

**CONFERENCE PROCEEDINGS**

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*Listed below are abstracts of student-faculty collaborative work presented at regional, national, and international conferences.*

Mitchell Revalski

*(Paul Wiita, Faculty Sponsor)*

*Exploiting Kepler to Study Quasar Variability*

Presented at the 221<sup>st</sup> American Astronomical Society Meeting, Long Beach, CA, January 6-10, 2013

Variability of emission across all bands on both short and long-term time scales is a defining feature of active galactic nuclei. We present here an analysis of the optical light curves of four flat spectrum radio loud quasars, highlighting the two most recently released quarters of Kepler satellite data. Long cadence data sets were analyzed to search for flare activity and potential variability. Power spectral densities (PSDs) were used to probe for periodicities and to characterize the variability. We analyzed the raw data and also analyzed that same data after we made corrections to remove artifacts including null values, downlink gaps, and thermally induced irregularities. Often significant differences arose in the PSDs due to these corrections. The standard Kepler pipeline reduction was found to remove nearly all of the long-term variations in question. Additionally, we applied end matching to the raw corrected data so as to remove a first-order linear term; this should improve the accuracy of the PSDs. Average PSD slopes for the raw and end matched data sets were  $\alpha = -1.76$  and  $-1.60$ , respectively. These values are consistent with ground-based analyses of other quasars and blazars. One of our objects showed significant but modest flare activity whereas the others were in low activity states. No significant periodicities or quasiperiodicities were detected for these objects. This work was supported in part by NASA Kepler GO Grant NNX11AB90G to SSI and MUSE funds at The College of New Jersey.

Gabriel Randazzo and Lisa LaJevic

*(Lisa LaJevic, Faculty Sponsor)*

*Cleaning Our World Through Art: Exploring Ecology Through Contemporary Art.*

Presented at the National Art Education Association (NAEA) Conference, Ft. Worth, TX, March 7-10, 2013

Recent literature suggests the importance of incorporating contemporary art in the classroom (Mayer, 2008; Walker, 2001). Often exploring global issues, contemporary art investigates interdisciplinary themes that are prevalent in everyday life/culture, and challenges viewers/students to examine issues and formulate their own beliefs. Highlighting this philosophy, our presentation focuses on how contemporary artists who explore important ecological issues can be incorporated into the art classroom. Investigating artists such as Moose, Scott Wades and Alexandre Orion, and their working with reverse graffiti, an ecological reductive artmaking process that is created by removing dirt from a surface, we offer practical, innovative lesson ideas that integrate art with science. Supporting the conference theme, we explore global environmental issues such as pollution, and creative lessons that make a difference by actively cleaning up our community/ies through art. This presentation helps push traditional art education boundaries by promoting student understandings of art, ecology, world, and self.

Jessica Scardino

*(Lynn Gazley, Faculty Sponsor)*

*Religious Attendance and Happiness: An Application of Interaction Ritual Theory*

(1) Presented at the 83<sup>rd</sup> Annual Meeting of the Eastern Sociological Society, Boston, MA, March 21-24, 2013

(2) Presented at the 83<sup>rd</sup> Northeast Regional Honors Council Conference, Philadelphia, PA, April 4-7, 2013

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(3) Presented at the 108<sup>th</sup> Annual Meeting of the American Sociological Association, New York, NY, August 10-13, 2013

Previous research on the relationship between religiosity and happiness has emphasized that happiness results from the social cohesion experienced by belonging to a faith community and the development of positive coping skills. I propose that this relationship can also be explained using "Interaction Ritual" Theory (Collins 2004). Using data from the 2010 General Social Survey (GSS), this study examines the relationship between religiosity and happiness using a binary logistic regression. Findings indicate that when controlling for age, race, sex, and socioeconomic status, there is a positive relationship between the frequency of religious attendance and increased happiness levels. I then explain these findings considering religious services as an "Interactional Ritual" (Collins 2004). While this study uses an application of "Interaction Ritual" Theory in order to explain the positive relationship between happiness and religious attendance, the quantitative analysis may serve to support elements of Collins's theory by providing a measurable dimension of the emotional effects of ritual participation.

Francisco Estevez and Shahzore Qureshi

(S. Monisha Pulimood, Faculty Sponsor)

*Students Organizing Against Pollution: Computational Thinking Across Boundaries*

Presented at the ITiCSE 2013 ACM SIGCSE Conference, University of Kent, Canterbury, United Kingdom, July 1-3, 2013

There is a growing need in computer science education to develop courses that demonstrate the articulations between computer science and an array of computing-dependent fields. This poster describes an effort to develop a model for students and faculty to collaborate across disciplines and with a community organization to develop computational solutions to address complex real-world problems. Students in computer science classes are collaborating with students in journalism classes and Habitat for Humanity, to develop a web-based system that manages pollution related data. This is an initiative aimed at empowering citizens in the Trenton area of New Jersey with the opportunity to learn, share, and contribute pollution data while encouraging them to become participants in environmental advocacy and public policy deliberations on these issues. While students focus on the objectives of the individual courses, they are also deeply engaged in the complexities of privacy, security, accessibility of data, user-centered design, etc. as they ponder civic justice issues.

Amanda Soler, Tiffany Piatt, Leeann Thornton

(Leeann Thornton, Faculty Sponsor)

*Molecular genetic and biochemical analysis of the role of CYP72A cytochrome P450s in regulating plant growth*

Presented at the American Society of Plant Biologists National Conference, Providence, Rhode Island, July 20-24, 2013

Plant metabolic responses to environmental conditions require thousands of enzymes that must work in delicately balanced concert to facilitate plant growth and defense against pests. Plants with the most tightly regulated metabolism and growth are more likely to thrive. The cytochrome P450s (CYPs) are a group of enzymes that catalyze biochemical reactions in all organisms, and they are particularly important in plant metabolism. There are hundreds of CYPs in plants, and they are grouped into subfamilies based on genetic similarity. Our approach is to combine a molecular genetic analysis with biochemistry to describe subtle differences in apparently redundant CYPs from Arabidopsis. The CYP72A subfamily appears to contribute to producing defensive secondary metabolites in response to stress and herbivory. The subfamily is found in all plants but appears to be diversifying in recent evolutionary history. We are examining double and triple mutants to determine the role the enzymes play in maintaining optimal plant growth in Arabidopsis. We are examining the structural constraints of the subfamily that will provide insight into the biochemical activity of the group from multiple plants. We are also optimizing expression of the CYP72A enzymes in yeast for direct analysis of

substrate interactions. This work provides insight into the ongoing evolution of plant genomes and the metabolites produced by CYP72As.

#### Shannon Grooms

(Emily Bent, Faculty Sponsor)

(Re)theorizing the Margins: A Comparative Analysis of Gloria Anzaldua's *Borderdwellers* and Kate Bornstein's *Gender Outlaw*

Presented at the 22<sup>nd</sup> Annual Women and Society Conference, Poughkeepsie, NY, October 25-26, 2013

This paper is a comparative analysis of Gloria Anzaldua's conceptualization of the border dweller (1987), and Kate Bornstein's gender outlaw (1994). It underscores the theoretical similarities between these two divergent concepts, and in doing so, provides a framework for understanding the experiences of those forced to exist outside of culturally and geographically enforced binaries. The author reads Anzaldua's, *Borderlands/La Frontera: The New Mestiza* as a queer text, and places central concepts such as: the border dweller, the coalitque state, and new mestiza consciousness into direct conversation with Bornstein's theories on gender and male privilege, in *Gender Outlaw: On Men, Women and the Rest of Us*. Based on this theoretical analysis, the author suggests that the border dweller and gender outlaw experience parallel identities from the spiritual and physical consequences of being 'caught in between'. Where the *border dweller* experiences a hybridity that comes from the two locational oppositions, (i.e. the US/Mexico border), the *gender outlaw* experiences this hybridity as two oppositional genders, or the feeling of being neither fully male nor fully female. Taken together, this paper proposes that the border dweller and the gender outlaw offer us a new understanding of the margins and the marginalized experience than previously conceptualized in feminist scholarship.

#### Nahrin Ahmed

(Blythe Hinitz, Faculty Sponsor)

*Umar and the Bully: Teaching Anti-Bullying to Muslim-American Students*

Presented at the World Organization for Early Childhood Education (OMEPE USA) Conference, Washington, DC, November 21, 2013

This lesson was designed to enhance the development of minority students in activating specific background knowledge to teach anti-bullying. The intended goal is to increase participation through the use of information by making it familiar to minority populations. The lesson about anti-bullying is meant to address the role of the bystander to protect a victim of bullying. Elementary anti-bullying school lessons are commonly taught to the largest population of students to address the needs and issues of the majority. However, lessons tailored to specific subsets of students have shown positive gains in overall students' social/emotional wellbeing and their academic achievement (Macpherson, 2009). The anti-bullying lesson I covered was taught to fourth-grade students of Muslim-American background and their parents of Arab and/or South Asian ethnicity. We used the book, *Umar and the Bully*, by Shabana Mir, which tells a story about an incidence of bullying taking place at an Islamic school. We used this to discuss bullying and responses to bullying in terms, linguistically and religiously, specific to this population. The purpose of the lesson was to give Muslim students understanding of anti-bullying concepts taught in public schools by accommodating it to their populations' unique set of terminology and surroundings. Five months after the lesson was taught, the following school year, now as fifth-grade students, they revisited the lesson of *Umar and the Bully*. The students anonymously responded to how they would handle the role of a bystander from both religious and individual points of view. The students' answers showed their tendencies in responding to bullying as a bystander, to have an ingrained religious element.

References:

- MacPherson, Seonaigh. (2009). Teachers' collaborative conversations about culture: negotiating decision making in intercultural teaching. *Journal of Teacher Education*. 61(3), 271-286. doi:10.1177/0022487109353032
- Mir, Shabana. (2007). *Umar and the Bully*. Islamic Foundation UK.

Mitchell Revalski

(Paul Wiita, Faculty Sponsor)

*Investigating AGN Variability Using Combined Multi-Quarter Kepler Data*

Presented at the 223<sup>rd</sup> American Astronomical Society Meeting, Washington, DC, January 5-9, 2014

The study of long- and short-term variability in active galactic nuclei (AGN) yields deeper insight into the physical nature of their emissions from the accretion disk around, and relativistic jets powered by, a galaxy's central super-massive black hole. We have now obtained a total of eleven quarters of Kepler data on four radio-loud AGN. Our prior work involved calculating power spectral densities (PSDs) on these data both with and without corrections for various instrumental artifacts. We now focus on combining these data sets into one continuous set for each object which spans approximately 2.5 years at a 30 minute sampling rate with >98% duty cycle. The process of stringing together these data is complicated by the quarterly rolls the Kepler space satellite telescope conducts, which causes each target to fall on a different CCD four times per year. We attempt to overcome this problem with a scaling procedure that maintains the original percentage of variations and scales all eleven quarters to the overall average. We calculate PSDs on these stitched light curves both with and without various end-matching techniques applied to increase the accuracy of the PSDs. The PSDs computed for the stitched light curves allow us to probe a full decade lower in frequency than our previous work and show comparable slopes to the PSDs calculated for individual quarters, suggesting we are linking the quarters appropriately. Our average PSD slopes are consistent with ground-based observations of other quasars, falling approximately between -1.6 and -1.9. In addition, we have used original codes to bin and average individual PSDs to reduce the bias introduced on the slope-fitting process induced by the uneven population of points in the PSDs. This allows for a more accurate power-law fitting and tends to steepen the overall slope by approximately 0.1 in the majority of cases. We note increased flaring in one of our objects on the order of 15%, with our remaining three objects being more quiescent with occasional flaring. This work was supported in part by NASA Kepler GO Grant NNX11AB90G and MUSE funds through The College of New Jersey.

Susan L. Knox, Aubrey N. Johnston, and Rajesh Nagarajan

(Danielle Guarracino, Faculty Sponsor)

*Synthesis of 2,2'-dimethyldodecanoyl ACP to understand substrate specificity in LasI catalyzed Pseudomonas aeruginosa quorum sensing*

Presented at the 247<sup>th</sup> American Chemical Society National Meeting & Exposition, Dallas, TX, March 16-20, 2014

Bacteria use signal mols. called autoinducers to est. local cell population densities. This mechanism, referred to as quorum sensing, aids bacteria to form biofilms. The LasI AHL (acylated homoserine lactone) synthase enzyme in *Pseudomonas aeruginosa* uses 3-oxododecanoyl ACP and S-Adenosyl-L-methionine substrates to make 3-oxododecanoyl homoserine lactone autoinducer. To understand the importance of a carbonyl group in C3 position of acyl-ACP substrate in LasI catalyzed AHL synthesis, we decided to compare the catalytic efficiency ( $k_{cat}/K_m$ ) of 2,2'-dimethyldodecanoyl ACP substrate with 2,2'-dimethyl-3-oxododecanoyl ACP to understand substrate specificity at the 3-oxo position. We used a Meldrum's acid procedure to make the beta-ketoester, dimethylated at C2 position, reduced the carbonyl at C3 via a hydrazone intermediate, and then prepd. acyl-CoA through an N-acyl

imidazole intermediate. The final acyl-ACP purifn. will be done using phosphopantetheinyl transfer enzyme. We will use a colorimetric assay to det. the catalytic efficiency of this substrate.

Jennifer Schablik, Joyce Seifried, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

*A Biology Module for the Integrative STEM Classroom: Nucleotide Base Colorimetric Detection using Silver Nanoparticles*

Presented at the National Association of Biology Teacher (NABT) 2014 Professional Development Conference, Cleveland, OH, November 13-15, 2014

The purpose of this summer research project was to develop a lesson plan that implements basic concepts of nanoscience into the classroom to make students more aware of possible careers in the STEM discipline. The lesson plan is proposed as a criminal investigation where a forensic scientist develops a way to code for a sample of DNA using nanoparticles through the reduction of silver nitrate with sodium borohydride. Interactions between DNA nucleotide bases (Adenine, Thymine, Cytosine, Guanine, and Uracil) and colloidal silver nanoparticles were investigated through a color change in solution at multiple concentrations (50 mM, 10 mM, 1 mM, 100  $\mu$ M). This work describes the interaction of silver nanoparticles with DNA nucleotide bases and how these interactions alter the absorption spectrum of visible light, resulting in a visible color change specific to each nucleotide base. A color change is important in the biological sciences as an indicator for molecular interaction. The lesson provides a hands-on investigation and visual representation of the absorption of visible light, a topic emphasized by the Next Generation Science Standards (NGSS). A spectrophotometer was used to record absorption data so students can graph and discuss the nanoparticle absorption of light. The activity was demonstrated in a high school science course in order to measure the effectiveness of the lesson and student understanding. Assessments include a pre and post lesson survey as well as in class discussion.

Joyce Seifried, Jennifer Schablik, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

*An Integrative STEM Approach to Teaching about Hydrophobic Interactions using Self-Assembled Monolayers*

Presented at the National Association of Biology Teacher (NABT) 2014 Professional Development Conference, Cleveland, OH, November 13-15, 2014

Hydrophobic materials are found in modern day commercial products, including windshield coatings, water repellent clothing and umbrella coatings, all of which display the biological property of hydrophobicity. The purpose of this summer research project was to design a water droplet maze for an inquiry based lesson to introduce the concept of hydrophilic, hydrophobic, and super hydrophobic interactions on specially made surfaces. The lesson was designed so that a biology teacher could explain why molecular-level structure is important in the functioning of designed materials, which is a specific standard of the Next Generation Science Standards (NGSS). In our research, we optimized a procedure so teachers can make three different surfaces and then pose questions to students to see if they can use observational skills to distinguish between different surfaces. In the lesson plan, students measure the contact angle of the water droplet to the surface in order to identify the surface. A contact angle measurement is a well-established scientific technique to measure the hydrophobicity of the surface. The lesson is flexible enough for students to use either a protractor or phone application to measure the contact

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angle. If a water droplet has an angle greater than 90° then it is hydrophobic. If the angle measures greater than 150° then it is super hydrophobic. Through observation and play, students will learn hands-on about how a self-assembled monolayer can alter surface interactions. The activity was demonstrated in a high school science class, and in order to measure student understanding and the effectiveness of the lesson a pre- and post-survey were administered.

### Brandon Gottlob

*(Deborah Knox, Faculty Sponsor)*

*Real Time Occupancy Notification: A Comparison Between Passive Infrared and iBeacon Implementations*  
Presented at the 46th Association of Computing Machinery (ACM) Technical Symposium on Computer Science Education (SIGCSE), Kansas City, MO, March 4-7, 2015

iBeacon technology has the potential to transform occupancy detection from the traditional passive infrared motion sensor approach because of its portability, relatively low cost, and capabilities beyond motion detection alone. This project implements study room occupancy detection in the TCNJ Library using a Raspberry Pi with a PIR sensor and an Estimote Beacon. The scalability of each approach is directly compared by cost, ease of setup and maintenance, and accuracy. Prototype occupancy detection systems that are set up in study room environments provide end-users with a listing of available rooms in real-time through new functionality in the TCNJ Library iOS app. Using iBeacon sensors can bring extra functionality to existing systems and new environments where portability is essential.

### Lianna Lazur

*(Ruth J. Palmer, Faculty Sponsor)*

*A Life History of Eunice Kennedy Shriver: Advocare and Change Agent for the Intellectually and Developmentally Disabled*

Presented at the National Council on Undergraduate Research (NCUR) Conference, Lexington, KY, April 3-5, 2014

This work presents the life history of Eunice Kennedy Shriver, 1921-2009. Life history, a form of narrative research inquiry, focuses on individual history to uncover how experience contributes to turning points in a person's life. Narrative researchers collect stories from multiple data sources, then retell or re-story the narrative to reveal the individual's experiences. Drawing on multiple field texts, this investigation adopted Clandinin and Connelly's (2002) re-storying approach, which allowed the inquiry to journey inward (internal conditions), outward (the environment), backward and forward (temporality), and into contexts (the boundaries of the inquiry landscapes). The results uncovered Kennedy Shriver's moral sensitivities, relentless passion, and uncompromising persistence. As a sociologist and social worker, she immersed herself in the societal issues of her time. Her interaction with her disabled sister aroused deep empathy; and the recognition that there were no services available to offer a quality life to her sister fired her lifelong mission to all disabled people. Kennedy Shriver's passion translated outwardly into action. She espoused her family's dedication to public service and, as a member of the Joseph P. Kennedy, Jr., Foundation, she steadfastly focused on its goals: the prevention of disabilities and the improvement of ways in which society dealt with mentally disabled persons. She also headed President John Kennedy's Committee on Mental Retardation, and contributed to the establishment of the National Institute for Child Health and Human Development. Her practical work included the establishment of summer camps for children with disabilities, out of which grew her most important contribution, the founding of the Special Olympics, first for summer and then winter sports. All together, this life history illuminated the experiences and

actions of this outstanding woman who changed the global community, and now stands as a model of change agency and advocacy for the intellectually and developmentally disabled.

Amanda Intili and Lisa LaJevic

(Lisa LaJevic, Faculty Sponsor)

(1) *Pre-Service Teaching and Art Workshops for Underserved Populations*. Presented at the National Art Education Association (NAEA) Convention, New Orleans, LA, March 26, 2015

(2) *Responding to an Art Education Crisis*. Presented at the Art Educators of New Jersey (AENJ) Conference, Long Branch, NJ, October 5, 2014

Recently, nonprofit organizations and schools have reduced their art programs because of budget cuts. Wanting to provide quality visual arts opportunities while increasing pre-service teachers' experiences working with underserved populations, our college designed workshops for local communities with limited funding and access to the arts. Pre-service art teachers traveled to a nonprofit arts organization and elementary school to offer free arts programming. The workshops were based on arts integration models that stimulated connections between art/design, self, and everyday life. This presentation weaves together the experiences of the coordinator and pre-service teachers with participants' artwork. As action researchers, we engaged in self-reflective inquiry, an important component of teacher education. Although we encountered challenges, all involved parties found the workshops valuable. The findings hold implications for our teacher education program as we examine the relationship between the college and community, as well as the future of other arts and design education programs.

Joyce Seifried, Jennifer Schablik, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

*An Integrative STEM Approach to Teaching about Hydrophobic Interactions using Self-Assembled Monolayers*

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Eric Mauro and Ambrose A. Adegbege

(Ambrose A. Adegbege, Faculty Sponsor)

*Programmable Logic Controller based Embedded Quadratic Programming for input-constrained Internal Model Control*

Presented at the European Controls Conference, Linz, Austria, July 15-17, 2015

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Advanced control algorithms such as optimization-based controls are known to offer superior performance as well as systematic constraints handling when compared to classical control strategies. However, the complexity of such advanced control methods makes their implementations difficult, especially on controllers with limited computational capacity such as the programmable logic controllers (PLC). This paper presents the capability of a low-cost low-end PLC for online computation of advanced control. In particular, an online quadratic program within the framework of input-constrained internal model control is implemented, and the effectiveness is illustrated using a hardware-in-the-loop experiment.

### Jillian Manzo

*(Blythe Hinitz, Faculty Sponsor)*

*Maria Montessori's Legacy of Peace Education*

Presented at the 67<sup>th</sup> OMEP World Assembly and Conference, Washington D.C., July 27-August 1, 2015

In 1907, Maria Montessori established the Casa dei Bambini in San Lorenzo to create social change, to help children in need, and because it was an opportunity to bring scientific pedagogy into education. Montessori's concern for the physical and mental health of every child and her "observation of free children" resulted in what is known today as the Montessori Method. Maria Montessori was profoundly influenced by World War I, the events of the interwar period, and World War II. She observed how WWI and the interwar period brought trauma to children who could do nothing about the conditions they faced. Montessori responded to these years of conflict by incorporating peace education into her method. Her belief that humanity must be educated and "make the child our principal concern" in order to seek common goals, parallels the principles World OMEP was founded on. Today's society is still filled with conflict and has not achieved the peace Montessori called for in her numerous essays and speeches on peace and education. Drawing from a series of interviews with Montessori Educators in New Jersey and Pennsylvania, this study looks at how Montessori's legacy of peace education is continued in the twenty-first century. The focus of the interviews includes peace activities and lessons, the peace materials used, how the environment is set up to promote peace, the impact peace education has on children, and how world events today shape the directress' role as a peace educator. Expected results from research in progress: Montessori's peace education philosophies are the basis of peace and sustainability lessons and activities in Montessori classrooms in the United States today.

### Mario Erisnord

*Collegiate Advising*

Presented at the 87<sup>th</sup> annual Eastern Psychological Association Conference, New York, NY, March 3, 2016.

This study evaluated learning outcomes (LOs) of a mandatory 4-year prescriptive academic advising model in a psychology department at an undergraduate institution. Some of the advising courses were delivered in structured seminars, while others consisted of elective workshops. The freshman year sequence achieved 12 of its 14 LOs, a revised junior year sequence achieved 7 of 14. Across the freshman-senior year spectrum only one of four identified LOs was achieved suggesting weakness in the less structured workshop models. Recommendations moving forward consist of interviewing students, faculty, department chairs, and staff to obtain qualitative data that might affirm and expand upon these findings. We anticipate that action steps will include: re-evaluation of the LOs better to align with developmental needs and corollary modification of the courses/workshops to reflect new LOs.

### Caroline Parent, Megan Krause, and Aleks Waciuta

*(Karen Becker, Faculty Sponsor)*

*Texting and Driving PSA Campaigns: Changing Attitudes, Not Behaviors: Explaining the Disconnect Through Theory of Planned Behavior*



Presented at the Eastern Communication Association Conference, Baltimore, MD, April 1, 2016. The National Highway Traffic Safety Administration reported in 2012 that distracted driving led to the deaths of 3,328 people and injured another 421,000 people. Although the number of anti-texting and driving campaigns has exploded, the fatality rates have only moderately diminished with 2,959 deaths in 2013 (distraction.gov). Text messaging while driving has reached epidemic proportions. This paper examines teens' prevailing attitudes toward texting and their actual behavior using the Theory of Planned Behavior (TPB) as a theoretical foundation for understanding why the behavior continues, despite increased awareness of the danger. People often engage in risky behaviors without thinking about the consequences of these actions. TPB helps to explain why this occurs. This study reports on research conducted at a Northeastern college evaluating the relationship between the attitudes toward texting and the actual behavior of text messaging while driving. The data suggest negative attitudes toward texting while driving, for both themselves and others who drove distractedly. Also, it was demonstrated that most respondents agreed that they should not text while driving, and cited strong norms with their peer groups against texting and driving. Yet, many still reported that they texted as they drove. Thus, perceived behavioral control was low, suggesting that respondents felt it was impossible for them to stop texting while driving. This is extremely important since this could mean there is something much deeper than just attitudes and subjective norms influencing individuals' behaviors. Campaigns today focus heavily on the attitudes and social norms of text messaging while driving in hopes of reducing this behavior. The conclusion of this paper looks at strategies and message tactics that switch emphasis from attitude to behavioral control.

Zachary Nelson

*(Ambrose Adegbege, Faculty Sponsor)*

*Projected Gauss-Seidel Algorithm for Multivariable Algebraic Loops with Applications to Constrained Control*

(1) Presented at the American Society for Engineering Education Northeast Section Conference, Kingston, RI, April 28-30, 2016

(2) Presented at the American Control Conference, Boston, MA, July 6-8, 2016

This work considers algorithms for the fast computation of multivariable algebraic loops comprising the feedback interconnection of a nonlinear map and a nontrivial static gain. Such algebraic circuits constitute delay-free loops which have received significant interests in engineering such as in audio and speech processing, control systems, and computational mechanics. When designing compensations for systems with saturating inputs, it is standard to introduce algebraic loops into the control loop to improve the system's overall performance. The goal of this research was to investigate if the Projected Gauss-Seidel (PGS) algorithm shows good promise for both real-time and embedded control applications. In order to demonstrate the trade-off between the number of iterations, speed, and accuracy, we solved several algebraic loops using the Gradient Projection algorithm, PGS algorithm, Lemke algorithm, and Matlab's quadprog function. The algorithms were run on a machine with an Intel Core i7-3635QM processor and 8 GB of memory using Matlab. We limited our testing to a 2-by-2 benchmark example taken from literature. We compared the algorithms in all nine solution space regions for algebraic loops with both symmetric and asymmetric feedback gains. The Matlab simulations show that the proposed PGS algorithm has the ability to solve symmetric and asymmetric algebraic loops with minimal computations per iteration. All iterates fall within the feasible set and can be terminated prematurely for a fast but approximate solution. The PGS solution also outperformed the other algorithms in terms of iterations and CPU time to reach the optimal solution. A further direction is to embed the PGS algorithm on control hardware such as a Programmable Logic Controller (PLC) or a Field Programmable Gate Array (FPGA). It would also be attractive to improve upon the convergence rate by incorporating adaptive step length computation or by incorporating sub-space optimization.

Sarah Wallin

(Jean Brechman, Faculty Sponsor)

*Cord Blood Banking Information: Seeking and Scanning in the General Population and in a Sample of Expectant Parents*

Presented at the American Marketing Association Marketing and Public Policy Conference, San Luis Obispo, CA, June 23-25, 2016

Stem cells contained within umbilical cord blood (UCB) have the potential to improve and save lives. Since the first transplant, performed in 1988, stem cells derived from UCB have been used in more than 30,000 transplants worldwide. Unfortunately, expectant parents still do not fully understand the significance of cord blood storage. Approximately one out of every three expectant parents does not realize they have the option to preserve their baby's cord blood. Of the two-thirds that are aware, 74% describe themselves as minimally informed (Perlow, 2006). In spite of efforts to supply prenatal patients with balanced information on public and private cord blood banking options, these numbers have not improved much in the past decade (Katz et al., 2011).

Parents' decisions (to bank or not, publically or privately) are affected, in part, by their interactions with doctors and other health professionals. In addition, their decisions may be affected by their interaction with nonmedical sources, including both mass media and interpersonal. In order to understand more about the ways in which expectant parents' receive and use information about UCB banking, our current research focuses on two information use behaviors - seeking and scanning. Traditional research on information use emphasizes individuals' engagement with information sources, that is, those that they have deliberately sought out (Bright et al., 2005; Muha et al., 1998). This active search for information is called *information seeking*. In contrast, *information scanning* takes place when people come across information through routine media use even when they do not actively look for it (Lee, Zhao, Pena-y-Lillo, 2016). While information seeking is an active behavior, this does not discount the possibility that information acquired through "routine patterns of exposure to mediated and interpersonal sources can be recalled with minimal prompt" (Niederdeppe et al., 2007, p. 154; Hornik et al., 2013) and may play a role when examining influences and motivations for making significant health-related decisions such as UCB banking.

Studies of expectant parents' knowledge acquisition and decision-making as it relates to cord blood banking are extremely limited. The majority of relevant literature utilizes non-U.S. samples of pregnant mothers and no single study investigates both information seeking *and* scanning behaviors. While it is reasonable to assume that pregnant women (and/or their partners) would seek out information on UCB banking, it is less clear how much UCB seeking and scanning occurs within the general population as they are not immediately faced with the issue. It is therefore likely that the knowledge they gain about UCB banking is not driven by active searching. It is probable that the information they encounter is incidental.

This research study aims to extend our understanding of how seeking and scanning behaviors influence decisions about umbilical cord blood banking. Our primary purposes are to (a) describe the extent of both seeking and scanning from mediated and interpersonal sources and (b) explore ways to improve marketing communication that will build awareness and knowledge acquisition in the general population and, more specifically, among expectant parents.

**METHODS**

Respondents were men and women between the ages of 18 and 40 (n = 213). The sample was fairly even distributed across gender (46.9% female) and age (M = 29.1, SD = 5.5). Eighty-seven percent of the sample had completed college. Importantly, a sub-sample consisted of expectant parents (i.e., pregnant women (n = 40) and males whose significant other was pregnant at the time of the study (n = 56)). Age and education in this sub-sample were consistent with that of the entire sample.

Upon successful completion of a screening questionnaire, respondents were directed to a self-administered survey powered by Qualtrics. Respondents completed items about their

general knowledge and familiarity with cord blood banking, information seeking and scanning behaviors, beliefs about cord blood banking and intentions to bank.

*Sought and Scanned Information Exposure about Umbilical Cord Blood Banking.* Respondents were asked to think about the prior 12 months, and whether they (a) actively sought out or (b) inadvertently came across information on cord blood banking from a variety of sources.

*UCB Communication Preferences.* Respondents were provided with a list of ways in which information about UCB could be communicated to expectant parents and asked to indicate which, if any, they would find helpful in the decision-making process using a 6-point scale ranging from "Not at all helpful" to "Very helpful." Open-ended feedback was also collected.

## RESULTS

Expectant parents encounter (*scan*) information more often ( $M = 1.21$  sources,  $SD = 1.78$ ) than men and women not currently expecting ( $M = .72$ ,  $SD = 1.31$ ),  $t(171.2) = 2.2$ ,  $p = .026$ . They also actively seek information from more sources ( $M = .33$  source,  $SD = .96$ ) than their non-expectant counterparts ( $M = .10$ ,  $SD = .44$ ),  $t(127.99) = -2.17$ ,  $p = .03$ . Seventy-two percent of the general population reports never having encountered information relating to UCB. Six percent ( $n = 7$ ) have come across UCB in one source, 9.8% in two sources ( $n = 11$ ). About 13% ( $n = 15$ ) encountered information about UCB from three or more sources. A slightly higher ratio of expectant parents report having encountered information about UCB in one or more sources. Ten percent have found information from two sources, 23.9% ( $n = 23$ ) percent from three or more sources. A majority of men and women (general population) do not seek out information about UCB (94%). Seeking behavior is higher among expectant parents, though still surprisingly low - 86.5% indicated they have not searched for information on UCB.

Seeking behavior across multiple sources is significantly correlated with expectant parents' intentions to bank. That is, the more sources an individual actively consults for information about UCB banking, the higher his/her intentions are to bank privately,  $r(94) = .287$ ,  $p = .005$ , or publicly,  $r(94) = .256$ ,  $p = .012$ . Consulting a greater number of sources in active search is also significantly, and negatively, correlated with intentions to discard UCB as medical waste at the time of delivery,  $r(94) = -.235$ ,  $p = .021$ .

The most common source of information about UCB, that men and women (general population) encounter inadvertently is the Internet ( $n = 25$ ; 21.4%). Additionally, nearly one fifth of individuals report having come across UCB information in online social networking contexts (e.g., facebook,  $n = 21$ ; 17.9%). Eleven percent hear about UCB from family or friends and slightly fewer (10.3%) gain exposure from books, brochures or pamphlets. A small percentage (4.3%) is informed about UCB from their OB/Gyn or another health professional, without seeking it out. Expectant parents most often encounter UCB information in books, brochures, pamphlets ( $n = 29$ , 30.2%), followed closely by information contained on the Internet ( $n = 26$ ; 27.1%). One-fifth of expectant parents scan information from online social networks ( $n = 20$ ; 20.8%), followed by their OB/Gyn or other health professional ( $n = 17$ ; 17.7%), family members and friends ( $n = 13$ , 13.5%) or other expectant parents ( $n = 11$ , 11.5%).

As noted above, it is a small percentage of individuals who seek out information about cord blood. Of those looking for information, the Internet is the most frequently consulted source ( $n = 6$ , 5.1%) by members of the general population. Expectant parents also look to the Internet for information ( $n = 10$ , 10.4%) followed by an OB/Gyn or medical professional ( $n = 9$ , 9.4%).

When asked to comment on a variety of ideas that could prove helpful in improving communication about and understanding of UCB, the entire sample indicated that efforts, ranging from free informational seminars for expectant parents to a non-partisan website, would be instructive and welcomed. Those that were considered to offer the most amount of assistance in the decision-making process included: Coverage from your insurance company for harvesting and/or storage ( $M = 4.86$ ,  $SD = 1.15$ ), availability of research on the viability of cord blood collection and storage ( $M = 4.97$ ,  $SD = 1.00$ ), availability of research on current and projected medical conditions treatable with cord blood ( $M = 4.85$ ,  $SD = 1.05$ ) and pre-banking advice from pediatricians ( $M = 4.74$ ,  $SD = 1.07$ ).

## CONCLUSION

## CONFERENCE PROCEEDINGS AND BIBLIOGRAPHIC LISTINGS

In anticipation of the annual conference, we hope to present additional data that will further illuminate ways in which marketers can improve awareness and understanding of cord blood banking options. Prior to the conference, an open-ended variable relating to individuals' preferences for availability and modes of UCB information delivery will be coded and analyzed. Consistent with this year's conference theme, "Fostering Change for Communities and Society", we look forward to sharing and discussing the implications of our research and how our findings can be used to support changes in the way that cord blood banking information is presented. An increase in knowledge about cord blood banking - both in public discourse and in targeted efforts for expectant parents - can ultimately improve and save lives, making this information critical to fostering change in cord blood education and awareness for both the individual and public-at-large.

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Caroline Wood, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

*Analytical method to fabricate reproducible SERS substrates*

Presented at the American Chemical Society Conference, Philadelphia, PA, August 21, 2016.

The objective of this research study was to design an analytical method to fabricate reproducible surface enhanced Raman scattering (SERS) substrates using printable silver nanoparticle ink as the main component. Printable ink is used in the electronics industry as a low-cost alternative to make conductive paths as the particles can sinter at low temperatures. The ability to control the sintering process through a preheating treatment makes it an attractive way to make SERS substrates over conventional colloidal particles as well as its low-cost and high amplification factors. Central to making reproducible SERS substrates is understanding the relationship between heat and interparticle spacing. The optimal Raman signals occur at a point before nanoparticles coalesce and when many small spaces between the particles are present.

Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) systems were used to find the temperature at which the capping agent on the nanoparticle sublimates, thus allowing the nanoparticles to move closer together, forming aggregates. Scanning electron microscope (SEM) micrographs were collected and then analyzed using an elliptical approximation method on ImageJ to determine interparticle spacing. Rhodamine 6G was used as the analyte to assess the SERS amplification and reproducibility. The thermal pre-treatment allows for the formation of interparticle gaps of the length scale of 10 nm or lower. The resulting Raman intensity increases when the heating method produces a greater abundance of smaller interparticle gaps. In addition to heating temperature, other variables have been observed in the ink preparation method including the effect of drop coating and spin coating samples. These experiments have been applied to two types of printable nanoparticle inks and TGA and DSC results show similar trends indicating the sublimation of the nanoparticle capping agent. Therefore it is expected that the fabrication method can be applied to multiple types of printable nanoparticle ink, making it a more useful method in producing SERS substrates. These results will be discussed to show how their importance in determining the optimal parameters for fabricating highly amplifying SERS substrates.

Tristan Gibson; Hazel D. Dean, ScD.; Brian R. Edlin, MD

*(Brenda Seals, Faculty Sponsor)*

*Prevalence of Opioid Injection among People Using Opioids Nonmedically in the United States: A Data Synthesis*

Presented at the Annual Biomedical Research Conference for Minority Students (ABRCMS), Phoenix Convention Center, Phoenix, Arizona, 11/1/2017-11/4/2017. Sponsored by Morehouse College Public Health Leader Fellowship Program & National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention

The opioid epidemic has created an immense health burden in the United States. An estimated 33,091 people died of an opioid overdose in 2015, a 330% increase from 2010. Opioid injection increases the risks of death and viral infection, but little is known about its prevalence. We examined data on heroin and nonmedical pharmaceutical opioid use in 10 national datasets, including the National Survey of Drug Use and Health (NSDUH), Monitoring the Future, Youth Risk Behavior Survey, Treatment Episode Data Set, and the National Vital Statistics System. The only nationally representative study of the U.S. population, NSDUH, is a household survey that excludes people who are homeless or institutionalized. Among the U.S. civilian population living in households in 2015, an estimated 29.5 million people had ever used opioids nonmedically, of whom an estimated 2.4 million (8%) had ever injected opioids. Of the 2.4 million people with an opioid use disorder in the past year, however, an estimated 600,000 (25%) had injected opioids. Among the 526,686 admissions to substance use treatment centers for opioid use in 2015, 294,130 (56%) were for opioid injection. Of the 33,901 people who died from opioid overdose in 2015, we estimate that at least 24%-44% had injected opioids. Of students in grades 9-12, 1.80% had ever injected an illegal drug of any type. Of students in grades 8, 10, and 12, 0.30% reported injecting heroin in the last 12 months. Probably at least 8% of all people in the United States in 2015 who had ever used opioids nonmedically had injected them. As opioid use became more severe, frequent, disabling, and fatal, the percentage of people who injected increased to as much as 56%. These data highlight the need for interventions to prevent opioid injection and reduce the harm it causes.

Krystal Ramsen

*(Anne Peel, Faculty Sponsor)*

Presented at the New York State Reading Association Convention, Saratoga, NY, November 12-14, 2017

Even in inclusive classrooms, many students are often still being othered because of the way their behavior or intellectual abilities are perceived. This research sought to address this issue by investigating how children with disabilities are portrayed in children's literature and what

implications that might have for young readers. The current report shares findings from a content analysis research project that analyzed representations of difference in children's literature. Texts were selected from a wide range of sources including college curricula, diversity web sites, and on-line book sellers. A sampling of 21 books were ultimately selected because they targeted young readers and had protagonist characters that had a disability or were perceived as different within their community. The selected texts also represent a wide range of genres ranging from picture books, to graphic novels, and memoirs. Data was analyzed using a critical literacies framework that considered each portrayal along a spectrum from otherizing to educative to emancipating. To help guide the exploration of each piece, a transactional rubric was created. Data analysis revealed that most of the narratives contained portrayals that created an otherizing or educative effect on the reader. The first-hand representations are labeled emancipating because there is a sense of truth behind their portrayal and they cause the reader to reflect back on their previous notions of difference and disability. Fictionalized portrayals written from an outside perspective reinforced the idea that individuals with disabilities are fragile or incapable. To be emancipating, children's books selected for literacy classrooms should present readers with the opportunity to build an understanding of the difference being discussed. The literature needs to present children with a raw and real representation of the disability or difference. Children should walk away from the book learning something about disabilities, or challenging the ideas presented within the text.

Aditi Mahapatra

*(Brenda Seals, Faculty Sponsor)*

*Experiential Pedagogy and Public Health Grant Writing*

Presented at the America Public Health Association (APHA) National Association Conference, Atlanta, Georgia, November 6, 2017.

Brenda Seals, Greg Seals, Mei Zhao, Alina Ahsan, Alexandria Chaves, Adrian Diogo, Tristan Gibson, Margaret Kennedy, Cleanthe Kordomenos, Stephanie Moy, Jennifer Schablik, Hannah Seo

Introduction: Going beyond imagined scenarios for project proposals to taking on community-centered projects builds students' leadership, interpersonal and academic skills. Involving community organizations and health agencies in experience-based courses like foundation grant writing provides win-win scenarios strengthening university-community relations.

Methods: Ten diverse health agencies and organizations were paired with 10 students to develop and complete a foundation grant using a common application. Over a semester, students refined the fundable idea and provided reports including: 1) a literature review and copies of articles; 2) a list of potential funders and details for up to three potential funders; and 3) a review of best practices and intervention materials. Lessons Learned: Agency buy-in was linked to minimizing the burden of working with students and receiving the report that would provide information on possible new funding streams. Agencies built infrastructure by expanding community partnerships and improving evaluation capacity, bi-products of the grant writing process. Some agencies focused on difficult to fund organization needs instead of more fundable ideas. Some agencies preferred supplemental compared to new programs. Development and executive staff were hard to contact, especially from small organizations. Students appreciated the opportunity to take on "real" projects yet struggled with delays that congested writing. Interpersonal skills, research techniques to find potential funders and writing as a consultant were unique skills.

Conclusions: Community based participatory approaches enrich student experience-based learning, building organizational trust and support. Grant writing uniquely positions students for advancement. Bringing funds into communities gives students enduring "footprints" and, potentially, new positions.

Kimberly Pfaff

*(Blythe Hinitz, Faculty Sponsor)*

*Nursery Rhymes for Historical Times*

Presented at the National Association for the Education of Young Children (NAEYC) Conference, Atlanta, Georgia, November 17, 2017.

The culminating project for the students of ECED 504 involved a group history project, for which the professor's book entitled, *History of Early Childhood Education* was the source of study. Each student was assigned a chapter to research and become an "expert", as an in-class presentation of the information followed, with each student teaching the others about their chapter in a creative, interesting lesson format. Chapter 12, *Federal Government Involvement (1900-1950)*, was the chapter I used to create the nursery rhyme book, *Nursery Rhymes for Historical Times*. The book included ten parodied rhymes to explain the significant parts of the chapter. Chapter 12 emphasized the importance of the government's involvement during the progressive era; with pre- and post-wartime circumstances surrounding children's rights and welfare programs of those times. The chapter highlighted the United States Children's Bureau in 1912 as significant to beginning a movement to protect the rights and welfare of children, particularly those at-risk. Rhymes such as *Hey Diddle Diddle*, *London Bridge is Falling Down* and *Hickory, Dickory, Dock* were written to describe the emergency nursery school programs created to service children of working mothers in the wartime era, as well as the implementation of a National Advisory Committee that was formed to supervise the nursery schools and ensure high quality programs. Additionally, the Lanham Act was highlighted with *Baa Baa Black Sheep*, to illustrate the importance of funding for child care facilities during and after World War II. Under each rhyme was a background statement to provide a clear explanation with relevant facts about the historical context, primarily child care issues during periods of war with the rise of governmental and societal responsibility for each.

#### Christopher Loos

(Robert McGreevey, Faculty Sponsor)

*Robert Queen and the Politics of Respectability in Trenton, 1930-1960*

Presented at the Phi Alpha Theta Biennial Convention, New Orleans, LA, January 3-6, 2018  
Robert Queen was a prominent Black lawyer who worked in Trenton from 1913 until his death in 1960. In his capacity as a leading attorney for the Trenton NAACP, chapter he argued for desegregation in a number of cases, most notably *Hedgepeth and Williams v. Board of Education, Trenton, New Jersey* (1944), which struck down segregation *de jure* in the state of New Jersey. Through his successes as a lawyer, Queen attained the middle-class position which many aspiring Blacks at this time desired, and which took as its cornerstone "respectability politics": that Black Americans should follow Victorian codes of morality so as to emulate whites and earn their respect and, in turn, their rights. This paper uses Queen's history to examine the changing ways in which middle-class blacks, through respectability politics, distinguished themselves from their "unrespectable" brethren in Trenton in the decades leading up to the Civil Rights Movement. Utilizing census and legal records, archival documents, and newspaper articles, it examines Queen's journey from the son of slaves to a bourgeois celebrity lawyer, and how the politics of respectability, though beneficial to those like Queen who could pursue them, directed both white and black disdain towards Black Trentonians who could not.

#### Giulietta Flaherty and Emma Young

(Joanna Herres, Faculty Sponsor)

*The Contribution of Externalizing Behaviors on Parental Attachment and Academic Achievement*

Presented at the Eastern Psychological Association Conference, Philadelphia, PA, March 2-3, 2018  
Children who experience parental attachment difficulties have poorer academic achievement (Battaglia et al., 2017). Attachment problems are also related to depression (Armsden, 1990) and suicidality (Langhinrichsen-Rohling, 2017). Externalizing behaviors, including defiant, impulsive, disruptive, and aggressive behaviors (Newsome et al., 2014) are also linked to depressive symptoms (Chronis-Tuscano, 2010), suicidality (Ballard et al., 2017), achievement problems (Hinshaw, 1992) and insecure attachment (Madigan et al., 2016). It is possible that externalizing problems are the common factor linking poor attachment and achievement problems. The aim of

the current study is to explore relationships amongst these variables. The study used pretreatment data from a sample of 129 adolescents, ages 12 -18 ( $M = 14.96$ ,  $SD = 1.66$ ), participating in a clinical trial for suicidality (Diamond et al., Under Review). Participants reported their typical grades (e.g., "Mostly As," "Mostly Bs," etc.), completed a Reasons for Suicide Scale, a measure of Motherhood attachment anxiety (Fraley, 2005), and the externalizing behaviors subscale of the Brief Problem Checklist (BPC; Chorpita et al., 2010). There was a significant relationship between poorer grades and more motherhood attachment anxiety ( $r = -.21$ ,  $p < .05$ ). Externalizing behaviors were not significantly related to grades or attachment; however, participants higher in externalizing behaviors were more likely to report that school ( $r = .23$ ,  $p < .01$ ) and parent problems ( $r = .32$ ,  $p < .01$ ) contributed to their suicidal ideation. These findings provide preliminary evidence for interrelations among these constructs that can be used to construct a more comprehensive model of how parental attachment influences the development of both adolescent internalizing and externalizing behavior, and how these behaviors influence academic achievement. Future research should attempt to combine these factors using longitudinal methods to explore possible causal relationships.

Felicia Selvakumar

*(James Stacey Taylor, Faculty Sponsor)*

*Free Markets: Kidney Sales and Effective Altruism vs. Selective Altruism*

Presented at Northeast Regional Honors Council Conference, Providence, Rhode Island, April 12-15, 2018

Patients diagnosed with chronic kidney disease, or who are in need of a new kidney, are limited to three options; receiving treatment, waiting for a postmortem donor, or seeking out a living and altruistic donor. The first option is painful, the second option is not guaranteed, and the third option is hardly viable considering an organ donor's only (legal) incentive to give up their kidney is goodwill. Proposing legal and regulated sales of organs might seem strange and upsetting to most people, but I argue that it will prove to be beneficial to those in need of transplants as well as donors themselves. The general argument against organ sales is that it will lower altruistic qualities in people and, in turn, allow for the use of people as a mere means rather than an end in themselves (a common philosophical issue in all contexts). Another argument against organ sales is that its legalization can allow for the exploitation of the poor. My presentation will not only explain why opening legal and regulated kidney sales in society will benefit both patients and donors, but why altruism is not lost through this type of free market economy. I will also address why other arguments against organ sales, such as the exploitation argument, tend to fail in proving why kidney sales should remain illegal.

Terance Schuh and Yutong Li

*(Paul Wiita, Faculty Sponsor)*

*Three-dimensional relativistic jet simulations and morphological classification of radio-loud AGN*

Presented at the American Astronomical Society Meeting, Denver, CO, June 3-7, 2018

We have computed a suite of simulations of propagating three-dimensional relativistic jets, involving substantial ranges of initial jet Lorentz factors and ratios of jet density to external medium density. These allow us to categorize the respective AGN into Fanaroff-Riley class I (jet dominated) and FR class II (lobe-dominated) based upon the stability and morphology of the simulations. We used the Athena code to produce a substantial collection of large 3D variations of jets, many of which propagate stably and quickly for over 100 jet radii, but others of which eventually go unstable and fill up slowing advancing lobes. Most of these simulations have jet-to-ambient medium densities between 0.005 and 0.5 and velocities between 0.90c and 0.995c. Comparing the times when some jets go unstable to these initial parameters allow us to find a threshold where radio-loud AGNs transition from class II to class I. With these high resolution



fully 3D relativistic simulations we can represent the jets more accurately and thus improve upon and refine earlier results that were based on 2D simulations.

Yutong Li and Terance Schuh

*(Paul Wiita, Faculty Sponsor)*

*Radio-loud AGN Variability from Propagating Relativistic Jets*

Presented at the American Astronomical Society Meeting, Denver, CO, June 3-7, 2018

The great majority of variable emission in radio-loud AGNs is understood to arise from the relativistic flows of plasma along two oppositely directed jets. We study this process using the Athena hydrodynamics code to simulate propagating three-dimensional relativistic jets for a wide range of input jet velocities and jet-to-ambient matter density ratios. We then focus on those simulations that remain essentially stable for extended distances (60-120 times the jet radius). Adopting results for the densities, pressures and velocities from these propagating simulations we estimate emissivities from each cell. The observed emissivity from each cell is strongly dependent upon its variable Doppler boosting factor, which depends upon the changing bulk velocities in those zones with respect to our viewing angle to the jet. We then sum the approximations to the fluxes from a large number of zones upstream of the primary reconfinement shock. The light curves so produced are similar to those of blazars, although turbulence on sub-grid scales is likely to be important for the variability on the shortest timescales.

Terance Schuh

*(Paul Wiita, Faculty Sponsor)*

*Making Nuclear Sandwiches using BCC Crystal Lattices*

Presented at the Fifth Joint Meeting of the American Physical Society Division of Nuclear Physics and the Physical Society of Japan, Waikoloa, HI, October 23-27, 2018

Neutron star crust is made up of a variety of sub-layers all with different compositions. Although crust models using only a uniform, continuous single bcc crystal lattice distribution benefit from simplicity and symmetry, models involving multiple crystal domains are more accurate in terms of the reality of the situation. With elements like transport properties in mind, using molecular dynamics simulations we were able to develop a code that produces this nuclear sandwich model as it shall be referred to in this work. This nuclear sandwich model, comprised of a two crystal domain structure, is more representative of neutron star crust than the single crystal domain models. We then simulated the model's implications for when crystal structures at different angles relative to each other meet at this new interface. Results from running these simulations with only protons and no nuclear forces show that our nuclear sandwich remains stable and can now be further tested to include parameters such as varying densities, temperatures, and magnetic fields.

Terance Schuh

*(Paul Wiita, Faculty Sponsor)*

*Three-dimensional magnetohydrodynamic jet simulations of radio-loud AGN*

Presented at the American Astronomical Society Meeting, Seattle, WA, January 6-10, 2019

We report on a suite of simulations of propagating three-dimensional non-relativistic and special relativistic magnetohydrodynamic (MHD) jets that have a range of initial jet velocities and ratios of jet density to external medium density. We use the Athena++ code to expand upon our previous set of over 50 3D special relativistic HD simulations by adding magnetic fields that can be dynamically important and examining their effects on the jet propagation. We focus on the differences in stability and morphology properties between runs and categorize the respective modeled AGN into Fanaroff-Riley class I (jet dominated) and FR class II (lobe-dominated) radio sources. Including magnetic fields in the simulations also allows for significantly better estimates of the variations of the synchrotron emission arising from these jets and this will be reported in future work.

Zoe Talbot

(*Felicia Jean Steele and Diane Steinberg, Faculty Sponsors*)

*Up the Food Chain*

Presented at the Sigma Tau Delta Regional Conference, Gainesville, GA, October 17, 2020

While some households experience a life of luxury, others struggle to survive. Carson McCullers highlights how the economy affects adolescents in her novella, *The Member of the Wedding*. She depicts Frankie Addams, child of a middle-class man and member of the bourgeoisie, struggling to determine what she as an individual contributes to society. Frankie creates an alternate identity for herself, F. Jasmine, through which she explores the life of a different, more prestigious class. The distinction between old Frankie and F. Jasmine, especially in her father's jewelry store, is how the wedding drives her to transform herself from a member of the working class to a privileged member of society with a sense of control. Despite Old Frankie feeling that she has no place in the world, F. Jasmine steps away from the unified working class toward the richer, more individualist class. Old Frankie embodies the proletariat, or the working class, people. Her brother's wedding acts as a catalyst, making Frankie recognize that she can take action and work to achieve a more productive position in the economy. Thus, F. Jasmine is born to embody the freedom and consciousness of the bourgeoisie. F. Jasmine goes where she wants when she pleases and puts her energy toward things that she feels matter. Furthermore, she speaks freely and opts out of working, instead voicing her opinion and displaying jurisdiction over her own life.

Yachao Li, Diana Higgins, and Angelina O'Brien

(*Yachao Li, Faculty Sponsor*)

*LGBTQ tobacco control: Does interpersonal communication about "The Real Cost" campaign predict lower vaping intentions via Health Belief Model variables?*

Presented at the 2020 Virtual D.C. Health Communication Conference, April 23-34, 2021

**Background.** Less is known about whether campaign-stimulated interpersonal communication mediates the effectiveness of social media messages on tobacco use intentions. Guided by the Health Belief Model (HBM), this study aims to address the research gaps in the context of "The Real Cost" anti-vaping campaign among college students. We hypothesize that increased exposure to the campaign on social media predicts more frequent interpersonal communication about the campaign, which in turn predicts more frequent interpersonal communication about staying away from vaping. More conversations about vaping predict higher perceived health threat of vaping, lower perceived benefits of vaping, greater costs of vaping, and heightened self-efficacy of staying away from vaping, all of which, in turn, predict lower intentions to vape.

**Methods.** Participants (N = 449) were recruited in undergraduate classes in a Northwestern university. The mean age was 20 years old (range: 18-24). About 78% of the participants were women, 88% were heterosexual, and 68% were non-Hispanic White. Most of the sample were non-smokers (96%). Nearly 28% of participants used e-cigarettes in the past 30 days.

**Results.** Results supported all the hypotheses. Indirect effect analyses demonstrated that perceived costs of vaping and perceived self-efficacy of staying away from vaping mediated the relationships between interpersonal communication about vaping and vaping intentions. Moreover, increased campaign exposure predicted lower intentions to vape indirectly via higher interpersonal communication about the campaign and about vaping, and in turn, higher perceived costs and self-efficacy.

**Conclusion.** Exposure to anti-vaping campaign messages only directly predicted interpersonal communication about the campaign, but indirectly predicted vaping-related conversations through conversations about the campaign. This further suggested that promoting conversations about public health campaigns may be the first step to achieve attitude and behavioral change. Future studies should explore other cognitive and emotional mechanisms to understand the effects of interpersonal communication on behavioral intentions.

Yachao Li and Bryan Chen

(Yachao Li, Faculty Sponsor)

*LGBTQ tobacco control: Do Health Belief Model constructs predict tobacco use intentions differently between heterosexual and LGBTQ+ individuals?*

Presented at the 71st Annual International Communication Association Conference, Denver, CO, May 27-30, 2021

This research includes two studies testing whether the Health Belief Model (HBM) constructs predict tobacco use intentions differently between heterosexual and lesbian, gay, and bisexual (LGB) people. Focusing on cigarette smoking, Study 1 ( $n = 1808$  U.S. adult current smokers) found that the perceived health threat and perceived benefits of smoking differently predicted intentions to continue smoking between heterosexual and LGB smokers. The perceived health threat of smoking had a weaker negative relationship and perceived benefits of smoking had a stronger positive relationship with smoking intentions among LGB smokers than heterosexual smokers. Focusing on vaping, Study 2 ( $n = 2801$  U.S. adults) found that the perceived health threat and perceived barriers of vaping differentially predicted vaping intentions between heterosexual and LGB individuals. The perceived health threat of vaping only negatively predicted vaping intentions among heterosexual people. Perceived barriers to vaping had a stronger negative relationship with intentions to vape among LGB people than among heterosexual people. Our finding suggests that compared to perceptions of tobacco-related health consequences (perceived health threat), behavioral perceptions (perceived benefits and barriers) may have stronger impacts on tobacco use intentions among LGB people. Thus, efforts focusing on reducing tobacco-related disparities among the LGB community should address perceived benefits and barriers of tobacco use.

Spencer H. Haber

(Christopher T. Wagner, Department of Biomedical Engineering, Faculty Sponsor)

(Nicholas A. Battista, Department of Mathematics and Statistics, Faculty Sponsor)

*A Mathematical Model of Wound Healing incorporating Strain-Induced MSC differentiation*

Presented at the Biomedical Engineering Society (BMES) Conference, Orlando, FL, October 6-9, 2021

Wound healing is a complex process involving interactions of many biological factors. There are no mathematical models for intervertebral disc healing after herniation that incorporate mechanics and mesenchymal stem cell (MSC) enhanced treatment. Since disc wound geometry, a simple curvilinear defect, is similar to that observed in dermal cut wounds, this work developed a simple non-spatial model for dermal cut healing that can then be translated to disc healing by including biochemical factors involved in both wound healing processes. An initial wound healing model, based on an existing collagen fiber production model (Dale, P.D. et al., 1996), was modified to incorporate additional biochemical pathways associated with wound healing. The resulting model can be used to provide valuable insights into the wound healing process and about wound strength based on normal conditions, treatments regimens, or healing perturbations. The model was used to investigate the effect of these added factors on wound healing. Results show a transient MSC population that contributes to fibroblast cell number and collagen formation. Wound strength predicted from collagen production in the model matches published dermal tissue strength experimental data. Finally, the model exhibits robust sensitivity to tissue oxygen level and to therapeutic application of MSCs. These results demonstrate the enhanced model's applicability to dermal wound healing and support its translation to the unique physiological conditions found during intervertebral disc healing.

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Salomine Ekambi

## CONFERENCE PROCEEDINGS AND BIBLIOGRAPHIC LISTINGS

*(Natasha Patterson, Faculty Sponsor)*

*The Impact of Policy on Black Maternal Mortality: Increasing Knowledge and Improving Attitudes About Doula Support*

Presented at the American Public Health Association (APHA) 2021 Annual Meeting, Denver, CO, October 24-27, 2021

Maternal and Child health disparities in New Jersey (NJ) are some of the worst in the nation with Black women having 7 times higher maternal mortality rates, much of which is due to poor access to health services and care. This project focuses on one aspect of the Healthy MOMMIES Act, sponsored by Representative Ayanna Pressley and Senator Cory Booker, is implemented at the state level. While the MOMMIES Act has yet to pass at the federal level, some states passed legislation including provisions of its statutes. In May 2019, New Jersey Governor Murphy signed Bills S1784 and S3365 into law to expand Medicaid to cover doula services and “establishes perinatal episode of care pilot program in Medicaid” (CHCS, 2020). With the extension of Medicaid coverage for doulas, the hope is that doulas can both increase the quality of care as well as facilitating timely use of prenatal and postnatal care. Our project highlights how doulas are included in the care plan for pregnant women and how this policy might improve outcomes for Black pregnant women and infants. Educational activities were also conducted with healthcare providers and community leaders to increase knowledge and improve attitudes about doula care and provide information for best practices that can direct future policy initiatives.

Purvi Shakelly, K. Thamtrakoln, K.D. Bidle, B.A.S. Van Mooy, and D.J. Hirsh

*(Donald J. Hirsch, Faculty Sponsor)*

*Virus-inspired transfection of a marine alga: Persistence of the antibiotic G418 in cell culture*

Presented at the American Chemical Society Mid-Atlantic Regional Meeting, The College of New Jersey, Ewing, NJ, June 1-4, 2022.

*Emiliana huxleyi* is a phytoplankton that is abundant in marine environments. To better understand this keystone species, we are attempting to stably transform *E. huxleyi* using plasmid DNA. The plasmid carries the neo gene, which if expressed, will confer antibiotic resistance to the antibiotic G418 (Geneticin®). G418 acts as a selection agent, permitting only transformed cells to grow. Maintaining sufficient selection pressure is critical to filtering out the cells that are not transformed. A method was developed to determine G418 concentrations which included derivatizing the antibiotic with 2,4,6-trinitrobenzenesulfonic acid (TNBSA). The concentration of the derivative could be determined by its absorbance at 340 nm. High performance liquid chromatography (HPLC) was used to separate the derivatized G418 from other substances in solution. The peak area of the fully detrivatized G418 was proportional to its concentration. Aliquots of growth media containing *E. huxleyi* cells and G418 were taken over a one-week period. The concentration of G418 remained essentially constant through day four at the initial concentration of 0.5 mg/mL. We discussed possible reasons for the slight decrease in G418 concentration observed on day six. Based on these results, it will not be necessary to supplement G418 during the course of the selection period.

Michael Pedowitz and Mariah MacDonald

*(Mariah MacDonald, Faculty Sponsor)*

*Constraining the Long-Term Stability and Habitability of Circumbinary Planets*

*(iPoster Abstract)*

Presented at the 54<sup>th</sup> Annual Meeting of the Division for Planetary Sciences, London, Ontario, and Virtually Anywhere, 2-7 October 2022

Circumbinary planets (CBPs) can provide valuable exoplanet laboratories regarding the effects of flux variation on habitability. Because very few Earth-analog CBPs have been detected, we must numerically constrain which parameters are necessary for stable and potentially habitable circumbinary configurations. We present preliminary results from thousands of *N*-body REBOUND simulations, exploring uniform ranges for binary eccentricity, binary separation, binary mass ratio, and planet semi-major axis for an Earth-mass CBP orbiting two subsolar-mass

stars; we integrate for 1 Gyr to ensure long-term stability. We characterize which subsets of parameters lead to stable orbits and which of these orbits may result in a potentially habitable planet, exploring the planets' equilibrium temperatures as a proxy for habitability. We find that planets orbiting close to a highly eccentric binary quickly become unstable and that nearly all (87%) planets with semi-major axes at least three times greater than the distance between stars are stable, regardless of binary mass or eccentricity. We find that roughly one-third of stable planets experience habitable insolation for some fraction of their orbit, although only half have habitable equilibrium temperatures for at least 80% of their orbit. The planets that spend most of their orbit in the habitable zone tend to orbit close to their stars and around binaries of any eccentricity with low separation distances. We find that potentially habitable CBPs rarely orbit binary stars that are similar in mass and that they tend to orbit closer to their host stars as the stellar mass ratio approaches 1.0.

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