

CONFERENCE PROCEEDINGS

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 221st 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 83rd Annual Meeting of the Eastern Sociological Society, Boston, MA, March 21-24, 2013

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

(3) Presented at the 108th 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 22nd 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 (OMEPEP 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.

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Mitchell Revalski

(Paul Wiita, Faculty Sponsor)

Investigating AGN Variability Using Combined Multi-Quarter Kepler Data

Presented at the 223rd 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 247th 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 μ 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 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.

CONFERENCE PROCEEDINGS AND BIBLIOGRAPHIC LISTINGS

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: Advocate 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.

Jillian Manzo

(Blythe Hinitz, Faculty Sponsor)

Maria Montessori's Legacy of Peace Education

Presented at the 67th 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.

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