

17TH ANNUAL

Graduate Multidisciplinary Conference

An annual conference to showcase the research and projects of the Clark University and Worcester graduate student community.

WEDNESDAY, APRIL 17, 2019, 12-8 P.M.

HIGGINS UNIVERSITY CENTER AND GODDARD LIBRARY



Conference Schedule

A conference to celebrate the contributions of graduate students from Clark University to the broader academic community. This year we also welcome students from Worcester schools! The graduate Multidisciplinary Conference is a platform to learn about the ideas and methods unique to each of the many fields encompassed by graduate research. The mission of the MDC is to give students a broad perspective on academic research, as well as to offer the graduate community the experience of communicating their findings to a diverse academic audience.

**12-1 p.m. Opening Address and Keynote
Welcome Luncheon**
Tilton Hall

1-3 p.m. Oral Session A
Higgins University Center

- *Lurie Conference Room*
Biochemistry, Physics
- *Grace Conference Room*
IDCE, History, & Psychology

Goddard Library

- *Fuller Room*
Geography
- *Prouty Room*
IDCE, History, Management, & Urban Studies

3-4 p.m. Poster Session
Tilton Hall

4-6 p.m. Oral Session B
Higgins University Center

- *Lurie Conference Room*
Interdisciplinary, Psychology
- *Grace Conference Room*
Biochemistry, Chemistry

Goddard Library

- *Fuller Room*
Economics, English

6-8 p.m. Evening Reception
Tilton Hall

Oral Presentations: Session A

Lurie Conference Room, 1-2:40 p.m.

Higgins University Center

1 p.m.

Dimerization of HECT C-terminal Lobe of HERC6 Engages in an Auto-Inhibitory Mechanism

Presenter: Ruben Neves

Adviser: Donald Spratt, Biochemistry and Molecular Biology, Clark University

HERC6 (aka HECT and RCC1-like domain Containing E3 ubiquitin ligase 6) is a Homologous to E6AP C-Terminus (HECT) E3 ligase involved in the post-translational modification of a ubiquitin-like modifier called interferon stimulated gene 15 (ISG15) in the ISGylation signaling pathway. HERC6 is unique to other HECT E3 ligases primarily because of its significant ISGylation activity more so than ubiquitylation, similarly to HERC5. HERC6 does conjugate ubiquitin but prefers to conjugate ISG15 to targeted protein substrates. HERC6 exhibits anti-viral activity and also plays a role in spermatogenesis in mice. Oligomerization analysis and biochemical assays of the C-terminal lobe of HERC6 shows preferential inactive dimer formation. HERC6 C-terminal lobe crystal structure supports the oligomerization studies showing a domain swapping mechanism between monomers in the dimeric structure. HERC6 C-terminal lobe dimer interface is stabilized by anti-parallel beta sheets and the domain exchange between monomers. Destabilization of the dimer of HERC6 increases ISGylation activity proving the dimer has a characteristic auto-inhibitory mechanism which reduces ISGylation activity. Mutagenesis analysis targeting the dimer interface will provide more information of how HERC6 auto-inhibitory mechanism functions.

1:20 p.m.

Evolution of Charge Density Wave States on CeTe2

Presenter: Bishnu Sharma

Adviser: Michael C. Boyer, Physics, Clark University

The rare-earth tellurides are a family of low-dimensional compounds which host charge density wave (CDW) states. While CDW states in the rare-earth tri-tellurides (RTe3) are relatively well-studied, less is known about CDW states in the rare-earth di-tellurides (RTe2). The RTe2 compounds are quasi two dimensional materials with a crystal structure which consists of alternating insulating rare-earth block layers

and single-layer conducting Te sheets. Here we present our scanning tunneling microscopy measurements on CeTe₂. Our measurements detect two unidirectional, perpendicular, spatially separated CDW states which smoothly evolve from one to the other. Our measurements shed light on the connection between CDW states and local strain.

1:40 p.m.

Drag of intruders through a sedimented granular bed: Friction or Viscosity

Presenter: Benjamin Allen

Adviser: Arshad Kudrolli, Physics, Clark University

We discuss experimental investigation of the forces encountered by a rod moving through a fluid-saturated granular medium to understand the dynamics of intruders and organisms in sedimentary beds at the bottom of lakes and oceans. By dragging vertically oriented rods through a granular bed of glass spheres, immersed in a fluid, we probe the observed transition from a quasi-static granular-like response to a viscous fluid-like behavior of the medium with speed. The relative importance of inertia, gravitational, and viscous forces is probed in terms of the dimensionless Stokes number, inertial number, and viscous number by varying the rod speed, rod depth, rod diameter, and the viscosity of the fluid. We find that the measured drag is best scaled with the integrated hydrostatic pressure along the rod and the Stokes number at low drag speeds corresponding to the quasi-static region. The transition between the quasi-static and fluid behavior scales with the viscous number, which is the ratio of viscous stress and gravity. We further discuss the interaction of two intruders as a function of the distance of separation compared with their diameter and length.

2 p.m.

Pattern Formation in Drying Drops of Protein and Liquid Crystal Solutions

Presenters: Anusuya Pal, Germano S. Iannacchione

Adviser: Germano S. Iannacchione, Physics, Worcester Polytechnic Institute

As soon as a drop containing (non-volatile) solute particles gets deposited on a solid-flat surface, the solute particles redistribute themselves until there is no solvent left to evaporate (dry). Once the solvent dries, the drop forms different patterns. This pattern formations strongly depend on the interactions between solutes, solvent and the surface of the drop. This

drying process, therefore, is a non-equilibrium process which attracts the attention of many researchers due to the significant applications- medicine, forensic and technology. Nonetheless, a comprehensive understanding of pattern formation in a multicomponent system is yet to be established. In my past two-years, I have examined drying systems containing different aqueous protein solutions with different bulk liquid crystals using optical microscopy. ImageJ/Fiji (image processing software) are used to analyze the images and the results are further statistically quantified. This indicates that the patterns depend on the solute particles (size, chemical composition), initial concentration, solvent (with or without ions), substrate, geometry and drying conditions (temperature, pH, relative humidity). The findings are anticipated to provide crucial insights of the complex drying mechanism and pattern formation involving protein and liquid crystal and could be extended to examine the drying mechanism of 'real biological fluid' such as blood.

2:20 p.m.

Solar Signals — Possible correlations between the 11-Year Solar Cycle and Earthquakes on Earth using the Fourier Transform

Presenter: Elizabeth Tyree

Adviser: Germano S. Iannacchione, Physics, Worcester Polytechnic Institute

Our understanding of the roll of sunspots (if any) in earthquake activity remains both elusive and disputed. The hypothesis of this study is that the frequency and magnitude of earthquakes on earth are influenced by changes in slope of the solar sunspot cycle. There are many previous earthquake studies that have found sunspots and earthquakes to be uncorrelated to each other. The approach of this study is to look for possible solar cycle signals with respect to sunspots and the change in slope of the solar sunspot cycle using three global earthquake catalogs. Two catalogs are from the United States Geological Survey (USGS) including the Centennial Y2K Catalog, and the ANSS Comprehensive Earthquake Catalog (ComCat) and the Third catalog is the International Seismological Centre (ISC) catalog of earthquakes. Using statistical tools combined with signal analysis techniques such as the fast fourier transform, this study investigates if there are solar signals contained in earthquake data. It is also the intent of this study to either show that earthquakes are indeed not correlated to the solar cycle at all, or at least help to provide another avenue for further study if the hypothesis of this thesis holds true.

Grace Conference Room, 1-2:40 p.m.

Higgins University Center

1 p.m.

Gender Curriculum: Understanding the Backlash

Presenter: Elena Novak

Adviser: Denise Humphreys-Bebington, International Development, Community, and Environment (IDCE), Clark University

Spreading throughout Latin America is a growing countermovement, born in Peru, called “Con mis hijos no te metas”, or “Don’t mess with my children”. The countermovement, supported by conservative organizations and the Catholic Church, seeks to challenge state policy aimed at promoting gender equality and sensitivity, including the introduction of gender curriculum into public education.

Movement leaders denounce government overreach and the spread of ideología de género, or gender ideology. Feminist scholarship that asserts gender is a social construct distinct from biological sex is seen by movement activists as a perversion of the natural order and an attack on family and parental sovereignty. The ongoing struggle is not unique to Latin America. In the United States, conservative responses to gender education look similar. In my research, I analyze efforts toward curriculum reform in both the U.S. and Peru. The results underscore the need to reshape the way we teach gender in our classrooms and to operationalize gender in our professions, as well as the urgent need to develop intersectional approaches to understand how educational practices produce and exacerbate inequality.

1:20 p.m.

A study on the reflections of women and men on a women’s empowerment project: A case study of Sindhuli, Nepal.

Presenter: Shreyasha Khadka

Adviser: Cynthia Caron, International Development, Community, and Environment (IDCE), Clark University

The empowerment of women is a key aspect of achieving development goals. Central to women empowerment process is also about incorporating men into the process through collaboration and understand how women empowerment works in a patriarchal setting. Rural Economic Empowerment Project (RWEE) project strives to empower and improve the status of rural women in Nepal. This study is a qualitative approach to understand the perspectives and lived experiences

of women (project beneficiaries) and their husband of what empowerment is and its significance in the project context. The study finds that women perceive the empowerment project have beneficial outcomes with regard to better household decision-making, income generation, mobility and family well-being. In addition, men also bring a positive and progressive view on the changing roles of women in the village. Despite significant development of women, gender equality is perceived to be relatively persistent given that Nepal is a patriarchal society, and that strategic gender inclusive laws are not effectively implemented in all sectors of the country. Empowerment is multifaceted and requires an intersectional approach to improve women’s status. Engaging men into women empowerment projects in a country like Nepal can help address inherent gender inequalities both in grassroots and policy level.

1:40 p.m.

Funding Freedom: International Aid to Afghanistan in the Cold War

Presenter: Adelaide Petrov-Yoo

Adviser: Douglas Little, History, Clark University

This paper pulls back the curtain on why the US, Saudi Arabia, and Pakistan sent weapons to the Afghan *mujahideen* (known in the Reagan era as “freedom fighters”) in the 1980s. Did US officials genuinely believe they were promoting peace and freedom in Afghanistan? Why were the Saudi and Pakistani governments willing to risk so much for Afghanistan, a relatively small player in the region? To understand why these unlikely bedfellows banded together I present background information on the Cold War history of foreign relations between these countries. Isolating the individuals in charge of foreign policy in each country, I will explain their beliefs and how this helped them decide to spend millions of dollars on the *mujahideen*. This chapter in history explains the foundations of the continuing unrest in Afghanistan, and the present-day jihadpolitical relationships between these countries.

2 p.m.

Challenges to Effective Monitoring and Evaluation Systems: Lessons from Afghanistan

Presenter: Qudratullah Jahid

Adviser: Edward R. Carr, International Development, Community, and Environment (IDCE), Clark University

Afghanistan has been among the top three development aid recipient countries since 2001. The country has achieved

progress in state-building and development with aid from the international community. Monitoring and evaluating development aid, which in turn have the potential to improve effectiveness, remains a challenging task.

Monitoring and evaluation (M&E) systems remain essential public management tools across developed and developing countries to improve results and effectiveness. M&E systems in Afghanistan, both in development organizations and government, are faced with challenges which can be addressed with strong leadership.

This paper is an attempt to understanding these challenges and providing recommendations to Afghan policy-makers and the international community on improving M&E systems.

2:20 p.m.

What are we? A Narrative Inquiry of Boundaries between Cross-Gender Friendship and Romantic Love Relationship

Presenter: Ebra Elsharnouby

Adviser: Michael Bamberg, Psychology, Clark University

The proposed research aims to understand how socio-cultural systems influence identity construction in intimate friendship and romantic love relationships by adopting a narrative approach. Based on Relational Freedom Theory (Blatterer, 2015), the study is designed to scrutinize social norms and identity construction in intimate cross-gender relationships. The study takes into consideration American homosocial and heterosexual norms, as well as romance culture to understand their restrictive roles in identity construction. The study focuses on the experiences with a romantic partner who was formerly a platonic cross-gender friendship (i.e. a shift from friendship to romantic love relationship) to demonstrate the positioning of self and the partner, the effects of attraction and potential of a sexual relationship, audience effect and shared discourses on intimate relationships. Participants include heterosexual, American, male adults (i.e. over 29 years of age). Two data-prompted narrative interviews were conducted with each participant, one focusing on friendship phase and the other on romantic love phase of the experience of the shift from cross-sex friendship to the romantic love relationship. Positioning analysis will be used to analyze stories by focusing on identity navigation. Results are forthcoming and will be discussed focusing on the distinct role of friendship and the importance of examining intimate relationships in the socio-cultural context.

Fuller Room, 1-3:20 p.m.

Goddard Library

1 p.m.

Problematizing illicit economies and territorial governance on the Caribbean Coasts of Honduras and Nicaragua

Presenters: Laura Aileen Sauls, Emilie Dupuits

Adviser: Anthony J. Bebbington, Geography, Clark University

Since the 1990s, the Atlantic coastal zones of Nicaragua and Honduras have seen a strong increase in levels of narco-activity, as its remoteness and the overall absence of the state have enabled maritime, air, and land transport for the international narcotics trade. The narco-economy has had clear impacts on trends in violence, land concentration, and deforestation, but less clear is how the presence of illicit activity in this region is interacting with nascent forms of territorial institutionality — including new titling of Indigenous lands. How international and state responses to this illicit economic activity affect communities in the path of narco-transport routes further complicates governance relations around land, territory, and economic development. The interconnections amongst narco-trafficker networks, the international and national efforts to respond to the illicit trade, and Indigenous and Afro-Caribbean territorial groups across borders challenge the scalar and spatial dimensions of “local” governance in this region. Further, the shape of resource use and development pathways derive from these complex, multi-scalar relations. Drawing from ethnographic fieldwork in Nicaragua and Honduras with Indigenous territorial leaders and with participants in the narco-economy, this paper provides theoretical and empirical insight into the ways in which illicit activity influences on-the-ground, networked forms of territorial governance.

1:20 p.m.

Hydrosocial Flow: Climate change and community relations in Chile's Mining Regions

Presenter: Scott Odell

Adviser: Anthony J. Bebbington, Geography, Clark University

Three out of four experts interviewed in Santiago, Chile, perceive conflicts over water in mining regions to be on the rise in the country over the past ten years, while the Environmental

Justice Atlas has identified more than 500 such conflicts globally (Temper et al., 2015). Through qualitative research in three case studies in Chile, this paper investigates the impacts of cooperation between communities, companies, and the state, as well as the expansion of water management technologies such as desalination, on conflicts of this nature. Hydrosocial theory demands that such analysis consider not only the physical (or hydrological) properties of contested water resources in these conflicts, but also the ways they are used, by whom, and for what purposes (see Linton & Budds, 2014). This paper advances hydrosocial theory by arguing that the technological and social fixes pursued to address hydrosocial conflict often do not resolve the underlying source of the dispute. Rather, unless investment in the conflict source is abandoned altogether, it tends to flow downstream and to more vulnerable areas, where new conflicts arise. The paper thus highlights the need for increased inter-community relations, and more targeted analysis of downstream impacts of proposed fixes to hydrosocial conflict.

1:40 p.m.

The influence of modern state institutions on forest transitions: the case of the Southern Yucatan, Mexico

Presenters: Carlos Dobler-Morales, Rinku Roy Chowdhury, Birgit Schmook

Adviser: Rinku Roy Chowdhury, Geography, Clark University

By the 1980s, the Southern Yucatan, in southeast Mexico, had consolidated its status as a global hotspot of deforestation. Forest conversion was a consequence of rapid smallholder occupation and swidden agriculture expansion. Today, however, the region exhibits considerably lower forest loss rates. This paper examines the factors that influenced this transition. The study focuses on the role that modern agrarian, welfare, and conservation policy has played in changing land-use patterns in the region. As elsewhere in Latin America, smallholder in the Yucatan have become exposed to a panoply of agricultural subsidies and antipoverty programs, as well as expanding protected areas and new conservation instruments. Drawing from a household survey, key-informant interviews, and Landsat time-series, this study traces the linkages between the region's shifting policy environment, smallholder land-use decisions, and their landscape-level expressions. Results describe how the array of state institutions operating in the Southern Yucatan have induced smallholders to intensify

their agriculture via incentives to “modernize” their swiddens and restrictions on field rotations. At a landscape level, these agricultural changes appear to be stabilizing and simplifying the formerly dynamic and complex agro-forest mosaic. The case of the Southern Yucatan thus represents a trajectory of forest recovery that does not fit neatly with interpretations.

2 p.m.

Conceptions of Climate Change: Conversations with U.S. Conservatives

Presenters: Mike Athay, Yuko Aoyama

Adviser: Yuko Aoyama, Geography, Clark University

As the U.S. withdrawal from the Paris Climate Accord in 2017 has shown, American conservatives' views on climate change have disproportionate consequences on climate-related policies and the future of the planet. While numerous broad surveys now exist on this topic, qualitative evidence that provides insights on how conservative U.S. citizens use arguments and narratives as rationales for their beliefs is scarce. In this paper, we examine what shapes U.S. conservatives' views in debates on climate change, based on focus groups we conducted in six states in 2014 and 2018. Findings demonstrate that U.S. conservatives' views and discourses on climate change vary widely. Moreover, conservatives disagree on desired government interventions and strongly favor private-sector solutions. Overall, findings suggest the need for a far greater and more complex understanding of U.S. conservatives' than suggested in media reports.

2:20 p.m.

Marketization, Transitions, and the Democratization of Biotechnology in Community Science Labs

Presenter: Dan Santos

Adviser: James T. Murphy, Geography, Clark University

Is biotechnology in the midst of being democratized? Over the past decade or so, biotechnological knowledge, materials and tools have become more accessible, easier to use and cheaper than ever before. This has enabled the rise of ‘biohacking’: the conduct of biological experiments and projects outside of ‘mainstream’ scientific institutions. Community science labs, where the broader public can engage in biotechnology experiments and collaboration, are particularly important spaces for biohacking. These labs operate through distinct practices and cultures, and members work on establishing their

own start-ups and developing commodities and open source biological products and protocols. In short, these labs are trying to democratize biotechnology by enabling the broader public to engage in biotechnological innovation. In this presentation, this potential democratization of biotechnology is conceptualized as an emerging socio-technical transition driven in part by marketization processes. Concepts from the marketization literature help conceptualize how biotechnological innovation occurs in these labs and whether these innovations are perceived as legitimate, and concepts from the socio-technical transitions literature help conceptualize whether these innovations are initiating broader changes towards a more democratized biotechnological industry. Counter Culture Labs and BioCurious — both located in the Bay Area, California — will be compared as case study labs.

2:40 p.m.

Wildlife as drivers of land change? Agricultural transitions in a farmer-wildlife conflict landscape

Presenter: Roopa Krithivasan

Advisers: Rinku Roy Chowdhury, John Rogan, Geography, Clark University

Agricultural and mixed-use landscapes provide important habitats and forage to protected wildlife species across the world. At the same time, living alongside protected species — particularly megafauna that damage or destroy crops — stresses agricultural livelihoods, compounds other stressors (such as economic and climate pressures), and can significantly impact farmers' cultivation practices, land management decisions, and livelihood outcomes. Studies of human-wildlife conflicts (HWCs) in forest-agriculture landscapes suggest that abandonment of arable land may be a common outcome when farmers face frequent, severe crop losses to crop-raiding wildlife. On the other hand, many communities are able to maintain agricultural livelihoods despite living with crop predators by investing in a variety of individual and collective measures to monitor and protect crops and by leveraging institutions to support crop protection efforts. Despite extensive research on the impact of wildlife on livelihoods and fine-scale land-use outcomes, little is known about wildlife's direct or indirect contributions to broader scale land-use/land cover transitions in agricultural landscapes, and how collective action and institutional engagement impacts these transitions.

3 p.m.

Transition as place-making: Governing sustainability in Pittsburgh "ecodistricts"

Presenter: Sarah SanGiovanni

Advisers: Deborah Martin; James Murphy, Geography, Clark University

As international agreements and national action on environmental challenges are increasingly contested and stymied, cities are increasingly faced with the need to directly address sustainability at the urban scale. As they debate, envision, and attempt to transition towards sustainable urbanism, cities must develop governance initiatives and arrangements capable of facilitating these ends. To do so, cities are increasingly turning to governance experiments—small-scale, place-based projects in which diverse actors work together to develop innovative responses to the concrete sustainability challenges they experience. While it is recognized that this approach represents a significant shift in urban governance from top-down to bottom-up approaches, whether and how such governance experiments can “scale up” to impact sustainability transitions at regional or city-wide scales remains an open question in both theory and practice. To address this gap, my project will examine the way that one such governance experiment called “ecodistrict planning” is emerging in, impacting, and scaling beyond neighborhoods throughout the Pittsburgh, PA, metro region. To analyze these dynamics, I integrate theorizations of how sustainability transitions occur with the concept of “relational place” from the urban geographical literature. This approach facilitates an examination of the relations between governance experiments, urban sustainability transitions, and the places in which they develop and occur.

Prouty Room, 1:20–3 p.m.

Goddard Library

1:20 p.m.

Finding Hidden Treasure

Presenter: Robert Megerdichian

Adviser: Anne Gathuo, Urban Studies, Worcester State University

Deep within each of us is a “hidden treasure”; whether a vocation or an avocation, it is something about which we are passionate - our driving force. I have found my hidden treasure through art and I will encourage others to find their own.

1:40 p.m.

Carroll Wright: Lessons in Leadership

Presenter: Paul Sullivan

Advisers: Elizabeth Wark, Patricia Donovan, Management (Leadership concentration), Worcester State University

Civil war General, Massachusetts State Senator, first Commissioner of the U.S. Bureau of Labor Statistics (BLS), and first President of Clark University's undergraduate college, Carroll Wright (1840-1909) lived through a tumultuous and transformative period of American history. Wright's pioneering work in the field of labor statistics provided the foundation for the principal economic indicators that underpin our understanding of the U.S. economy. Based on archival research at Clark and BLS, this presentation will explore Wright's legacy and lessons in leadership.

2 p.m.

An Exploratory Spatial Analysis of Adverse Birth Outcomes in Massachusetts from 2000-2014

Presenters: Madeleine Haynes, Yelena Ogneva-Himmelberger

Adviser: Yelena Ogneva-Himmelberger, International Development, Community, and Environment (IDCE), Clark University

This study evaluates patterns in adverse birth outcomes (ABO) in the state of Massachusetts from 2000-2014 both spatial and temporally. ABO include low birth weight (< 2500 g) and preterm deliveries (gestational age <= 37 weeks). This research seeks to identify areas in Massachusetts that have experienced statistically significant increases or decreases in ABO throughout the study period as well as what socioeconomic characteristics are potentially correlated. Birth data was obtained from the Massachusetts Department of Public Health and only singleton, live births were included for the analysis. The data were aggregated to census blocks, and the total number of births and the number of ABOs were calculated for each census tract for each year. Birth data for white and black mothers will be evaluated separately to determine if there are similarities in the trends and patterns as previous literature has identified a much higher rate of ABO in births to black women. Temporal trends will be assessed using the Space Time Cube and spatial trends will be evaluated using spatial regressions in ArcGIS. Results of this study can be used to identify areas that are experiencing an increase in ABO to potentially allow more effective, targeted intervention methods.

2:20 p.m.

Coastal Plastics Abatement on Aquidneck Island, Rhode Island: Stakeholder Perspectives and Lessons Learned

Presenter: Paige Myatt

Adviser: Tim Downs, Dave Bell, International Development, Community, and Environment (IDCE), Clark University

This practitioner research focuses on the stakeholder perspectives and lessons learned about mitigating plastic pollution in the marine environment of Aquidneck Island, Rhode Island. It uses a mixed method approach of surveys, interviews, focus groups, and active participation in mitigation strategies to answer four main research questions. These questions aim to gather perspectives on the problem from multiple stakeholders in the community, including the general public, the restaurant industry, and local and state governments. This research also investigates what factors make this community a leader in igniting social change and reducing plastic pollution. The active involvement of the researcher via internship allowed her to gain familiarity with the mitigation strategies present on Aquidneck Island. These research questions culminated in discovering what combination of community factors and mitigation strategies allow the opportunity for success in other coastal communities. Most notably, there is a strong sense of community on Aquidneck Island. Its members are increasingly aware and involved in solving the problem. There are individuals, community groups, businesses, and non-profit organizations who participate in meaningful discussions on the issue. The research concludes that these conversations and actions have positioned Aquidneck Island to be a model for other coastal areas facing similar problems.

2:40 p.m.

Virtue is Always Green: A Short History of the Green Family of Worcester

Presenter: John Griffin

Adviser: Erika Briesacher, History, Worcester State University

Many of the residents of Worcester, Massachusetts have at one time or another visited Green Hill Park, but few realize that it is not named for the color of its rolling hills but for the family whose estate it formerly was. Three generations of the Green family will occupy Green Hill, beginning in the 18th century, until the heirs sell the family estate to the City of Worcester for a nominal sum in 1905. Though a prominent family in the

history of Worcester one of the most infamous members of their clan, Andrew Haswell Green, would later become known as the Father of Greater New York City after he dedicates several decades of his life to its improvement. Focusing on their legacy of serving their communities “Virtue is Always Green” looks at the Green family’s beginnings in Malden, Massachusetts, tracing their history to the founding of the nearby town Leicester and their settling at the family estate atop Green Hill in Worcester.

Poster Presentations: 3-4 p.m. *Tilton Hall, Higgins University Center*

1. Water Oxidation using Copper-Peptide Complexes

Presenter: Qurrat Ul-Ain

Adviser: Arundhati Nag, Biochemistry and Molecular Biology, Clark University

With increasing energy demands, exploring carbon-neutral, non-polluting technologies to produce fuel is crucial. Using the natural processes of photosynthesis as a framework, work has been done to synthesize water oxidation catalysts that can harness solar energy to split water, an abundant, inexpensive, natural resource, into hydrogen and oxygen gases, which can be stored as chemical energy. The catalysts currently used for water oxidation are mainly transition metal complexes comprising of precious metals such as ruthenium, iridium, platinum, which are not cost efficient and generate toxic waste. A few complexes using copper, an earth abundant and biorelevant metal have been reported¹⁻². Using an established catalytically active complex of copper with a tetraglycine peptide ligand², we developed new complexes by varying the peptide scaffold coordinating with the copper center to increase efficiency. Tetrapeptides with different amino acids were synthesized using Solid Phase Peptide Synthesis and coordinated to the copper at pH 11. Using Cyclic Voltammetry (CV) experiments, Na₂[Cu(MeGGGG)] was identified as the most efficient catalyst out of the synthesized compounds. To increase efficiency further, meta-dibromoxylene was used to dimerize the complex, in which a benzyl group links together the two amine termini of the polyglycine peptides.

2. Biophysical Analysis of Drosophila Transcription Factors

Presenter: Aaron Bogle

Advisers: Donald Spratt, Robert Drewell, Biochemistry, Clark University

The mis-regulation of gene expression can lead to cellular abnormalities. Gene expression is regulated by transcription factors (TFs) that bind to DNA sequences. While the DNA binding sequences that these TFs recognize are known, there are many unanswered questions about how and why these TF-DNA complexes form. How do the residues in the TF contribute to nucleotide specificity? Is the binding affinity of a TF-DNA complex a good predictor for gene activation/repression? To answer these questions, DNA-binding domains of TFs were overexpressed, purified, and characterized. The homeodomain of FUSHI TARAZU (FTZ-HD) and the zinc-finger domain of KRUPPEL (KR-ZFD) were examined due to their importance in *Drosophila melanogaster*. The overarching goal is to understand the biophysical basis for the formation of TF-DNA and to create an algorithm that can predict the strength of TF-DNA binding for any protein to a given DNA sequence. Electrophoretic Mobility Shift Assays (EMSAs) were performed in the presence of DNA sequences to see how changes in the consensus sequence affect binding. Structural tests were performed using Nuclear Magnetic Resonance (NMR) on FTZHD to identify which amino acids are involved in DNA sequence recognition. Isothermal Titration Calorimetry (ITC) experiments are performed to determine the dissociation constant (K_D).

3. Biophysical studies on HACE1: a HECT E3 ligase involved in Cancer and Huntington's Disease

Presenter: Diana Argiles Castillo

Adviser: Donald Spratt, Biochemistry & Molecular Biology, Clark University

HACE1 is a HECT E3 ubiquitin protein ligase involved in the ubiquitylation signaling pathway. These ligases covalently attach ubiquitin to substrate proteins to regulate their expression levels in essential cellular processes. HACE1 has been found to be essential for the antioxidative stress response pathway, neurodegeneration, and Golgi membrane biogenesis. HACE1 has also been found to be downregulated in various cancers such as Wilms' Tumor, the most common childhood kidney cancer, and Huntington's disease. Understanding the

unknown structure and biochemistry of HACE1 is important to learn the molecular causes of such diseases for future drug development. Studies of the HACE1 C-lobe, the region of the enzyme responsible for ubiquitin activity, have shown that it forms a stable disulfide complex with ubiquitin. Ubiquitin activity assays have revealed that the HACE1 C-lobe can build unanchored polyubiquitin chains, a characteristic linked to Huntington's disease. Nuclear Magnetic Resonance (NMR) studies have been performed on the HACE1 C-lobe and its backbone has been assigned to determine its structure. Performing biochemical studies for HACE1 C-lobe using CD spectroscopy, NMR spectroscopy, and activity assays can aid in the understanding of its structure and the mechanism used in the pathways it is involved in.

4. Science on the Brain: The Biochemical Characterization of Ubiquitin E3 Ligase, HECTD1

Presenter: Misa Mai

Adviser: Donald Spratt, Biochemistry and Molecular Biology, Clark University

Homologous to the E6AP Carboxyl Terminus (HECT) Domain E3 Ubiquitin Protein Ligase 1 (HECTD1) is an E3 ligase protein involved in post-translational modification within Ubiquitin Signaling Pathway that initiates proteasomal degradation. By doing so, lays down the crucial foundation for further investigation in disease pathways. Current studies show that HECTD1 is implicated in various neurological diseases such as glioblastoma and exencephaly through regulating the expression levels of heat shock protein 90 (Hsp 90), but the 3-dimensional structure has not been discovered. Identifying the structure and revealing the influence of mutations on functionality can validate HECTD1 as a drug target. This research project aims to biochemically characterize the C-lobe of HECTD1 to define how exactly it binds to ubiquitin to target specific substrates. The C-lobe of the HECT domain contains the necessary catalytic site, which is most important for ubiquitin attachment. This project assigned the backbone of HECTD1 C-lobe through nuclear magnetic resonance (NMR) spectroscopy and studied the activity of HECTD1 variants through in vitro ubiquitylation assays. Our cumulative results indicate that HECTD1 C-lobe is a stable, monomeric protein that is capable of building polyubiquitin chains. These studies provide initial insight into HECTD1 E3 ligase ubiquitin mechanism and drug development. Science on the Brain: The Biochemical Characterization of Ubiquitin E3 Ligase, HECTD1

5. Learning to Fly: Understanding Homeodomain Transcription Factor-DNA Binding Affinity in *D. melanogaster*

Presenter: Jeanmarie W. Loss

Advisers: Donald E. Spratt, Robert Drewell, Jacqueline Dresch, Biochemistry and Molecular Biology, Clark University

Transcription factors (TFs) are proteins that assist in controlling gene expression and bind at cis-regulatory modules (CRMs) upstream of genes. These TFs can both activate and repress the transcription of a given gene associated with the CRM, and in *Drosophila melanogaster* (fruit fly), the development of the embryo is controlled by a cascade of TF activity. However, an important question remains: how do these transcription factors identify and bind to their respective DNA targets? Antennapedia (Antp) and Ultrabithorax (Ubx), two *Drosophila* homeodomain (HD) TFs, are proteins of interest because of their importance in the development of the thoracic and abdominal regions, wings, and halteres. These proteins share a highly conserved 60 amino acid sequence called the homeodomain, that allows the TF to bind to a 6-8 amino acid binding site found in the major groove of DNA. TFs within this class recognize a variety of binding sequences in DNA. Using electrophoretic mobility shift assays (EMSAs) and isothermal titration calorimetry (ITC), we are currently examining how, where, and why HD-TFs bind to various DNA sequences. The results obtained will allow for a better understanding of TF-DNA binding affinity and for the prediction of other TFs' binding affinities through an algorithm.

6. Mutagenesis of oleaginous bacteria and yeast for the development of a next generation biofuel

Presenter: Terren Flanders

Adviser: Ellen Fynan, Biology, Worcester State University

While nature provides the compounds necessary to make fossil fuel, there is not yet an effective synthetic replacement. Incredibly high levels of carbon dioxide have been found in our atmosphere, and, as a result, it is important to find cleaner alternative energy sources (Head & Gray, 2016). Some effective biofuels include those developed from organic matter as well as some oleaginous microbes. These contain some strains from the *Streptomyces* species and *Aureobasidium pullulans* species (Rossi et al., 2011; Sitepu et al., 2014). Within this study, two species were subjected to a series of mutagenesis experiments to develop a library of oleaginous bacteria and yeast mutants with enhanced fatty acid capabilities. Some of these mutants were selected and compared to palm oil samples as a model for

what a fatty acid for a next generation biofuel might look like. Through statistical analyses of the data generated from the Nile red assays in this study, it was concluded that selected mutant strains demonstrated enhanced fatty acid producing capabilities as well as exhibiting other unique characteristics that suggest possible directions for future study.

7. Signed Distance-based Deep Memory Recommender

Presenters: Thanh Tran, Xinyue Liu, Kyumin Lee, Xiangnan Kong

Adviser: Kyumin Lee, Computer Science, Worcester Polytechnic Institute

Personalized recommendation algorithms learn a user's preference for an item by measuring a distance/similarity between them. However, some of the existing recommendation models (e.g., matrix factorization) assume a linear relationship between the user and item. This approach limits the capacity of recommender systems, since the interactions between users and items in real-world applications are much more complex than the linear relationship. To overcome this limitation, in this paper, we design and propose a deep learning framework called Signed Distance-based Deep Memory Recommender, which captures non-linear relationships between users and items explicitly and implicitly and work well in both general recommendation task and shopping basket-based recommendation task. Through an extensive empirical study on six real-world datasets in the two recommendation tasks, our proposed approach achieved significant improvement over ten state-of-the-art recommendation models.

8. Development of Near Real-Time Sleep Stage Detection Based on Single Channel EEG

Presenter: Khald Aboalayon

Adviser: Miad Faezipour, Computer Science, University of Bridgeport

Sleep disorders are considered as one of the major human life issues in the recent years. Therefore, efficient and automated systems that can differentiate sleep stages and assist physicians/neurologists in the diagnosis and treatment of sleep-related disorders, are highly on demand. The present paper is devoted to developing an easy-to-implement sleep stage classification algorithm that works fast in real time in a proficient way. The proposed algorithm is based on two new statistical features applied to single-channel EEG signals. We examined the effectiveness of our technique by building a near real-time

detection system using the Neurosky's Mindwave Mobile device, an affordable wireless EEG headset, to obtain EEG signals. The system is one-way without feedback loops. The results of analyzing our algorithm show that the run-time performance of this detection technique is linearly proportional to the size of the input samples and the execution time is very fast, regardless of the time recording the data.

9. Bridging the Communication Gap In Global Fire Safety Using Neural Machine Translation

Presenters: Mukund Khandelwal, Krushika Tapedia, Chenjie Jiang, Chen Liang

Advisers: Fatemeh Emdad, Chun-Kit Ngan, Data Science, Worcester Polytechnic Institute

According to the National Fire Protection Association (NFPA), more than 1.3 million fires were reported by fire departments in the United States in 2017, resulting in an estimated 3,400 civilian deaths, nearly 15,000 civilian injuries, and \$23 billion in property loss. NFPA's analysis also suggests that marginalized communities face particularly high fire risks. Further, while international data is less certain, these tragedies almost certainly occur at a much high frequency across the world. As NFPA aims to be the global leader in the elimination of deaths, injuries, and economic loss from fire, it is imperative that the codes and standards are accessible in various major languages such as Spanish so fire safety professional can engage with communities in their own language. To achieve this objective, NFPA's Research and Data Analytics (RDA) team collaborated with Worcester Polytechnic Institute (WPI) to develop a machine translation platform optimized for the specific terminology and jargon used in fire safety. The purpose of this research is to: Develop state-of-the-art domain-specific translation models using advanced Artificial Intelligence capabilities; Develop a user-friendly and scalable Graphical User Interface (GUI) using TensorFlow Serving to provide an effective platform for large-scale translation.

10. Fleet Maintenance Data Mining

Presenters: Umesh Nair, Nathan Hsu, Dekun Geng

Advisers: Fatemeh Emdad, Chun-Kit Ngan, Data Science, Worcester Polytechnic Institute

This project presents the analyses and results of mining vehicle maintenance records at National Grid, and how it can help improve the vehicle availability and reduce the maintenance costs.

11. Do female politicians matter for female labor market outcomes? Evidence from state legislative elections in India

Presenter: Sadia Priyanka

Advisers: David Cuberes, Magda Tsaneva, Economics, Clark University

This paper studies the long-term economic consequences of electing women to State Legislatures in India. I estimate the causal effect of exposure to female politicians during young adulthood on later life female labor market outcomes for age-cohorts 15-24 from 1980 to 2007. To address endogeneity of electoral preferences, I use close elections between male and female candidates, won by a woman, as an instrument for female political representation in a district. Exposure to female politicians between ages 18-20 across cohorts has non-trivial effects on later life wage employment. Specifically, an additional female politician in a district results in a 2.5 percentage point increase in the probability of working in wage employment, corresponding to an increase of 42%. These results are driven by employment in the private sector and areas with less entrenched gender bias. I provide suggestive evidence and discuss whether the employment effects are consistent with a policy channel or changed aspirations of young girls due to role modeling.

12. Do EPA regulations affect productivity? Evidence from the pulp and paper industry

Presenter: Yue Gao

Adviser: Wayne Gray, Economics, Clark University

The paper is to study the impact of the EPA regulations on plant productivity using difference-in-difference techniques. Using the confidential establishment-level data from the Census of Manufacturers and Annual Survey of Manufacturers at the U.S. Census Bureau from 1992 to 2007, we find that plant productivity changes are associated with the imposition of the Cluster Rule, an integrated, multi-media regulation. Plants covered by the Cluster Rule regulation have increased productivity in 2001 compared to the non-Cluster Rule plants. Furthermore, the plants covered by both BAT water regulations and MACT air regulations have a lower increase in productivity than the MACT-only plants.

13. Conflict and Nutrition: Endogenous Dietary Responses in Nepal

Presenters: Keenan Marchesi, Marc Rockmore

Adviser: Marc Rockmore, Economics, Clark University

Although stunting and other health shortcoming are frequently found in the aftermath of large-scale violence, the specific pathways from violence are largely unstudied. Despite the intuitive link from endogenous household responses to changes in dietary diversity, to the best of our knowledge, this has never been studied. This paper analyses the short-term consequences of the Nepalese civil war on household dietary diversity as proxied by household food consumption score (FCS). Using panel data from the Nepalese Living Standards Survey we compare changes to household FCS from immediately before and in the middle of the violence. Using household fixed effects, we address both the placement of violence and household selection into violence as well as address a variety of omitted variables. Our identification relies on the within-district variation in the monthly conflict intensity after controlling for household fixed effects and district-time trends. We find a strong effect of violence on dietary diversity. Additionally, we find that when household production increases, household purchasing decreases, suggesting households are shifting away from purchasing toward production for major food categories. Additionally, we find that conflict often leads to a reduction in household purchasing, while often increasing household production.

14. The Historical Impact of Canals on U.S. Urban Growth

Presenters: Jinyan Chang, David Cuberes, Junfu Zhang

Advisers: David Cuberes, Junfu Zhang, Economics, Clark University

This paper studies the causal effect that the construction of the canals network in the 19th century US had on regional economic development. To do so we geocode the location of canals and collect data on the exact dates in which the canals were operative along with the urban agglomerations that lied near these canals. We then use the inconsequential unit's analysis to find a causal relationship between proximity to canals and regional economic development. The main idea behind this strategy is that, if a canal was built with the main objective of connecting two locations, a third urban center situated between these two locations will exogenously be affected by the construction of the canal.

Utilizing the propensity score matching technique along with difference-in-differences analysis, we were able to show the differentiated population growth rates before and after the canals open to shipping, between counties with and without canal(s) passed by. In order to strengthen our identification strategy, we follow Faber (2014) and construct the hypothetical least costly canal route between any two locations and use this as an instrument for the actual canal routes.

15. The Effect of a Large-Scale Workfare Program on Child Marriage in India

Presenters: Ashley O'Donoghue, Magda Tsaneva
Advisers: Magda Tsaneva, Wayne Gray, Economics, Clark University

This paper examines the impact of a large-scale workfare program, the National Rural Employment Guarantee Scheme (NREGS), on child marriage in India. We use two rounds of data from the District Level Household & Facility Surveys from 2004 and 2014, and estimate a difference-in-differences model by comparing changes in child marriage rates between a cohort of young women and a cohort of older women before and after the program was implemented and across districts with different program intensity. Our results are also robust to using a hazard model. Overall, we find that NREGS is associated with an increase in the probability of marriage before 18. Heterogeneity analysis shows that the effects are driven by Hindu households in North India, which is consistent with dowry practices affecting marriage decisions when resource constraints are relaxed.

16. Comparison of remote sensing methods for depicting phenology of *Picea glauca*; a case study for unmanned aerial vehicles

Presenter: Clare Gaffey
Adviser: Karen Frey, Geography, Clark University

Plant phenology, timing of recurring phases of vegetation development, is controlled by climatic variables and photoperiod. As such, it can serve as an important indicator of local climate changes. While most metrics of vegetation development have been frequently analyzed at fine scales by ground-mounted cameras and visual observations, on one hand, and monitored at coarse scales by satellites, on the other, near surface remote sensing with Unmanned Aircraft Systems (UAS) should provide important improvements for bridging these scales together. UAS-derived phenological patterns were

compared to those from Landsat and MODIS, and in-situ camera. Dense time-series of UAS-acquired data add valuable capabilities for phenology monitoring. However, the operation of UAS also adds unique challenges in terms of flight planning, flight requirements, technical maintenance, and post processing of data. Lessons of the process and recommendations for future implementations of UAS technology will be highlighted.

17. Inaccessibility and Environmental Microaggressions: Disability Inclusion and Transforming Workplaces as Places

Presenter: Catherine Jampel
Adviser: Anthony Bebbington, Geography, Clark University

This poster shares one set of findings from my PhD research on disability “diversity and inclusion” (D&I) initiatives in professional workplaces in the US: that commitments to and practices of inclusion lead to changes in the form and character of workplaces. As a geographer, I theorize workplaces as anywhere work happens, including offices, conference rooms, meeting venues, and other sites of work. Based on qualitative research (interviews, participant observation, and document review) in the world of disability D&I in the federal government and federal contractors, I explain shifts in place character from three perspectives. First, a legal perspective offers an understanding of place change as a function of the law, through mechanisms such as enforcing ADA building codes and reasonable accommodations. Second, a phenomenological perspective offers an understanding of place change as it happens through lived experience. Third, a social justice perspective offers an understanding of place change through the framework of environmental microaggressions. That is, whereas leading employers may actively shape place character to make it inclusive (e.g. adding particular visual elements, eliminating particular chemical elements), a workplace or work environment that remains unchanged is likely replete with environmental microaggressions and therefore not inclusive.

18. Optimizing the Utility of Septic Tanks Using Anaerobic Digestion to Generate Renewable Energy

Presenter: Swapnil Mishra
Adviser: Peter Schwartzman, IDCE, Clark University

A septic system is a highly efficient, cost-effective and self-contained underground wastewater treatment system used to treat and dispose of small volumes of wastewater, mainly from houses and businesses. They are usually very simple in design

which makes them generally cheaper to install and maintain. Moreover, they can have various public health, environmental, and economic benefits if properly executed. Alternate domestic septic tank models have been designed and proposed for adoption against the existing domestic septic tanks for treating domestic sewage for both energy recovery and meeting the environmental requirements for such exuding effluent. Small scale use is only viable in low-income developing countries, where fuel sources are scarce and waste management systems are needed to prevent harm to human and environmental health. Besides cheap alternative sources of energy, a need for more advanced and proven commercial biogas systems, and regulation barriers, the amount of waste generated by a single household does not have a large enough nutrient potential to produce enough biogas in a digester to be economically viable.

19. Control of Multicellular Magnetotactic Bacteria with a Magnetic Field

Presenters: Ben Roque, Alejandra Rosselli, Cameron Mitchell, Alexander Petroff

Adviser: Alexander Petroff, Physics, Clark University

Bacteria of the species *Magnetoglobus multicellularis* form spherical colonies composed of tens of cells. A colony moves as a single unit as each cell rotates its flagella. Magnetic minerals within each cell cause the direction of the colony's motion to align with the ambient magnetic field. Here we characterize the motion of these large, fast-swimming colonies both individually and collectively in an oscillating magnetic field. First, we observe the dynamics of individual colonies. We measure their swimming speed, magnetic moment, and diffusion coefficient. Next, we observe the collective motion of dense swarms of colonies in a rotating magnetic field. We compare these observations to the predictions of a simple model. We use these results to propose a method to direct swarms of swimming colonies to perform tasks, such as sorting tracer particles in a fluid.

20. Solar Signals — Possible correlations between the 11-Year Solar Cycle and Earthquakes on Earth using the Fourier Transform

Presenter: Elizabeth Tyree

Adviser: Germano S. Iannacchione, Physics, Worcester Polytechnic Institute

Our understanding of the roll of sunspots (if any) in earthquake activity remains both elusive and disputed. The hypothesis of this study is that the frequency and magnitude of earthquakes on earth are influenced by changes in slope of the solar sunspot cycle. There are many previous earthquake studies that have found sunspots and earthquakes to be uncorrelated to each other. The approach of this study is to look for possible solar cycle signals with respect to sunspots and the change in slope of the solar sunspot cycle using three global earthquake catalogs. Two catalogs are from the United States Geological Survey (USGS) including the Centennial Y2K Catalog, and the ANSS Comprehensive Earthquake Catalog (ComCat) and the Third catalog is the International Seismological Centre (ISC) catalog of earthquakes. Using statistical tools combined with signal analysis techniques such as the fast fourier transform, this study investigates if there are solar signals contained in earthquake data. It is also the intent of this study to either show that earthquakes are indeed not correlated to the solar cycle at all, or at least help to provide a another avenue for further study if the hypothesis of this thesis holds true.

21. Investigating Parental Styles Related to Self-Regulation and Treatment Adherence in Chronic Pediatric Headache Over Time

Presenter: Alessandra Caruso

Adviser: Wendy Grolnick, Psychology, Clark University

Headache is the most prevalent chronic pain complaint in pediatric populations and is related to decreased quality of life. While treatment adherence is associated with improved functional outcomes, little evidence has explored how parents might facilitate children maintaining treatment behaviors. Self-Determination Theory (SDT) suggests that children move toward greater self-regulation through the process of internalization. Parents' autonomy support (vs. control) is hypothesized to relate to children's self-regulation as it satisfies the need for autonomy. This study explores the degree to which parental autonomy support relates to self-regulation of treatment behaviors and adherence in pediatric chronic pain over time. Participants were 58 children and adolescents (ages

10-17 years; 74.1% female; 77.6% Caucasian) who underwent multidisciplinary evaluation at a headache clinic, and their mothers. Data were collected at two time points over six months. Study findings provide insight into how parent-child interactions relate to symptom management and treatment outcomes in pediatric chronic illness concurrently, and possibly over time.

22. Visualizing Human Brain Connectome in Mixed Reality

Presenter: Shravan Murlidaran

Adviser: Dmitry Korokin, Robotics Engineering, Worcester Polytechnic Institute

Human Brain is a highly complex structure. With the advancements in technology, Brain has been extensively studied from various fields like Psychology, Neuroscience, and Computational fields. The idea of the brain as a network of interconnected neurons has a long and illustrious history in neuroscience. These findings have helped researchers to build and investigate computational models of different functions of the brain. Although most of these pioneering research use network theories to provide foundation and intuition to their results, they haven't explored further on visualizing such networks. Visualization has been an integral part of graph theory, but the sheer magnitude of neurons and its exponential connections hinders current research to come up with intuitive interpretations using the traditional way of visualizing 3D objects on 2D screens.

Our work tries to solve this problem by introducing mixed reality to visualize brain Connectome. We are developing a proof of concept for visualization that puts the mixed reality to its best use and provide better interpretations of the Brain networks, integrate other biological information such as the medical images and region information along with the network data and provide animation to the results of analysis (like shortest path) done on the brain networks.

23. Finding Hidden Treasure

Presenter: Robert Megerdichian

Adviser: Anne Gathuo, Urban Studies, Worcester State University

Deep within each of us is a "hidden treasure"; whether a vocation or an avocation, it is something about which we are passionate — our driving force. I have found my hidden treasure through art and I will encourage others to find their own.

Oral Presentations: Session B **Lurie Conference Room, 4-5:20 p.m.** *Higgins University Center*

4 p.m.

Stereotypical Representations of Black Women in American and Turkish Popular Culture

Presenter: Melike Sayoglu

Adviser: SunHee Kim Gertz, Interdisciplinary, Clark University

In this presentation, I will present a section of my dissertation which largely focuses on comparisons of nineteenth-century American and Ottoman slavery. More specifically, here, I will explore how cinematic portrayals of African Turkish women in the 1970s-80s illustrate some Othering aftereffects of Ottoman slavery, as it was understood in the Ottoman Empire and emerges in Turkey. I will draw a parallel to some stereotypical images from American popular culture that have been shaped by the history of slavery as well—namely the image of the Mammy and Aunt Jemima—to analyze stereotypical depictions of Black women in two Turkish films, Ertem Eğilmez's *Süt Kardeşler* [literally means "Milk Siblings," a Turkish expression denoting two or more children breastfed by the same woman] (1976) and Atif Yılmaz's *Şekerpare* [a type of Turkish desert, here the name of the main female character] (1983).

4:20 p.m.

Coping in the face of minority stress: A Qualitative Study of Strategies Employed by Lesbian, Gay, Bisexual, Pansexual and Queer Latinxs

Presenters: Néstor Noyola, Esteban V. Cardemil

Adviser: Esteban V. Cardemil, Psychology, Clark University

Latinxs with minoritized sexual identities (e.g., gay, lesbian, bisexual, pansexual, etc.) represent the largest minoritized racial/ethnic group in the U.S. adult LGBT population, yet their experiences have been overlooked in studies of coping with minority stress (i.e., heterosexist stigma/prejudice and discrimination). In this qualitative study, we explored the different ways in which eighteen Latinxs with minoritized sexual identities (LMSIs) living in the U.S. coped with minority stress. Integrating intersectionality and cultural approaches in psychology, our analysis highlights several coping processes, including a) strategic racial/ethnic and sexual identity image management, b) protective distancing, c) seeking and creating support from/for Latinx and LGBT communities, and d) contesting systems of oppression. Throughout our analysis, we

highlight some of the ways in societal privileges such as White- and straight-passing privileges, as well as Latinx cultural values, such as familismo, marianismo, and machismo shape these processes. Results from this study highlight that coping with minority stress cannot be understood without proper attention to sociocultural context and to the intersections of systems of privilege and oppression.

4:40 p.m.

***The Couple that Sits Together Stays Together:
The Influence of Meditation on Relationships***

Presenter: Justin Laplante

Adviser: James Cordova, Psychology, Clark University

Relationship health is an important, and under-researched, component of overall health and well-being. Satisfaction with relationships have an outsized impact on the physical and emotional health of individuals; therefore, anything that can benefit relationships has the ability to not just strengthen partnerships, but also support individuals. Meditation has been shown to have myriad benefits for both individuals, and has been shown to increase relationship satisfaction overall. However, to date there has been no investigation of the ways in which meditation is influencing relationships to bring about these positive overall benefits. The present study therefore applies a qualitative approach to investigate the ways in which meditation influences relationships in a sample of long-term meditation practitioners.

Thematic analysis was used to analyze semi-structured interviews with 20 participants, who had been in a relationship and practicing meditation for at least a year. Results indicate both global benefits (acceptance, non-reactivity, empathy) and specific benefits (communication and the sexual relationship), as well as downsides to practice, the influence of the partner's practice or non-practice on the relationship, and the developmental trajectory of practice. Limitations, future directions, and applications to life will be discussed.

5 p.m.

Trans Emerging Adults' Experiences with and Approaches to Intimate Relationships

Presenters: Melissa Manley, Abbie Goldberg

Adviser: Abbie Goldberg, Psychology, Clark University

Little research has examined the experiences of trans emerging adults, and even less work has focused on their experiences with and approaches to intimate relationships.

Relationship experiences during emerging adulthood may represent formative experiences of intimacy, cohabitation, and exploration or establishment of personal identity. For trans students, dating and romantic relationships require navigating a wide range of issues, including identity disclosure to potential or established partners, heteronormative and binary societal expectations of gender, and support versus stigmatization from partners.

The current study aims to expand our understanding of intimate relationships among trans emerging adults in higher education settings. Thirty-six trans-identified undergraduate and graduate students were interviewed. Participants ranged in age from 18 to 29 ($M = 24.28$, $SD = 2.81$), and identified predominantly as White and queer. Analyses showed that participants avoided men or cisgender people as dating partners and ensured potential dating partners were aware of their identities as strategies to mitigate stigma. A few participants had experienced relationship dissolution related to a gender transition, but all currently partnered participants described their partners as supportive. Additionally, several participants identified as polyamorous. Our findings will enhance understanding of the relationship experiences, challenges, and strategies of trans emerging adults.

Fuller Room, 4-6 p.m.

Goddard Library

4 p.m.

The effect of naloxone access laws on opioid-related mortality

Presenter: Ashley O'Donoghue

Advisers: Wayne Gray; Magda Tsaneva, Economics Department, Clark University

On average, 130 Americans die each day from an opioid overdose. To combat the growing opioid epidemic, all states have passed a version of a naloxone access law that aims to increase the availability of naloxone – a prescription drug that can reverse the effect of an opioid overdose. This paper examines the impact of state-level naloxone access laws on opioid-related mortality in the United States, using monthly data from the Centers of Disease Control and Prevention (CDC) on county-level mortality rates from 2010 to 2017. I use variation in the timing of access laws across states to identify the effects of naloxone access and find that states that

passed naloxone access laws prior to 2013 saw reductions in opioid-related mortality. After 2015, states with a naloxone access law saw increases in opioid-related mortality. These findings are consistent with changes in the timing of fentanyl distribution in the United States, suggesting a limited role for naloxone when fentanyl contaminates the heroin supply. The increases in mortality are largely driven by the Midwest and South, two areas which have been hit particularly hard by the fentanyl epidemic, while simultaneously having the least access to substance abuse treatment.

4:20 p.m.

Does Local Environmental Regulation Affect Plant Location? Evidence from U.S. Manufacturing Industry

Presenter: Yue Gao

Adviser: Wayne Gray, Economics, Clark University

This study examines whether differences across local environmental regulatory stringency affects the plant location within the manufacturing industry in the United States. We use the industry-level data compiled from the County Business Patterns to pinpoint net new plant births in U.S. counties over the 1978-2009 period. And the League of Conservation Votes scorecard is used as a proxy to measure the local environmental regulatory stringency. We find a negative and significant impact. A county with stricter environmental regulation is associated with a lower birth rate of new plants in the manufacturing industry. These results are robust across most estimators, in terms of sign, significant level, and magnitude. Meanwhile, robustness tests are used to allow for heterogeneity within-industry and within-states.

4:40 p.m.

The Legacy of Karintha's Burning Child in Jean Toomer's "Box Seat"

Presenter: Will Whitehead

Adviser: Stephen Levin, English, Clark University

Jean Toomer's *Cane* is a 1923 gothic modernist novel which is split into three distinct sections. This presentation will discuss primarily a story from the second section, "Box Seat", but in doing so will explore the relationships between this story and the novel's opening tale, "Karintha". The continuity running between "Karintha" and "Box Seat", can be described as a gothic depiction of the ways African-American history continues to

haunt the present. Taking the link between "Karintha" and "Box Seat" as its basis, in this presentation I will argue that "Box Seat" represents the impossibility of assimilation into the USA for African Americans, not through any fault of their own, but due to a violent ancestral legacy which haunts the present. This past burns inside the minds of African Americans and colours their existence.

5 p.m.

Middle Age Werewolves: Werewolves in Medieval Literature

Presenter: Callie Ostrowski

Adviser: Dianne Berg, English, Clark University

Werewolves appear in written literature dating back to the Ancient Greeks and have retained their popularity as supernatural figures to this day. The legend of the werewolf was especially popular in Europe during the Middle Ages and varied by each story's region of origin. One popular werewolf tale in particular was "Bisclavret," one of the twelve *lais* of Marie de France. It recounts the story of a man who is betrayed by his wife and trapped in the form of a wolf. This project examines this lay and its religious motifs as compared to the werewolf lore and Christianity contemporary to the Middle Ages in England.

5:20 p.m.

Inflections of 'Slave Narrative' in Mansfield Park and Frankenstein

Presenter: Md Nurul Ahad

Adviser: Stephen Levin, English, Clark University

This paper examines the trauma of slavery and its vicissitudes as registered in Jane Austin's *Mansfield Park* and Mary Shelley's *Frankenstein*. These novels, written within ten years of each other in the early nineteenth century, are essential to understand late eighteenth and early nineteenth-century British culture and formation of British nationalism, which is arguably shaped by the traumatic events associated with colonialism and slave-trade. In order to fully understand the historical context of Romanticism, the time-frame in which the novels were written, it is crucial to recognize Britain's imperial domination/colonization and subsequent trauma of slavery that deeply informed the formation of British nationalism. The novels in question fictionalize this vexed historical category of slavery in their individual aesthetic mood. I show that *Mansfield Park*

reveals through its characterization of Sir Thomas Bertram dark overtone of slavery and colonization, highlighting Britain's complicity in both. Similarly, *Frankenstein* allegorizes the master-slave relationship through the characterization of Victor and the unnamed creature (for Victor, a monster). In analyzing both texts, this paper also exposes the dimension of *slavery-trauma*, as it were, which is ought to be considered a characteristic component of Romanticism.

Grace Conference Room, 4:30–5:30 p.m.

Higgins University Center

4:30 p.m.

G2E3 is a functional HECT E3 ligase

Presenter: Steven Beasley

Advisers: Donald Spratt, Biochemistry, Clark University

Control of the cell cycle is a fundamental aspect of health. When this process goes awry, cells can proliferate unchecked (cancer) or are destined for cell death (apoptosis). The protein G2E3 was identified as a regulator of the checkpoint between G2 growth phase and the mitosis cell division phase. G2E3 is an essential protein that is specifically expressed during the G2 phase. Contrary to the current literature, this study found G2E3 was a functional HECT E3 ubiquitin ligase. The HECT family of E3 ubiquitin ligases catalyze the post-translational modification of substrate proteins with the small protein ubiquitin. Ubiquitylation targets substrates for degradation or subcellular localization. Understanding the structure/function relationship of G2E3 is an important step in elucidating its role. This study looks into the biophysical characterization of this enzyme's structure and function using a variety of techniques including site-directed mutagenesis, NMR spectroscopy, CD spectrophotometry, and activity assays. The biophysical data indicates the G2E3 C-lobe forms a well-folded and stable protein. Activity assays show that the G2E3 C-lobe can facilitate K63-linked polyubiquitin chains. These intriguing new results will aid in our understanding of this protein's mechanism and function.

4:50 p.m.

Investigation of on-resin reactions for cyclization efficiency to control monomer — dimer ratios for comprehensive macrocyclic peptide libraries

Presenter: Rene Kandler

Adviser: Arundhati Nag, Chemistry, Clark University

Cyclized peptides are getting more and more attention in different applications because of their stability and rigidity that make them interesting compounds for biological applications and drug design. They are more resistant to metabolic cleavage, bind tighter and are more potent compared to linear peptides. It was shown in recent years that on bead cyclization results in a lower number of byproducts due to more conformational restriction and protection of the C-terminal carboxyl group of the peptide compared to the off-bead peptide. In order to develop cyclic peptide libraries for future screening against oncogenic proteins, we are investigating the efficiencies and mechanisms of on-resin cyclization reactions such as Copper catalyzed Azide-Alkyne Cycloaddition (CuAAC) reaction. We will present our newest findings on variations observed by changing parameters like peptide sequence length, peptide sequence identity, position of orientation of azide and alkyne containing amino acids, and effect of N-terminal functional groups. The analysis and optimization of these parameters will allow development of on-resin cyclic libraries with monomeric peptides formed thorough intramolecular CuAAC reaction, as opposed to dimeric or polymeric peptides formed through intermolecular CuAAC reaction.

5:10 p.m.

Synthesis and Applications of Thermo-responsive Polymers

Presenter: Pramod Mishra

Advisers: Sergio Granados-Focil, Chemistry, Clark University

Polymers are the chain of concatenated monomer molecules having versatile physio-chemical properties. We have been surrounded by polymers all around from fabrics that we wear to the plastics materials and appliances we use daily; from coatings of the car and buildings to coat of the drug capsules. We have been focusing on the Polymers which change their properties in response to change in temperature also widely

called as thermo-responsive polymers. They are capable of storing large amount of heat during transition from crystalline to amorphous state on heating. In addition to that, they show change in optical properties during such transition which can further be useful in various applications. We have successfully synthesized these polymers and studied their properties. We have been investigating their potential use in outer building enclosure system and thermo-sensitive systems.

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