Richard
Major: Rhetoric and Professional Communication
Adviser: Abby Dubisar
In our modern world, it has become an accepted fact that technology frequently causes unintended consequences even in the process of solving more immediate problems. Citizens in a democracy ask for and need transparency from governmental bodies in order to be better informed and able to participate in policy decision making. One of those areas where citizens ask for transparency is in the publication of timely crime data. Simultaneous with the growth of community policing methods in the 1980s and 1990s, law enforcement agencies started using technology more strategically to collect, consolidate, and report crime data to the public. The internet and interactive crime maps based on GIS technology are the most prevalent methods of notifying the public of crime activity in their neighborhoods and cities. The apparently transparent publication of this crime data is complicated by the fact that maps in general are socially constructed artifacts with sometimes hidden limitations and ideologies. Average citizens who rely on these crime maps for accurate information in order to make both private and public decisions are usually not aware of the complications and frequently may not have the analytical skills to "read" these crime maps. In a rhetorical analysis of two crime maps affiliated with San Francisco—one sanctioned by the police department and the other created by a private design firm—I explore the benefits and complications of crime maps in relationship to the needs of citizens in a democracy. I also explore some potential "fixes" or improvements that could achieve the goal of timely reporting while still providing contextual information so that viewers of the maps can make decisions based on more accurate and complete information.

3:25PM

Composition Students Can Form Community and Improve Writing through Feedback within a Virtual Peer Review System

Presenter: Kathy Rose

Major: Rhetoric and Professional Communication

Adviser: Barb Blakely

Students in composition classrooms often engage in peer review activities where they read drafts of each other's essays and offer revision feedback. A pedagogically sound practice, peer review does not always accomplish its goal of helping students develop better critical writing skills. This researcher focused a qualitative study on students in two composition classes by examining survey reactions about their experiences with peer review and examining their responses to each other's work in an online peer review system. The purpose was to understand student perceptions about what impedes writing improvement in the peer review process. Methods included a grounded theory emic approach with an intensity sampling of the researcher's classes, which included her perceptions about productive community-building moves; she argues that an important aspect of peer review is that students in a class can develop interpersonal skills and connections that enable community in a blended environment. The researcher shows how these classroom interactions fit the framework John Swales (1990) established defining the characteristics of a discourse community. Results include how: a) these students prefer anonymous peer review, b) teacher endorsements clarified conflicting advice and increased confidence in reviewers, c) teacher directions about appropriate facework enabled students to offer and accept constructive criticism, d) teacher endorsement requires a substantial time commitment, and e) students appreciate substantive comments but do not always receive them. Conclusions imply that: a) online systems can facilitate anonymity and teacher endorsement, b) teachers need to teach students how to give substantive, face-saving feedback and allow them opportunities to practice mindfulness about their skills, and c) teachers need to reconsider how much time they allow for revision in a writing class. With appropriately timed teacher intervention and instruction, students can form a sense of community in composition classes and offer feedback that improves the writing process.

3:40PM

Phase Field Approach to Multiple Twinning and Variant-Variant Transformations in Martensite

Presenter: Arunabha Roy

Major: Aerospace Engineering

Adviser: Valery I. Levitas

In the paper, an advanced phase field approach to transformation between martensitic variants / and multiple twinning in martensitic variants is developed which resolves numerous existing problems. Large strain and rotation formulation is developed, which is not based on simple shears along all numerous possible twinning systems. New set of the order parameters is chosen that allowed us to describe transformation between martensitic variants Tj and Ti and all twinnings between them with a single order parameter. This gave us an opportunity to develop a strict and well-controlled description of Tj-Ti transformations and multiple twinnings, including expressions for interface tension, completely similar to that for phase transformation from austenite to single martensitic variants. The finite element algorithm and procedure is developed and implemented in the COMSOL and applied to the solution of a number of examples of twinning and combined austenite-martensite and martensite-martensite phase transformations and nanostructure evolution for various complex loadings. Examples include nanoindentation and double indentation, as well as thermally induce martensitic phase transformation. Twin tips bending and splitting, as well as twins crossing are reproduced. A similar approach can be developed for electric and magnetic phase transformations.

3:55PM
Novel Capacitive-Based Sensor for Structural Health Monitoring Applications
Presenter: Hussam Saleem
Major: Civil Engineering
Adviser: Simon Laflamme
A bio-inspired sensing membrane is proposed for large-scale civil applications; the membrane consists of a network of soft elastomeric capacitors (SEC). Each SEC is made of a polymeric dielectric sandwiched between two electrodes. The SEC is capable of transducing any strain experienced on a surface into a change in its electrical properties which can be monitored using a data acquisition system. The advantages of using the sensing membrane include the use inexpensive materials to fabricate the sensor, durability, customizability in shapes and sizes and simple signal processing is required for data interpretation. The performance of the sensor to monitor strain, localize cracks, and detect vibration signatures is demonstrated. Results show the promise of the SEC at monitoring of large surfaces for local as well as global structural behavior.

Session XI
Room: 416 Design
Moderator: Mengguo Yan
Judges: Dr. Chris Minion, Dr. Laura Jarboe, and Dr. Adriana Valcu

3:10PM
Trapped Between Worlds: Heredity and Patriarchal Imprisonment in 'Summer'
Presenter: Caroline Martin
Major: English Literature
Adviser: Sean Grass
This paper explores the discussion of the societal entrapment of women within Edith Wharton's novella Summer. I examine the cultural components that play a role in creating a lack of options for women during this period, with a particular focus on the patriarchy as depicted within the work. Secondary to this discussion is the theme of nature over nurture, the language of which is embedded in the novella. I look at "family study" works contemporary to the novella, tying the implications regarding "degenerate" familial descent suggested in these works back to the reality depicted in Wharton's text. I further explore the themes of ancestry addressed in the novella in order to arrive at an understanding of whether nature dictates the individual or the individual dictates their own nature. In the end, I reject the notion, by way of Wharton's work, that nature wholly guides one's destiny. This rejection allows me to return to the role that patriarchal oppression plays in the novella. Ultimately, Wharton's message is a bold one; it insists that women's worth can—and must—exist beyond the realm of male-centric power, which was indeed a subversive suggestion for her time.

3:25PM

Colonizing the Countryside: Rural Newspapers and the Discourse of Rural Modernization in America and Russia, a Transnational Perspective

Presenter: Jack Seitz

Major: Agricultural History and Rural Studies

Adviser: James Andrews

This paper analyzes the discourses of rural modernizers in Russia and the United States in the late 19th century, specifically in rural newspapers. It examines the ideas of rural modernization as a transnational force, and explores the connections between it and colonial ideologies. In doing so, it uncovers surprising similarities between seemingly disparate places and impulses. In both regions the ideologies of rural modernizers and colonial authorities were built on the idea of a "correct" and an "incorrect" way of doing things. What is more, this distinction between correct and incorrect was not presented as though it was derived from emotion or obvious political ideology, but rather as an emotionally detached and "objective" way of seeing the world based on science and reason. / In order to "fix" the countryside, rural modernizers developed an array of criticisms and proposed solutions that relied on a faith in their own objectivity. This paper examines several desires of rural modernizers that were shared by proponents of modernization in both the United States and Russia, and examines the possible negative effects of the proposed solutions—many of which would later be adopted by governments, farmers, and experts alike. It also explores how these critiques and a faith in objectivity might exert a type of power over the countryside that allowed rural modernizers to present their solutions as inevitable regardless of their effects on rural communities. In doing so, this research enters into the ongoing conversation that seeks to help us understand how the countryside came to be a place of seeming contradiction, as it is simultaneously a place of great agricultural productivity as well as population decline.

3:40PM

Using Web Scraping Technology to Automatize Cost Data Collection for Calculating Construction Cost Indexes

Presenter: Joseph Shrestha

Major: Civil, Construction, and Environmental Engineering

Adviser: David Jeong

Construction Cost Index (CCI) and Building Cost Index (BCI) published by Engineering News Record (ENR) are two of the very popular cost indexes used in the industry. Many state DOTs publishes their highway construction cost indexes to keep track of the current trend of cost escalation. The ENR BCI and ENR CCI are prepared by collecting cost data from agents of the 20 cities in the country. Such manual process of collecting cost data can be costly. The proposed method of price data collection, based on a computer technology called "web scraping," can automatically collect material prices and labor wage rates from the websites of material suppliers and labor unions. The material price data and labor rate can then be used to calculate various construction cost indexes. As a proof of concept, an application has been developed that collects price data from one of the popular chain store websites that sells the construction materials in small scale. The collected data is then stored in a MySQL database for further use. The benefit of using this technology is ability to calculate the indexes as often as required. Also, it would be easy to extend the geographical coverage of the indexes based on the availability of the suppliers publishing the cost data online for that location. The limitation of the technology is that if there are changes in the structure of the website which are beyond the changes in just a layout of the website, then the system is likely to break requiring a manual fix.

3:55PM
TALEN-induced Somatic Inactivation of rb1 Tumor Suppressor in Zebrafish Leads to Central Nervous System Tumors
Presenter: Staci Solin
Major: Molecular, Cellular, and Developmental Biology
Adviser: Maura McGrail

Disruption of tumor suppressor rb1 is found in many human sporadic cancers. Our objective was to isolate an rb1 null allele for use in studying its role in zebrafish tumorigenesis. We discovered that somatic inactivation of rb1 leads to solid tumor formation in the central nervous system of adult zebrafish. To isolate an rb1 null allele we designed a pair of TAL-effector nucleases to target the second exon of rb1. 25-200 pg of rb1-TALENs were injected into one-cell zebrafish embryos. 100% bi-allelic inactivation of rb1 was detected in more than half of injected embryos. We recovered 4 new rb1 alleles in the F1 generation including frameshift and in frame deletions. We observed that at six months of age F0s injected with 150-200 pg developed tumors in the brain at a frequency of 4/24 to 3/6. Histopathology revealed massive overproliferation in the diencephalon disrupting normal brain architecture. The tumors contain small blue cells that are undifferentiated, dense, and round, indicating some similarity to human pineoblastoma. In the retina regions of disorganized, proliferating cells in the ganglion cell layer, inner plexiform layer and ciliary marginal zone were observed in 2 of the brain tumor bearing fish. Sequencing of rb1 alleles revealed a single allele in tumor in contrast to multiple alleles in other somatic tissues indicating loss of heterozygosity in the tumor. Somatic inactivation of rb1 induces retinal and brain neoplasms in adult zebrafish. We will further develop the zebrafish TALEN somatic mutagenesis to examine the functional interaction of pRb with tp53 and other tumor suppressor pathways implicated in brain cancer progression.

Session XII

Room: 362 Design
Moderator: Avipsa Ghosh
Judges: Dr. Martino Harmon, Dr. Mary Weidenhoeft, and Dr. John Pleasants

3:10PM
Do biotype-1 Soybean Aphids Benefit from the Presence of Biotype-2 on Resistant Soybean?
Presenter: Adam Varenhorst
Major: Entomology
Adviser: Matthew O-Neal

Despite the genetic bottleneck that soybean aphids passed through on the way to North America and the sparse use of aphid-resistant soybeans (i.e. Rag genes) in North America, biotypes have been identified that overcome this resistance. Plant defenses may be up regulated based on the density of herbivores attacking the plant. However, large populations of insects can overcome plant basal defenses thereby inducing susceptibility. Induced plant susceptibility allows for avirulent populations of insects to feed on resistant plants. Our objective was to determine if a population of virulent biotype (biotype-2) soybean aphids could facilitate the growth of an avirulent (biotype-1) population on soybean containing the Rag1 gene. We compared the impact of an initial population of biotype-1 and biotype-2 soybean aphids on a subsequent population of both biotype-1 and biotype-2. The initial population varied by two densities (0 or 50 aphids) and were caged on the first trifoliate of a V2 soybean plant. After 24-hours, a response population of aphids was placed on the second trifoliate, and the growth rate of this secondary population was measured over 10 days. Indicating that co-occurring biotype-1 and biotype-2 populations of soybean aphids on resistant soybean will be indistinguishable.

3:25PM

Highway Infrastructure Data and Information Integration & Assessment Framework
Presenter: Asregedew Woldesenbet
Major: Civil, Environemntal and Construction Engineering
Adviser: H. David Jeong

The American Society of Civil Engineers (ASCE) grades the highway infrastructure a D+ and estimates a $2.2 trillion need to bring the nation's infrastructure to a good condition over a five-year period. As the need for maintaining highways is significantly growing, agencies should have better management systems to make effective and reliable decisions for optimal use of limited financial resources. Today, the advancement in digital technologies has allowed State Highway Agencies to invest large amount of resources in collecting, storing and managing various types of highway project data during its life-cycle. Despite this investment, the current use is limited and minimal in extracting information and knowledge and supporting decisions. This paper presents a new approach of integrating and measuring highway infrastructure data and information use in making reliable highway infrastructure decisions through an application of a social network theory. The concept of social network theory is used as principal component to perform three tasks: interlink highway infrastructure data, information and decisions, identify key players in highway infrastructure decision-making process and assess the performance of highway infrastructure data use. Based on the analysis, a three-tiered hierarchical data and information integration framework is developed. The study also present a new performance measure, Highway Infrastructure Data Integration (HIDI) to facilitate active utilization of data. This new framework will set a benchmarking example to State Highway Agencies in the area of data and information integration to make effective and reliable decisions through data-driven insights. The output of this paper can also be used as a tool to evaluate data use that may serve as periodic infrastructure data report card and justify the return on investment on the growing data collection efforts.

3:40PM

Nudging Hybrid Vehicle Purchase by Framing Vehicle Cost and Fuel Economy
Presenter: Kam Leung Yeung
Major: Psychology
Adviser: Bethany Weber

Switching to energy-efficient vehicles such as hybrids can achieve a substantial reduction in carbon dioxide emissions. In deciding which vehicle to buy a common process is comparing two models side by side. But objectively identical vehicle information such as vehicle price and fuel economy can be framed in alternative format, thereby altering the perceived difference across models. In Study 1, college students indicated their purchase intention between a regular Camry and a hybrid Camry listed side by side. Framing fuel economy in mile per gallon (MPG) significantly increased purchase intention for the hybrid model compared to fuel economy framed as estimated annual fuel cost. When the vehicle prices were framed as the total amount of installments instead of each monthly installment, the purchase intention for the hybrid model increased when fuel economy was framed as MPG. A similar design in Study 1 was used Study 2, but with a different vehicle pair (Honda Accord) and with paid U.S. participants recruited from Amazon Mechanical Turk. The same patterns of findings in Study 1 were replicated. It is concluded that preference for hybrid vehicle can be altered by simply framing vehicle price and fuel economy in alternative format.

3:55PM

A Computer-based Inspection Method for Determining Surface Flaws of Wind Turbine Blades

Presenter: Huiyi Zhang

Major: Wind Energy Science, Engineering, and Policy

Adviser: John Jackman

Wind turbine blades made from fiber-reinforced composite material and surface coating protection layers account for a significant portion of wind farm maintenance costs due to internal and surface damage that occurs during operation. Surface damage (e.g., erosion, cracking, or peeling) can occur during the transportation, installation, and operation stages. Small cracks (as small as hairline thickness) can be a sign of a more severe problem and represent a challenge for existing inspection methods. This study examined a rotor blades surface crack optical inspection method with image processing techniques that can identify and quantify hairline thickness cracks. The method was compared with a platform-based visual inspection method and the results demonstrated that the optical inspection method performed consistently with a significantly low time and cost. Further studies were addressed after the methods comparison, which include a best fit-crack image capturing algorithm, and a identifying and eliminating environmental noises algorithm. These algorithms will be tested with both synthetic cracks and field images. Finally, a prototype rotor blades surface health inspection system with testing environment was described. This study is part of ongoing efforts to provide accurate and cost-effective inspection methods and these results support the feasibility of this approach.

3 Minute Thesis Competition
4:15PM – 5:00PM

Room: 1140 Howe Hall
Students will present their research in 3 minutes with one static slide. Audience will vote on their favorite presentation.

Judges: Jean Goodwin (English department), Dr. Chitra Rajan (Assistant Vice President for Research), Sophia Magill (Government relations), Dr. Holger (Dean of the Graduate College), and Richard Reynolds (Memorial Union Director)

Presenter	Major	Advisor
Rosemary Bulyaba	Agronomy	Andrew Lenssen
Michael Curtis	Human Computer Interaction	Stephen Gilbert
Catherine Delong	Soil Science	C. Lee Burras
Anthony Guerra	Undeclared	William Graves
Matthew Jefferson	Neuroscience	Russell E. Morgan
Sally Mallowa	Plant Pathology & Microbiology	Alison Robertson
Divita Mathur	Bioinformatics & Computational Biology	Eric R. Henderson
Joyce Pham	Chemistry	Gordon J. Miller
Rahul Roy	Genetics	Diane Bassham
Kevin Townsend	Computer Engineering	Joseph Zambreno

Keynote Speaker
5:00PM – 5:30PM

Room: 1140 Howe Hall
The Pros and Cons of Interdisciplinary Research

Stephen B. Gilbert will describe some of the challenges and benefits of conducting research across disciplinary boundaries, combining research on innovation and personal examples.

Dr. Gilbert has an interdisciplinary background, working 10 years in the software industry before returning to academia. He has a B.S. from Princeton in civil engineering and operations research and a Ph.D. from MIT in brain and cognitive sciences. He joined Iowa State in 2007 as a lecturer in Psychology and since 2012 is an assistant professor in Industrial and Manufacturing Systems Engineering. He has been Associate Director of the Virtual Reality Applications Center and its Graduate Program in Human Computer Interaction since 2009.

Awards Ceremony
5:30PM – 6:00PM

Room: 1140 Howe Hall
The following awards will be presented:

Top Posters	presented by Vivek Lawana, co-chair of the conference
Top Oral Presentations	presented by Zack Zenko, co-chair of the conference
3 Minute Thesis Winners	presented by Dr. Holger, Dean of the Graduate College
GPSS Awards	presented by Anna Prisacari, GPSS President

GPSS Spring Social
7:00PM – 9:00PM

Free pizza and bowling at Perfect Games. All graduate and professional students are invited.