Previous Award Recipients

2015
Oral Presentation
Maria Alcivar-Zuñiga, Human Development & Family Studies
Damarius Fleming, Genetics and Genomics
Augustine Beeman, Plant Pathology
Julia Anderson-Lee, Mathematics

Poster Presentations
Randie Camp, Human Development & Family Studies
Porsha Thomas, Toxicology

2014
Oral Presentations
Melissa Irizarry, Plant Pathology and Microbiology
Syed Maaz Gardezi, Sociology

Poster Presentations
Kelly Addelmassih, Apparel Events and Hospitality Management
Christine Hutchison, Food Science and Human Nutrition

2013
Oral Presentations
Andres Lopez, Sociology
Elease McLaurin, Industrial Engineering
Christine Hutchison, Nutritional Science

Poster Presentations
David Manu, Food Science and Technology
Rafael Martinez-Feria, Sustainable Agriculture

2012
Dedrick Davis, Soil Science and Environmental Science
Jose Guzman, Agronomy
Pedro Martinez, Immunology
Jessica Tate, Psychology

2011
Elizabeth Asque, Genetics Development & Cell Biology
Stephanie Link, Applied Linguistics and Technology
Kofi Whitney, Human Computer Interaction
Derrick Coble, Food Science and Technology, Interdepartmental Genetics

2010
James Delgado, Toxicology
Jeremy Brown, Electrical Engineering
Tyrone Moore, Mechanical Engineering
Brittany Porter, Food Science and Technology

2009
Dedrick Davis, Agronomy
Pedro Martinez, Ecology, Evolution & Organismal Biology
Ricardo Acevedo, Agriculture & Biosystems Engineering
Teske Drake, Human Development and Family Studies
J. Francisco Hernandez, Interdisciplinary Graduate Studies
Kendra Malone, Anthropology

Graduate College
A Message from the 10th Annual GMAP Research Symposium Planning Committee

We, the planning committee, welcome you to the 10th Anniversary of the GMAP Research Symposium. GMAP is a collection of initiatives designed to recruit and retain underrepresented students to the many graduate programs offered at Iowa State University. The symposium was created to showcase our research contributions.

The symposium is organized by graduate students supported by GMAP funding and it is our goal to highlight some of tomorrow’s leaders in education, social sciences, humanities, mathematics, science, and technology.

It is our hope that the excellence and commitment demonstrated by the presenters will not only attest to the legacy of greatness for Iowa State University graduate students, but also uphold the assurance of research excellence.

Today we are graduate students presenting our research. Tomorrow we will be the leaders in our respective fields. Thank you for your presence, enthusiasm, and support.

Best Regards,
2016 GMAP Research Symposium Planning Committee

Acknowledgements

The Graduate College
Faculty Judges
Dr. Craig Ogilvie
Dr. Zayira Jordan
Dr. Javier Vela-Becerra
Dr. Rajeev Arora
Dr. Jeff Essner
Dr. Clark Coffman
Dr. Ceren Gunsoy
Dr. David Vogel
Dr. Ashley Garrin

Session Moderators
James A. Walker
Antionette Fowlkes
William Davis-Hager
Christian Montes-Serey
Schedule

Registration
8:00 - 11:30am
Registration

8:30 - 8:50am
Opening Session
The Gallery
Welcome
Dr. David Holger
Associate Provost for Academic Programs
Dean of the Graduate College

Speaker
Dr. Dedrick Davis
Assistant Professor
Department of Biological and Environmental Sciences
Alabama A&M University, Huntsville, AL

9:00 - 10:00am
Concurrent Oral Presentations
Rooms 3505, 3558
1.A—Mathematics/Physical Sciences
1.B—Biological Sciences
1.C—Social Sciences/Humanities

10:00 - 11:00am
Poster Presentations
Pioneer Room

10:00 - 11:00am
Seminar—"Gaining an International Presence in Research"
Room 3534
Dr. Linda Hagedorn, Associate Dean of Undergraduate and International programs; Student Services; Diversity, Equity and Community Programs and Professor, School of Education

11:00 - 12:00pm
Concurrent Oral Presentations
Rooms 3505, 3558
2.A—Mathematics/Physical Sciences
2.B—Biological Sciences
2.C—Social Sciences/Humanities

12:15 - 1:30pm
Luncheon and Awards
Campanile Room
Speaker
Dr. Aurelio Curbelo
Director
Multicultural Center for Academic Excellence
University of Minnesota, Minneapolis, MN
Oral Presentations At A Glance
9:00 a.m. – 10:00 a.m.

Session 1.A Mathematics/Physical Sciences — Room 3505

1.A.I  Zach Benedict, Aerospace Engineering — Progress Towards the Development of a Compact Calibration Set for Quantitative NDE Inspection of Aerospace Composites
1.A.II Ricardo Martinez, Education - Student’s Perception on Part-Part Proportional Relationships

Session 1.B Biological Sciences — Room 3558

1.B.II Junmarie Soto-Burgos, Interdepartmental Genetics & Genomics - AKIN10 Regulates Autophagy in Plants

Session 1.C — Social Sciences /Humanities — Pioneer Room

1.C.I  Jorge Blanco-Herrera, Psychology - Mining Creativity: Video Game Creativity Learning Effects
1.C.II Carlos Casanova, Social and Cultural Studies in Education - Countering Dehumanization of Latin@ Youth Through a Liberating Pedagogy of Praxis

GMAP Symposium History

In the Fall of 2006, three graduate students (Aurelio Curbelo, Erik Otarola-Castillo, and Brian Campbell) accepted the challenge of planning the very first Graduate Minority Assistantship Program (GMAP) Research Symposium. Their vision was to highlight the research contributions of underrepresented minority students receiving GMAP funding. Students were invited to present their research in a professional environment allowing them to engage in fruitful discussion and to network with faculty and administrators.

In early 2008, the Graduate College allocated funding for the symposium and the three founders established a planning committee. Since then, the number of participants has grown each year. With the ongoing support of the Graduate College, the GMAP Research Symposium will continue to be an avenue for underrepresented graduate students to share their knowledge.
Oral Presentations At A Glance
11:00 a.m.—12:00 p.m.

Luncheon and Closing Session
12:15– 1:30pm

Welcome
Jennifer Major
Psychology

LUNCH

Tribute to Dr. George A. Jackson
Former Assistant Dean of the Graduate College

Introduction of Speaker
Maria Alcivar-Zuñiga
Human Development and Family Studies

Speaker
Dr. Aurelio Curbelo
Director Multicultural Center of Academic Excellence
University of Minnesota, Minneapolis, MN

AWARDS
Dr. William Graves
Associate Dean, Graduate College
Professor of Horticulture

Closing Remarks
Dr. Craig Ogilvie
Assistant Dean, Graduate College
Morrill Professor of Physics

Session 2.A Mathematics/Physical Sciences — Room 3505
2.A.I Chassidy Bozeman, Mathematics — Zero Forcing and Power Propagation Time
2.A.II Therin Young, Mechanical Engineering — Development of Durable Superhydrophobic Materials for Ice- and Snow-free Airport Concrete Pavements
2.A.III Chelsea Velasquez, Aerospace Engineering — Computational Study of Fluidic Actuators for Active Flow Control

Session 2.B Biological Sciences — Room 3558
2.B.I Daniela Flores, Interdepartmental Genetics and Genomics — Epigenetic Inheritance and Predisposition to Sex in Temperature-dependent Sex Determination
2.B.II Zachary Paige, Plant Breeding — Evaluating High-Nutrient Maize for Poultry Palatability
2.B.III Lauren Washington, Plant Pathology and Microbiology — Nanoparticle Mediated Seed Treatments: The Fight Against Fusarium

Session 2.C — Social Sciences /Humanities — Pioneer Room
2.C.I Daniel Bell, Human Computer Interaction — Autonomous Vehicles - Ontology of Social Inclusion
2.C.II Deborah Burns, Sociology — The Effects of Mainstreaming: Presentation of Gender in Popular Tattoo Magazines
2.C.III Yuk Pang, Human Development and Family Studies — Trajectories in Religious and Spiritual Development Among African American Young Adults
2.C.IV Paula Fender, Rhetoric and Professional Communication — Ancient African Rhetoric and its Relevance in Contemporary Composition Classrooms
Poster Presentations At A Glance
10:00 a.m. — 11:00 a.m.
Pioneer Room

I.P.1 Desmond Bonner, Human Computer Interaction and Industrial Engineering - Developing Game-Based Learning Requirements for Increasing Female Middle School Students' Interest in STEM Fields

I.P.2 Karri Folks, Ecology and Evolutionary Biology – Using Science Communication and Informal Education to Become an Informational Portal to the Public

I.P.3 Jorrell Fredericks, Interdepartmental Toxicology – Cytotoxic Effects of Metal Nanoparticles and Interaction with Microbial Components on Maintenance of Gut Epithelium and Mucosal Homeostasis

I.P.4 Michael Martinez, Political Science – Does Veteran Benefit Funding Affect Suicide/Homeless Rates?


I.P.6 Julio Rivas, Psychology – Belongingness, Intellectual Safety, and Academic Persistence Among Latino/a College Students


FACULTY JUDGES: Dr. Ashley Garrin

I.P.7 Haley Strass

Effects of stereotypical media representations of American Indians on implicit and explicit bias: The power of Pocahontas

Cultivation theory suggests people learn about the world from the media and social cognitive theory suggests we learn how to interact with our social environment through observing others. These theories provide an explanation for why stereotypical media might increase biased attitudes. No research has examined the connection between media portrayals and biased attitudes for American Indians, a group underrepresented in the media. This study assesses the role of stereotypical media portrayals of American Indians on explicit and implicit attitudes and examines the mediating impact of motivation to respond without prejudice and awareness of White privilege on these relationships. In this study, participants were randomly assigned to watch a series of videos representing either stereotypical portrayals of American Indians or control videos. Measures of explicitly biased attitudes, implicitly biased attitudes, awareness of White privilege, and motivations to respond without prejudice (both internal and external) were assessed. Results from three hierarchical regression analyses suggest that media impacts modern racist attitudes towards American Indians, but not general colorblind racial attitudes nor implicit attitudes towards American Indians. Importantly, this relationship between media portrayals and modern racist attitudes is moderated by one’s awareness of White privilege. Higher awareness of White privilege only led to less endorsement of modern racist attitudes towards American Indians when not presented with stereotypical portrayals of American Indians. There were no differences between those low and high on awareness when stereotypical media portrayals were present. Implications and limitations are discussed.
Belongingness, Intellectual Safety, and Academic Persistence Among Latino/a College Students

Latino/a high school graduates are attending college at higher rates than European American high school graduates, yet Latino/as are still lagging behind their European American peers in obtaining 4 year degrees (Fry & Taylor, 2013). The literature indicates that Latino/a students’ sense of belonging within the higher education environment and their intent to persist academically are related and important variables to understand when attempting to increase college degree attainment for Latino/a students. Nora’s Student Engagement Model (2002, 2003, 2006), itself an extension of Tinto’s classic Student Integration Model (1975, 2004) served as a theoretical framework for this study examining intellectual safety, which concerns Latino/as students’ reluctance to participate in classroom discussions because they do not believe their ideas will be accepted or valued. Data was collected from 95 undergraduate Latino/a college students on student’s level of perceived sense of belonging in college, intellectual safety and intent to persist in college. The relations among the three variables were examined. We examined the moderating effect of intellectual safety on the relation between Latino/a students’ sense of belonging in higher education and their intent to persist toward their college degrees. Additionally, a scale for intellectual safety was created for the study. An exploratory factor analysis was conducted to provide evidence for its usability. Conclusions and implications were discussed.

Progress Towards the Development of a Compact Calibration Set for Quantitative NDE Inspection of Aerospace Composites

Inspection of aircraft components for damage utilizing ultrasonic Non-Destructive Evaluation (NDE) is a time intensive endeavor. Additional time spent during aircraft inspections translates to added cost to the company performing them, and as such, reducing this expenditure is of great importance. There is also great variance in the calibration samples from one entity to another due to a lack of a common calibration set. By characterizing damage types, we can condense the required calibration sets and reduce the time required to perform calibration while also providing procedures for the fabrication of these standard sets. We present here our effort to fabricate composite samples with known defects and quantify the size and location of defects, such as delaminations (separation of the composite layers), and impact damage. Ultrasonic NDE is compared with thermography (the study of thermal gradients in a structure to detect defects) for comparison.

FACULTY JUDGES: Dr. Ceren Gunsoy

I.P.6 Julio Rivas

ROOM: 3505

FACULTY JUDGES: Dr. Craig Ogilvie, Dr. Zayira Jordan, Dr. Javier Vela-Becerra

1.A.I. Zach Benedict, Aerospace Engineering

Progress Towards the Development of a Compact Calibration Set for Quantitative NDE Inspection of Aerospace Composites

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FACULTY JUDGES: Dr. Craig Ogilvie, Dr. Zayira Jordan, Dr. Javier Vela-Becerra

1.A.I. Zach Benedict, Aerospace Engineering

Progress Towards the Development of a Compact Calibration Set for Quantitative NDE Inspection of Aerospace Composites

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1.A.II. Ricardo Martinez

**Student’s Perception on Part-Part Proportional Relationships**

Proportional reasoning has a crucial role in learning advanced mathematics and daily life, such as percent, slope, trigonometry function, or rate of change. Based on these beliefs, we designed this study to investigate how middle school students conceptualize ratios and proportions and what misconceptions they tend to attempt when solving tasks involving ratios and proportions. We investigated how middle school students approach a mathematical task that involves a proportional relationship in a real-life context. Only 10% of students provided correct answers and the rest of students demonstrated various misconceptions. Open coding was conducted revealing the following incorrect approaches, additive reasoning (A), cross multiplication (Cm), equal amount (E), equivalent ratios/fractions and whole number confusion (W). The results of this study indicate that some students in middle and high school do not have solid understanding of ratios and proportional relationships. This implies that they have not developed multiplicative reasoning although they have procedural knowledge of multiplication. As prior researchers found confusion with additive reasoning being one of the common reasons why students could not solve proportional tasks. However, we found that a significant portion of students have a difficulty using the whole quantity in the ratio. Our study may help mathematics teachers and educators identify what students need to learn to understand proportional relationships in the progression of multiplicative reasoning.

**Poster Presentations (continued)**

**FACULTY JUDGES: Dr. Javier Vela-Becerra & Dr. Linda Ambrosio**

I.P.5 Stephanie Oyola-Reynoso

**Recruiting Physisorbed Water in Surface Polymerization for Bio-Inspired materials of tunable hydrophobicity**

Chemical grafting has been widely used to modify surface properties of materials, especially surface energy for controlled wetting, because of the resilience of such coatings/modifications. Reagents with multiple reactive sites have been used with the expectation that a monolayer will form. Step-growth polymerization mechanism, however, suggests the possibility of gel formation for hydrolyzable moieties in the presence of physisorbed water. In this report, we demonstrated that using alkyltrichlorosilanes (trivalent [i.e., 3 reactive sites]) in the surface modification of a cellulosic material (paper) does not yield a monolayer but rather gives surface-bound particles. We infer that presence of physisorbed (surface-bound) water allows for polymerization (or oligomerization) of the silane prior to its attachment on the surface. Surface energy mismatch between the hydrophobic tails of the growing polymer and any unreacted bound water leads to the assembly of the polymerizing material into spherical particles to minimize surface tension. By varying paper grammage (16.2–201.4 g/m²), we varied the accessible surface area and thus the amount of surface-adsorbed water, allowing us to control the ratio of the silane to the bound water. Using this approach, polymeric particles were formed on the surface of cellulose fibers ranging from ~10 nm to a film. Hydrophobicity of the surface, as determined by water contact angles, correlates with particle sizes (p < 0.001, Student’s t-test), and, hence, the hydrophobicity can be tuned (contact angle between 94° and 149°).
I.P.4  Michael Martinez

Does Veteran Benefit Funding Affect Suicide/Homeless Rates?

This research analyzes the budget of both federal and state level agencies focused on veteran benefits, as well as the suicide and homeless rates of veterans in every state. The goal of this project is to indicate whether areas that commit more funding toward veteran assistance do indeed have lower suicide and homeless veteran rates as opposed to areas that commit less funding. My research is gather from the federal and state budgets, various homeless studies and organizations, and studies of veteran suicides. The focus is to help indicate if there is a relation of funding toward these social programs and the effectiveness of that funding. Is more money solving the veteran homelessness and suicide epidemic?

Phylogenetic Reconstruction of the Paper Wasp Genus Polistes (Hymenoptera: Vespidae)

Kevin Quinteros

The genus Polistes (paper wasps) is a diverse genus of insects with over 200 species that are distributed across six continents. The genus is a model taxonomic group for studying the evolution and maintenance of social behavior. Although they are eusocial, meaning colonies consist of reproducing queens and non-reproducing workers, their social behavior is somewhat primitive in nature, providing a useful system for studying the evolutionary transition from solitary to eusocial. There is variation within the genus in the extent of cooperative breeding, where multiple female wasps can establish a nest and take care of offspring. Evidence suggests cooperative breeding is a driver in the evolution of complex social traits such as facial recognition. In order to understand the mechanisms underlying the evolution of social behavior and associated traits in this genus, a well supported and robust phylogeny is needed, which we lack. This study produces a rooted phylogeny of 58 Polistes and 8 out-group species using morphological and molecular data of six genes (COI, 12S, 16S, 28S, H3, and EF1-a) obtained from previous published analyses. Bayesian inference was used to produce the phylogeny using the programs Revbayes and BEAST. Our most supported tree topology was time calibrated using available data from the Polistes fossil record, under the fossilized death birth model in BEAST. The results from our phylogeny will be used in future analyses by incorporating biogeography data to reconstruct the ancestral geographic range of Polistes and improve understanding of the evolution of social traits in the genus.
**AKIN10 regulates autophagy in plants**

Autophagy is a degradation process in which cells break down and recycle their cytoplasmic contents when subjected to environmental stress or developmental cues. In plants, autophagy is involved in stress tolerance. Several regulators of autophagy have been identified in mammals, yeast, and plants. AMPK (AMP-kinase; mammals) and SNF-1 (Sucrose-non-fermenting-1; yeast) are protein kinases that function in the activation of autophagy in response to decreased energy levels. The SnRK1 (Snf1-related kinase-1) complex is the plant ortholog of AMPK and SNF-1. Two isoforms exist of the catalytic subunit of the SnRK1 complex, AKIN10 and AKIN11, of which AKIN10 is responsible for most of the activity. We therefore hypothesized that AKIN10 may play a role in the regulation of autophagy in Arabidopsis, as in mammals and yeast. We determined the effect on autophagy of alterations in the amount of AKIN10 and AKIN11 using transgenic lines overexpressing AKIN10, or akin10 and akin11 mutants. Plants were exposed to various abiotic stresses and autophagy activity measured. While autophagy was not active in wild-type plants or akin10 and akin11 mutants in control conditions, AKIN10 overexpression lines had increased autophagy under these conditions. In the akin10 mutant, autophagy was not induced by most of the abiotic stresses, with the exception of osmotic stress. In the akin11 mutant, autophagy was induced during salt and starvation stress, but not by osmotic stress. These results suggest that AKIN10 and AKIN11 are positive regulators of autophagy, with AKIN10 playing a more prominent role in most stress conditions but AKIN11 acting during osmotic stress.
Using Science Communication and Informal Education to Become an Informational Portal to the Public

Effective communication with the public is a key component of research outreach. As graduate students, our curriculums usually require some form of public outreach. You are expected to demonstrate the broader impacts of your research through multi-generational education, however training for this type of communication is usually not provided. Reiman Gardens (Ames, IA) provides outreach development and training to Iowa State graduate students, scientists, engineers, researchers, and other science-based professionals through their Portal to the Public Science Communication Fellowship. The fellowship provides training on how to effectively communicate your research to diverse audiences and enhance our science communication skills. Each fellow worked individually to develop a hands-on activity related to their specific research with an intention to share this activity with the general public through various programs at Reiman Gardens. The activities developed are presented at schools, conferences, and other educational or professional settings. My activity intended to demonstrate the skill sets required from primatologists to conduct behavioral research in the field. Activities included a “monkey charades” activity, intended to reveal some of the obstacles associated with deciphering primate behavior and a “monkey memory” activity envisioned to convey the complexity in identifying individual primates within a large troop.

Mining Creativity: Video Game Creativity Learning Effects

Most psychological studies into the learning effects of video games have focused on action video games. Playing action video games involves abstract thinking, imagination, generating ideas, and problem solving. While many studies have focused on aggression or reaction times effects, this kind of thinking, imagining, ideating, and solving are the cornerstones of creative thinking. This study seeks to expand the learning theory of video games into the realm of creativity. One of the best examples of a creative video game is Minecraft, often lauded for the creative freedom it gives its players. Our results show significant correlation between trait creativity and game play habits. Additional results show that players assigned to play Minecraft freely, without instructions, demonstrate significantly higher creativity compared to playing Minecraft with instructions to “be creative”, playing a driving game, or watching a television show. This indicates that learning effects aren’t solely predicted by game mechanics, but also the way the player plays.
Poster Presentations

FACULTY JUDGES: Dr. Craig Ogilvie & Dr. Linda Ambrosio

I.P.1. Desmond Bonner

Developing Game-Based Learning Requirements for Increasing Female Middle School Students’ Interest in STEM Fields

Females are underrepresented in Science, Technology, Engineering, and Mathematics (STEM) fields. Middle School is where students begin to determine where their interests are for careers. One way to increase interest is to use Game-Based Learning. This paper presents work on the development of requirements necessary to build a game to increase female middle school students’ interest in computer science (CS). Six requirements (Protagonist, Mechanics, Socialization, Fun, Uncertainty, and Story) were developed for inclusion into games for learning. A game to teach concepts of programming, SORCERESS OF SEASONS was developed to evaluate the effectiveness of the requirements. Fifteen middle school students played the game during an exploratory experiment and provided feedback on the requirements, their learning, and their interests in STEM fields. Students’ responses demonstrated that a game developed under the requirements positively impacted both male and female middle school students. Performance assessments throughout the study showed an increase in CS comprehension in students. Finally, playing the game had a positive effect on students’ attitudes towards STEM. The results suggest that the requirements may be helpful when developing games with a goal of increasing interest in STEM in these students.

Session 1.C. Oral Presentations
Social Sciences Humanities (continued)

1.C.II Carlos Casanova

Countering Dehumanization of Latin@ Youth Through a Liberating Pedagogy of Praxis

This on-going ethnographic study examines how a counter-space offers Latin@ students a liberating pedagogy of praxis that counters the dehumanization they experience in public education. This study used Solorzano and Bernal (2001) transformational resistance framework to capture transformational actions that resulted from the implementation of a pedagogy of praxis. This study found Latin@ high school students’ engage in oppositional behavior that leads to transformational resistance and social justice in their schools. The researcher spent nearly 100 hours over eight months in the field conducting participant observation, focus group interviews, and personal reflection essays. Observational data was collected from Latin@ youth across the state during events such as Latin@ Identity Object Sharing activity and youth presentations on college campuses. One focus group interview was conducted with three seniors as well as one youth led focus group. Tentative results reveal participants engage in both forms (internal and external) of transformational resistance. For example, participants are inspired to graduate from college and give back to the community through service professions. Also, participants engage in presentations on college campuses with future teachers about unfair treatment by teachers due to their Latin@ness.

1.C.II Lauren Malone,

As institutions of higher education make strides towards building inclusive campuses, the area of promotional materials becomes even more important in maintaining the ethos of the school. Through visual rhetorical analysis of a wide selection of admissions materials, this paper seeks to answer if schools are finding effective ways of promoting diversity and inclusion, or if multicultural representation veers to the side of tokenism. Finding the balance between accurate representation and showing your school’s commitment to inclusion can be difficult, and this paper seeks to find any trends in promotional materials that could make admissions professionals’ lives easier in that respect.
Ancient African Rhetoric and its Relevance in Contemporary Composition Classrooms

This presentation explores the history of rhetoric that can be placed in the context of contemporary college classrooms. Though US colleges explore and teach the fundamentals of rhetoric from a Greek perspective, I will share with you the oratory heritage of ancient Kmt, now called Africa, where rhetoric began (Diop 2008; Hilliard, Williams, and Damali 1987; Jackson II and Richardson 2003; Semmes 1992) and how its authentic history shapes and informs African American culture, particularly in college class rooms. Contemporary college classrooms can remediate their practices of teaching rhetoric by exploring it through the lens of Egyptian’s ancient rhetorical traditions. African American (AA) students maintain their oral traditions through storytelling and contemporary religious rhetoric. The scholars I attribute my research to will show that the oral rhetorical traditions of ancient Africa, African American spirituality, and AA linguistic patterns can help teachers of AA students in the contemporary classroom.

Zero Forcing and Power Propagation Time

Zero forcing on a simply graph is an iterative coloring procedure that starts by initially coloring vertices white and blue and then repeatedly applies the following color change rule: if any vertex colored blue has exactly one white neighbor, then that neighbor is changed from white to blue. Any initial set of blue vertices that can color the entire graph blue is called a zero forcing set. The zero forcing number is the cardinality of a minimum zero forcing set. A well known result is that the zero forcing number of a simple graph is an upper bound for the maximum nullity of the graph A variant of zero forcing, known as power domination (motivated by the monitoring of the electric power grid system), uses the power color change rule that starts by initially coloring vertices white and blue and then applies the following rules: 1) In step 1, for any white vertex w that has a blue neighbor, change the color of w from white to blue. 2) For the remaining steps, apply the color change rule. Any initial set of blue vertices that can color the entire graph blue using the power color change rule is called a power dominating set. We present results on the power domination problem of a given graph by considering the power dominating sets of minimum cardinality and the amount of steps necessary to color the entire graph blue.
2.A.II  Therin Young

Development of durable superhydrophobic materials for ice- and snow-free airport concrete pavements

Superhydrophobic surfaces that mimic surfaces found in nature, such as the lotus leaf, are an attractive research topic in various fields of study because of their numerous applications. More recent studies have focused on superhydrophobic surfaces that reduce or completely stop the accretion of ice and snow on power lines and aircraft that operate in cold regions. The superhydrophobic phenomena is usually achieved by creating a dual-scale roughness that is composed of micro- and nano-scale structures that trap air in-between themselves and reduce the surface energy of the textured surface. The objective of this study was to assess the tribological behavior of micro/nano particle based superhydrophobic coating mixtures composed of PTFE, composite PTFE/PEEK, diatomaceous earth (DE), and composite PTFE/ZnO that can be potential candidates for anti-wetting and anti-icing applications for transportation systems. A contact profilometer was used to measure and characterize the average roughness and thickness of coatings. Coating wettability was assessed by measuring the tangent-line contact angle of static water drops on coated surfaces. Friction and cyclic abrasive wear tests were conducted via ball-on-flat tribometer using a spherical tungsten probe at room temperature. Scanning electron microscopy was used to characterize the physical and chemical properties of the coatings and identify the wear mechanisms. The results showed that all coatings except ZnO/PTFE exhibited superhydrophobicity. Abrasive wear mechanisms were the dominant modes for the coatings. PTFE and ZnO/PTFE coatings displayed good wear resistance, superior to that of the DE and PTFE/PEEK coatings.

Session 2.C. Oral Presentations
Social Sciences Humanities (continued)

2.C.III  Yuk Pang

Trajectories in religious and spiritual development among African American young adults

Religiosity and spirituality have been an important component within the African American culture throughout U.S. history. Previous research has documented the importance of religion to African Americans, particularly in terms of coping with the negative experiences they face in the U.S. While many studies have focused on the positive impact of religiosity and spirituality on African American’s mental health, fewer studies have addressed change in African American’s religiosity over time, especially during the period when they transition from adolescence into young adulthood. Utilizing data from the Family and Community Health Study (FACHS), a longitudinal study that examines African American families, this study extends the current state of the literature by examining and identifying multiple trajectories in African American adolescents’ religious development. Sociocultural factors that predict long-term growth, decline, or stability in their religiosity will also be examined. Finally, the present study will test for both gender and regional differences in African American religious and spiritual development.
The Effects of Mainstreaming: Presentation of Gender in Popular Tattoo Magazines

In the past, tattooing was viewed as primarily an unacceptable and deviant practice in the United States. However, this has largely changed and the current views on tattooing have broadened to span those who still view it as a generally deviant practice to a widening group who see it as an acceptable form of expression, pride and art. One reason for the possible change in attitudes towards tattooing in the United States is due to its exposure and integration into mainstream culture through mass media. Roughness that is composed of micro- and nano-scale structures that trap air in-between themselves and reduce the surface energy of the textured surface. The objective of this study was to assess the tribological behavior of micro/nano particle based superhydrophobic coating mixtures composed of PTFE, composite PTFE/PEEK, diatomaceous earth (DE), and composite PTFE/ZnO that can be potential candidates for anti-wetting and anti-icing applications for transportation systems. A contact profilometer was used to measure and characterize the average roughness and thickness of coatings. Coating wettability was assessed by measuring the tangent-line contact angle of static water drops on coated surfaces. Friction and cyclic abrasive wear tests were conducted via ball-on-flat tribometer using a spherical tungsten probe at room temperature. Scanning electron microscopy was used to characterize the physical and chemical properties of the coatings and identify the wear mechanisms. The results showed that all coatings except ZnO/PTFE exhibited superhydrophobicity. Abrasive wear mechanisms were the dominant modes for the coatings. PTFE and ZnO/PTFE coatings displayed good wear resistance, superior to that of the DE and PTFE/PEEK coatings.

Computational Study of Fluidic Actuators for Active Flow Control

The fluidic actuators being evaluated in this research are robust devices that produce sweeping jets to improve aerodynamic performance. Current actuators that are integrated into aerospace vehicles are used to minimize control surface sizing and reduce fuel consumption. This research directly compares CFD simulations to experimental data for validation and to determine repeatability and reliability of actuators. This methodology allows for access to types of data that can be difficult to gather from wind tunnel experimentation. After the computational models were verified, additional simulations were executed to gather data at varying Mach conditions to see how the same models work at supersonic conditions. The purpose of this research is to also analyze the flow physics inside the actuators to get a better understanding of how fluidic actuators behave and what improvements can be made for a more efficient model. Supplemental to gathering the typical velocity and pressure data, flow visualizations were captured. The visualizations offer crucial insight when manipulating the geometry of the actuators. The research continues to modify the geometry of the actuators to change both the internal and external flow fields.
Vertebrates with temperature-dependent sex determination (TSD), a sex determining mechanism which relies on incubation temperature to determine the sex of developing embryos, are especially threatened by the impending changes in climate. Previous studies have suggested modes of inheritance in this system that may provide opportunities for these species to adapt to climate change, however a molecular mechanism remains elusive. Epigenetic studies have the potential to unlock crucial information previously cryptic in traditional genetic studies. DNA methylation is well-known for its dynamic ability to silence genes, and evidence is accumulating for its role in determining sex in TSD systems. Using the painted turtle, Chrysemys picta, as a model for TSD, this study investigated the heritability of DNA methylation and its ability to predispose individuals to a particular sex by observing the methylome at different life stages of related individuals. Clutches collected in the field were incubated at a temperature to produce both sexes. The adrenal-kidney-gonad complex was harvested from a subset of early-stage embryos and gonads from the remaining hatchlings were collected to compare basal and hatching methylation. These were also compared to the methylome of their respective mother to determine inheritance. Epigenetic inheritance has the potential to mediate the effects of climate change on the population dynamics of species with TSD. This can be leveraged by global conservation efforts, as well as evolutionary and ecological studies, as climate change threatens to extinguish reptiles with TSD.

Self-driving cars are already arriving to market one feature at a time. We already have cars with accident avoidance routines or convenience features such as the ability to park themselves. These cars are making us question something that we’ve grown to accept; that a machine invented as a substitute for horse and buggy, which has come and gone as symbols of generations and lifestyles, is becoming as impersonal as a household appliance. Between where we stand now, grinding our teeth while sitting in traffic, and the future where we merely summon the nearest Smart Sedan, there will be many iterations of new cars. Their success isn’t simply a question of engineering, technology, or cost. Success depends on whether or not people understand what these new “thinking machines” can or can’t do, and most importantly, do we trust it? The real challenge is in making these technologies into something people understand and want to use. This paper looks at social acceptance of other technologies through history, and some of the barriers to wide-spread adoption of autonomous vehicles.
Session 2.B. Oral Presentations
Biological Sciences (continued)

2.B.III Lauren Washington

Nanoparticle Mediated Seed Treatments: The Fight Against Fusarium

Fungicide seed treatments have long been a viable and effective strategy for protecting against seedborne and soilborne pathogens. However, losses to seeding diseases are still an important issue and there is a need for improved seed treatment efficacy. Amphiphilic polyanhydride nanoparticles have been used to enhance efficacy for several active ingredients in animal systems and have the potential for agricultural use. Nanoparticle encapsulation has the potential to reduce active ingredient dosage and to provide sustained release. In order to assess these potential benefits, we are developing a method to load polyanhydride nanoparticles with fungicide active ingredients, as well as create novel seed treatments, to protect maize seeds against seedling blight caused by Fusarium graminearum. The objectives of this study are to determine the efficacy of a reduced rate of nanoparticle-encapsulated thiabendazole for suppression of seedling blight on hybrid maize seeds.

Session 2.B. Oral Presentations
Biological Sciences (continued)

2.B.II Zachary Paige

Evaluating High-Nutrient Maize for Poultry Palatability

Evaluation of 20 lines of nutrient dense maize for high nutrient levels of carotenoids, amino acids- methionine and lysine, yield, pest resistance, standability and earliness will be conducted on four locations: two locations in Northern MN, IA and WI, with four repetitions in three seasons. The entries consist of six conventional hybrids, six hybrids from breeder Walter Goldstein with promising high nutrient/carotenoid content, one European hybrid, and seven open pollinated entries. Statistical data will be taken on these three groups: hybrids, Walter’s hybrids, and open pollinated corn for all selection criteria to help determine which group works best in organic growing systems. There will be a paired comparison palatability test with laying hens to see if the high nutrient corn is favored over conventional organic corn. The goal of our project is to produce a nutrient dense, locally adapted organically bred corn that is favorable for poultry palatability. This is important for Northern Minnesota farmers as they desire a more palatable organic corn feed for their poultry according to organic feed mills. The Minnesota climate has long winters where layers do not have access to grass and methionine is not present in the natural environment. By increasing the ratio of the limited amino acids into layer feed through classical organic breeding methods, the poultry will meet the amount of protein they require without the use of synthetic methionine. We are currently in the first year of our evaluations.