

Northwestern

UNDERGRADUATE RESEARCH



**UNDERGRAD
RESEARCH
EXPO &
CREATIVE ARTS
FESTIVAL**

MAY 17 - MAY 18, 2022

Dear exposition attendees,

The annual Undergraduate Research and Arts Exposition is a wonderful celebration of the intellect, creativity and resilience of Northwestern's undergraduate students. This year, we have been delighted by the resurgence of research activity as the trajectory of the pandemic improves.

To share some noteworthy examples of this trend, our Academic Year Undergraduate Research Grant program, which provides research expense funding in support of senior thesis and independent study courses, funded 102 awards, the second-highest total in its history. For this year's Summer Undergraduate Research Grant competition, we funded a record number of creative arts and journalism projects. In fact, more than a quarter of the winning projects will end with a creative output and, in total, the Office of Undergraduate Research (OUR) has awarded more than \$250,000 this year in support of students pursuing arts- and journalism-based learning. And, across all disciplines, we were particularly happy to fund a record number of sophomores. This cohort has faced more challenges than most during the pandemic, and we are thrilled that they are able to fully engage with the opportunity to learn through research.

The exposition would not be possible, of course, without the dedicated work of our committed faculty. These experiences transform students' lives, and I am consistently inspired by the care and dedication of our instructors. I also want to congratulate OUR for once again hosting this event, and for the staff's service to students' research opportunities. Associate Director Megan Wood, Administration/Finance/Communications Assistant Tori Saxum, Education Program Manager Christina Ginardi, Outreach Coordinator/Advisor Diamond Jones, and Director Peter Civetta support and empower students to achieve beyond their wildest expectations.

This year, we are excited to showcase the students' work in three separate forms: poster presentations, oral presentations and a return to our in-person Creative Arts Festival. Through these platforms, you will see not only the bright future of these students, but also their tremendous awareness of the present moment. In the midst of all we have all experienced over the past few years, they are revealing new knowledge and experience to world.

I hope you enjoy this culminating expo as much as I do, and I encourage you to attend the inaugural Winner's Circle event at 4 p.m. Tuesday, May 24, in the Norris Louis Room. It will feature the top judged winners across all three categories and will include a keynote address from Dr. Wendy Roldon, who began her career with a grant from OUR. It promises to be a great ending to a superb year of undergraduate research.

Sincerely,
Kathleen Hagerty
Provost and Professor



Join us on May 24, 2022 from 4:00 to 6:00 PM for the inaugural Winner's Circle Event. We will celebrate the top Oral Presenters, Poster Presentations, and Festival Winners with University executive leadership.

Norris – Louis Room.



The 2022 Virtual Undergraduate Research and Arts Exposition

Northwestern University's
twentieth annual celebration of
undergraduate research and creativity

**Tuesday, May 17 - Wednesday
May 18, 2022**

Virtually Hosted by Symposium



∞ Contents

Program of Events	ii
Office of Undergraduate Research Advisory Council	iii
Exposition Planning & Organization	iv
Guide to Undergraduate Research Programs at Northwestern	v
Next Steps for your Research	vii
Expo Keynote Address: Wendy Roldan	1
Faculty Judges	2
<i>Please use the search function to find Northwestern University student presenters</i>	
Oral Presentations	4
Guide to Oral Presentations	4
Oral Presentation Abstracts	9
Poster Presentations	34
Poster Presentation Abstracts	34
Creative Arts Festival	92
Creative Arts Festival Jury	93
Creative Arts Festival Abstracts	94

Program of Events

LINK TO ASYNCHRONOUS POSTER PRESENTATIONS AND ORAL PRESENTATIONS

symposium.foragerone.com/nuexpo22

Tuesday, May 17, 2022

12:00-1:00 PM

Oral Presentation Q&A Session One

Innovations in Science and Engineering

<https://northwestern.zoom.us/j/95566498004>

4:00-5:00 PM

Oral Presentation Q&A Session Two

Using Power and the Past

<https://northwestern.zoom.us/j/92719910877>

Wednesday, May 18, 2022

12:00-1:00 PM

Oral Presentation Q&A Session Three

Identities and Their Resistance- Engagement in Our Complicated World

<https://northwestern.zoom.us/j/93048796585>

4:00-5:00 PM

Oral Presentation Q&A Session Four

Our Environments- How We Impact and Are Impacted By Our World

<https://northwestern.zoom.us/j/99207678360>

Office of Undergraduate Research Advisory Council

Tanya Bhargava, Student Representative, TEDx

Nadege Bizimungu, Student Representative, NU-Q

Neal Blair, Professor, McCormick School of Engineering and Applied Science

Wes Burghardt, Associate Dean, McCormick School of Engineering and Applied Science

Ace Chisolm, Student Representative, Arts

Ryan Dohoney, Associate Professor, Bienen School of Music

Renee Engeln, Professor of Instruction, Weinberg College of Arts and Sciences, Chair of the Undergraduate Research Assistant Program Committee

Jenna Greenzaid, Student Representative, Northwestern Undergraduate Research Journal

Bill Haarlow, Director, Weinberg College – Admission Relations

Mei-Ling Hopgood, Professor, Medill School of Journalism, Chair of the Undergraduate Research Grant Committee

Elizabeth Lance, Research Administrator, NU-Q

Molly Losh, Professor, School of Communication

Daniel MacKenzie, Associate Director for Student Life, Medill School of Journalism

Sydney Matrisciano, Student Representative, Humanities

Marina Micari, Associate Director, Undergraduate Programs, Searle Center for Advancing Learning and Teaching

Beth Pardoe, Director, Office of Fellowships

Megan Powell, Program Coordinator, School of Professional Studies

Ken Powers, Senior Advisor, School of Education and Social Policy

Colin Runt, Advisor, Athletics

Onnie Rogers, Assistant Professor, Weinberg College of Arts and Sciences

Miriam Sherin, Associate Provost for Undergraduate Education

Jorja Siemons, Student Representative, Social Science

Shreya Sriram, Student Representative, Northwestern Undergraduate Research Journal

Russell Steans, Student Representative, Chicago Area Undergraduate Research Symposium

Lee West, Director of Undergraduate Education, Office of the Provost

Kaua'i Wu, Student Representative, Natural Sciences & Engineering

Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta, Director

Megan Wood, Associate Director

Christina Ginardi, Education Program Manager

Diamond Jones, Advisor & Student Outreach Coordinator

Tori Saxum, Administration, Finance, & Communication



Guide to Undergraduate Research Programs at Northwestern University

Below is a partial listing of current Northwestern programs supporting undergraduate research and creative projects. More are available on the Office of Undergraduate Research web site. You can also search for research opportunities from across the university through the Global Research Opportunities database. Many departments and programs have other opportunities that are not widely advertised. External agencies fund a number of programs, such as the National Science Foundation or the Fulbright IIE government grants. The Office of Fellowships can help students identify these external opportunities.

Office of Undergraduate Research Programs

Academic Year Undergraduate Research Grants:

undergradresearch.northwestern.edu/funding/ayurg/

Summer Undergraduate Research Grants:

undergradresearch.northwestern.edu/funding/surg/

Undergraduate Research Assistant Program (Academic Year and Summer):

undergradresearch.northwestern.edu/funding/urap/

Conference Travel Grants:

undergradresearch.northwestern.edu/funding/ctg/

Undergraduate Language Grants:

undergradresearch.northwestern.edu/funding/language-grants-ulg/

Circumnavigators Travel-Study Grant:

undergradresearch.northwestern.edu/funding/circumnavigator-grant/

Emerging Scholars Program:

undergradresearch.northwestern.edu/funding/emerging-scholars/

Other University-Wide Programs and Resources

Center for Global Engagement:

gloapp.northwestern.edu/index.cfm?FuseAction=Programs.ViewProgramAngular&id=10200

Global Research Opportunities: globalresearchopportunities.northwestern.edu/

Global Learning Office: northwestern.edu/abroad/

Institute for Policy Research: ipr.northwestern.edu/who-we-are/students-postdocs/summer-undergraduate-research-assistant-program/

Northwestern Scholars: scholars.northwestern.edu

Weinberg College of Arts and Sciences

African Studies: africanstudies.northwestern.edu/research/funding/index.html

Anthropology: anthropology.northwestern.edu/research/index.html

Guide to Undergraduate Research Programs at Northwestern University, continued

Astrophysics: ciera.northwestern.edu/Education/REU

Biological Sciences: biosci.northwestern.edu/research/

Chemistry: chemistry.northwestern.edu/undergraduate/programs/index.html

Chicago Field Studies Program: internships.northwestern.edu/

Economics: economics.northwestern.edu/undergraduate/major/research.html

History: Leopold Fellows of the Center for Historical Studies:

historicalstudies.northwestern.edu/fellowships/leopold-fellows/

Mathematics: math.northwestern.edu/undergraduate/research-opportunities/index.html

Neurobiology:

neurobiology.northwestern.edu/undergraduate/Research%20Opportunities/index.html

Physics and Astronomy: physics.northwestern.edu/undergraduate/research.html

Political Science: polisci.northwestern.edu/undergraduate/research-opportunities

Psychology: psychology.northwestern.edu/undergraduate/research

WCAS Baker Program in Undergraduate Research: baker.northwestern.edu

School of Communications

EPICS: External Programs, Internships, & Career Services: epics.soc.northwestern.edu

School for Education and Social Policy

Research in SESP: sesp.northwestern.edu/ugrad/opportunities/research.html

McCormick School of Engineering and Applied Science

Biomedical Engineering: mccormick.northwestern.edu/biomedical/undergraduate/research-opportunities/index.html

Chemical & Biological Engineering:

mccormick.northwestern.edu/chemical-biological/academics/undergraduate/research-opportunities.html

Electrical Engineering: mccormick.northwestern.edu/electrical-computer/research/undergraduate-research.html

Computer Science: mccormick.northwestern.edu/computer-science/research/groups-labs.html

International Institute For Nanotechnology:

iinano.org/northwestern-university-nanotechnology-reu

Materials Research Science and Engineering Center: mrsec.northwestern.edu/undergraduate-opportunities

McCormick Opportunities: mccormick.northwestern.edu/students/undergraduate/research-opportunities/

Next Steps for your Research

The most important step in research, and often the most over-looked for undergraduate researchers, is sharing research findings. This final step allows for the vital process of peer review and contributes to the ongoing development of our knowledge about the world. Moreover, research is a cumulative process that grows from one project to another. It is also important to think about how your research can be transformed into new and related projects. Below are some examples of programs that have been developed at both Northwestern and nationally to help undergraduate researchers participate in and learn from the final step in the research process.

Present Your Research

Northwestern's Annual Undergraduate Research and Arts Exposition:

undergradresearch.northwestern.edu/expo

Chicago Area Undergraduate Research Symposium: caurs.com

Academic Conferences:

Consult with your advisor for major conferences in your field and apply for funding through the Conference Travel Grant program: undergradresearch.northwestern.edu/ctg

Council on Undergraduate Research: cur.org/engage/undergraduate/presentation/

Publish Your Research

Northwestern Undergraduate Research Journal: thenurj.com

Council on Undergraduate Research: cur.org/engage/undergraduate/journals/

Directory of Undergraduate Research Journals (UNC Office for Undergraduate Research):
our.unc.edu/share/publish/

Transform Your Research

Apply for National & International Research Grants: northwestern.edu/fellowships

Apply for Graduate School. Consult with your advisor for the best programs in your field and apply for funding through the Office of Fellowships:
<https://www.northwestern.edu/fellowships/find-fellowships/fellowship-finder/>

EXPO KEYNOTE ADDRESS

TUESDAY, MAY 24TH – 4PM

NORRIS LOUIS ROOM



Dr. Wendy Roldan

“My Human Centered Approach to Research”

Dr. Wendy Roldan is a User Experience Researcher at Google. Wendy completed her Ph.D. in the Department of Human Centered Design & Engineering at the University of Washington in December 2021. Dr. Roldan’s research was funded by the National Science Foundation Graduate Research Fellowship and her dissertation was titled *Noticing and Enacting Equity Across Design Sites of Knowledge*. Her published research has received best paper and honorable mention awards from engineering, design, and human computer interaction conferences. Prior to attending the University of Washington, Wendy received a B.S. in Mechanical Engineering from Northwestern University in June 2017. She was supported by the Gates Millennium Foundation and Northwestern’s Good Neighbor, Great University scholarship during her undergraduate studies. While at Northwestern, she participated in undergraduate research for two years and was a recipient of a summer undergraduate research grant to work in the Delta Lab with Dr. Liz Gerber and Dr. Julie Hui on exploring equitable makerspaces.

∞ Judges

Alessia Para,	Neurobiology
Amine Garci,	Chemistry
Amy Kehoe,	Office of Fellowships
Andrew Rivers,	Physics and Astronomy
Andrew Roberts,	Political Science
Ange-Therese Akono,	Civil and Environmental Engineering
Ann Fernandez,	Chemistry
Ayse Lokmanoglu,	Communication Studies
Bayley Taple,	Preventative Medicine
Ben Gorvine,	Psychology
Benjamin Partridge,	Chemistry
Bill Muller,	Pathology
Bradley Zakarin,	Office of the Provost, Anthropology
Brian Bouldrey,	English
Bryon Drown,	Chemistry
Charles Camic,	Sociology
Chinnaraja Eswaran,	Chemistry
Chloe Thurston,	Political Science
Chris Davidson,	Northwestern University Libraries
Christos Dimoulas,	Computer Science
Claudia Haase,	Human Development and Social Policy
Daicong Da,	Mechanical Engineering
Daniel Horton,	Earth & Planetary Sciences
David O'Neill,	Biomedical Engineering
David Schieber,	Sociology
Debabrata Sengupta,	Chemistry
Diane Coddling,	Physics & Astronomy
Diego Arispe-Bazan,	Anthropology
Diptaman Chatterjee,	Neurology
Elizabeth Lewis Pardoe,	Office of Fellowships
Erin Waxenbaum,	Anthropology
Greg Beitel,	Molecular Biosciences
Hojoon Lee,	Neurobiology
Ian Mondragon,	Physics
Ignacio Cruz,	Communication Studies
Ingrid Zeller,	German
Iqbal Utama,	Materials Science and engineering
Istvan Kovacs,	Physics and Astronomy
Jason Kruse,	University Libraries, Sociology
Jason Roberts,	Office of Fellowships
Jean Clipperton,	Political Science / Sociology
Jennifer Tackett,	Psychology
Jian-Hong Tang,	Chemistry
Joe Lau,	Communication Sciences and Disorders
Jolie Matthews,	Learning Sciences
Jonathan Emery,	Materials Science and Engineering
Joseph Whitson,	History
Judy Franks,	Integrated Marketing Communication

Karen Springen,	Medill
Karrie Snyder,	Sociology
Katherine Amato,	Anthropology
Keith Gordon,	Physical Therapy and Human Movement Sciences
Keith Woodhouse,	History
Koushik Pal,	Materials Science and Engineering
Liang Feng,	Chemistry
Lilah Shapiro,	School of Education and Social Policy
Lindsay Caesar,	Chemistry
Linsey Seitz,	Chemical and Biological Engineering
Lisa Del Torto,	Cook Family Writing Program
Liz Gerber,	Mechanical Engineering/Communication Studies
Megan Roberts,	Communication Sciences and Disorders
Michael Elbaz,	Neurobiology
Michelle Driscoll,	Physics
Mindy Douthit,	School of Education and Social Policy
Mitchell Barklage,	Earth and Planetary Sciences
Mohamed Abazeed,	Radiation Oncology
Mohammed Elbaz,	Radiology & Biomedical Engineering
Nathaniel Odell,	Physics and Astronomy
Neal Blair,	Civil & Environmental Engineering
Onnie Rogers,	Psychology
Or Berger,	Chemistry
Ozge Samanci,	Radio, Television, and Film
Pati Vitt,	Plant Biology and Conservation
Penghao Li,	Chemistry
Peter Smith,	Chemistry
Reza Vafabakhsh,	Molecular Biosciences
Rifka Cook,	Spanish and Portuguese
Sarah Rodriguez,	Global Health Studies
Schuyler Kain,	Physics & Astronomy
Sherif Badawy,	Medicine and Pediatrics
Shravas Rao,	Computer Science
Siobhan Phillips,	Preventive Medicine
Sirus Bouchat,	Political Science
Sri Bala Gorugantu,	Chemical & Biological Engineering
Stephanie Knezz,	Chemistry
Stephen Carr,	Materials Science and Engineering
Stephen Hill,	Office of Fellowships, Anthropology
Tabitha Bonilla,	Human Development and Social Policy
Tingwei Zhang,	Biomedical Engineering
Tiwa Ajibewa,	Preventive Medicine
Veronica Berns,	Chemistry
Vivasvan Soni,	English
William Horton,	Psychology

∞ Guide to Oral Presentations

Oral Presentation

Question and Answer Session One

Innovations in Science and Engineering

Tuesday, May 17th 12:00-1:00pm (CST)

<https://northwestern.zoom.us/j/95566498004>

Cyrus Abrahamson, "Vimentin Is a Requirement for Complete Closure of the Ductus Arteriosus"

Ria Desai, "Feasibility and Acceptability of Fit2ThriveMB: A Technology-Based Intervention for Patients with Metastatic Breast Cancer"

Eirene Fithian, "Establishing A Quantitative Proteostasis Probe for Neuronal Signaling Receptor Trafficking Upon Protein Aggregation"

Rebecca Gu, "Application of Ovarian Anatomy Nomenclature to Classify and Quantify Follicles in the Rhesus Macaque Ovary"

Heather Humbert, "Identifying the Role of Niche Signaling in Hofstemia Miamia Regeneration"

Kade Kelley, "Ligand-Binding Coactivators in Nuclear Receptor Transactivation"

Unsun Lee, "Protein Expression Optimization for a Novel Split Adenylate Cyclase Disease Biomarker Detection Scheme"

Madelyn Moy, "Evaluating the Long-Term Effects of Hepatitis-B Infection on the Gut Microbiome of Captive Chimpanzees (Pan Troglodytes)"

Alexia Popescu, "Connecting Conductivity with Surface Structure for a Clean Energy Catalyst"

Aru Singh, "Classifying Cell Phenotypes in Small Cell Lung Cancer Using Machine Learning Imaging Techniques"

Sarah Sobol, "Advancing Cell-Free Glycoconjugate Vaccine Production"

Imra Tajuddin, "Strongly Luminescent Hybrid Lead Halides with a Symmetric Triamine"

Kaua'i Wu, "Characterizing Carbon Slurry Properties with a Custom Built Device"

Oral Presentation

Question and Answer Session Two

Using Power and the Past

Tuesday, May 17th 4:00-5:00pm (CST)

<https://northwestern.zoom.us/j/92719910877>

Tomer Cherki, "You Had to Be There: Jewish Humor in the Holocaust as a Complex Form of Resistance"

Katica Hope O'Connor, "Religiosity, Voter Turnout, and Congressional Representation of Black Americans"

Olivia Putnam, "Aftermath of Wrongdoing: The Relationship Between Moral Threat, Withdrawal, and Repair"

Robert Read, "The Power of Social Justice Movements on College Campuses: Perceptions from Past and Present Student-Led Campus Movements at Northwestern University"

Laurisa Sastoque, "Drugs, Ethnic Profiling, and the American Perception of Colombian Immigrants: A Case Study of Central Falls, Rhode Island"

Sophia Scanlan, "‘I Wasn’t Going to Wear No Shorts:’ Baseball and the Ideals of Mid-Twentieth Century Black Womanhood"

Michelle Sheinker, "Deceptively Progressive: Are Evanston’s Reparations in Name Only?"

Carolina Stutz, "A Historical Exploration of Lunfardo, Tango, and Italian Immigration in 19th Century Argentina"

Harry Xie, "With Great Power Comes Great Responsibility: Voting Power and Self-Interest"

Oral Presentation

Question and Answer Session Three

Identities and Their Resistance- Engagement in Our Complicated World

Wednesday, May 18th 12:00-1:00pm (CST)

<https://northwestern.zoom.us/j/93048796585>

Zak Brustman, "Up Close & Personal: The Effects of Psychological Distance on Moral Judgments"

Miléna DeGuere, "American Jewish Identity in Conversation with Zionism, Antisemitism, and Social Justice"

Sarah R Eisenman, "I still kinda don't feel like enough: 'Trans*normativity, Whiteness, and the Diversity of Genderqueer & Non-Binary Identities"

Juliet Jacques, "Monstrous Masculinities and the Portrayl of Adolescent Development in the *Twilight* Saga"

Leah McGruder, "I Speak, Therefore I Am: An Exploration of the Relationship Between World Language Study and Black Student Identity"

Gabrielle Olson, "Sex Differences in Autism: A Prosodic Analysis"

Nathan Omprasadham, "Postcolonial Prestige: Reconciling a Fractured Postwar Sri Lankan Identity Through Anglophone Writing and the Literary Prize"

Joey Romansky, "Exploring the Relationship between Adult Attachment Styles and One's Proclivity towards Supporting or Not Supporting One's Partner in a Romantic Relationship"

Richa Shah, "The Impact of Racial Identification on Asian Americans' Intergroup Empathy"

Wenbo Zhang, "How Do You Feel About Being Social Online: Correlational Study between the Social Media Usage and Anxiety Level with Sleep and Digital Stress as Mediating Factors"

Oral Presentation

Question and Answer Session Four

Our Environments- How We Impact and Are Impacted By Our World

Wednesday, May 18th 4:00-5:00pm (CST)

<https://northwestern.zoom.us/j/99207678360>

Pranav Bajaj, "Identifying Deficiencies in Food Allergy Awareness and Accommodation on College Campuses"

Regan Cronk, "Investigating Relationships between Asthma Mortalities, Environmental Factors, and Social Determinants in Chicago"

Sarah Davis, "Parenting While Black: Experiences and Perceived Health Impacts of Raising Black Children in American Society"

Leila Foulon, "Do You Have a Type or Just a Lack of Choice? Measuring the Stability of Physical Attraction Types across Environments"

Grace Frome, "Learning Disabilities and Children's Media"

Grace Hauser, "Quantifying the Air Quality and Public Health Benefits of LED Adoption in the Continental United States"

Ethan Nourbash, "How Remote Work Will Reshape Our Cities: Exploring the Heterogeneity in Pandemic-Era Urban Housing Price Changes"

Emma Austin Stein, "Teaching the Apocalypse: Emotional Management in Climate Change Education"

∞ Oral Presentation Abstracts
Alphabetical by presenter's last name

Cyrus Abrahamson

Faculty Advisor: M. Luisa Iruela-Arispe

Vimentin is a Requirement for Complete Closure of the Ductus Arteriosus

Prenatally, the ductus arteriosus (DA) shunts blood from the pulmonary artery to the aorta bypassing the lungs. Immediately post-birth, the DA closes, allowing the lungs to oxygenate blood. Failure of the DA to close, termed a patent ductus arteriosus (PDA), is responsible for 5-10% of all congenital heart defects. While existing treatments can help close a PDA, many cases require surgery. For this reason, the molecular mechanisms surrounding DA closure must be further investigated. Single-cell RNA sequencing of the DA from mice just before and after birth identified vimentin, an intermediate filament (which maintain cell structure and stability), as a potential candidate in DA remodeling. A combination of RNA analysis, established vimentin knock-out mice and their wild-type controls, and analysis of DA remodeling were used to further elucidate the impact of vimentin loss. RNA analysis found that vimentin was the highest expressed intermediate filament in vascular cells, and expression peaked at 0.5 days post-birth before returning to baseline levels, the time at which the DA closes. Concurrently, expression of Notch signaling genes, known to be important for DA closure and interact with vimentin, peak at this time point. Histological analysis revealed differences in remodeling of the DA. Adult vimentin knock-out mice demonstrate open, intact lumens as demonstrated by the presence of blood through the DA whereas wild-type mice have proper closure of the DA. These findings demonstrate vimentin as a requirement for the complete closure of the DA and indicate possible involvement with Notch signaling.



Pranav Bajaj

Faculty Advisor: Ruchi Gupta

Identifying Deficiencies in Food Allergy Awareness and Accommodation on College Campuses

Fatal food-induced reactions are common among the adolescent and young adult population, yet food allergy (FA) experiences and accommodations on campus are under-investigated. An online, cross-sectional survey was sent to U.S. college students. Descriptive statistics were used to assess students' experiences and suggestions for improvement on college campuses for those with FA. Of 94 total respondents from 42 universities, 43 students indicated having FA. Of those with FA, 39.5% indicated their University was not aware of their FA. More than a quarter of respondents indicated experiencing an allergic reaction in the dining hall since starting college (27.5%), and most common reasons were due to receiving the wrong meal (staff aware of allergy) (36.4%) or having a mislabeled food (36.4%). The top needs students cited to improve life on campus were allergy awareness training for students (77.7%), regular allergy training for dining staff (77.7%), and availability of stock epinephrine on campus (64.9%). When asked about the dining halls, the top areas for improvement were availability of stock epinephrine in dining halls (51.6%) and better labeling system for the foods (40.7%). Results suggest improvements in food allergy awareness and training among both the students and dining staff are necessary to improve life with FA on campus. Within dining halls, action must be taken to

limit cross-contact, increase stock-epinephrine availability, and enhance labeling systems. Finally, universities across the board must be more effective in identifying students with food allergies.



Zachary Brustman

Faculty Advisor: William Horton

Up Close & Personal: The Effects of Psychological Distance on Moral Judgments

In this study we examined the effects of applying Construal Level Theory (CLT) to typical moral dilemmas similar to the well-known trolley problem. CLT proposes that objects and situations can be mentally represented either abstractly, in terms of high-level goals and values, or concretely, via situational details and feasibility. We modified the surface-level descriptions of four moral dilemma scenarios to be either strongly distal (abstract) or proximal (concrete). For each scenario, participants judged whether it was acceptable to sacrifice one life to save others. We found that people found these actions less acceptable when the dilemma evoked a proximal construal. While previous research has examined the effects of individual dimensions relevant to psychological construal on moral judgements, this is the first study to holistically apply the theory's various factors to moral dilemmas. Our results support multiple predictions made by Construal Level Theory and further demonstrate the importance of carefully evaluating the materials used to elicit moral judgments.



Tomer Moshe Cherki

Faculty Advisor: Dana Mibailescu

You Had to Be There: Jewish Humor in the Holocaust as a Complex Form of Resistance

Many Jews in the Holocaust used subversive humor as a defense mechanism. This pervaded life in hiding, in the ghettos and in concentration camps. Destruction is a common theme in Holocaust studies and the cultural production of Jews during this time is often neglected – until the finality of death, life went on. To fully get it, you had to be there. Humor does not trivialize the Holocaust; to the contrary, it is because the persecution faced by the Jews was systematic that a small twist of wit or moment of levity became transcendent. I will use the testimonies collected by conducting interviews with survivors who had varying wartime experiences along with archival materials to delineate uses of humor according to empirical circumstances. These sources will be evaluated through the lenses of Freudian psychology, the history of resistance during genocide, and the sociological functions of humor. Whereas humor as a response to anti-Semitism dates at least to the Scroll of Esther, the Holocaust transformed this into an existential struggle and practical means of survival. Previous traditions of joke-making were reoriented to face mass extermination. The limited research that has been done on the topic is yet to provide a comparative analysis of forms of humor (e.g., performances, art, and jokes) in relation to the extraordinary settings in which they were employed for distinctive

purposes. Putting these vignettes in context I will demonstrate that they are linked as a complex resistance to genocide, while being contrasted by their functions in discrete settings.



Regan Cronk

Faculty Advisor: Daniel Horton

Investigating Relationships between Asthma Mortalities, Environmental Factors, and Social Determinants in Chicago

Chicago has one of the highest asthma mortality rates in the country, particularly among BIPOC communities. Previous studies have posited a host of underlying causal mechanisms for this disparity, including increased air pollutant exposure. However, a key limitation in these analyses is the lack of robust neighborhood-scale air quality data. Here, we employ a novel high spatial resolution air quality dataset and additional social determinants data to assess relationships between asthma mortality and social and environmental factors in Chicago. We used the Cook County Medical Examiner Case Archive to quantify asthma mortalities on a community-area scale over a four-year period (2015-2018). To assess the potential influence of poor air quality, a newly developed neighborhood-scale resolution (1 km²) fine particulate matter (PM_{2.5}) dataset from the University of Chicago's Spatial Lab was utilized. In addition, we included demographic and housing data from American Community Survey, and a multidimensional summary index that estimates the effect of social determinates of health on community areas. A Poisson Regression model was used to assess the relationship of each variable to asthma mortalities. We identify 268 acute asthma mortalities in this period, excluding those related to drug overdoses. By using different variables in each regression, the effect of PM_{2.5} without the possibility of confounding variables is assessed, and we find that PM_{2.5} does not have a significant association with asthma mortalities. Of the tested social determinants of health, we find that only minority group status has a positive and statistically significant association with asthma mortalities.



Sarah Davis

Faculty Advisor: Bruce Greenbow Carruthers

Black Parenting Experiences & Perceived Parental Health Impacts

Chronic stress is associated with negative health outcomes. Perceived discrimination and environmental stress are some contributors to chronic stress. Throughout history, discriminatory laws and policies have put Black Americans specifically at greater risk for hardship and negative health outcomes compared to other racial groups. In order to combat health disparities, it is important to understand the impact that structural racism has on the lives of Black Americans. There is not much research on this topic, and 11 Black parents from the greater Chicagoland area were interviewed for this study to better understand the experiences of Black parents and the potential impacts that these experiences have on their health and wellbeing. Parents discussed three main fears and concerns they have for their children, including workplace discrimination and lack of opportunities, police brutality,

and being subject to negative stereotyping. There were also recurring themes of experiences with indirect tokenism and the consequences of upward mobility. Parents spoke of negative emotional, mental, and physical health impacts caused by the concerns they have for their children, and the coping mechanisms and joys of parenting that help mitigate some of these negative health impacts. This research has implications for better understanding the unique challenges that Black parents face when raising their children and how this affects their health and wellbeing. It sheds light on systematic inequalities in our society and can help inform on how to better support Black parents.



Miléna DeGuere

Faculty Advisor: Lilah Shapiro

American Jewish Identity in Conversation with Zionism, Antisemitism, and Social Justice

Northwestern University is home to both a large thriving Jewish population and an overwhelmingly progressive and socially oriented student body, and there are many people who identify with both. Across the past decade, there have been periods of heightened tension between these communities regarding the state of Israel and its treatment of Palestinians. On a national level in recent years, the friction between supporters of Zionism/Israel with progressive, left-leaning movements has either grown or become more widely broadcasted. This has been apparent on Northwestern's campus, where strain between social justice spaces and progressive Jewish students on topics related to Israel/Palestine has erupted multiple times. In order to better understand this tension and the relationship between these issues, I interviewed 13 progressive American Jewish undergraduate students. Then, I open-coded the interviews for emerging themes using grounded theory, in addition to exploring the historical interactions between American Jews with Zionism and social justice in America. The findings indicate that progressive American Jewish students are grappling with their support for a Jewish homeland against the overwhelmingly pro-Palestine/anti-Israel sentiments among left-leaning spaces on campus. While most have felt productively challenged on their stances and described a positive evolution in their beliefs, this has come at the cost of antisemitism and marginalization for some. While some American Jewish students are trying to manage the nuance of their Zionism with their disagreement towards the Israeli government's treatment of Palestinians, they have overwhelmingly struggled to feel supported by the social justice community they're seeking to reckon with.



Ria Desai

Faculty Advisor: Siobhan Phillips

Feasibility and Acceptability of Fit2ThriveMB: A Technology-Based Intervention for Patients with Metastatic Breast Cancer

Increased incidence and treatment have resulted in a growing population of patients with metastatic breast cancer (MBC). These individuals have high rates of morbidity and mortality which could be attenuated with increased physical activity (PA). Mobile health (mHealth) PA interventions may be useful for MBC patients to remotely monitor and tailor interventions to patients' abilities. Yet, no studies have examined a mHealth PA intervention in this population. This study aims to test the feasibility and acceptability of Fit2ThriveMB, a mHealth intervention to promote increasing daily steps in insufficiently active (<150 min/week of moderate PA) patients with MBC (n=49; Mean age=54.8(SD=11.3); 55% on chemotherapy). Participants were randomized to Fit2ThriveMB (Fit2ThriveMB app, Fitbit, weekly coaching calls) or a Healthy Lifestyle control for 12 weeks. Fit2ThriveMB participants completed an online questionnaire and interview post-program to gauge intervention acceptability. Quantitative data were analyzed using descriptive statistics. Transcribed interviews were evaluated using a thematic content analysis approach and consensus review. Participant retention was high (98%; 1 Fit2ThriveMB participant died). All participants (100%) reported using the app more than 5-6 times per week and overall satisfaction with their study experience. The majority were satisfied with the app design (68%) and content (73%) and found it easy to use (86%). Participants indicated they were, generally, satisfied with the intervention; however, areas for improvement were identified for some study components. Overall, Fit2ThriveMB was feasible and acceptable for increasing activity in MBC patients and warrants future refinement and testing in trials with larger sample sizes.



Sarah Eisenman

Faculty Advisors: Leoandra Onnie Rogers and Héctor Carrillo

“I still kinda don’t feel like enough”: Trans*normativity, Whiteness, and the Diversity of Genderqueer & Non-Binary Identities

Patriarchy and racism constrain gender identity via the gender binary, in which two distinct options—woman and man—are upheld by racialized gender norms. Genderqueer and non-binary (GQNB) individuals resist forced identification with the gender binary. Currently, relatively scant psychological research examines GQNB identity, and even less includes racial-ethnic identity among GQNB individuals. During summer 2021, I conducted one-on-one semi-structured interviews with 19 GQNB students (ages 18-23). Nine participants were white, three were Black, three were Asian American, two were Latin American, and two were multiracial. I asked questions regarding participant experiences with others' expectations about their gender identities, racial-ethnic identities, and the intersections of both. I coded references to these expectations in the interview transcripts into five themes: *Race/Ethnicity/Culture*, *Queer Normativity*, *Privilege & Power*, *Binary Rigidity*, and *Educating Others*. I analyzed

the results using theories of identity as a psychosocial process. The results reveal the rigidity of societal expectations for how to be GQNB and emphasize the interdependent individual and sociocultural processes of developing and internalizing norms about identity. These norms were contextually dependent and shifted based on participant positionality, particularly for participants of color. The erasure of alternative ways of being constrained participants who aligned with the norms and those who did not. Participants demonstrated varying strategies of resistance and conformity to these norms, making use of the possibilities accessible within particular contexts. This project expands the emerging field of GQNB identity research and offers a qualitative, intersectional perspective on the specific experiences of a subset of these individuals.



Eirene Fithian

Faculty Advisor: Richard Morimoto

Establishing A Quantitative Proteostasis Probe for Neuronal Signaling Receptor Trafficking Upon Protein Aggregation

In neurodegenerative diseases, such as Alzheimer's and Parkinson's diseases, genetic mutations can lead to an accumulation of misfolded proteins in neuronal cells. The aggregation that occurs when misfolded proteins clump together results in cellular toxicity. Molecular chaperones are a type of protein that aid in the clearance of these aggregates. However, chaperones also play key roles in other vital cellular processes. One such process is called clathrin-mediated endocytosis (CME), a type of vesicular trafficking that cells use to transport materials. When aggregates are present, they sequester the limited pool of chaperones available to the cell, causing a collapse in CME. The quantification of CME can therefore serve as an indicator of the chaperone availability in the cell. My research aims to develop a molecular probe to measure the collapse of CME upon protein aggregation. The probe generated uses a tag to fluorescently label CME cargo. Study results demonstrate that the probe effectively quantifies CME activity in the cell. Further, the data obtained is consistent with the literature that CME decreases upon protein aggregation. This indicates that the probe can effectively be used to measure the availability of chaperones in the cell. Further development of this probe can then be used for testing candidate small molecules that can be used in therapeutics for neurodegenerative disease.



Leila Foulon

Faculty Advisor: Eli Finkel

Do You Have a Type or Just a Lack of Choice? Measuring the Stability of Physical Attraction Types across Environments

The present study investigated the stability of physical attraction types in young adults, specifically how the homogeneity of one's environment impacts the coherence of attributes one finds attractive,

and how entering a new environment influences the stability of one's type. Participants ($N = 257$) were college students in the United States, who were single at the time of the study. Participants reported the physical characteristics of three crushes they had in both high school and college, as well as the diversity of their environments at the institutional, broad social scene, and core friend group levels. Participants in overall lower diversity environments were found to have a more coherent attraction type in both high school and college. In the high school environment, the diversity of participants' academic institutions had the strongest influence on the coherence of their attraction type, while in the college environment, the diversity of participants' core friend groups had the strongest influence. When participants moved from a high school to college institution with different levels of diversity, they exhibited a less stable physical attraction type. Lower phenotypic similarities between these two environments were correlated with higher attraction type instability. Further, conservative political orientation was associated with having a more stable attraction type across environments, as mediated by higher Self-Concept Clarity. These findings provide evidence that exposure to diversity impacts the range, extent, and stability of one's attraction type, thus implying that attraction types are malleable and do not exist in the rigid colloquial manner typically discussed.



Grace Frome

Faculty Advisor: Lynn Kelso

Learning Disabilities and Children's Media

I am dyslexic. In thinking about dyslexia in the media, I found a lack of positive representation. Combined with an interest in children's media, I intended to learn how to best create media for and about students with dyslexia. The crux of my project was an ethnography with Charles Armstrong School. Charles Armstrong was founded to teach students with dyslexia the tools and confidence necessary to succeed. Over the summer, I attended classes, played games, and had conversations with students. From this, I created drafts of a webseries focused on the everyday lives of siblings with dyslexia, Jackie and Sam. Sometimes the problems they face are because of a classmate, or neighbor, or yes, their dyslexia, but it is always their gifts and talents that help them solve it. My original idea was that this would be an anthology webseries, with each episode focused on learning about a new type of learning difference, but I learned that these students wanted a consistent role model to look up to. That was when I knew that I had to create recurring characters with dyslexia who could have fun, mess up from time to time, and most importantly be relatable. Another thing I learned was that dyslexic students enjoy the radio and audio books as favorite mediums. The next step will be to transform these scripts into audio drama format to be able to produce and distribute. This work will be added to the growing canon of media focused on positive disability representation.



Rebecca Gu

Faculty Advisor: Francesca Duncan

Application of Ovarian Anatomy Nomenclature to Classify and Quantify Follicles in the Rhesus Macaque Ovary

Ovarian follicles are units within the ovary which house developing reproductive cells called oocytes. Females are born with a finite number of follicles, which declines with age and is associated with a decline in fertility. Therefore, assessing the types and quantities of follicles present in an ovary provides valuable information about an individual's reproductive lifespan. Our team pioneered a method to systematically classify follicles from non-human primate (NHP) ovaries based on categories established by the National Institutes of Health's 2021 Ovarian Anatomy Nomenclature Workshop. First, we defined criteria to classify follicles by developmental stage (primordial, transitional primordial, primary, transitional primary, secondary, multilayer, antral) based on characteristic morphological features. We also classified follicles with abnormal morphologies. Next, we prepared hematoxylin-and-eosin-stained cross sections of ovarian tissue from old and young rhesus macaques, and three individuals each counted one section per ovary (N=12). We conducted blinded counts in a subset of the tissue and found an inter-observer variability of 1.9% across >700 follicles. In total, 3315 healthy follicles were identified in the 12 representative sections from 4 young animals, with 276 ± 62 healthy follicles per section (mean \pm SEM, range 58-731), and 467 were identified in the 24 representative sections from 8 old animals, with 19 ± 8 healthy follicles per section (mean \pm SEM, range 0-153). As expected, follicle counts were lower in old animals compared to young animals. Our method enables rigorous, reproducible NHP follicle classification and counting across the field, which can be applied to future studies in fertility.



Grace Hauser

Faculty Advisor: Daniel Horton

Quantifying the Air Quality and Public Health Benefits of LED Adoption in the Continental United States

In the fall of 2019, the Trump administration repealed the 2007 Energy Independence and Security Act (EISA), allowing Americans to continue purchasing incandescent light bulbs despite their energy inefficiency. The recall of EISA created significant controversy because it potentially derailed the nation from a path towards green energy infrastructure. While attempting to understand the negative impacts of EISA's repeal, we discovered that there has yet to be a study conducted on the relationship between lighting efficiency, air quality, and human health. While the United States Department of Energy (DOE) has estimated the energy and monetary savings of widespread residential light-emitting diode (LED) light bulb adoption, their estimates are not geographically specific, nor do they address the ancillary air quality and human health impacts due to reduced electricity demand and lesser emission of pollutants. Here, I estimate the number of light bulbs in the residential, industrial, and commercial sectors of the continental United States (CONUS) in the Northeast, Midwest, South, and

West. I then assess their associated electricity demand in accordance with the DOE's LED adoption estimates. To assess the benefits of more efficient lighting, I model the 2016 technical potential savings of LEDs, i.e., how much electricity is saved if CONUS replaces all incandescent bulbs with LEDs. Using the Spatial Matrix Operating Kernel Emissions model (SMOKE) I calculate the change in emissions at electricity generating units (EGUs) due to full LED implementation. Using the two-way coupled Community Multi-Scale Air Quality Weather-Research and Forecasting model (CMAQ-WRF), we determine the air quality changes that would result from full LED implementation on a 4 km scale. CMAQ-WRF allows for complex modeling of air chemistry to understand how emissions interact in the atmosphere and form pollutants. Finally, I implement datasets from the Environmental Protection Agency's (EPA) Environmental Benefits and Mapping Tool – Community Edition (BenMap-CE) to contextualize these changes in air quality in terms of human health impacts. I find that full LED implementation would result in a 16% decrease in electricity demand; a 17.3% reduction in EGU emissions of carbon monoxide (CO), sulfur dioxide (SO₂), and nitrogen dioxide (NO₂); annual reductions in premature mortality of 1,261 due to reductions in particulate matter (PM_{2.5}), and 98 deaths avoided due to decreased ground level ozone (O₃) formation. This research provides a compelling framework for policy makers because it illustrates the multiple benefits, in addition to reduced costs and energy burden, that accompany reductions in energy demand.



Heather Humbert

Faculty Advisor: Christian Petersen

Identifying the Role of Niche Signaling in *Hofstenia miamia* Regeneration

Regeneration is a complex biological phenomenon, whose elucidated mechanisms could inform development of countless therapeutic practices in human medicine. Several model systems have been developed to study animals capable of whole body regeneration, the newest of these being the acel worm *Hofstenia miamia*. *Hofstenia* are a saltwater species that possess a population of adult, pluripotent stem cells called neoblasts, which function under stunningly conserved mechanisms of regeneration, across millions of years of convergent evolution. As these neoblasts are known to express several markers shared with human embryonic stem cells, understanding their mechanisms of proliferation remain important. Stem cells often differentiate under the direction of signals secreted by niche cells. The niche in *Hofstenia* has not yet been explored, and the location and nature of the secreted signals that promote neoblast differentiation remain unknown. My project seeks to uncover the signaling pathways that directly impact regeneration of *Hofstenia*. Starting with known niche signaling factors in other model systems, I experimentally silenced genes and challenged animals to regenerate in the absence of their expression. If they were not able to generate new tissue a week after lateral amputation, it would indicate that the silenced gene acts in a regenerative pathway. I found that several of the *TGF-β* homologs play an essential role in whole-body regeneration, with their absence causing stunted and missing head and tail phenotypes across individuals. As *TGF-β* factors have a role in human stem cell differentiation, this further supports the conserved nature of regenerative pathways across pluripotent cell species.



Juliet Jacques

Faculty Advisor: Nick Davis

Monstrous Masculinities and the Portrayal of Adolescent Development in the *Twilight Saga*

The *Twilight Saga* has become a popular culture staple, with an enormous and dedicated fanbase and a corresponding diverse field of literary and sociological analysis. However, scholars are prone to overfocusing on a feminist or post-feminist lens, without seriously analyzing the corresponding representations masculine characters. This project argues that *Midnight Sun*, the highly anticipated 2020 retelling of *Twilight* from hero and love interest Edward Cullen's perspective, reveals the complexities surrounding *Twilight*'s portrayals of identity, vampirism, and masculinity. The project uses psychoanalytic theories of development and British *fin de siècle* Gothic novels to read *Midnight Sun*, arguing this novel presents a darker, more Gothic and monstrous view of vampirism than fans and critics of the series often assume. It then applies this analysis to other masculine characters, specifically werewolf and love interest Jacob Black, in order to argue that *Twilight* presents a radical, vulnerable alternative to patriarchal masculine hegemony. This project argues that studying Edward is essential to understanding the multiplicity of masculinities portrayed in *Twilight* and more broadly, the way the series is critiquing patriarchal norms and presenting alternatives to toxic hypermasculinity. It has implications for both the study of Young Adult literature and the broader field of gender and masculinity studies, pointing to the gap in the study of masculinity, particularly around cis, straight, masculine characters. Literary analysis can help uncover the messaging that has made *Twilight* such an enduring, influential, and beloved series, while also understanding the way that Young Adult literature engages with and reshapes representations of adolescent masculinity.



Kade Kelley

Faculty Advisor: Ishwar Radhakrishnan

Novel Mechanisms in Nuclear Receptor Gene Regulation

Parkinson's disease is a neurodegenerative disorder associated with impaired motor function and reduced lifespan. Although the molecular mechanism of Parkinson's remains poorly understood, reduced levels of Nurr1 have been shown to cause a Parkinson's disease-like state, suggesting its importance to potential therapeutics. Nurr1 is a nuclear receptor (NR), a class of proteins which respond to environmental signals through binding small molecule ligands. This binding event allows the NR to interact with other proteins, called coactivators, to turn genes on or off. Unlike other NRs, however, Nurr1 is an "orphan" NR, lacking the canonical ligand-binding pocket. Not much is known about Nurr1's alternative mechanism to modulate gene expression. Instead of binding Nurr1, I hypothesize that small molecules can bind a pocket on the NCoA1 coactivator protein, modulating its affinity with Nurr1 to affect gene expression. To identify potential ligands that can bind to NCoA1, I developed a high-throughput screening protocol *in silico* to model NCoA1's binding against a library of compounds. In addition to screening, I also used Rosetta to predict the binding conformation of various compounds which have been demonstrated, by *in vitro* experiments, to bind NCoA1. Although

more work is needed to characterize the effect of ligand-binding on the Nurr1-NCoA1 interaction, current results propose a likely group of lipid ligands and their binding configurations. Since orphan NR mechanisms have yet to be discovered, and such proteins have vital roles in cellular metabolism, development, and homeostasis, our research also holds potential implications in other maladies, too.



Unsun Lee

Faculty Advisor: Keith Tyo

Protein Expression Optimization for a Novel Split Adenylate Cyclase Disease Biomarker Detection Scheme

While many point-of-care diagnostic devices, such as the paper-based lateral flow assay, can rapidly detect the presence of specific proteins at high concentrations, they have limited sensitivity due to a lack of signal amplification as leveraged in DNA amplification-based diagnostics (i.e., PCR). This project focuses on the development of an ultrasensitive *in vitro* detection scheme for proteins and small molecules via self-amplifying split adenylate cyclase system. The proposed proof-of-concept detection scheme for small molecule rapamycin includes a recombinant split protein network, in which the split adenylate cyclase halves are fused to rapamycin binding protein domains for producing the initial sensing signal. In this study, we optimize the expression for these proteins, investigating the addition of a genetically encoded solubility tag maltose binding protein (MBP) to enhance final protein solubility, which signifies proper protein folding. This was tested through site-directed mutagenesis via Gibson Assembly of the fusion tag, followed by IPTG-induced expression in T7 Express *E. coli* and subsequent purification via immobilized metal affinity chromatography. Qualitative comparison between the amounts of soluble/insoluble fractions was assessed by SDS-PAGE, and quantitative measurement of enzymatic activity was conducted via cAMP accumulation assays to confirm the retained activity of split adenylate cyclase. Our results indicated that MBP fusion yielded a significant increase for both soluble expression and enzymatic viability. With further optimization of protein expression, we believe the engineering of this split protein network-based detection scheme will be much more feasible for scaled-production that will enable its development into a commercial platform for antigen diagnostics.



Leah McGruder

Faculty Advisor: Lilah Shapiro

I Speak, Therefore I Am: An Exploration of the Relationship Between World Language Study and Black Student Identity

World language study strengthens students' identity relationships. Black adolescents draw on racial identity beliefs as a resource to remain academically engaged when experiencing negative treatment based on race. Language study, where black students are underrepresented, could provide

opportunities for developing or maintaining positive racial identities. Conversely, negative experiences in language courses could contribute to negative identity associations. My thesis investigates how black American students perceive the relationship between their racial identities and world language education. I conducted fourteen semi-structured interviews with black Northwestern undergraduate students and asked about their racial identity relationship and experiences with secondary and post-secondary world language education. I utilized a grounded theory approach to data analysis. Findings suggest that language learning expands black students' worldview regarding how they understand racial and cultural identity globally and allows them to contextualize blackness outside of an American context. Additionally, black students find community in the language classroom, citing that they feel more comfortable with their racial identities in language class as opposed to other classes. Conversely, black students feel marginalized in the language classroom, taking issue with unsatisfactory black representation or lack of black representation. They also feel that more nonwhite language instructors would diversify curriculum and allow them to feel more comfortable in their racial identities. These findings provide novel insights into an understudied aspect of world language education and identity development. They suggest that language curricula and instruction should be culturally responsive to black students in order to support their academic and personal growth.



Madelyn Moy

Faculty Advisor: Katherine Amato

Evaluating the Long-Term Effects of Hepatitis-B Infection on the Gut Microbiome of Captive Chimpanzees (*Pan troglodytes*)

Due to its theorized role in human immune system regulation, the gut microbiome (GM) – the community of microorganisms that live in the digestive tract – may mediate immune changes during and after infection. However, the exact nature of this relationship remains unknown, as bidirectional immune system-GM interactions, where the GM and host immune cells mutually influence each other, make it difficult to isolate specific mechanisms. Hepatitis-B, a liver infection caused by the Hepatitis-B virus (HBV), can directly affect the GM through the bile duct with microbial metabolites, which are small molecules critical for cellular function. Consequently, Hepatitis-B represents a unique situation to better understand the immunity-GM relationship. As the only nonhuman host fully susceptible to HBV, chimpanzees (*Pan troglodytes*) have been the ideal model species to study HBV disease progression, thereby making them well-suited for identifying how HBV infection affects the GM. Thus, this study tested the hypothesis that the chimpanzee GM differs between HBV infected and non-infected individuals. Fecal samples for GM analysis were collected from twenty-one former biomedical research chimpanzees living in the Chimp Haven sanctuary with differing HBV exposures. Bacterial DNA sequencing and liquid chromatography-mass spectrometry indicates significant GM composition and microbiota-mediated metabolism differences based on viral status, respectively. More specifically, the GMs of HBV-infected individuals exhibit reduced microbial richness and diversity. Therefore, this study not only provides the first insights into the effects of HBV infection on the chimpanzee GM, but also informs the development of microbial techniques to monitor and improve human patients' health.



Ethan Nourbash

Faculty Advisor: Joel Mokyr

How Remote Work Will Reshape Our Cities: Exploring the Heterogeneity in Pandemic-Era Urban Housing Price Changes

Covid-19 triggered a large-scale work from home experiment in America's labor force. Faced with an increase in location flexibility, workers with remote-capable jobs fled locations that were initially chosen for proximity to their offices. My question is what amount of heterogeneity existed within this urban exodus. My hypothesis is that the amenities a city has to offer are more aligned with young professionals' amenity preferences and they will be less likely to leave the city after the threat of infection subsides. To test this hypothesis, I gathered demographic information at the zip-code level from the U.S. Census Bureau and merged it with housing price data from Zillow. This allowed me to discern which communities experienced the largest negative demand change. In initial findings, I have discovered that the average amount of work that can be done remotely for residence of a given zip-code is a strong predictor of housing price change in the region. I have yet to run a regression where resident characteristics — such as average age, marital status, and education level — are interacted with the work from home variable to find which kinds of people are most likely to take advantage of their location flexibility. The implications of a significant change in urban demographics includes a shift in which businesses and industries can stay profitable in the city given that different age and education groups have different consumption preferences.



Katica Hope O'Connor

Faculty Advisor: Anthony Chen

Religiosity, Voter Turnout, and Congressional Representation of Black Americans

The 2018 Election recorded the highest number of votes by Americans in any midterm election, with particularly high rates for Black Americans. How much of this had to do with church? I conduct interviews with seven Chicagoland residents on the motivators behind their turnout to understand how church may motivate turnout. I determine that religion serves to shape the sociopolitical beliefs and resources to vote that respondents access, but other communities can play a similar role. Using a combination of the 2018 Cooperative Congressional Election Study and House roll call votes, I determine whether districts with higher Black turnout have better representation for issues that Black voters care about. I find that, ultimately, alignment with the party of the Representative is what is consequential to receiving “good” representation.



Gabrielle Olson

Faculty Advisor: Molly Losh

Sex Differences in Autism: A Prosodic Analysis

Autism spectrum disorder (ASD) is a neurodevelopmental disability involving impaired social communication and ritualistic, repetitive behaviors. In ASD, diagnosed at a 3:1 male-to-female ratio, sex differences have been reported in cognition, behavior, and language. Of the latter, there are differences in pragmatic, or social, language, of which one important aspect is prosody (rate, rhythm, and intonation of speech). Though females with ASD tend to have better social communication abilities than males with ASD, no research has examined sex differences in prosody. This study sought to examine sex differences in prosody in individuals with ASD and assess how prosody may relate to pragmatic language difficulties. Participants included 21 males and 13 females with ASD and 26 male and 26 female controls. Participants narrated a wordless picture book with speech recorded using a microphone and transcribed. Prosodic features were extracted using Praat scripts at the utterance-level, including average (mean) and variation (SD, range, excursion) of fundamental frequency (F0), an acoustic measure for pitch. Males with ASD had higher mean, maximum, range, and excursion F0 than control males, whereas no significant differences were found between ASD and control female groups. In males with ASD, higher mean F0 was associated with more social communication impairment, but no associations emerged in females. These results suggest sex-specific prosodic profiles, where prosody appears more noticeably affected and related to larger social communication difficulties in males. Findings contribute to a deeper understanding of sex differences in social communication difficulties in ASD and may implicate sex-specific intervention considerations.



Nathan Omprasadham

Faculty Advisor: Kalyan Nadiminti

Postcolonial Prestige: Reconciling a Fractured Postwar Sri Lankan Identity Through Anglophone Writing and the Literary Prize

Books that win prizes shape culture in unique ways, and in Sri Lanka, reading prizewinning literature provides the opportunity to reveal and reconcile facets of a fractured national identity while also destabilizing the dogmas of postcolonial literary studies. In particular, the institution of the literary prize reveals Sri Lankan Anglophone (SLA) writing as having a fundamentally different trajectory to other South Asian prizewinning texts due to two key factors. First, the hyperlocal scope of SLA novels destabilizes the overdetermined binary of Occident and Orient, shifting focus to the hegemonies present within South Asia specifically, and Asia more broadly. Second, Sri Lanka's status as a tourist nation manifests in a sense of literary didacticism, a desire to explain Sri Lanka to an imaginary audience to render itself legible. The combination of these two factors subverts the long-held tensions between the categories of "national" and "global south" novels, manifesting in a new category that is at once inward looking and externally facing. To determine the contours of the unique form of postcolonial novel being written in Sri Lanka, and how it helps us reconcile the paradoxes of Sri Lankan identity, my proposed project will examine the Gratiaen prize winning works of Shehan

Karunatilake, Tissa Abeysekera, and Andrew Fidel Fernando as a set of prizewinning authors, focusing on the patterns that emerge in their novels in conversation with the sociological factors the shape the institution of the literary prize.



Alexia Popescu

Faculty Advisor: Sossina Haile

Connecting Conductivity with Surface Nanostructure for a Clean Energy Catalyst

In light of both the drastic environmental impact of pollution and energy-driven geopolitical conflicts, there is an unprecedented need to invest in clean energy technology. Devices such as fuel cells and photocatalytic reactors generate power that largely depends on the speed of their electrochemical reactions, often studied as kinetics. To improve kinetics, electrocatalytic materials are often incorporated to speed up reactions. Cerium oxide (ceria) is one such catalyst, especially promising due to its abundance and unique electrochemical properties. Recent atomic-scale simulations have proposed a trend between ceria's catalytic performance and the orientation of its surface nanostructure. Validating this prediction would open exciting possibilities for engineering nanomaterials and thus motivates the present work in studying the kinetic characteristics of oriented ceria. This project used ceria thin films, prepared with high-energy laser pulses to have well-defined surface structures. The kinetics of each structure were determined as reaction rate constants extracted from a carefully-engineered method known as electrical conductivity relaxation (ECR). In this method, the ceria changes conductivity or 'relaxes' as a response to changes in the concentration of gases flown to react with it in typical high-temperature operating conditions. The temperature, gas environment, instrumentation, and thin film preparation have been fine-tuned in this project to allow for assumptions that greatly simplify the mathematical relationship between conductivity and rate constant. Comparing the extracted rate constants of different ceria orientations provides key experimental insights and establishes a robust process for kinetic investigations of similar clean energy materials.



Olivia Putnam

Faculty Advisor: Wendi Gardner

After Wrongdoing: Exploring the Relationship Between Moral Threat, Withdrawal, and Repair

When a person recognizes themselves as having wronged another, they experience it as a moral threat—a threat, that is, to the sense of themselves as a good person who does good things—and this experience is often accompanied by feelings of guilt and shame. Existing literature has tended to cast

guilt as an adaptive response to moral threat, driving repair, and shame as a maladaptive response, driving withdrawal. Still, debate remains as to the functionality of both emotions in the context of interpersonal wrongdoing. Our study aimed to further explore these questions by examining how shame and guilt interact with self-repair to influence how participants engage with those they have wronged. Participants first played an online game with a “partner,” in which they were led to believe that they had wronged this partner, followed by a self-repair task, and they were then given the choice to either reengage with their partner or withdraw. Those who chose to reengage were given an opportunity for relational repair through donating tickets to the partner. Results showed that feelings of guilt mediated the relationship between moral threat and relational repair. Shame, however, had no relationship to withdrawal or relational repair, likely because it was not effectively elicited by the moral threat condition. There was no effect of either the self-repair task, nor of individual differences in shame-and-guilt-proneness on either withdrawal or relational repair. These findings add to the body of evidence that guilt motivates reparative behavior after wrongdoing and indicate that a stronger manipulation is needed to fully understand the influence of shame in the aftermath of interpersonal wrongdoing.



Robert Read

Faculty Advisors: Lilah Shapiro and Joanna Grisinger

The Power of Social Justice Movements on College Campuses: Perceptions From Past and Present Student-Led Campus Movements at Northwestern University

There has been increased attention to police brutality against people of color in the U.S. because of the Black Lives Matter movement and the recent revival of the “Cops Off Campus” movement. Northwestern University’s history of student-led campus activism provided a base to create their version of the “Cops Off Campus” movement in 2020, known as Northwestern University Community Not Cops (NUCNC). This study focuses on the perceptions of university stakeholders in response to Northwestern campus activism and how these perceptions have shifted over time and reinforced narratives around activism on campuses. Through a content analysis of newspaper articles from Chicago-area publications, I collected perceptions and created a chronological background of Northwestern campus activism. Through semi-structured interviews, I collected current perspectives of student activists at Northwestern to provide insight into the NUCNC movement. From our historical search, I found that student perceptions remained similar over time. However, the perceptions of faculty and administrators shifted in response to the movements at Northwestern; some from support for the activists to opposition while others shifted from oppositional or neutral perceptions to that of support. The interviews with NUCNC student activists revealed the themes and narratives that emerged from our content analysis remained true. The noticeably consistent themes were students’ distrust in administration and opposition to white institutions. I believe the emerging themes found in Northwestern’s history of student activism are similar to other institutions and could be used to learn more about the power of social justice movements on college campuses more generally.



Joey Romansky

Faculty Advisor: Wendi Gardner

Exploring the Relationship between Adult Attachment Styles and One's Proclivity towards Supporting or Not Supporting One's Partner in a Romantic Relationship

Past research in relationship science has found a link between engagement in the Michelangelo phenomenon, supporting one's romantic partner's desires to become their ideal self, to more positive relationship outcomes. Meanwhile, past research has also found that engagement in the Pygmalion phenomenon, instead pushing one's romantic partner into becoming who *they* want their partner to become, has been linked to far more adverse relationship outcomes. Study 1 investigated whether there is a potential link between adult attachment styles, measured on the separate and continuous scales of anxiety and avoidance, and engagement in the Pygmalion phenomenon. Results indicated that more avoidantly attached individuals, yet not more anxiously attached individuals, are more likely to engage in this more controlling and less supportive Pygmalion phenomenon. Study 2 attempted to answer this new question as to why avoidantly attached individuals are more likely to engage in the Pygmalion phenomenon. It was hypothesized this was because avoidantly attached individuals are more likely to misperceive how controlling their own partner is, and as a result respond with controlling behaviors (i.e., engaging in the Pygmalion phenomenon). Machiavellianism, or being manipulative and seeing people solely as a means to an end, was also investigated as a potential link between avoidance and Pygmalion behaviors. While the initial findings of Study 1 were not replicated in Study 2, results from mediation analyses did indicate that Machiavellianism, and not a misperception of control, served as an indirect effect linking avoidance with Pygmalion behaviors. In other words, avoidantly attached individuals who are particularly Machiavellian may be the ones who are most likely to engage in Pygmalion behaviors.



Laurisa Sastoque

Faculty Advisor: Sarah Maza

Drugs, Ethnic Profiling, and the American Perception of Colombian Immigrants, 1979-1990

In July of 1979, the Dadeland Mall Massacre in South Florida marked the start of the "Cocaine Cowboy" era, where Colombians involved in the drug trade received widespread portrayals of violence in American media. As U.S. anti-narcotics efforts concentrated on the seizure of South Florida drug smuggling crafts, drug trafficking routes spread throughout major urban centers, such as New York and Los Angeles. Along with drug trafficking, drug-related violence became a common portrayal of Colombians in U.S. media. This paper analyzes how the media's portrayal of Colombian drug trafficking turned into a stigma that affected the Colombian community in the United States at large. By reviewing periodical sources between the years 1979-1990, this paper argues that the formation of the drug trafficking stigma stems from the media's almost exclusive portrayal of Colombians as drug traffickers, within a context of U.S.-Colombia relations that encompassed tensions regarding responsibility for the growing transnational drug problem. Ultimately, this study proves that the drug

trafficking stigma for Colombian immigrants is inherently tied to how American society viewed the Colombian government's actions in the War on Drugs.



Sophia Scanlan

Faculty Advisor: Brett Gadsden

“I Wasn’t Going to Wear No Shorts”: Baseball and the Ideals of Mid-Twentieth Century Black Womanhood

Toni Stone, Mamie Johnson, and Connie Morgan were among the first women to play professional baseball alongside men when they debuted for the Indianapolis Clowns of the Negro American League in 1953 and 1954. Throughout their lives, the women played baseball, refined their skills, and chose to pursue careers as elite athletes during a time when most women worked in the home or other jobs deemed more suitable for women. My undergraduate thesis in History argues that Stone, Johnson, and Morgan challenged the gender line that had defined baseball and disrupted racial and gender expectations—which historians conceptualized as the cult of true womanhood, separate spheres, and the politics of respectability—about the “proper” place for Black women in the mid-twentieth century United States. As they challenged the barriers of the sport and overcame immense opposition from their contemporaries, Stone, Johnson, and Morgan managed to exist and excel in a place not considered open to them because of their race and gender. Most research on the Negro Leagues does not include sufficient historical analysis, and the literature on Black womanhood ignores the efforts of Black female athletes, who made important contributions. My thesis strives to unite these two conversations. Drawing from archival collections, oral histories, and hundreds of newspaper articles, this project recovers the lives of three underappreciated historical actors and complicates the existing understanding of Black womanhood in the Jim Crow era.



Richa Shah

Faculty Advisor: Sylvia Perry

The Impact of Racial Identification on Asian Americans’ Intergroup Empathy

Asian Americans hold a unique racial position in the United States, as their economic success is similar to White Americans, but they continue to be the targets of racism. Asian Americans’ nuanced racial position in the United States may impact how much they empathize with other racial groups. The present study examines how Asian Americans’ level of identification as an Asian, American, or person of color (POC) impacts the amount of intergroup empathy they feel. In an online study, 420 Asian-American participants completed racial identification measures and read about White or Black targets who were unfairly treated. While greater Asian ethnic identification was not associated with empathy for either the White or Black targets, greater American identification predicted increased empathy for

White targets and decreased empathy for Black targets. In contrast, greater POC identification predicted greater empathy for Black targets, and was unrelated to empathy for White targets. Follow-up analyses showed that overall perceived discrimination of specific groups in the U.S. explained these associations between identity and empathy, such that greater American identification predicted greater perceived discrimination of White people, which was then associated with increased empathy for White targets and decreased empathy for Black targets. Meanwhile, greater POC identification predicted greater perceived discrimination of Black people, which then predicted increased empathy for Black targets and was not correlated with empathy towards White targets. This research suggests that for Asian Americans, American identity is associated with pro-White and anti-Black attitudes, while POC identification promotes interminority empathy, and not anti-White attitudes.



Michelle Sheinker

Faculty Advisor: Joanna Grisginer

Deceptively Progressive: Are Evanston's Reparations in Name Only?

If reparations can be weaponized, can they be leveraged? Reparations are a remedy provided by the wrongdoer to the harmed party due to past injury. Scholars have rationalized and evaluated various reparations programs; yet none have examined the nation's first attempt at local reparations to Black residents in Evanston, Illinois. This thesis engages with Evanston City Council and Reparation Subcommittee meetings, community voices, and newspapers to determine if Evanston's program *is* truly reparations. The program is evaluated on its own internal guidelines for successful repair. Evanston's reparations are also weighed on set of external, "bottom up" criteria, provided by the U.N., and operationalized by postdoctoral researcher Eva Ottendoerfer. My research found that the Local Reparations Restorative Housing Program does not address the litany of harms inflicted on Evanston's black population, as defined by Black Evanstonians, prominent leaders, and reparations activists – there is a mismatch between harm and remedy. This paper argues that the program is inadequate by demonstrating community discontent, Evanston's failure to uphold their own internal criteria, and Dr. Ottendoerfer's criteria. It is especially important to evaluate this program because it is the first of its kind in the U.S., serving as a model to be replicated in other cities. Since the "model" program fails to address harmed community need and lacks adherence to scholarly definitions of reparations, the repercussions could be widespread. One can only hope that other cities will learn from Evanston's mistakes and create transparent, bottom-up remedies that truly address stakeholder defined harms.



Aru Singh

Faculty Advisor: Mohamed Abazeed

Classifying Cell Phenotypes in Small Cell Lung Cancer Using Machine Learning Imaging Techniques

The goal of my research project was to develop a methodology to detect displacement of cells in a small cell lung cancer model (SCLC). We used SCLC as a model due to its ability to undergo plasticity and exist in distinct phenotypic states. To study the interactions in this ecosystem, we primarily used codes that were developed in MATLAB. The first step was to determine whether there were any changes in motions associated with the distinct states suspension, cells that exist in aggregates, and adherent, cells that existed as flat larger cells. Displacement measurements were made from high resolution time lapse images of cells using transmission light known as brightfield or gray images. We used the Lucas-Kanade optical flow algorithm for motion analysis. This algorithm created vectors for each pixel in the grayscale images that indicated the difference in motion for that pixel from one image frame to another. The general motion of the cells was estimated using the results of the velocity vectors generated by the algorithm. We applied this algorithm to images that constituted distinct subtypes as well as a mixed population of cells. Using the pixel based information we defined a bounding box for each cell in the images for feature extraction. Studies to date have not sufficiently addressed the role of inter/intra tumoral heterogeneity of SCLC in recurrence, thus emphasizing the need for being able to quickly and accurately differentiate between cell populations in this disease.



Sarah Sobol

Faculty Advisor: Michael Jewett

Advancing Cell-Free Glycoconjugate Vaccine Production

Glycoconjugate vaccines, composed of a pathogen-specific sugar antigen attached to a protein that stimulates the immune system, are an effective method to prevent bacterial infection. Currently, vaccine production uses cells, requiring centralized facilities and distribution under refrigerated conditions. The Jewett Lab has developed a freeze-dried, cell-free system to produce glycoconjugate vaccines at the point-of-care. Within this cell-free glycoprotein synthesis (CFGpS) platform, a specialized protein, known as PglB, transfers sugars to proteins forming the glycoconjugate vaccine. However, three main challenges prevent the adoption of this technology. First, the PglB enzyme is specific to certain sugars and cannot transfer all vaccine-relevant sugar antigens, such as those from diarrheal disease-causing bacteria *Shigella flexneri* and *Shigella dysenteriae*. Second, the platform requires an expensive energy source. Third, the platform is not stable at elevated temperatures. To address the first challenge, we hypothesized mutating PglB would expand its transfer capabilities for non-native sugars. Through western blotting, we demonstrated that mutating PglB increased transfer efficiency of sugar antigens from *Shigella flexneri* 5-fold and *Shigella dysenteriae* 2-fold compared to wild-type PglB. To address the second and third challenges, we developed a low-cost, thermostable CFGpS reaction formulation by screening low-cost alternative energy sources that could also increase thermostability. Using this formulation, we produced glycoconjugate vaccines against enterotoxigenic *E. coli* 078 for

~\$0.50 per dose after storage for up to four weeks at 37°C. Overall, we advanced cell-free glycoconjugate vaccine production by increasing the number of potential disease targets and developing a low-cost, thermostable formulation for accessible distribution.



Emma Austin Stein

Faculty Advisors: Simone Ispa-Landa and Megan Bang

Teaching the Apocalypse: Emotional Management in Climate Change Education

Whereas research on climate change has focused on ecological, economic, and geopolitical consequences, scholars and advocates have recently turned their attention to the psychological impacts of environmental decline. Though terms like climate anxiety have entered the newsroom and therapists' offices—we know less about how environmental educators have taken these psychological issues into account in their teaching practices. This study draws on interviews with professors and students, across disciplines in the environmental studies, and classroom observations of courses at Northwestern, exploring the following: How do educators manage students' emotions within the context of climate change and ecological disaster? How do students process the psychological demands of climate change education? Building on theories of emotional labor, and using a grounded approach to analyze interview and observation data, I explore how educators navigate emotionally charged subject matter and how their practices of emotional management inform students' understanding of climate change and their role in it. Preliminary findings suggest that classroom emotional norms influence the course content and methods of instruction, framing particular climate interventions and student behaviors as relevant to addressing the crisis. Instructors employ different strategies, including modes of rationalization and attempts to empower students with skills or hopeful rhetoric, to help them comply with the emotional norms of their teaching practice. This research builds on the growing understanding of the psychological consequences of climate change, which has important implications for balancing mental well-being with climate literacy for students of all ages in curriculum development and climate information campaigns.



Carolina Débora Stutz

Faculty Advisor: Michelle Molina

Italian Immigrants' Negotiation of Social Liminality in Late 19th and Early 20th Century Argentina

In the late 19th and early 20th centuries, Italian immigrants arrived in large waves to Argentina. They were not only escaping from poor conditions in Italy, but were courted by the Argentine state, which wanted to Europeanize the country. My study digs into the social and cultural realities that shaped Italian immigrants' everyday lives in Buenos Aires, and more specifically the ambiguity surrounding their acceptance, given the fact that they were simultaneously welcomed and stigmatized. Utilizing

Argentine newspapers, secondary literature, and, to a lesser extent, lyrics from the music and dance genre of tango, and ethnographies, I gathered data about how Italians occupied a liminal space in Argentine society. Rather than simply noting the ways Italians were sometimes “insiders” and sometimes “outsiders” during this period, however, my aim was to understand the ways they responded to the particularities of their status. I found that their navigation of Argentine society as liminal subjects was often carried out through the creation and use of new forms of linguistic communication such as *cocoliche* and *lunfardo*, the adoption of local identity markers such as the *compadre* and *compadrito*, and the establishment of social ties in and around their tenement housing, or *conventillos*. Exploring these phenomena contributes to a nuanced construction of Italian immigrants’ lives by placing their forms of social agency at the center of the discussion. Part of on-going senior thesis research, this study adds to historical scholarship on Italian immigrants in this period as it addresses and synthesizes dimensions of their quotidian lives.



Imra Tajuddin

Faculty Advisor: Mercuri Kanatzidis

Strongly Luminescent Hybrid Lead Halides with a Symmetric Triamine

Hybrid inorganic-organic lead halide perovskites and their lower-dimensional related structures are rising materials with extensive applications in photovoltaics, solar cell energy conversion and light-emitting diodes (LEDs), in part due to their luminescent properties. Our work proposes a synthetic strategy in designing hybrid lead halide compounds with a symmetric triamine molecule that exhibits strong photoluminescent emission. Herein, I present a family of low-dimensional lead halides that incorporate the symmetric triamine 1,3,4-tris(1,3,5-tris(4-aminophenyl)benzene, symbolized as T. A novel zero-dimensional (0D) lead bromide structure incorporating T with the formula $(T)_7Pb_3Br_{27}DMF$ was synthesized using solution synthesis in hydrohalic acid and slow cooling methods. The 0D structure consists of the triamine with isolated $[PbBr_6]^{4-}$ octahedra and dimethylformamide molecules dispersed throughout the unit cell. Photoluminescence spectroscopy reveals that the studied compounds demonstrate strong photoluminescence emission, a desirable property for perovskite-related compounds used in the development of more energy efficient optoelectronic devices. The photoluminescence spectrum of the triamine exhibits blueish-white emission with a broad emission peak centered at 428 nm along with a shoulder at 370 nm. The 0D $(T)_7Pb_3Br_{27}DMF$ compound demonstrates strong and narrow blue emission at 368 nm with a lifetime of 5 milliseconds due to self-trapped excitons. These interesting photoluminescent properties are promising for continued investigation and potential application in optoelectronics. The lead chloride and lead iodide analogues incorporating the triamine molecules have also been synthesized, and instrumental analysis of these compounds may also reveal useful photoluminescence properties.



Kaua'i Wu

Faculty Advisor: Jeffery J. Richards

Quantifying the Capacitance and Rheology of Carbon Suspensions for Flow Batteries

Wind and solar sources today are now competitive with carbon fossil fields thanks to investment in renewable energy generation technology. However, innovation in grid-scale energy storage systems is required to integrate these renewable energy sources. One promising system are semi solid flow batteries (SSFBS) that utilize solid material in an electrolyte solution, commonly referred to as a slurry, for electrical storage. Compared to existing pure aqueous batteries, SSFBs have higher storage capacity while compared to existing pure solid batteries, SSFBs can be more easily scaled to grid-level energy storage. Highly conductive carbon black - structurally engineered soot - is an appealing potential active material for slurries due to its high surface area corresponding with high storage capacitance and low capital. Prior studies have extensively shown the electrical properties of carbon slurries are affected by how well the slurry flows, or rheology. This project aims to characterize the relationship between capacitance and rheology for carbon slurries. To measure rheology, a pre-existing machine - known as a rheometer - physically induces pressure, or shear, onto a sample to force it to flow. To generate electrical measurements, a custom-built apparatus was attached to the rheometer allowing current to run through the sample and acquiring electrical impedance data. By using a Python code, the electrical impedance data was converted into capacitance per unit area of the slurry. Thereby, capacitance can be shown as a function of shear rate. Overall, this project showcases how rheology and capacitance can be simultaneously measured as a function of one another.



Harry Xie

Faculty Advisor: John Bullock

With Great Power Comes Great Responsibility: Voting Power and Self-Interest

Pivotality is the likelihood that an individual casts the deciding vote in an election. It can be used as a measurement for the “voting power” than an individual has in an election. While the concepts of pivotality and self-interest have both received significant attention within political science, literature which connects the two is scarce. This study uses a novel two-part experiment consisting of an economic game and a policy study to answer the question of whether increasing pivotality influences the likelihood that people vote in their self-interest. It finds that pivotality does affect self-interest in voting, but the direction of this effect can vary. In some contexts, increasing pivotality results in more selfish voting while in others, increasing pivotality results in less selfish voting. The results have important ramifications for both practical and theoretical reasons. The United States has seen an increase in voting rights restrictions across the country, which effectively increase the voting power of certain citizens; this study can help understand the impacts of this phenomenon. On the other hand, epistocracy is a form of government which limits suffrage to more knowledgeable citizens and has received increased attention in political philosophy in recent years. Epistocracy has been criticized in part due to concerns that enfranchised citizens will have increased voting power and will thereby vote

selfishly and neglect the needs of the unenfranchised citizens; this study addresses these concerns and contributes to a rich and relevant debate.



Wenbo Zhang

Faculty Advisor: Benjamin Gorvine

Social Media Usage and Anxiety

Recent research has found that 72% of adults in the United States utilize social media at varying rates. Given the widespread usage of social media, especially among young adults, its effect on users' mental health is significant. Social media also has a strong presence in China. Therefore, this study investigates how social media usage can affect young adults' mental health in two different cultures. This study utilizes a survey to collect answers from current undergraduate students to examine the effect. For example, we ask participants questions such as "how often you feel you have to constantly available for your friends online". Through these questions, we can gain insight in how much stress their perceived availability needed for social media creates. In addition, we will collect data related to participants anxiety level, their addiction level to social media, how social media has created stress digitally in their life, and their sleep quality to test our hypothesis that social media usage negatively affects one's anxiety level and that sleep and digital stress mediate that relationship. Because data collection is ongoing, results are not yet available. The relevant body of literature is already considerable, but the current research is distinctive since it aims to identify factors that may mediate the relationship between social media usage and mental health. Additionally, as the United States and China are often considered representative countries of Western and Eastern cultures respectively, we intend to examine how social media may affect populations from different cultural backgrounds.



∞ Poster Presentation Abstracts

Alphabetical by presenter's last name

Nicholas Alia

Faculty Advisor: Eli J. Finkel

“One American Family”: Can Familial Relationships Decrease Partisan Hate and Increase Out-Party Respect?

The increasing polarization in contemporary U.S. politics has fueled political tension. Within the last decade, partisan citizens’ hatred toward the opposing party has outweighed their in-party love. Despite the growing prevalence of out-party hate, politicians continue to refer to U.S. citizens as “one American family.” The present study examined whether encouraging partisans to identify as a family could reduce out-party hate and promote equal respect and treatment toward out-party members. Self-identifying Democrats and Independent leaners were randomly assigned to watch one of three videos displaying an argument between a male, Democratic confederate and a female, Republican confederate about climate change. Participants were conditioned to believe the interaction occurred between family members (Family) or between co-workers (Intern), or they watched the video without any audio (Control). After the manipulation, participants rated their warmth toward each confederate and toward typical voters of each party, then completed four measures associated with respect for the opposing party. Results showed that participants in the Family condition rated the female, Republican confederate as significantly warmer than participants in the Intern condition. However, this significant difference did not transfer to their warmth toward typical Republican voters, nor any measure of out-party respect. These results suggest that the reduction of out-party hate via familial relationships is limited to the specific, out-party individual rather than generalized to the entire party. In the modern era of growing partisan strife, the present study establishes a novel mechanism for reducing partisan hate.



Aino Alkio, Rachel McCardell, and Kelly Su

Faculty Advisor: Sarah Van Wart

TECtalks: A Podcast Series Focused on Educating Listeners in Technology, Ethics, and Climate

Despite increasing awareness of environmental issues, few people stop to consider the effects of their daily use of technologies on the environment, from the electricity and water required to maintain data centers to the mining of minerals required for manufacturing batteries for electric cars. We seek to educate everyday people by answering the following research questions: What do researchers and climate advocates want people to understand about technology and the environment and what actions can be taken, individually or collectively, towards mitigating the negative effects of technology on the environment? In pursuit of discovering more, we have reviewed research papers, conducted interviews with experts, and gathered captivating and veracious content for the production of our podcast episodes. Based on our analysis of interview transcripts, we have found that experts and practitioners possess very different theories of change. There are various kinds of actions that we may take as individuals and as a society to mitigate environmental degradation. For example, individuals can work towards maintaining their personal technology devices for longer periods of time before throwing

them away or that society can employ better methods in regulating large technology companies that obtain energy from unethical sources. The experts we interviewed all mentioned that it is critical to understand and take responsibility for these effects in order to better collectively fight climate change and environmental injustices. Moving forward we aim to continue to seek expert insight into such problems, produce insightful episodes for our listeners, and inspire positive change for our world.



Sasha Benson

Faculty Advisor: Jolie Matthews

Media Rhetoric Surrounding Black Women in Rap and Sports: Exploring Cognitive Dissonance in People's Viewing of Social Topics

How does society's perception of Black women transcend into various lifestyles and life forms? How does the negativity Black women receive in rap crossover with the hate they receive in sports? We wanted to explore the idea of comparing two social topics that seem different but have the same core. How do people display cognitive dissonance in rationalizing and justifying similar situations? I focused on the context of black athletes and black female rappers. Using a social media frame (to demonstrate the public dialogue), we looked for posts on the app Twitter for tweets that mirrored the other; opinions about Black women athletes vs. white male/female athletes, Black female rappers vs. Black male rappers, and ensured that we showed people's tweets in an argument for both sides. We utilized surveys on Qualtrics to see if people saw similarities, double standards, contradictions, and agreements/disagreements in each tweet. We asked unopinionated questions to ensure no bias and complete free thinking in the answers. Most people agreed with the broader question of how society treats Black women in media and the underlying racism and sexism still present in sports, music, and other lifestyles. Most responses came from frequent social media users and young people. Our work added to existing discourse about these questions, as the comparison between sports and rap is typically not discussed. We brought to light these double standards that people may not actively ponder and raised increased awareness to lessen sexist and anti-black media presence for Black women.



Ri Boksenbaum, Jack Burkhardt, Molly Schneck, and Aden Weiser

Faculty Advisor: Sarah Van Wart

GoodAsNU: A Community-Based Approach to Reducing E-Waste Through Electronics Self-Repair

As society's demand for smart devices and consumer electronics grows, the amount of electronic waste (e-waste) created is drastically increasing. The influx of electronic materials such as rare earth metals and lithium-ion batteries into our waste streams has far-reaching effects on societal health and wellness, and the increased demand for these materials causes irreparable damage to our environment. To help break this cycle of electronics demand, our project, GoodAsNU, wants to better understand: (a) how the university currently repairs, repurposes, and recycles electronic devices, (b) whether

students would be interested in learning about computer repair and maintenance, and (c) the types of repairs that students typically need. To explore these questions, we conducted 17 interviews with Northwestern students, staff, and faculty. Additionally, we performed repairs on 7 electronic devices ranging from smartphone screen replacements to laptop battery replacements. Through our research, we learned that students actually want to fix their electronics before outright replacing them, but can often face significant economic or technical barriers preventing them from doing so. Furthermore, tech companies often make device repairs more difficult through incompatibility with third-party components or by making device disassembly exceedingly difficult for the average consumer. Our research findings will inform the design of a self-repair workshop that we plan to organize and host in the spring. Our findings also have implications for how we might discourage companies' reliance on planned obsolescence, and how we might foster a culture of repair among consumers.



Emma Burnham

Faculty Advisor: Monika Nanda [UNC Chapel Hill]

Can Actual Administration of Prescribed Acetaminophen Be Used as a Quality Improvement Measure?

Acetaminophen is a well-known analgesic used to treat moderate post-surgical pain. The drug is opioid sparing, a strategy which could be incredibly useful in combating the ongoing opioid crisis. Acetaminophen should be prescribed in conjunction with opioids as part of a multimodal analgesia plan aiming to reduce total opioid consumption. A number of patients will not have acetaminophen prescribed, but even if the drug is prescribed, the question remains, how often is it actually given? Can the acetaminophen prescription rate and number of completed doses after surgery be used as a quality improvement measure to identify if tertiary care centers are effectively utilizing this medication to the fullest extent? This QI project investigated this question with a retrospective data extraction from an electronic medical record describing post-surgical acetaminophen prescriptions at a university medical center in March 2021. Analysis consisted of a stratification by surgeon and service, and average prescription was identified for each. Other notable patterns were identified as well. Analysis of the medical record revealed that the hospital-wide average post-surgical acetaminophen prescription falls at roughly $\frac{3}{4}$ of the maximum recommended dose, and that there is significant variation in prescribing habits by various surgical services. This data informs us that improving upon current prescription habits by substituting a portion of prescription opioids with acetaminophen to treat moderate post-surgical pain in a tertiary care setting may have the potential to better post-surgical analgesia, reduce opioid related side effects, and improve post-surgical outcomes for patients at risk for substance use disorders.



Esther Cha

Faculty Advisor: Pamela Souza

Hearing Loss as a Modifiable Risk Factor for Dementia in Dual Diagnosis Populations

Incidence of cognitive impairment and hearing loss increases with age. However, to date there are few studies examining the impact of having a dual diagnosis of hearing loss and cognitive impairment on conversation effectiveness and efficiency, leaving important gaps in treatment considerations (e.g., hearing aid processors, aural rehabilitation) for this rapidly growing population. The present study tested the interaction between hearing loss and cognitive impairment in older adults with hearing loss management and mild cognitive impairment (MCI). The affected persons ($N = 3$) and their care partners filled out subjective questionnaires in which they answered questions regarding their cognition, well-being, and caregiver burden (care partner only). Participants also completed standardized dialogue elicitation tasks with and without hearing aids. Statistical and conversational analysis yielded support for the hypothesis that conversation breakdowns would increase without hearing aids and when the affected person was required to lead the conversation. The results of this study contribute to understanding the effects of hearing loss on communication. This understanding can help offer treatment considerations for populations with hearing loss and cognitive impairment, potentially increasing social engagement and reducing caregiver burden.



Elana Charlson and Yola Mzizi

Faculty Advisor: Leoandra Onnie Rogers

Talking About Race in the Sociocultural Moment: Emerging Adults' Critical Consciousness and Racial Identity in Context

In the United States, systemic racism informs how individuals come to understand themselves and their place in the world—a context marked by social injustice, racial violence, and political polarization. Research in psychology often studies identity development at the interpersonal level, without accounting for how larger social structures inform our experiences. This study aims to understand how white and BIPOC emerging adults make meaning about their racial identity, society, and their positionality through *critical consciousness*, a framework which posits that recognizing and acting against societal inequity is integral to the development of a secure racial identity. In our sample of 47 college students, we asked participants to describe a recent race-related conversation they had at two time points surrounding the 2020 election. Responses were coded as critical reflection (recognition and critique of social inequality) critical action (such as participation in protests and social justice workshops), political efficacy (belief in one's ability to enact sociopolitical change), and/or uncritical reflection (no critique of social inequity). We found that participants of color engaged in a greater degree of critical reflection and action and viewed their racial identity as inextricable from the sociopolitical context. White participants primarily engaged in uncritical reflection; although they acknowledged the existence of racial inequity, they failed to connect their individual experiences to broader systems of oppression. These findings underscore the impact of privilege and positionality on racial identity development and the extent to which individuals critically engage with social inequity.



Alexi Ortega Chavez

Faculty Advisor: Sarah Bartolome

Music Education in the Pandemic

Before the pandemic, the AMASE organization at Northwestern University provided free music lessons for local students with special needs and disabilities. Once the pandemic hit, Dr. Bartolome and Dr. Draper aimed to find out how the online shift affected the learning and overall environment of how AMASE functioned. Our research team approached this by organizing interviews with the teachers, students, and families of the students to achieve a better understanding of how online learning affected the teaching process for the students. When interviewing the student teachers, we were interested in hearing their experiences in teaching online for the first time and how they were able to adapt to best fit the needs of their students. In interviewing the parents and students we wanted to gauge the challenges of finding access to a functional learning environment at home and any other challenges that arose. Through our interviews we observed that many of the families experienced the similar challenge of simply missing the in-person environment that AMASE created every Saturday morning. The parents missed communicating with other families and the connections they made through AMASE that helped them create a community of reliance and aid. My work in the research cohort was to organize media files of interviews and annotate transcriptions of interviews. I developed skills in data organization for systems like dropbox and excel to manage information about recorded interviews. I also participated in interviews with families and students to record notes and ask questions.



Erica Chavez

Faculty Advisor: Reza Vafabakhsh

Assessing the Functional Impact of Phosphorylation on the Neurological Receptor mGluR2

Our survival depends on the way our bodies respond to the environment. Receptor proteins communicate environmental signals to our cells to begin these responses. Metabotropic glutamate receptors (mGluRs) are a class of receptors that trigger responses in the central nervous system, especially the brain. The mGluR2 receptor can be regulated by phosphorylation, which is when chemical phosphate groups get added onto specific parts of it. mGluR2's tail can have various differing phosphorylation codes with specific patterns that are essential to control its function in helping the cell respond properly to the environment. The purpose of this study is to map the location and number of detected phosphorylation sites to relate them back to the signaling of mGluR2. I hypothesized that the specificity of this code, at least partially, is responsible for controlling the sensitivity of mGluR2. To understand how phosphorylation impacts receptor sensitivity in a human cell line, I created and cloned two mutant versions of mGluR2. One mutant mimicked phosphorylation sites, while the other

removed phosphorylation from these sites. Samples of cells with these mutants, as well as the unaltered mGluR2, were imaged and then quantified to compare their level of sensitivity. We found that the unaltered and phosphorylation mimicking mutants had the highest sensitivity, while sensitivity was lost when removing the phosphorylation sites. Therefore, these findings determined that the phosphorylation code can indeed regulate sensitivity of mGluR2. Future work can use this methodology to study how various neurological drugs affect the phosphorylation state of mGluR2.



Annie Chen

Faculty Advisor: Eli Finkel

The Effect of Outside Recommendations on Choosing Romantic Prospects

Factors such as our social networks or dating application algorithms play a role in modern dating. However, research has not yet evaluated how we take opinions from these sources into account at the beginning stages of a romantic relationship and which sources are most influential to our dating decisions. To address this question, we conducted an online survey experiment in which single individuals aged 18-25 were randomly assigned to one of three conditions: imagining a scenario in which their close friend has made a dating profile recommendation for them, imagining a scenario where they have signed onto a dating application and have received a recommendation from the app's matching algorithm, or a control with no scenario. Participants were then asked to rate dating profiles using two sets of questions: one regarding their perception of whether the person in the profile possessed ideal partner traits and one regarding overall attraction towards the person in the profile. We found that there were no significant differences between profiles rated under the friend, algorithm, or control conditions for either set of questions. From these results, we can begin to understand the factors that influence selection of romantic partners and the early development of romantic relationships. Future research should further investigate these questions using more naturalistic manipulations rather than hypothetical scenarios in order to better understand how we make these evaluations in the real world.



John Chen

Faculty Advisor: Erica Hartmann

Investigation of Whether Environmental Context Affects the Antimicrobial Efficacy of Copper-Coated Surfaces

In both indoor and outdoor environments, the survival of bacteria depends on the surface conditions and materials on which they reside. In particular, copper-containing surfaces have been shown to reduce bacterial viability, and copper coatings are thus attractive antimicrobial treatments. Although the antimicrobial properties of copper surfaces have been studied before, the effect of the chemical compositions of the bacteria-containing liquid medium and the surrounding environmental conditions

are poorly understood. My project simulates the conditions experienced by bacteria on high-touch surfaces, such as bedrails in hospitals, and evaluates how exposure to these conditions affects their viability on copper-coated surfaces. I am investigating the effects of medium composition (saline solution and artificial saliva), as well as dry, ambient, and wet humidity conditions, on the survival of bacteria on copper-coated metal surfaces. I apply the bacteria-containing solutions to copper-coated metal surfaces before incubating them in glass jars set to a specific humidity condition. The amount of living bacteria remaining on the surfaces is quantified by swabbing the surfaces and performing colony counts on resulting cultures. The results thus far suggest that the copper coating is equally effective under all treated conditions. Future work will be performed to corroborate these observations and expand the range of environmental conditions tested. Results from this project will improve our understanding of when and how to use copper-containing materials in healthcare and residential facilities, and reveal considerations we should make before replacing traditional materials with antimicrobial copper ones.



Zorina Chen

Faculty Advisor: Ann Orloff

Intersectionality in Migration: Navigating Identities in Cross-Cultural Socialization

How do women Chinese students perceive and experience their identities in the US context? How do these students' collective identifications influence their experiences of socializing with local peers in US colleges? Drawing on survey data and in-depth interviews, this study finds that women Chinese students' intersectional identities, as well as their associated mix of privileges and disadvantages, have been hindering their socialization with American students – especially when they begin adapting to local culture and social practices – through inducing hyperconsciousness about identities, lasting senses of insecurity, and demand for belongingness. The foreign values and social practices closely linked to their intersectional identities also complicate women Chinese students' cross-cultural socialization. Over time, these students develop different streams of strategies for coping with their intersectional identities when socializing with American peers as well. Both regularities and variances among women Chinese students' experiences with their identities are examined. How the broader socio-cultural contexts manifest themselves in women Chinese students' identity navigation and cross-cultural socialization is closely investigated, too. This study not only reveals the potential of broadening the application scope of intersectionality as an analytic framework, but also fosters our understanding of Chinese students who study at US colleges as a growing population and highlights the systematic vulnerabilities faced by women Chinese students.



Radoslaw Chrzanowski*Faculty Advisor: Richard B. Silverman***The Optimization of Blood-Brain Barrier Permeability for Potent and Selective 2-Aminopyridine Neuronal Nitric Oxide Synthase Inhibitors**

Neuronal nitric oxide synthase (nNOS) is an enzyme that produces the small molecule nitric oxide, which has been linked to neurodegenerative diseases, such as Alzheimer's disease, at high concentrations. A potential therapeutic approach to prevent neurodegeneration is inhibition of nNOS by small molecules. Although previous molecules have shown good potency and good selectivity for nNOS over other NOS isoforms, they lack the blood-brain barrier (BBB) permeability necessary to enter the central nervous system where nNOS is located. Thus, this project intends to optimize the most effective published molecule through the incorporation of an oxygen atom in the linker of the scaffold and functionalization of the tail amine to enhance lipophilicity and BBB permeability. Though synthesis of final compounds has not been completed, key intermediates have been produced for both the head and tail fragments. Organic chemistry methods, such as palladium-catalyzed cross-coupling, hydroboration, tosylation, and radical bromination were used to synthesize a tosylated 2-ethanol-5,6-difluorophenol tail fragment and a 2-amino-6-bromomethyl-4-methylpyridine head fragment. So far, these results suggest that many new nNOS inhibitors may be accessed from the tosylated intermediate due to its ease of synthesis and functionalization, which has important implications for quickly screening their characteristics. Once the final products are completed using S_N2 chemistry to combine the two fragments, results for potency and BBB permeability can be obtained using the respective hemoglobin capture and PAMPA-BBB assays, which will indicate whether these modifications balance potency, selectivity, and permeability, and what other changes might be necessary before a clinical candidate is found.

**Olivia DeGulis***Faculty Advisor: Jeff Savas***Investigating the Role of Alix in the Spread of Amyloid Pathology in APP Knock-In Mouse Models**

Alzheimer's Disease (AD) affects roughly 24 million people worldwide and has been predicted to increase 4-fold prior to 2050. AD is caused by a toxic buildup of A β ₄₂ misfolded proteins, so if we could prevent the spread of these peptides between neurons, there is a chance we could stop the progression of dementia. Currently, there is no way to prevent nor eliminate AD pathology completely. For my project, I began investigating the role of the Alix protein functioning in the release of extracellular vesicles (EV) in the cortexes of mouse brains. Alix is a membrane scission factor in cells and works to release vesicles from cell membranes. Alix-dependent processes provide a potential mechanism for the spread of AD A β ₄₂ pathology through A β ₄₂-filled vesicles. Inhibition of vesicle release could provide a mechanism for slowing down AD pathology. My hypothesis was that by knocking out Alix, the spread of amyloid would decrease due to reduced release of vesicles containing A β ₄₂ from the pre-synaptic membrane. To do this, I created transgenic mice that had advanced

humanized-AD pathology and performed Thioflavin S staining and quantification on sagittal brain slices. I then performed an A β ₄₂ ELISA to quantify amyloid burdens. After analyzing the data, the project findings indicated that the Alix protein does not have a negative effect on total amyloid deposition throughout the brain. This finding eliminated further research of Alix has a possible therapeutic target for slowing the progression of AD.



Rahul Devathu

Faculty Advisor: James Thomas

Temporal Strain Data Reconstruction from Echocardiographic Strain Graphs

Strain imaging allows us to visualize the movement of the heart muscle, but it is often reduced to a single parameter, global longitudinal peak strain (GLPS). Raw strain time-series data is largely unexplored and restricted as studies only save images of graphs lacking numerical data. The troves of retrospective strain studies saved as images can be unlocked by reconstructing the numerical values contained in strain graphs. Such datasets would be critical to future artificial intelligence strain analysis and advanced detection of heart disease. This study aims to investigate the methods of extracting and reconstructing strain curve graphs to raw numerical outputs. By using an automated curve recognition algorithm, individual curves can be isolated as scattergram type plots of pixels. Intelligence-guided filtering, interpolation, and curve filling can convert the pixel scattergrams into clean and complete temporal strain data. Using a set of 21 studies containing 6 regional curves, 126 unique curves were reconstructed and compared to prospectively exported temporal strain data. Results demonstrate that this method reconstructs the numerical data with high accuracy and precision. The reconstructed data was compared with the exported numerical data, yielding an average R² of .996 with an average runtime per study of 7.32s. The minute deviation from fidelity can be attributed to the finite resolution of the pixels in the analyzed graph. Ultimately, highly accurate strain data can be extracted from routine strain studies, which may allow for advanced statistical and artificial intelligence analysis of strain.



Georgia Assanuma Dutra

Faculty Advisor: Matthias Doepke

Educational Assortative Mating and Income Inequality in Brazil

It is undeniable that income inequality has become a widely studied topic in various subjects, and even more so in Economics, as the trends have been towards increasing – and worrisome – levels of wealth concentration across the globe. Moreover, assortative mating is the tendency that individuals with similar characteristics, like education and income, are more likely to form couples. In this context, assortative mating might have an important impact on aggravating income inequality: if wealthier and highly educated people are marrying each other, they will concentrate wealth as a household and reduce possibilities of “marrying up.” Furthermore, with the increase in female education levels, a

better “pairing” is enabled, as there is an increasingly balanced market for individuals across different levels of education. Brazil is particularly interesting to analyze because it was in a wave of decreasing inequality until roughly 2018, and then it has suffered a recent increase. Additionally, the country has race and historic trends that make assortative mating even more complex, as the likelihood of getting married to someone from a different race, for example, is smaller regardless of socio-economic status. This study uses statistical software and regression analysis to dissect the effect that increasing levels of female education might have on assortative mating and, consequently, on income inequality in Brazil. The novelty of the study comes from the fact that the existing literature is mostly on high-income countries, for which income inequality is not significantly affected by assortative mating, but the effects and trends might differ due to cultural and economic disparities.



Kate Feldstein

Faculty Advisor: David Schieber

I Know You Are But What Am I: Presentation and Labelling within Sexual Identity

A great deal of research focuses on how people think about and define their own identities in the context of their social world. This is especially true with the expansion of queer terminology and how people define and present their own sexual identities. As this identity terminology grows, people use different terms over time and in different spaces, and thus, it has become necessary to understand how these new terms are present and affected by social norms. For this research, I conducted semi-structured, in-depth interviews with 21 queer-identified, non-male students at a private university to better understand how people use terminology, identity, and appearance to communicate their sexuality and/or gender identity. I find that the two most salient factors that go into participants’ conceptualizations of their identities are presentation and labelling. People strategically use labels to describe their sexual identities in different situations in two overarching ways. Firstly, respondents tend to use umbrella terms to maintain identity ambiguity and flexibility. And secondly, I find that people switch between the use of umbrella and specific terms depending on the social context. This work adds to the existing body of knowledge through my application of the terms “autonym” and “exonym” to the field of sociology. I define autonym as the label that one identifies with internally, and I define exonym as the term that one discloses to others as imposed upon them by social norms.



Caroline Forbess

Faculty Advisor: Scott Ogawa

Learning Loss and COVID-19: Pandemic Schooling Mode for U.S. Public Schools and Student Test Scores

School districts across the United States varied in their responses to the COVID-19 pandemic. While the shift to remote learning was nearly universal in the Spring of 2020, there was robust heterogeneity in the modality of instruction (in-person, hybrid, and fully remote) during the 2020-21 school year at

the district level. The unevenness of school openings allows researchers to broadly consider the short- and long-term consequences of a lack of in-person schooling. In context of an educational learning production function—with foundations in microeconomic theory—schools faced the choice of instruction modality without clear evidence on the efficacy of remote learning. Literature, particularly by Oster et al. (2021), have begun to point towards the learning loss from decreased face-to-face instruction. I utilize a detailed database on schooling mode from academic school year 2020-2021 alongside Spring 2021 test score data from over fifteen states. I find an overall drop in average test scores through empirical statistical analysis. I quantify the decrease for students Grades 3-8 to be 8.5 percentage points and 6 percentage points for Math and ELA scores respectively. However, test scores for students in Grade 11 performed only minimally worse, if not the same, on the Scholastic Aptitude Test. This may be due to positive selection bias and lower participation rates. This research can be utilized by school districts in the future when faced with modality of instruction choices, as evidence now exists to demonstrate that virtual learning cannot directly substitute for in-person learning, at least, for younger students.



Joy Fu

Faculty Advisor: Christopher Bush

Use of Languages in Edward Yang's *Yi Yi*: Exploring the Local and the Foreign in Taiwan New Cinema

Historically, Taiwan has been influenced by diverse cultures and languages, from indigenous and Chinese civilizations to Japanese colonization and American hegemony. In the early 1980s, the Taiwan New Cinema movement emerged, highlighting revolutionary films portraying new waves of urbanization and political freedom in Taiwan. Edward Yang and Hou Hsiao-Hsien are the leading directors of the movement. Numerous studies have examined the artistic characteristics of Taiwan New Cinema, but most works focused on Hou's films instead of Yang's, and few explored the significance of language diversity in the movement. This research fills the gap by analyzing the cultural and political implications of languages used in Yang's last film *Yi Yi* (2000). The study employs both textual analysis of film dialogues and extrinsic historical and sociolinguistic research on language diversity in Taiwan. This research shows that in *Yi Yi*, Hokkien is the only language that represents sincerity and pure "localness." English and French represent the most "foreign" because they demonstrate the neo-colonial impacts of America and France on Taiwan. Japanese and Mandarin are in the middle of the local-foreign spectrum, symbolizing Japan's faded but lingering colonial impact on local culture and the ubiquitous usage and dominance of Mandarin in Taiwan. This study provides more insights into the use of local and foreign languages as symbols of cultural dynamics and (neo-) colonial influences in formerly colonized regions. Specifically for Taiwan New Cinema, it provides a new lens for research on themes of globalization and urbanization in both the movement and Taiwanese society.



Ruichen Gao

Faculty Advisor: Jeffrey Lewis

The Impact of Wage Spending on Team Performance in Soccer: Evidence From the Premier League

In the past two decades wage and transfer fee spending in professional soccer has increased significantly as more and more teams hope to improve performance with financial investment. This paper examines, via three models, the impact of wage spending on team performance in soccer. In particular, the first model analyzes the effect of team total wage bill on performance, the second model analyzes the effect of wage dispersion on team performance, and the third model examines the so-called “superstar effect”. Ordinary least squares (OLS) regressions with robust standard errors are used for all three models, and robust standard errors clustered on teams are used in the first two models to account for autocorrelation. The results in the first two models suggest that team total spending, but not wage dispersion, has a statistically significant positive impact on team performance. Moreover, even with alternative definitions of the team, the effect of wage dispersion on team performance remains insignificant. The results in the third model confirms the existence of the “superstar effect” in soccer, as the playing time of superstars has a statistically significant positive effect on average points per game for a team, which indicates that targeted high-quality spending may be more effective at improving team performance.



Suhanee Giroti and Aidan Ocampo

Faculty Advisor: Shelby Hatch

Environmental (In)Justice: Racial and Socioeconomic Disparities of Heavy Metal Contamination in Chicago

Heavy metal contamination, resulting from immense industrialization over the past four decades, continues to threaten the health of Chicago’s residents. More disturbingly, this contamination poses an unequal threat to communities based on race and socioeconomic status. The city’s history of discriminatory practices such as redlining and zoning laws result in people of color and lower SES Chicagoans living in areas with a potentially higher rate of contamination. Evidence of these disparities can be visible through the chemical analysis of surface and subsurface soil and water from across the city’s diverse neighborhoods. In the current study, we are investigating the correlation between the extent of heavy metal contamination, current and historical industries, and the demographics of neighborhoods in the City of Chicago. Our research involves collecting environmental samples, analyzing them for heavy metal content, then using Geographic Information Systems (GIS) software to depict the resulting data in connection with U.S. Census tract data. Analysis of samples collected through previous research by Dr. Shelby Hatch indicates an already concerning pattern of contamination. The continuation of this research will be done through the collection of soil and water samples from 25 identified neighborhoods with contrasting racial demographics and industrial histories. The analysis of the environmental samples is done through the inductively-coupled plasma optical emission spectrometry (ICP-OES) which identifies which heavy metals are present and their

concentrations. Our preliminary results indicate a correlation between heavy metal contamination and the percentage of people of color and lower SES.



Shubhanshi Gaudani

Faculty Advisor: Elizabeth M. Gerber

Intelligent Coaching Systems: Understanding One-to-Many Coaching for Ill-Structured Problem Solving

One-to-many coaching is a common, yet difficult, coaching technique used in learning environments with many novices learning to solve ill-structured problems. Intelligent systems might be designed to support 1-to-many coaching by automating routine and repetitive tasks. To explore how to do so, we need a detailed task model of novices' challenges, coaches' strategies, and coaches' goals. To build a task model, we observed 1-to-many coaching with novices developing new products in a university incubator and conducted interaction analysis on 24 coaching session video recordings and retrospective analysis with 3 coaches and 30 novices. We contribute a detailed task model of novices' challenges, coaching strategies, and goals that shows how coaches offload some coaching to peers, support accountability and self-efficacy, and help novices test frequently and regularly through 1-to-many coaching. Our task model informs emergent design implications for future intelligent coaching systems to assist coaches in monitoring large numbers of novices' progress with ease, build a network of expertise among novices and help both coaches and novices access the network, as well as support novices in developing help-seeking and communication skills.



Delaney Glassner

Faculty Advisor: Sarah Van Wart

Targeted: A Short Film In-Progress Exploring Modern-Day Surveillance Capitalism

Targeted is a short film in-progress resulting from a TREE Working Group research project on surveillance capitalism. Surveillance capitalism is the term that describes the commodification of personal behavioral data for monetary gain. It is the modern evolution of capitalism which has only recently been brought into public consciousness with recent scandals like the Cambridge Analytica scandal, wherein Cambridge Analytica used Facebook data to sway the 2016 election and the Brexit vote. However, it is still not a very widely understood framework despite its impact. The goal of this project is to produce a short film centered around the ideas of surveillance capitalism, in order to spark a dialogue. I have focused on two threads of research- surveillance capitalism itself, and the history of films communicating complex issues to its viewers. In hopes of better understanding what researchers in the field are concerned about, I am performing a literary review of surveillance capitalist literature and interviewed a professor on internet security at Northwestern, Dr. Sruti Bhagavatula. Meanwhile, I have analyzed movies with distinct messages and read theses on the best ways films can convey a message. Because of my research, I narrowed the scope of my script to focus on surveillance

capitalism as an everyday control tactic. I also have applied tactics to my script to make my message more understandable to a wide audience, without being paralyzingly overwhelming. This next quarter, I will be expanding my research in both threads, and applying it to new drafts of the script.



Eleanor Goes

Faculty Advisor: Gemma Carvill

Determining Splice Factors for Poison Exon Inclusion in SCN1A Disorders

Dravet Syndrome (DS) is a severe developmental and epileptic encephalopathy. Over 80% of patients with DS exhibit variants in the SCN1A gene, which encodes the alpha subunit of voltage-gated sodium channel, Nav1.1. Mutations in the SCN1A gene leads to a decrease in channel function, leading to haploinsufficiency/dysfunctional cells. Genome and exome sequencing has successfully identified disease-causing variants in between 30-50% of patients with severe pediatric epilepsies. For around 20% of patients with DS, these techniques have been unsuccessful, implying that variants causing DS are located outside of the region typically sequenced and lie in the intronic region. Intronic variants can affect gene function via inclusion of a poison exon, 20N, through alternative splicing mechanisms. Inclusion of 20N causes a premature termination codon within the final transcript, targeting the RNA for NMD and therefore decreasing the amount of SCN1A protein produced. A previous study sequenced the poison exon and surrounding intron in 640 patients with severe pediatric epilepsies and five likely pathogenic variants were found. Our project confirmed that three of these pathogenic variants do lead to increased levels of 20N inclusion. Additionally, differing levels of exons 20 and 21 (neighboring the poison exon) suggest a potential exon usage mechanism when 20N is included in the transcript. Our work also determined unique proteins bound to the 20N region in each of the five variants using a pull-down method. Many of these proteins play a role in splicing and mRNA processing.



Annie Goss

Faculty Advisor: Lilah Shapiro

Perception of Teachers and Student Experience During Covid-19

During the summer of 2021, I set out to better understand how the COVID-19 pandemic has affected public perception of teachers and the education system. Throughout the pandemic, it became clear from anecdotal evidence in the popular press and social media that the pandemic had a negative effect on teacher's experiences in the classroom. Prior research has shown that there is a connection between teacher self-esteem and student engagement and performance. It was important to examine how the circumstances of the pandemic affected the experiences of students and families, and the perception of teachers and the education system. I interviewed parents and teachers of public high school students in the north shore of Chicago about their experiences during the first year and a half of the pandemic.

A grounded theory approach was used to craft a coding scheme and analyze my interview data. I found that the change in interpersonal dynamics surrounding educational spaces resulting from the pandemic affected the way students and parents perceived the value of education. Further, during the pandemic new schemas for the role of “teacher” were constructed. These new schemas impacted the way teachers viewed themselves and their work as well as how their students and students’ parents perceived them and their work. This research illuminated the impact that public discourse can have on the quality and value of education within the context of a public health crisis, such as a pandemic.



Noah Holubow

Faculty Advisor: Ian Savage

Did the Cournot Paradox Apply to the Merger of American Airlines & US Airways?

The proposed merger of AMR Corporation, the parent company of American Airlines, and US Airways Group, Inc. garnered much public attention and debate in 2012. At the time, it was set to create the world’s largest airline. Following then recent mergers of Delta Air Lines & Northwest Airlines Corp. and United Airlines & Continental Airlines, this subsequent merger further reduced the number of legacy carriers from four to three, raising enormous antitrust red flags. In this paper, we explore how market share of the combined “New American” changed on the most significant routes of concern to the Department of Justice (DOJ) between 2012 and 2019. Using passenger count data in each year from 2012 through 2019, we use regression analysis to see whether Cournot merger paradox, which in this context states that the increase in market share for the combined New American was captured by non-merging airlines, ultimately held true by 2019. We find that American did, in fact, tend to lose market share over time, but in certain instances it was strengthened, particularly along former US Airways hubs and routes. We argue that this is due to the fact that the formerly independent American Airlines had a much stronger network and product and hence US Airways had more to gain from this merger. This paper is relevant to policymakers in identifying areas that should be considered more deeply in future airline mergers, particularly when disparities exist between the two merging firms.



Coco Huang

Faculty Advisor: Nadine George

“The Walking Axis:” An Interactive Audio-Tour Performance into Beijing Memory

“The Walking Axis” is an audio-guided interactive tour along the architectural remains of imperial Beijing’s central axis, a site-specific performance I created with a team of local artists in Summer 2021. It is my effort to reconnect with my hometown after seven years of studying abroad, to explore the contemporary residuals and relevance of its rich cultural history. As the imperial capital of the Ming and Qing dynasties from 1369 to 1912 CE, the old Beijing is divided into two symmetrical halves by

a 7.8-km long central axis. The southern tip of the axis is now a public park, where slices of old city life miraculously last into the present despite the grinding process of modernization and urban reconstruction. Rooting “the Walking Axis” in the park, we conducted field recordings, designed original costumes, interviewed historians, cultural scholars, architects, and local dwellers...Our final performance merges audio-tour with outdoor theatre, incorporating oral storytelling, dances, role-playing, and interactive activities. Accompanied by six actors and two “tour guides,” each participant would wear a headphone and embark on an hour-long walk along the central axis, a journey through time and space into the memories embedded in the city. From May to July 2021, we welcomed over 200 audiences participating in ten public non-commercial performances. As expressed in their feedback, “the Walking Axis” was a unique experience during the pandemic that enlivened Beijing's profound cultural-historical heritage, brought performance into public spaces, and explored its participatory and healing potentials.



Kaitlyn Hung

Faculty Advisor: Clara Peek

Clock Regulation of Glucose Metabolism During Diabetes

Type 2 diabetes is characterized by elevated blood glucose due to the development of insulin resistance. Skeletal muscle is responsible for taking up 70-90% of blood glucose after a meal and is a key site for insulin resistance in diabetes. Previous studies show that circadian rhythms, an internal clock that tracks the time of day, control glucose metabolism and response to insulin in muscle. This skeletal muscle clock is driven by a key protein, BMAL1, and deletion of the *Bmal1* gene leads to reduced glucose uptake in muscle. Due to the clock's vital role in glucose metabolism and insulin signaling, we investigated the role of circadian rhythms in diabetes. We hypothesized that *Bmal1* disruption in muscle during diet-induced obesity, a model for type 2 diabetes, leads to accelerated diabetes development. To test this hypothesis, we used mice with muscle-specific deletion of *Bmal1* and control mice fed regular chow or 60% high-fat diet. Contrary to our hypothesis, glucose tolerance test (GTT) and immunoblot results showed equal glucose clearance and increased insulin sensitivity in *Bmal1* knockout mice compared to controls. This suggested a compensatory mechanism may be maintaining glucose clearance in knockout mice. To overcome this mechanism, we repeated the experiment for an extended 12 weeks. GTT results showed reduced glucose clearance in *Bmal1* knockout mice, consistent with our hypothesis. The next step is to immunoblot to investigate mechanisms contributing to reduced glucose clearance. Our preliminary results suggest that skeletal muscle clock disruption may lead to decreased ability to adapt to diabetes.



Molly Jones

Faculty Advisor: Mary Weismantel

Tracing the Experiences of Queer Ugandan Migrants and the Development of a Queer Diaspora

The United Nations High Commission for Refugees (UNHCR) and countries across the world, including the United States since 1994, Canada, and states of the European Union honor claims from those who flee homophobic or transphobic persecution. Despite the growing body of literature on the experiences of queer migrants, there is limited research analyzing the specific experiences of queer Ugandan migrants who seek refugee protection. This project reviewed literature of queer migration, analyzed 16 recent news media articles relating to queer migration, and conducted one hour semi-structured in-depth interviews over WhatsApp text or call with six queer Ugandan migrants (one asylee, two deportees, and three current asylum seekers). The results highlight the specific difficulties faced by queer migrants in the asylum process and the ways in which queer Ugandan migrants engage with the community in their host country and maintain connections to Uganda. This project uses Ugandan citizenship as an analytic to trace potential “queer diasporas” of Ugandans which have emerged as a result of forced migration due to the contemporary politicization of homosexuality in the country.



Isabelle Kang and Michelle Kee

Faculty Advisors: Theresa Moulton and Colleen Peyton

Synergistic Movement Patterns in Infants with Cerebral Palsy

Cerebral palsy (CP), caused by a brain injury during early infancy, results in impaired movement and coordination. Emerging independent joint motor control is seen in typically developing infants as early as 6-8 weeks of age, indicating intact corticospinal motor connections. However, infants with spastic CP who have damage to the motor cortex may compensate with increased reliance on brainstem motor pathways, resulting in less independent joint movements and more synergistic joint contractions. This study quantified synergistic movement patterns of infants with and without CP through overlap analysis. The length and frequency of movement patterns (knee flexion/extension, hip flexion/extension, ankle plantar/dorsiflexion) for the right and left extremities were recorded in 28 preterm infants (14 CP, 14 non-CP). Videos of infants aged 12-14 weeks were coded using Datavyu software and analyzed for observable correlations between movement patterns and CP diagnosis. The coder was blinded to CP diagnosis to prevent bias. The percent times of different overlapping combinations of the three different movements were calculated using Python software and compared between the two groups. Preliminary data suggests significant differences in the coupling between the right knee flexion and ankle dorsiflexion ($p = 0.048$). This behavior was observed in a combined 3.27% in the non-CP group and 1.80% in the CP group, considering both right and left sides. Further study is needed to investigate differences in the time course of joint movement patterns during development and can contribute to a better characterization of the natural history of CP, revealing potential for intervention.



Denise Kao

Faculty Advisors: Theresa Moulton and Colleen Peyton

Examining the Relationship Between Parent Stress and Infant Development

Parents of newborns have many daily responsibilities that may lead to high levels of stress. However, caring for an infant with additional health complications may amplify the stress and worry experienced by parents. For these mothers, regulating their stress levels is not only necessary for their own wellbeing, but can also influence how they interact with their children. This study seeks to examine the association between parent stress levels and delays in developmental areas for premature infants. We hypothesized that parents with infants with a medical diagnosis will experience higher stress levels than parents with infants without a medical diagnosis. Data was acquired through three questionnaires: Parental Stress Scale, 12 month Ages and Stages Questionnaire, and a 12 month survey developed for an adjacent study. Pearson's correlation coefficients were calculated from parent stress levels and scores from the Ages and Stages Questionnaire. Currently, data from 30 mothers of infants born 36 weeks or earlier have been analyzed. Preliminary data suggests that higher parent stress levels are most strongly correlated to delayed personal and social development in their children ($r=-0.36$, $p=0.03$). The negative correlation indicates that parent stress levels increase as scores for personal and social development in infants decrease. Furthermore, current data implies that parents of infants with a medical diagnosis do not have significantly higher stress levels than parents of infants without a medical diagnosis. Although not conclusive, this suggests earlier support for parents of babies with delayed personal and social development may be warranted.



Karina Karbo-Wright

Faculty Advisor: Barnor Hesse

'When Did the Representation Become More Traumatic than the Reality?' Black Trauma Porn and the Question of Black Representation in Film

The American film industry is inextricably tied to the history of racism in the United States, thus, Black representation in the media has been a topic of rigorous academic and public debate. Most recently, that debate has circulated around the topic of "Black trauma porn." Emerging on social media in 2016 during the Black Lives Matter Movement, Black thinkers used the phrase "Black trauma porn" to articulate the nuanced complexities of the phenomenon, specifically sharing police brutality videos and the production of films and television series with similar themes. Many pieces have received extreme backlash, and "Black trauma porn" became loaded with negative connotations, labeling the pieces as exploitative and harmful. However, as the phrase gained popularity, the analysis of this media became derivative and uncritical, instigating the need to investigate if the phrase properly articulates what authors were utilizing it for. To interrogate "Black trauma porn," it is necessary to explain the impact of film on the spectator and engage the history of race in Hollywood in order to conclude that

“Black trauma porn” is actually a modernist subgenre of Black horror. This conclusion is supported through an analysis of white versus Black horror, a deep-dive into what “trauma” and “porn” mean individually and within this context, and an analysis of a series branded as “Black trauma porn.” *Them*. Reframing and usurping the phrase “Black trauma porn” provides the beginning to a new framework for analyzing Black historical horror films and answering larger questions about Black representation in media.



Joshua Kennedy

Faculty Advisor: William Revelle

Mapping Personality Across the United States

Informational maps are innately interesting as they provide a quick yet comprehensive way to display information gathered over a geographic region. Specifically, maps of personality characteristics offer a high-level view of sociocultural trends across different regions; however, many existing attempts at mapping have lacked a significantly expansive source of personality inventory data. The Synthetic Aperture Personality Assessment project (SAPA), a personality assessment voluntarily taken online by thousands of participants every year, offers a new approach to mapping personality characteristics that combines a large dataset with sophisticated mathematical reasoning to provide a powerful addition to existing research on personality maps. Thus, one of the goals of the current study is to utilize SAPA data and the R programming language to map Big 5 and Little 27 personality traits across the contiguous United States. In addition, this study will attempt to create a depression scale from existing SAPA questions using advanced statistical learning techniques and validate it against national depression trends from the Behavioral Risk Factors Surveillance System. Additionally, SAPA depression data will be mapped and compared to a national map of depression levels at the county level. If SAPA is shown to be a reliable indicator of depression across the United States, it would add a significantly large and ever-growing dataset to the world of depression research. In any case, the maps generated can be used by scholars in other fields attempting to link personality to different phenomena across the country.



Maddie Kerr

Faculty Advisor: Gregory Phillips II

The Mental Health of Older Gender Minorities: A Review of the Literature

While research on the mental health of gender minority (GM) populations has expanded in recent years, there remains a substantial gap in studies on the mental health of GM adults aged 50 and older. This narrative review sought to synthesize and evaluate the quality of the existing literature on this largely-neglected topic, aiming to identify prevalent psychological concerns among GM older adults, possible risk and protective factors, barriers to treatment, and mental health disparities between GM

older adults and the general population. Peer-reviewed articles and relevant reports were extracted using Boolean phrases related to “transgender,” “older adult,” and “mental health.” Sources were required to be published in English since 2010, address some aspect of mental health as an outcome of interest, and include gender minorities and individuals aged 50 or older within their focus. The examined literature revealed a concerning and disproportionate prevalence of mental health issues among GM older adults, including depression, self-harm, and suicidality, which sources generally attributed to widespread discrimination and barriers to treatment. Additional risk factors proposed included loneliness, HIV-positive status, and stigma visibility. Meanwhile, social support, individual attitudes, and access to transition-related resources were suggested as protective factors. Unfortunately, small, unrepresentative samples constrain the generalizability of many findings. Studies involving GMs tend to conflate data from various subgroups, and inconsistent, binary definitions of terms like “transgender” create limitations. This review highlighted the pressing need for more comprehensive research that explores the diverse experiences, demographics, and concerns of this marginalized population.



Kayan Khraisheh

Faculty Advisor: Kirsten Pike

Gendered Messages in *The Handmaid's Tale*: Offred's Evolution, 1985 – 2017

The Handmaid's Tale is one of the key texts that has been analyzed by scholars in the fields of gender and media. There are three versions to date: the original 1985 novel by Margaret Atwood, the 1990 film adaptation directed by Volker Schlöndorff, and the ongoing 2017 TV series by executive producer Bruce Miller. While several scholarly articles analyze the individual media artifacts from a feminist perspective, few studies, if any, compare the three versions in terms of gender representations. Therefore, this paper examines the changes in feminist narratives with an awareness of the different contexts at the time of each artifact's release. It also examines their historical reception by both audiences and critics. It is concluded that the three versions differ narratively and in terms of visual portrayal. In the film, these changes reduce the complexity and emotional depth of the story, resulting in a negative reception. In the show, the changes made suit the contemporary context while still resonating with Atwood's original portrayal. This analysis is significant because the story of *The Handmaid's Tale* was not only inspired by real-life events, but continues to resonate with audiences in different political and social contexts decades after its initial release. The Handmaids and their costumes have become a symbol of resistance in various protests across the world. For this reason, it is essential to consider the different interpretations of the messages encoded within the narrative.



Sarah Kim

Faculty Advisor: Martha Vitaterna

Screening for Contributing Factors and Countermeasures to Spaceflight-Induced Changes to the Gut Microbiome Through Bioinformatical Analysis Using STARMAPs

Astronauts face multiple health ramifications in spaceflight, several of which resemble the effects of disruptions to the gut microbiome, including metabolic changes, interference with immune functions, and gastrointestinal problems. Interestingly, spaceflight-induced shifts to the gut microbiome have been observed. Microbiome responses vary depending on the environment and stressor, thus opening the potential of finding Earth-based analogs to study the effects of spaceflight by identifying stressors that produce significantly similar gut microbiome shifts. Furthermore, finding factors with opposite shifts to spaceflight-induced gut microbiome changes could reveal potential countermeasures to these changes. We performed bioinformatics analyses using the analytical tool STARMAPs (Similarity Test for Accordant and Reproducible Microbiome Abundance Patterns). I compared gut microbiome shifts shown in mice from a previous International Space Station experiment (RR-1) to microbiome shifts in other independent datasets. We tested the microbiome changes from factors potentially contributing to the spaceflight environment, exercise and hypercapnia (elevated CO₂), to the changes observed during RR-1 spaceflight. Additionally, we used STARMAPs to screen for factors that produce opposite shifts to spaceflight-induced gut microbiome changes, including various prebiotic, probiotic, and symbiotic supplements. We found that neither hypercapnia nor lack of exercise produced a similar shift in the gut microbiome to that observed in spaceflight, suggesting these factors are unlikely to significantly contribute to gut microbiome changes during spaceflight. However, STARMAPs demonstrated a significant, opposite, microbiome shift in mice given galactooligosaccharides (GOS) prebiotic supplements to the spaceflight-induced shift in RR-1, suggesting its potential as a preventative countermeasure to microbiome changes in spaceflight.



Hannah Klein

Faculty Advisor: Quinn Mulroy

Crises and Democracy: Freedom of the Press as a Measure of Democratic Change During the Covid-19 Pandemic

The Covid-19 pandemic was more than just a crisis of public health. Governments around the world implemented new policies to combat the pandemic ranging from various lockdown requirements to delayed elections. This project explores the effect that Covid-19 had on democracy, specifically through the measure of the freedom of the press. The goal of this research is to examine 1) how and to what extent states enact more illiberal forms of governance and policy under times of crisis, 2) whether this effect is greater among states identified as liberal democracies -- as opposed to states characterized by illiberal forms of governance -- preceding the crisis, and 3) what factors explain this variation. Using four countries as case studies, I scanned newspapers, press releases, social media reports, and written policies to determine the impact that Covid-19 had on democracy, specifically through the lens of the freedom of the press. In order of most liberal to least liberal from the Freedom House Democracy's scale, I focused on New Zealand, Brazil, Hungary, and the Philippines. I found

that the countries in the middle of the democracy scale, Brazil and Hungary, were far more likely to experience democratic backsliding than the countries on the ends of the scale, New Zealand and the Philippines. New Zealand, the most liberal democracy, has checks and balances in place to protect it from experiencing major changes to its freedom of the press and the Philippines already had major press restrictions in place prior to the pandemic. These research findings will hopefully prepare us more for the next global crisis, as we can more easily pinpoint the countries at the greatest risk for democratic backsliding.



Lola Knight

Faculty Advisor: Terri Sabol

Parenting Education for High School Students: An Examination of the ParentABLE Curriculum Implementation in Illinois

There have been several private and public interventions aimed at increasing awareness of child development and promoting positive parenting, with most targeting the avoidance of repeat child maltreatment, and few approaching interventions through preventative education. In the 2020-2021 academic year, the state of Illinois piloted an educational curriculum called ParentABLE for high schoolers in Illinois based on positive parenting and the negative impact of harmful parenting. The purpose of this study is to explore the association among high school students between participation in the ParentABLE curriculum and the change in parenting knowledge. The ten-day ParentABLE unit was administered to twelve public high schools and a pre- and post-intervention test was administered to each student. Data from the ten Illinois high schools that had non-aggregate data were analyzed. A quantitative analysis was performed of the pre- and post-intervention tests that were administered to 410 highschoolers. Secondary analyses include the extent to which this association varies based on the students' sociodemographic characteristics, including race, sex, and sexual orientation, as well as based on school-level factors, including school location, size, type, and racial makeup. I find no statistical evidence that student- and school-level factors predict growth in parenting knowledge. There is evidence of heterogeneity between schools on average post-test scores, suggesting potential variation in implementation of ParentABLE at each school. Measuring and accounting for school-level qualitative factors, including cultural context and implementation details may prove more effective in identifying factors that predict student growth.



Khadijat Kokumo

Faculty Advisor: Mitra Hartmann

Imaging Hydrated Harbor Seal Whiskers to Better Understand Perception

For over a century, researchers have been using the vibrissae (whisker) system as a model for the study of sensorimotor integration and tactile sensing. Seals have whiskers with specialized geometry that can

sense small disturbances in the water as they swim, and they use this ability as their primary means for catching prey. In this project, I focused on devising and carrying out methods to use a computed tomography (CT) machine to create 3D images of seal whiskers to quantify their geometry. Because seal whiskers are specialized for sensing in sea water, it is important to characterize their geometry in a hydrated state, as the geometry of their whiskers change as they dehydrate. Scanning whiskers purely in water, however, is not feasible as both materials have similar radio density, making them indistinguishable in a CT scan. I conducted experiments to determine the time to hydrate and dehydrate whiskers based on size, while also visually characterizing the changes in geometry. It was determined that large whiskers dehydrate too quickly to be scanned. I then tested the viability of the use of contrast materials to increase the contrast between whiskers and water and determined iodine to be a suitable candidate for further testing. I constructed jigs to hold the whiskers during the scanning process and scans of the surface of hydrated small and medium whiskers in air were successfully completed. We expect the usage of a contrast material to yield effective scans of larger whiskers, which will aid in further sensing models.



Divy Kumar

Faculty Advisor: Eric Perreault

The Natural Progression of Force Matching Deficits in Patients Treated with Oxaliplatin Chemotherapy

Oxaliplatin (OX) chemotherapy is associated with neurotoxicity that can impair patients' movement function and quality of life during and after treatment. Identifying the progression of OX-related movement dysfunction is critical for timely intervention, but objective and precise assessments of dysfunction are not routinely completed in clinics. Previous research demonstrated that proximal force-matching ability was significantly impaired after OX treatment, and the deficits were correlated with perceived movement dysfunction. The proximal force-matching task might be a useful tool for assessing sensorimotor dysfunction linked to neurotoxicity. This study aims to monitor the progression of force-matching deficits in patients undergoing OX to determine if it helps monitor OX neurotoxicity in a clinical setting. We used a portable apparatus to assess force-matching ability in the shoulder joint of 14 cancer patients. Participants matched several force targets using their dominant arm under conditions with and without visual feedback. Questionnaires documented changes in quality of life and symptoms. The force-matching performance deteriorated throughout OX treatment, but performance changes were small. Compared to the previous study on cancer survivors post OX treatment, the smaller force matching deficits observed in this study suggests that force matching deficits might emerge post-treatment. There was also a progressive decrease in shoulder strength with increased cumulative OX dose, which suggests that strength might be an important quantity to monitor chemotherapy-related dysfunction during treatment. Our study demonstrated that quantifying sensorimotor-related functional decline in patients undergoing active treatment is feasible, and this paradigm will be useful for future characterization of cancer-related movement dysfunction.



McKenna Lanter

Faculty Advisor: Adriana Weisleder

Let's Talk It Out: Understanding the Relationships Between Caregiver Internal State Language, Child Expressive Language, and Child Emergent Metacognition

Handling big emotions is tough for toddlers to learn. It is especially hard for late talkers, or toddlers with low expressive language, who may express feelings through externalizing behaviors. Caregivers' use of internal state language (ISL) may teach children how to label these feelings. Over time, children's emerging metacognition (EM) may help them regulate emotions. However, the relationship between caregiver ISL, children's EM, and children's expressive language (EXPL) is not well understood. To help fill this gap, our study explores the developmental relationships between caregiver ISL, child EXPL, and child EM. At age 2, we used an adapted coding scheme to identify caregiver ISL during caregiver-child play interactions (N=47) and measured child EXPL using the Preschool Language Scales—Fifth Edition. At age 4, we measured children's EM via parent report on the Behavior Rating Inventory of Executive Function—Preschool Version. We plan to analyze how caregiver ISL differs between typically-developing and late-talking toddlers, as well as how caregiver ISL and child EXPL at age 2 relate to children's EM at age 4. We expect that caregiver ISL will differ between typical talkers and late talkers, specifically that caregivers of typical talkers will use more mental state terms than caregivers of late talkers. We also predict that caregiver ISL and child EXPL at age 2 will be positively correlated with children's EM at age 4. By better understanding the links between caregiver ISL, child EXPL, and child EM, this study aims to guide more effective social-emotional intervention design for late talkers.



Rivers Leche

Faculty Advisor: Kelly Wisecup

Simon Pokagon: Remapping and Visualizing Potawatomi Presence at the 1893 World's Fair

The motivation behind the research conducted with Isabel St. Arnold and Professor Kelly Wisecup was to further understand the presence and actions of author Simon Pokagon at the 1893 Chicago World's Fair. The research is rooted both in Indigenous Studies and English methodologies, which can be understood under the umbrella of Indigenous Literatures. Indigenous Literatures distinctly views texts as written in their own language or language base and the oral and cultural traditions that may be historically rooted in that language and its written practice. Potawatomi Literature compared to Cherokee Literature should be approached as uniquely as Korean and Vietnamese Literatures. Our approach was to study primary documents and their paratextual materials in the form of Simon Pokagon's *Red Man's Rebuke/Greeting* which was distributed at the World's Fair and the later published *Queen of the Woods*. With these texts as our starting point we chose to examine maps of the Chicagoland area - traditional Potawatomi homelands - and images of Simon Pokagon. In regards to mapping we found very different interpretations of space in Indigenous and settler created maps, and in the images different commercial and racial gazes placed onto Pokagon as an Indigenous author in the U.S. in the

late 19th century. The implications of our work press us to further examine the historical perceptions and actions of other Indigenous authors. Under a contemporary lens how might we view their work? More radical, complex, as a basis for other texts, etc.?



Khantey Lim

Faculty Advisor: Linsey Seitz

Tuning Gas Diffusion Electrode Construction to Mitigate Flooding and Degradation Processes for Electrochemical CO₂ Reduction

Carbon dioxide (CO₂) makes up 80% of the total man-made greenhouse gas emissions, which are a major contributor to climate change. Electrochemical CO₂ reduction (ECR) is a promising technology for converting CO₂ to useful fuels and chemicals using renewable electricity, potentially enabling net-negative emissions. A critical limitation of overall ECR performance is suboptimal construction of gas diffusion electrodes (GDEs). Commercialized GDEs starts to lose their hydrophobicity after ~2hrs of electrocatalytic reaction, leading to flooding and failure of the entire reactor system. Compared to catalyst development, there is scant work towards fundamentally understanding GDE's local reaction environment and the process of electrode degradation. Herein, we prepare 2 different catalysts (Cu and CuO) with varied loadings of polytetrafluoroethylene (PTFE) (the addition of PTFE particles to the catalyst layer of GDEs can enhance CO₂ electrolysis by improving hydrophobicity) and carbon black deposited on PTFE membrane or carbon paper supports to investigate overall GDE properties and monitor time-dependent changes. We alternate ECR reaction with electrochemical impedance spectroscopy (EIS) and goniometer contact angle measurements to track changes in impedance and hydrophobicity as a function of GDE construction and operating conditions (i.e., time, applied potential). We find that GDE made from PTFE membrane/spray casted carbon black/catalyst to be incompatible for further analysis at different time intervals as the PTFE membrane is innately insulating and leads to high ohmic loss. Results from this work will guide continuing investigation and improved GDE construction to mitigate degradation processes.



Kylie Lin

Faculty Advisor: David Rapp and Cindy Xiong [UMass Amherst]

Attempts to Augment Refutation Text Benefits with Visualizations

Conflicting information can lead people to develop misconceptions about complex topics. One approach to support comprehension involves presenting texts that confront potential misconceptions (“Climate change is a natural process”) and additionally, directly refute them (“Some people think climate change is natural. Most scientists disagree with this.”). While these refutation texts are often useful, in general it can be difficult to change people’s beliefs. So, how might refutations be designed more effectively? Visualizations offer a solution as they offload cognitive work to the perceptual

system. We conducted two experiments to explore visualizations as a tool for refuting climate change misconceptions. For both experiments, we designed a “refutation visualization.” In the first experiment, we used open-response knowledge assessments to evaluate whether refutation materials promoted knowledge revision and a belief measure to determine whether participants’ opinions changed after viewing the refutation. In the second experiment, we used these belief measures and new multiple-choice knowledge assessments that strategically targeted information from the text and visualization. Participants ($n_{\text{exp1}}=59$, $n_{\text{exp2}}=89$) were assigned to one of two experimental conditions: *refutation text only* or *refutation text+visualization*. They answered knowledge and belief questions before and after viewing the refutation materials. While results were inconclusive across the experiments, the observed patterns suggest that visualizations may augment refutation text benefits. However, further research is required to understand precisely what elements of a visualization might support learning.



Layna Lu

Faculty Advisor: Lynn Yee

Exploring Psychosocial Burdens of Diabetes in Pregnancy and the Role of Technology-Based Support

Gestational and type 2 diabetes mellitus (GDM/T2DM) impose psychosocial burdens on pregnant individuals. These burdens interact with the barriers imposed by social determinants of health to reduce self-management success. We aimed to identify the psychosocial burdens of having diabetes during pregnancy and understand how a novel smartphone application may alleviate such burdens. This is an analysis of qualitative data generated in a feasibility randomized controlled trial of a novel mobile app designed to promote self-management skills, motivate healthy behaviors, and inform low-income pregnant individuals with GDM/T2DM. Individuals were randomized to use of the SweetMama app ($n=30$) or usual care ($n=10$). All individuals completed exit interviews at delivery about their experience of having diabetes during pregnancy. SweetMama users were queried about their perspectives on the app. Interview data were analyzed using constant comparative techniques. Of the 40 participants, the majority had GDM (63%) and identified as non-Hispanic Black (68%) or Hispanic (28%). Participants identified multiple psychosocial burdens, including challenges taking action, negative affectivity regarding diagnosis, diet guilt, difficulties managing other responsibilities, and reluctance to use insulin. Participants largely agreed use of the app helped mitigate these burdens by enhancing self-efficacy, capitalizing on external motivation, validating efforts, sustaining medical nutrition therapy, extending clinical care, and building a sense of community. The psychosocial burdens of diabetes during pregnancy present challenges with diabetes self-management. The use of a mobile app may be an effective tool to provide motivation, behavioral cues, and access to educational and social network resources to alleviate these burdens.



Janitza Luna

Faculty Advisor: Myrna Garcia

The INS Shooting of Margarito Rosendo Padilla: Latina/o Immigration Activism During Chicago's Chicano Movement, 1972-1974

The Chicano Movement was the largest and most widespread Mexican-American civil rights movement of the 1960s and 1970s. However, a political shift occurred in 1972 when Immigration and Naturalization Services (INS) shot immigrant Margarito Rosendo Padilla in Pilsen, a predominantly Mexican neighborhood in southside Chicago. Coined “*sin fronteras* [without/beyond borders]” politics, Chicago’s Latino/a residents began mobilizing against INS terror and pursued immigrant rights activism regardless of their personal citizenship and immigration status. We recover this unexplored aspect of the Chicano Movement by drawing upon newspapers located in digital databases and Chicago libraries, as well as documents from the personal collections of activists and their family members. Additionally, we relied on oral histories of the immigration rights activists. We find that the community-led fight against state violence upon immigrants catalyzed a turning point in the Chicano Movement, in which *Chicanismo*—an ideology centering Mexican-American identities and nationalism—had prospered. From a *sin fronteras* perspective, activists challenged the idea of citizenship as an endpoint and thought more expansively about rights and belonging beyond an American identity. Furthermore, *sin fronteras* activists brought to light the powerful forces of racialization that affected the Latino community despite an individual’s citizenship status. Telling Margarito Rosendo Padilla’s story helps contextualize how organizers advocated for inclusivity and justice within Chicago’s Latino community regardless of documentation, challenging the dominant notions of membership in the United States.



Shayan Malik

Faculty Advisor: Mehreen Arshad

Acquisition of Resistant Bacteria: Maternal Colonization with ESBL Enterobacteriaceae

The rapid increase in antibiotic resistance (AR) is a global public health emergency. Specifically, AR bacteria can be transmitted to a susceptible host through direct contact which can lead to implications for treatment of bacterial infections and diseases in humans. Recent biological research has investigated the rapid rise in Extended Spectrum Beta-Lactamase producing Enterobacteriaceae (ESBL-E) and its enhancement of virulence and growth capacity. This is in comparison to the current paradigm in which AR bacteria are at a growth disadvantage due to a metabolic cost. Additionally, the gut microbiome acts as a reservoir for AR bacteria by allowing exchange of resistance genes and formation of new mutations. *E. coli* belong to the Enterobacteriaceae family and are among the first colonizers of the infant gut microbiome. Thus, this study seeks to examine the perinatal transmission and gut colonization of ESBL-E bacteria of healthy parents and infants in the Chicagoland area. Infant fecal samples and rectal and vaginal swabs were collected from pregnant persons anticipating a vaginal birth from Northwestern Medicine Prentice Women’s Hospital and Northwest Community Hospital. The samples were cultured and screened for resistant colonies from which positive ESBL-E colonies were identified and then characterized using DNA extraction, PCR, gel electrophoresis, and

sequencing experiments. This study is ongoing, but preliminary data and previous studies suggest that ESBL-E perinatal transmission rate is 48% and gut colonization rate is 15% and 7% for parents and infants, respectively. These rates indicate significant risk of ESBL-E colonization in the Chicagoland area.



Nicole Manning

Faculty Advisor: James Hornsten

CEO Employment History at Hiring Firm and Hiring Firm Performance, 1990-2021

We study the effect of insider Chief Executive Officers on firm performance of publicly-traded firms in the S&P 1500, using data on 507 unique CEOs who started in their roles between 1990 and 2021. We analyze Chief Executive Officers' previous history at the hiring firm, and discuss how new CEO-hire decisions are made by the Board of Directors. We find that more than 70% of CEOs are insiders, defined as the CEO having worked at the hiring firm for two or more years before being hired into the CEO role. The evidence suggests that a CEO's insider status acts as a statistically significant predictor of firm performance over their tenure, in specific situations, but not taken alone. Such situations vary by firm size classifications.



Claire Mason and Evan Vlahandreas

Faculty Advisor: David H. Uttal

The Effect of Building Materials on Families' Spatial Conversations During a Playful Construction Activity

Children's and parents' spatial language use — talk about shapes, sizes and locations — supports children's spatial skill development (Pruden et al. 2011). Families use spatial language during building and construction activities. However, spatial language quantity varies with the activity's design characteristics. Here, we ask how the number of building materials affects the quantity and variety of families' spatial conversations while building. Twenty-two 4- to 10-year-old children ($M = 8$ years, $SD = 1.8$) and their parents were recorded over Zoom completing an activity where their goal was to build a 6-foot-long ramp out of recyclables. 11 families used one or two recyclables and 11 families used three or more. Spatial conversations were sorted into 9 categories ranging from discussing measurement (e.g., "it is 6 feet") to describing part-whole relations (e.g., "two of Mommy's fingers is 1 inch"). Recordings were split into 15-second intervals, each coded for presence/absence of each type of spatial conversation. Results indicate that materials had no effect on spatial conversation variety, but children who used 3 or more materials engaged in spatial conversations in a marginally larger proportion of intervals than those who built their ramps out of fewer than 3 materials. However, again, no correlation was seen amongst parents. Our research suggests that using more materials may better support children's spatial conversations possibly because they require more manipulation and

arrangement. Future research could examine the role of specific spatial features of the materials on spatial conversations



Lauren Masse

Faculty Advisor: Galen Bodenhausen

A Study of the Instructed Societal Perspective as a Mitigator of Social Desirability Bias

One method used to mitigate social desirability bias related to attitudes toward social groups asks participants how “society” or the “average American” views a social group, rather than explicitly asking for the participants’ personal opinion. This method assumes (a) that participants typically project their own views onto society at large, and (b) that participants are more candid in sharing their personal views in this indirect way, because they feel less personally accountable for those views. However, perceptions of societal views could also reflect how participants understand culturally-shared perceptions of groups (i.e., how social groups are perceived in a wider societal context), independent of projected self-views. Our study aims to inform understanding on the efficacy of the instructed societal perspective (as opposed to the personal perspective) at mitigating social desirability bias. We seek to determine what is elicited when participants are asked for a personal vs a societal perspective on a marginalized group, by asking ““How closely do participants’ explicit ratings of Black Americans from an assigned first-person perspective and an assigned societal perspective relate to participants’ implicit anti-Black bias, and how does social desirability influence these relationships?”” Our primary interest is in the possibility of a main effect between two conditions - the two perspectives the participants are asked to assume when filling out explicit ratings of Black Americans (“personal” or “societal”) - and a potential dispositional moderator of this effect: socially desirable responding. At the time of writing this abstract, data collection is complete, but statistical analysis is ongoing.



Grace McDonnell

Faculty Advisor: Daniel J Ceradini [New York University]

The Impact of Youth Onset Type 2 Diabetes on Postoperative Wound Healing Complications

Youth-Onset Type Two Diabetes Mellitus (YOT2DM) is characterized by a very rapid decline in beta cells, as well as accelerated microvascular and macrovascular complications compared to adult-onset type 2 diabetes, highlighting the value of viewing this disease as a unique clinical entity. However, it remains unclear if, like adult-onset diabetics, YOT2DM patients experience increased surgical complications with respect to tissue repair and regeneration. The purpose of this study is to determine whether YOT2DM is a risk factor for postoperative surgical complications compared to age-matched non-diabetic patients. The National Surgical Quality Improvement Program Database (NSQIP) for years 2012-2019 was used to identify patients aged 18-24 with non-insulin dependent diabetes. Patient

demographic information and comorbidities were recorded. Outcomes of interest included wound infections, wound dehiscence, readmissions, and re-operation. Univariate analysis (Independent sample T-test and Chi-Squared) was initially performed to identify differences between YOT2DM and non-diabetic patients for relevant variables and postoperative outcomes followed by multivariate logistic regression to control for potential confounders. This analysis of the NSQIP surgical outcomes database found that when compared to non-diabetics, youth-onset type two diabetics exhibited a higher incidence of superficial surgical site infections in the 30-day postoperative period. Higher rates of SSI were found, despite the YOT2DM cohort exhibiting lower rates of wound contamination. After controlling for confounding variables, YOT2DM remained a significant predictor of SSI.



Krissy McGee

Faculty Advisors: Mesmin Destin, David Silverman, Josiah Rosario, and Nicole Guarino

Impact of Educators on Marginalized Students' Academic Outcomes

Both perceived and actual beliefs an educator has about a student's background can influence the student's beliefs about their background. For marginalized students of lower socioeconomic statuses (SES), this effect has the potential to shape a positive identity despite deficit-based rhetoric emphasizing where they fall short. Cultivating a mindset based on background-specific strengths (BSS) that celebrates cultural uniqueness can lead marginalized students to have higher motivation, expectations, achievement, and retention in academic settings. Across the lab, literature reviews, analyses, experiments, and correlational studies have further explored this subject in diverse student populations at varying grade levels. Sufficient data demonstrated that educators who developed BSS beliefs positively impacted motivation and academic persistence for marginalized students, more so than those from higher-SES backgrounds. Furthermore, students who already developed BSS beliefs had a greater effect. When able to connect academic success with their social identities, students experienced increases in academic outcomes as well. Results of these works serve to establish how and to what extent societal and academic contexts can be used to bolster support for marginalized students. Providing the space for marginalized students to create a constructive view of their cultural identity gives them the tools to apply themselves academically as is most comfortable for them.



Madison McReynolds

Faculty Advisor: Xiaomin Bao

Characterization of Evolutionarily Related ATF3, a Novel Driver of Epidermal Differentiation Mediated by the Super Elongation Complex

Stem cells rely on transcriptional and translational changes to properly differentiate and lose proliferative potential. Characterizing these processes allows us to understand how protein dysregulation impacts cell health. While existing research investigates dysfunction at the initiation step

of transcription in cancer, this work explores elongation in keratinocytes, a type of human epidermal stem cell. Elongation is controlled by RNA polymerase II (Pol II), regulated by the Super Elongation Complex (SEC) to drive differentiation. This project investigated the role of ATF3, a novel direct target of the SEC. ATF3 was identified as a SEC direct target after keratinocytes treated with TPA, a SEC activator, showed increased ATF3 protein levels. To investigate the downstream effects of ATF3, immunofluorescence assays were performed on keratinocytes treated with KL drugs, which disrupt SEC function to induce ATF3 transcription. KL effects were verified using immunoprecipitation assays showing that the Hexim1-CDK9 interaction is disrupted following treatment, a novel finding in keratinocytes. Following KL treatment, the protein-level upregulation of differentiation marker P21 and downregulation of proliferation marker Ki67 further implicated ATF3 as a differentiation driver. On the genetic level, overexpression of both human and mouse ATF3 increased expression of differentiation factors and suppressed proliferation factors, indicating that ATF3 is a highly conserved transcription factor. Collectively, this data supports that ATF3 is a key driver of epidermal differentiation, likely acting upstream of other well-studied differentiation factors. Further understanding how ATF3 functions is key in elucidating pathways of elongational control carried out by the SEC and Pol II.



Alejandro Medina

Faculty Advisor: Richard B. Silverman

Synthesis of a New Cyclopentene-based Compound as a Selective Inactivator of Ornithine Aminotransferase

Ornithine aminotransferase (OAT) is overexpressed in hepatocellular carcinoma (HCC), an aggressive liver cancer, and contributes to proliferation. Inactivation of overexpressed OAT is a potential therapeutic treatment for HCC. Mechanism based inactivators (MBIs) are unreactive compounds that specifically bind a target enzyme's active site and are activated by the enzyme's normal catalytic mechanism into a species that may inactivate the enzyme. BisCF₃ is an existing selective OAT MBI that inhibits OAT through a covalent bonding adduct. Based on the determination of the BisCF₃ inactivation mechanism, we intend to develop a novel inactivator with improved potency. Prior work on the synthesis and characterization of MBIs for similar aminotransferase enzymes suggest that incorporation of a double bond (olefin) into the cyclopentane of previously developed MBIs can improve potency. Introduction of an olefin to BisCF₃ would lower the pK_a of the adjacent hydrogen and modify the inactivator structure to reduce distance between the trifluoromethyl warhead and the enzyme's catalytic Lys292 residue, which both have the potential to increase inactivator potency. The previous synthesis of a BisCF₃ analog which incorporated an endocyclic olefin failed due to isomerization of an exocyclic olefin from its desired position. Recent crystallographic studies of the BisCF₃ inactivation mechanism suggest that only one of the two trifluoromethyl groups participates in inactivation. We propose the synthesis of a BisCF₃ analog with an endocyclic double bond where one trifluoromethyl group is replaced with a carboxylate methyl ester (COOMe) electron-withdrawing group, which could potentially stabilize the exocyclic olefin and prevent the isomerization previously observed.



Muhammad Wasay Mir

Faculty Advisor: Abraham Abusharif

JoeVincent So: Blue-Collar Fighter, White-Collar Preacher

This project is intended to be a feature profile on a mixed martial artist from the Philippines trying to make ends meet in Qatar. JoeVincent So has lived an ordinary life in extraordinary circumstances with a desire to one day build a legacy in combat sports. This profile captures his journey with all its tribulations and future aspirations. He is at a crossroads in life where Christian pedagogy, information technology, cage fighting, his father's illness, and mother's fears all direct the traffic of his decisions. I personally reached out to the Oryx MMA Gym management in Doha, where JoeVincent is working, and got to meet him for an interview. The project rationale was to tell a story that would otherwise go untold in a country where there is little to no infrastructure for mixed martial arts. This profile would also spread awareness on the struggles of expats in Qatar (who make up the large majority of the population) and celebrate their perseverance through JoeVincent's story. So far, the piece has won Northwestern Qatar's Media and Research Award 2022 under the "Journalistic Writing" category.



Joelle Moore

Faculty Advisor: Leoandra Onnie Rogers

Discovering Research Through the Voices of Black Girls

As a new research assistant, I contributed to two projects involving adolescent Black girls: an in-depth interview analysis of 60 Black girls discussing their racial and gender identities, and *Teen TEE (Talk, Educate, Experience)*, an afterschool program designed by my advisor to provide space for middle schoolers to talk about their identities as Black girls. These projects pushed me to critically consider questions like: *How does one systematically code young people's complex identity narratives? How do researchers' identities influence the research? Where was Teen TEE when I was younger?* Our analysis revealed girls' awareness of racial and gender oppression and their resistance to believing it. Although I was familiar with the general scientific process, participating in systematic qualitative research centering the voices of Black girls reshaped how I understand research and my motivations to pursue it. First, I learned that *research is an iterative process* requiring careful and critical listening. Second, I experienced how *researcher positionality matters* and shapes what we see in our data. Finally, I realized the value of *critical self-reflection* because we can sometimes unintentionally reproduce inequities in research. As a Black gay girl navigating a predominantly white institution and professional field, this research cultivated my own capacities to reckon with and resist systems of oppression and motivated my independent summer research project, which will use qualitative interviews with genderqueer and nonbinary college students to understand mental health. Discovering research as iterative, personal, and disruptive to hierarchy is a powerful lesson that will shape my undergraduate trajectory.



Shreya Mukherjee

Faculty Advisor: William Klein

Amyloid-Beta Oligomers in the Embryonic Chick Retina: Understanding the Role of These Toxic Proteins in the Development of the Central Nervous System

Toxic proteins known as amyloid-beta oligomers (A β O) have been implicated in Alzheimer's Disease, but our laboratory has now discovered that A β O expression in the central nervous system, surprisingly, is required for proper neurodevelopment. Using embryonic chicks as a model system, we have found that A β O are briefly expressed in the retina and show marked spatio-temporal regulation. Treatments that decrease A β O cause retinal malformation, suggesting that A β O are required for proper retina formation. Which particular retinal cells rely on A β O for their development is unknown, but imaging suggests possible involvement of a cell type known as horizontal cells. I have begun investigating this hypothesis through immunolabeling experiments, where I label the horizontal cells with cell-specific antibodies in order to monitor the effect of blocking A β O formation. I block A β O formation with an inhibitor of A β metabolism, which I inject into the developing eyes of shell-free chick embryo cultures. Understanding the defects that occur in the absence of A β O will help to elucidate their natural function. After injections, I dissect, slice, and image the retinae to (1) observe whether A β O inhibition resulted in retinal malformations and (2) determine if horizontal cells are involved in such malformations. This is an ongoing project, but preliminary results indicate that horizontal cells are indeed involved. This project is important because understanding the non-pathological role of A β O has the potential to lead to a greater understanding of what causes pathological A β O appearance in Alzheimer's disease, which could lead to new approaches to therapeutic intervention.



Yasmeen Nahas

Faculty Advisor: Mark Beeman

The Effect of Sleeping or Awake Incubation Periods on Creative Problem Solving

The effect of sleep on our cognitive abilities remains relatively unexplored. One intriguing question is whether and how sleep functions as an effective incubation period, in regard to problem-solving skills. Incubation is the period of time in which an individual steps away from thinking about a problem they are trying to solve, which may actually improve the chances of solving it once effort is resumed. Whether awake incubation or asleep incubation periods are more effective has not yet been studied. Sleep may be an effective incubation period due to processes of memory consolidation, reconstruction, and reorganization that occur during sleep. In other words, by changing the way information is stored in our minds, sleep improves the prospects for an individual to approach a problem in a new manner that could lead to the correct solution. I hypothesize that the participants in the sleeping incubation condition will have better problem-solving skills. In order to test this hypothesis, I designed an experiment involving two sessions, where each participant will participate in both a sleeping and awake incubation condition. Each session encompasses three periods: 1) exposure period (where participants attempt to solve problems until they are left with four unsolved problems), 2) incubation period, and

3) problem-solving period (re-attempt to solve unsolved problems). The data collection portion of the study is still underway. The study will increase our understanding of how sleep can affect our cognitive abilities, as well as how best to approach creative problem solving, advancing creativity research as a whole.



Eva Offutt

Faculty Advisor: Lilah Shapiro

Exploring Sources and Perspective of Body Positivity in the Ballet Industry

In response to a rapidly growing eating disorder (ED) epidemic, the Body Positivity Movement has gained popularity across various social media platforms. The campaign challenges societal standards and inspires millions, particularly young women, to embrace bodies regardless of shape or size. This powerful social movement, however, has failed to infiltrate professional ballet: an industry plagued with unreasonable body expectations and life-threatening eating disorders. To understand the industry's enduring enthrallment with what many refer to as the "ballet body," I examined collegiate dancers' perspectives on the phenomenon. The study investigates how body expectations are produced, reinforced, and perpetuated to determine why the Body Positivity Movement has been unsuccessful in dismantling ballet's damaging standards. In a series of interviews that were recorded, transcribed, and analyzed using a grounded theory approach, I concluded that body expectations are instilled in dancers from a young age and are reinforced when their success inevitably becomes contingent on their weight. The psycho-emotional implications of this policy result in deeply ingrained, life-long mental habits conducive to the development of EDs, perpetuating the industry's epidemic and making it difficult for the grossly over-generalized Body Positivity Movement to dismantle the heavily defended "ballet body." These findings provide valuable insight into the nuances of the ED epidemic; in order to eliminate damaging beauty standards, all institutions responsible for the reinforcement and perpetuation of unreasonable body expectations must be thoroughly examined and challenged by the creation of unique body positivity movements catered to each industry and its specific practices.



Malena Otero

Faculty Advisor: Claudia Haase

Positivity Resonance in Friendships, Friendship Satisfaction, and Loneliness: Evidence from a Dyadic Interaction Study

Positivity resonance involves moments of shared positive emotions, mutual care, and biobehavioral synchrony between two people. To date, positivity resonance research has focused on romantic relationships in adulthood, but little is known about its importance in friendships in adolescence and young adulthood. We examined positivity resonance in friendship interactions and associations with

friendship satisfaction and loneliness in a sample of adolescents and young adults. We hypothesized that higher subjective positivity resonance would be associated with higher friendship satisfaction and lower loneliness. Data came from an observational study in which 108 friend pairs (aged 15-26) engaged in two online 10-minute naturalistic conversations about a conflict in their friendship and something they enjoyed doing together. After each conversation, participants completed an emotion checklist assessing momentary subjective experiences of positive emotion. Subjective positivity resonance was measured by creating positive emotion composite scores for each friend and then calculating difference scores between friends. Participants also completed the McGill Friendship Questionnaire (MFQ-RA) and the UCLA loneliness scale. Preliminary correlational analyses revealed that higher positivity resonance during friendship interactions was associated with higher friendship satisfaction but not with loneliness. Follow-up analyses probe specificity across conversation type (i.e., conflict, pleasant topic) and positive emotion (i.e., love, affection) and robustness when controlling for friends' individual emotions, age, gender, and friendship length. A better understanding of positivity resonance during friendship interactions provides insights into the well-being benefits of friendship—an understudied close relationship that plays an important role in the lives of young people.



Javiera Cabezas Parra

Faculty Advisor: Dayne Swearer

Plasmonic Copper Nanoparticles for Photocatalytic Dry Methane Reforming: Synthesis, Surface, and Performance

Synthesis gas (Syngas) is composed of carbon monoxide and hydrogen and is in high demand for its wide variety of uses in electricity generation and production of common chemicals. The most environmentally-friendly production method is dry methane reforming (DMR) which reacts methane with carbon dioxide, two potent greenhouse gases, sequestering them before entering the environment. However, modern DMR is prohibitively energy intensive, requiring temperatures between 1000-1200K. Plasmonic metal nanostructures (PMNs) have garnered considerable research interest due to their potential for sustainable photocatalytic chemistry, with promising evidence supporting copper-based Antenna-Reactor PMNs specifically for photocatalytic DMR (pDMR). Previous research indicates that modification of synthetic methods for supported nanoparticles affects their surface areas, morphologies, and dispersion; reports also link such surface characteristics to the PMNs' photocatalytic activity. A project was designed to answer how these factors relate to each other in pDMR, addressing the research need to comprehensively compare how different supports (host material on which the nanoparticles are placed) and loading (amount of supported active catalyst) affect pDMR kinetics, selectivity, and stability. Supported copper nanoparticles will be synthesized via co-precipitation while systematically varying metal oxide support types and copper-precursor concentration, then screened for copper loading relative to single and mixed oxide phases through different characterization techniques. The results will be collected into a library for comparative photocatalytic performance testing with the purpose of narrowing down the ideal range of characteristics for an optimal low-temperature, energy-efficient pDMR photocatalyst. The complete project will be reported, including future work on photoreactor design for performance testing.



Shivani Patel

Faculty Advisor: Wendi Gardner

The Effect of Hedonic vs. Eudaimonic Employee Benefits on Work Engagement and Well-Being

The tidal wave of the Great Resignation has led many companies to take data-driven approaches to improving retention through non-traditional ways of increasing worker well-being. There are two pillars that encompass well-being: hedonic well-being (which targets subjective experiences of pleasant activities, enjoyment, and positive emotions), and eudaimonic well-being (which targets our subjective pursuit of purpose, meaning, and growth that lead to self-actualization). We aimed to investigate the effect of whether implementing a hedonic versus eudaimonic employee benefits in one's workplace would impact their work engagement and well-being. Participants were randomly assigned to create either a hedonic workplace benefit (i.e., massages, free meals, and seasonal entertainment passes) or an eudaimonic workplace benefit (i.e., offering volunteer opportunities through their organization, personal/professional development services to encourage growth) that they would like to see implemented in their workplace. With this benefit plan in mind, they completed six outcome measures to assess their work engagement, as well as other workplace outcomes, and overall well-being. We hypothesized that eudaimonic employee benefits would have a stronger impact on work engagement and well-being than hedonic employee benefits. Our preliminary findings did not support this hypothesis as we did not find significant differences between the two benefit conditions on workplace outcomes and well-being. However, we are still coding the benefit implementation plans to assess task engagement and focus. Ongoing analyses will be discussed.



Irena Petryk

Faculty Advisor: Joel Horowitz

Measuring Risk-Sharing in a Developing Economy: A Study of Rural Thailand

Due to limited financial services in developing countries, the world's poor often form informal credit and insurance agreements with relatives, neighbors, and moneylenders. Sparse records of informal transactions make them difficult to track. As a result, economists studying developing economies may conclude that the level of financial risk-sharing is far lower than it actually is. This project seeks to accurately measure the level of risk-sharing in rural Thailand using models based on the theory of full insurance. The theory posits that households receive money from others in their village to maintain similar consumption levels. Therefore, changes in household consumption should track changes in village average consumption rather than changes in household income if risk-sharing is complete. I tested the theory of full insurance for Thai provinces with household data from the Townsend Thai Project. Using survey responses, I constructed consumption variables and estimated two models: one that analyzed year-to-year changes of the variables and another that focused on fluctuations of the variables around a long-term average. Both models demonstrated that changes in household

consumption partially tracked changes in household income, rejecting the theory of full insurance. However, the regressions also provided evidence of considerable, though incomplete, risk-sharing. The study's conclusions did not change when additional models considered provincial differences or household savings. This project demonstrates that informal mechanisms allow households to engage in risk-sharing in Thailand even if formal institutions are limited. This result has important implications for development efforts in the region, particularly microfinance initiatives.



Olivia Pierce

Faculty Advisor: Joshua Chambers-Letson

Performance Studies: Queer Expressions of Love & Loss

I worked as a research assistant for Dr. Joshua Chambers-Letson through the 2021-2022 Emerging Scholars Program. We aimed to discover how queer artists of color express themes of love and loss through their creative works. To answer this question, we reviewed archival materials from the Northwestern McCormick Library of Special Collections regarding mediums from music and sculpture to digital media. We found that many of the artists we researched did not have collections which centered their personal narratives. On the contrary, the majority of their historical documents were only preserved if they were directly connected to white individuals through correspondence. This revealed how racial dynamics impact archival work, which I hope to continue investigating as a Musicology Major. Our research culminated with a trip to New York City, where we visited art installations highlighting the same artists that we had sought out in the archives. Trips to the Museum of Modern Art (MoMA) and the Metropolitan Museum of Art allowed us to consider how artistic expressions of love from the past can be applied to present-day experiences. Additionally, we explored how these works are displayed in contemporary spaces, how viewers are encouraged to engage with them, and whether artistic meaning develops overtime with changing social contexts. The final products of this research include Dr. Chambers-Letson's manuscript regarding queer expressions of love and loss.



Harlym Pike

Faculty Advisor: Renee Engeln

Who Can Be Body Positive on Instagram?: Effects of Model Race and Body Size on Perceptions of Body Positivity Posts

The body positivity movement has found a wide audience through the rise of social media. However, both researchers and activists have argued that the lack of diversity among body positivity influencers may promote the exclusion of marginalized bodies. In the current research, women were randomly assigned to rate one faux-Instagram post, which featured either a Black or White model who was either fat or thin. Results of Study 1 indicated participants had the most positive reaction to models

with marginalized bodies (i.e., fat or Black). We replicated these initial research findings with a new sample (Study 2), a new set of images (Study 3), and in a larger sample that allowed us to examine effects of participant race on reactions to the post (Study 4). Results suggested that in the context of body positivity posts (e.g., “Every body is a swimsuit body”), women preferred posts featuring women with marginalized bodies over posts featuring thin, White women. In Study 4, White women rated images with a fat model higher than images with thin models and images with Black models higher than images with White models. Black women rated the image with the fat, White model higher than the image with the thin, White model, but gave similarly high ratings to images featuring a Black woman regardless of her body size. Despite evidence that body positivity social media posts tend to center thin, White women, these studies suggest that women prefer posts that center marginalized bodies.



Isabel Podolsky

Faculty Advisor: Henry Binford

Redefining the Periphery: A Humanistic Approach to Recategorizing the Priorities of NYC's Riverside Park Under a 'Multi-Community' Framework

My primary intention was to understand how individual users relate to and interact with Riverside Park, and how the relationships that people have with the park are unique from those witnessed within any other city park. Utilizing a nuanced picture of what makes the park unique developed through observations, readings, and interviews, I concluded that the park is defined through contradictions. Its physical segmentation engenders incredible variety in what the park has to offer. Yet, most users of the park utilize it only for localized purposes, which fosters a sense of ownership unique for a park of its size. This community investment has two main consequences. Firstly, the park is a vibrant reflection of its surrounding neighborhoods. Secondly, the park is (re)configured through a plethora of competing agendas. This combination of characteristics is the park's defining factor. As my project evolved, I developed a second line of inquiry focused on the concept of the “scenic landmark,” of which Riverside is one of eleven. This designation yields strict design guidelines that are difficult to enforce given a lack of funding. It also has failed in its job to ensure that the park is always in a state of good repair. And lastly, the landmark designation does not adequately recognize the park's reliance on community involvement. Thus, I propose that the “scenic landmark” designation be adapted to enforce preservation of natural resources and improvement of critical infrastructure and de-emphasize outdated aesthetic standards that hamper the activities of typical users.



Chloe Ponzio

Faculty Advisor: Cynthia Robin

Bringing Home Spot: Domestication and Human-Dog Relationships Across the Ancient Americas

Investigating human involvement in dog domestication allows us to understand the social and emotional bonds that ancient humans may have developed with ancient wolves that facilitated domestication. However, there is a gap in the scholarship on dog domestication surrounding how cultural ideas may have affected the social and emotional bonds between humans and canids that could have directed dog domestication. This research addresses both the evolutionary and cultural associations between ancient humans and ancient canids through an analysis of existing scholarship in zooarchaeological literature on dog and wolf genetics and cultural anthropological studies on human-dog and human-wolf interactions. Inherited cultural stories of relationships between humans and dogs or wolves are explored. This project investigates indigenous North American and Mesoamerican human-dog and human-wolf relationships examining how cultural perceptions of wolves as guides and teachers could have altered ancient humans' motivations to integrate wolves into their daily activities. This analysis demonstrates that social similarities and emotional bonds between ancient humans and ancient canids were likely needed to facilitate domestication, an argument that is furthered by looking at the differences between companion dogs and working dogs. While working dogs needed emotional attachments for a cooperative, mutually beneficial relationship, companion dogs required more complex social and emotional bonds to sustain their interactions and care relations with ancient humans. These results highlight why dogs were domesticated before other animals and why Western and non-Western cultures have culturally specific understandings of wolves, as well as different socially accepted roles for dogs today.



Hatim Rachdi

Faculty Advisor: Sami Hermez

Mapping “Impossibilities”: Queerness and Anti-Colonial Struggle in Palestine (In Exhibition Only- Not for Judging)

It is well-documented that movements of queer liberation in South-West Asia and North Africa (SWANA) find themselves entangled with multiple discourses and critiques. On one hand, they face homophobia from their local communities, and, on the other, they are seen as agents of Westernization and colonialism by academic elites, whose works became paradigmatic in queer SWANA studies. Palestine is no exception. However, queer politics and praxis, outside of their liberal mainstreaming, have always engaged with questions of imperialism, nationalism, state-building, neo-colonialism, and racial capitalism. Understood as such, the liberation of Palestine should be part and parcel of queer politics, not only in the SWANA region but also in transnational queer solidarity movements. Using academic literature and textual analysis of activists' writings, speeches, and webinars, I attempt to put academic and activists' debates in conversation with each other. In doing

so, this review paper outlines the main themes that emerge from the nexus of queerness and the Palestinian anti-colonial struggle: Intersectionality, homonationalism and homo-capitalism, and pink-washing and pink-watching. I illustrate how the interlocking axes of imperialism, homophobia, and racial capitalism help challenge the Anglo-American roots of queer theory, the liberal rights-based approach to queer politics, and the academic understanding of sexual identities in SWANA. These debates are illustrative of the issues that queer movements face in the region. Thus, alternative theorizations namely decolonial queering, queer checkpoints, and politics of cruelty, have the potentiality of creating a discipline-wide space where the queer SWANA subject is given centrality in any theorization and/or analysis.



Hatim Rachdi

Faculty Advisor: Joe F. Khalil

Under Arabo-Islamic Eyes: Indigeneity and Digital Language Practices in Morocco

Post-colonial nation-state building in Morocco required a homogenization of the Moroccan citizen linguistically, culturally, and religiously resulting in an Arabo-Islamic identity. The latter came at the expense of Amazigh (indigenous) people, languages, cultures, and identities. Despite the opportunist state language officialization and recognition in 2011, Tamazight's (Amazigh language) dissemination in public television remains hampered by political, economic, and logistic forces. The Covid-19 pandemic has resurfaced these structural issues when official state Public Health promotion only spoke French and Arabic. Using a case study approach, I look at the use and engagement with Tamazight in COVID-19 health promotional videos self-produced by two Amazigh individuals. I argue that Tamazight-speaking people maintained their linguistic practices via alternative media. These cyberspaces are sites of agency where linguistic practices transcended the state's narrative of standardization and officialization. They afford younger generations the ability to learn, teach, and share ways to address linguistic limitations. The digital nature of this media, I argue, allows for the remix and re-purposing of content which gives it different meanings and interpretations beyond language. I pit these state-bound, analog, and institutional efforts against the digital, rhizomatic, transnational, and grassroots practices of Amazigh alternative media. This case study contributes to the ongoing academic effort to understand indigenous language standardization and officialization as common nation-state tactics to respond to indigenous demands while not compromising its legitimacy. It is illustrative of the way that reformist tactics, standardization, and indigenous erasure are maneuvered and bypassed by indigenous people within the digital realm.



Hatim Rachdi

Faculty Advisor: Rana Kazkaz

“Not Good For Business”: A Postcolonial Reading Of Marco Through The Lens Of Mimicry (In Exhibition Only- Not for Judging)

Marco (2019) is a short film written and directed by Saleem Haddad, a novelist and aid worker of Iraqi-German and Palestinian-Lebanese descent. It narrates the story of Marco (Ahmad is his real name), a massage sex worker, meets Omar and discovers that they are both Arab. Marco and Omar, two Arab queer bodies, meet each other in a contested, emotionally charged, and tense encounter. This sexual rendezvous illustrates the dynamic and complex space that the queer Arab body occupies in post-Arab Spring society, expressing the deep malaise with queerness in the Arab world. This post-colonial reading of *Marco* looks at mimicry, as articulated by Bhabha, and as it is operative in the film. I argue that postcolonial mimicry is challenged and disrupted using Arabic language in the colonized-to-colonized encounter. However, mimicry, using the name Marco for example, remains a recourse that Ahmad employs to fit in the dominantly queer English society. *Marco* challenges the concept of mimicry as it presents a nuanced facade of Ahmad, one that goes beyond his identity as a mere mimicking colonial subject. This film is illustrative of the unease and anxieties surrounding queer Arab bodies. It invites us to see that queer Arab bodies are not just pretending to be Western liberal subjects, but rather try to carve out space themselves between mimicry and ‘authenticity’ one encounter at a time. It also invites us to look at queer Arab cinema as a space questioning the ‘authentic’ subjectivities of queer existence in the neo-colonial world.



Helen Radoff

Faculty Advisor: Alissa Levy Chung

Understanding Trans- and Gender Nonbinary Experiences with Being Misgendered and Attributional Claims

In recent years, there has been a much needed push to diversify psychology research on all fronts, from race to class to gender identity. Contrary to this contemporary push, a large historical body of literature exists that explores how people make causal claims and understand responsibility in social and clinical psychology. This research aimed to merge the older research with the modern movement and explore how people who do not identify as cisgender experience being misgendered by different people in their life. Thirty-six adults contacted through university groups that focus on queer or diverse gender identities were asked to complete surveys online and then complete a one-on-one semi-structured Zoom interview where they were asked about the last time they were misgendered by a stranger and someone close to them. Their responses were coded into two categories of external causal attribution and internal causal attribution. We also measured their levels of depression, anxiety, identity strength, and felt stigma. We found that trans* and nonbinary adults were most likely to be misgendered by their mother when it was someone close to them, and by an employee at a store when it was someone not close to them. The participants were significantly more likely to make external attributions when they were misgendered by someone close to them versus by a stranger. We found

that most participants do not desire to pass as any gender, but that much more research is needed to study this population and misgendering.



Zindeh Scere

Faculty Advisor: Shirin Vossoughi

Student Learning and Teacher Pedagogy: Emergent Forms of Collaborative Learning

I assisted with an ethnographic study focused on documenting and analyzing the emergent patterns of student and teacher thinking/learning that occurred during the YWCA's MetaMedia Student Experience (MSX). We utilized storytelling, music-making, STEAM projects, and deep connections to ancestry and culture to cultivate equity-centered learning. This work moves away from deficit perspectives on learning and instead leans into nurturing spaces that recognize the complex ways that learning, joy, and social and historical education intersect. The study employed extensive ethnographic fieldnotes and observations of student and teacher interactions across MSX's three sites, photos from each site, audio-recorded debriefs with mentors, teacher residents, and researchers, and weekly curriculum design/planning meetings with program staff. The data is still being analyzed but through careful thematic coding, team discussions about data, and reflections about design implications, we have noticed that centering collaboration, allowed shifts in the roles between mentors and students. Instead of a teacher-to-student structure, students and teachers shared expertise with each other, with teachers and students leaning on each other for ideas and support. Additionally, rather than centering students when activities didn't go as planned, intentional examination and reflection of structure and design were utilized to nurture more engagement with activities. There has also been an emphasis on leaning away from punitive discipline and instead honing skills for redirecting and affirming students as critical constructors of knowledge. There are major implications for the construction of next summer's MSX design and curriculum and support the creation of educational spaces for collaborative and community-based learning/thinking.



William H. Schirmer

Faculty Advisor: Erica Hartmann

CRISPRi Mediated Mutation of *Pseudomonas Aeruginosa* for Targeting Genes Involved with Biofilm Formation

Pseudomonas aeruginosa is a common pathogen that can lead to infection in the bloodstream, lungs and other parts of the body post-surgery. This organism is found in various environments and has shown resistance to a variety of antibiotics. Because antibiotic resistance in *P. aeruginosa* is so common, there is a dire need for novel therapeutics to treat these infections. One mechanism that protects this pathogen from antibiotics is the development of rigid biofilms. These surface-attached microbial communities form a layer of organic material that provides extra protection to a cluster of bacteria.

Biofilms can develop phenotypic and biochemical properties that are distinct from their planktonic counterparts and allow for easier transfer of antibiotic resistance genes between present bacteria. Within *P. aeruginosa*, *algU*, *rpoN*, *recA*, and *lecB* have all been identified as contributors to biofilm formation. We study generated mutants targeting the three specified genes for suppression by designing CRISPR-mediated modifications. We examined methods of salt extraction and the plasmid backbone in order to ensure successful transfer of the CRISPRi plasmid system into *P. aeruginosa*. We further tested six sgRNAs, two for each targeted gene, denoted as *lecB1/2*, *rpoN1/2*, and *algU1/2*. This resulted in a total of 12 mutant strains, 6 targeting *lecB* (4 *lecB1*, 2 *lecB2*), 2 targeting *rpoN* (*rpoN2*), 4 targeting *algU* (*algU2*), and 4 targeting *recA* (*recA2*). The mutated *P. aeruginosa* strains were analyzed through a crystal violet assay to demonstrate the targeted gene's repression and effects on biofilm growth and cell density.



Ilyana Schlesinger

Faculty Advisor: Renee Engeln

Does One Size (Model) Fit All?: Effects of Body Size on Clothing Attitudes

Models featured in fashion advertising are significantly thinner than most American women. Exposure to images featuring the body ideal represented by these ultra-thin models has been shown to negatively impact women's body satisfaction. A limited number of companies have launched size-inclusive advertising campaigns in response to concerns about the detrimental effects of advertising with ultra-thin models. Nevertheless, many companies are likely hesitant to transition away from ultra-thin models because they fear that using models whose bodies deviate significantly from the thin-ideal will decrease the appeal of their products to consumers. This study examined the advertising effectiveness of using thin models (US size 6-8), which represent a compromise between ultra-thin models (US size 00-0) and the average U.S. woman (US size 16). Three hundred seventy-one U.S. undergraduate women were randomly assigned to view either images of thin or ultra-thin models wearing identical articles of clothing. Participants in the thin condition reported significantly more positive evaluations of the brand and significantly less positive evaluations of the models' appearances than participants in the ultra-thin condition. Though the clothing evaluation scores did not differ significantly across conditions, cost estimates for each item of clothing were higher for participants in the ultra-thin condition compared to participants in the thin condition. While women may express preferences for brands that feature models whose bodies deviate from the thin ideal, findings from this study suggest that they may perceive clothing as more appealing and higher quality when worn by ultra-thin models rather than thin models.



Daniel Seog

Faculty Advisor: Borna Bonakdarpour

Alterations in Basal Ganglia Connectivity in Primary Progressive Aphasia Caused by Frontotemporal Degeneration and Alzheimer's Disease

Primary progressive aphasia (PPA) is a syndrome of progressive language impairment caused by neurodegenerative disease. A group of structures in the base of the brain involved in coordination of movement known as the Basal Ganglia (BG) have been shown to be affected by the underlying causes of PPA, however the pattern of involvement may differ in PPA cases due to Alzheimer's disease (AD) versus frontotemporal degeneration (FTLD), disorders caused by progressive nerve cell loss in the areas of the brain behind the forehead and ears. In this study we investigated whether connectivity between Basal Ganglia and the language network is more impaired in agrammatic PPA (PPA-G; characterized by gradual loss of ability to speak) versus logopenic PPA (PPA-L; characterized by difficulty finding words). This study consisted of 30 controls, 27 individuals with PPA-G and 16 with PPA-L. Functional MRIs, an imaging technique used to identify regions of the brain with cognitive processes, were conducted for each participant and statistical comparisons comparing connectivity in the brain for the two subtypes were executed. Results for PPA-G and PPA-L patients showed worse decreased connectivity between the Basal Ganglia and other regions on the left side of the brain. The pattern of decreased connectivity in the two subtypes seems to be different from our original hypothesis which stated that PPA-G would display more decreased connectivity. To determine whether our finding is due to more abnormal function within specific areas of the BG, we plan to compare regional brain metabolism in PPA-L and PPA-G patients.



Palak Shah

Faculty Advisor: Guillermo Ameer

Efficacy of Bioactive Glass in Healing Diabetic Wounds

Diabetes is often characterized by improper wound healing that stems from poor circulation and impaired immune function. This leads to the formation of chronic wounds, which often result in infections that escalate to amputations in diabetic patients. This project takes the approach of fabricating a bioactive glass ointment as a potential treatment method to increase both the speed and efficacy of diabetic wound healing. Bioactive glass has proved to be a revolutionary advancement in regenerative medicine. Historically, it has been used to stimulate osteogenesis, promoting bone regeneration. Recently, however, the use of bioactive glass in soft tissue has also shown promising effects for tissue regeneration. In addition, bioactive glass is biodegradable, has high mechanical strength, and stimulates angiogenesis. As a wound treatment method, bioactive glass provides a lower-cost alternative to allografts and autografts, and can provide a lower risk of immunogenic toxicity that many cell-based therapies can carry. Bioactive glass is a porous material, having the ability to attract and hold proteins that aid in the growth of blood vessels, and this characteristic makes it especially well-suited to increase the speed of wound closure. Previous studies have demonstrated successful angiogenesis, the formation of new blood vessels, with the application of a bioactive glass ointment

on wounds in diabetic mice. Our project builds on that research to design a similar bioactive glass ointment that incorporates copper as well, which has been shown to add greater antibacterial properties to the glass, and to increase the thickness of the healed skin.



Rhea Sharma

Faculty Advisor: Francesca E. Duncan

Acute Caloric Restriction Attenuates the Age-Associated Loss of Ovarian Follicle Number in a Population of Peri-Menopausal Rhesus Macaques

The ovary is the first organ to age in humans, with a significant decrease in female fertility occurring in the mid-30s. In mice, caloric restriction (CR) maintains ovarian function into advanced ages. The goal of this study was to determine whether CR confers a similar beneficial effect on the ovary in a non-human primate (NHP) model. Our study is a secondary analysis of collected ovarian samples, in which reproductively young (10-13 years) and old (19-26 years) rhesus macaques received a moderate caloric restriction or ad lib diet over four years. For our study, the ovaries were sectioned and stained with hematoxylin and eosin. To test the effect of CR on follicle number, we classified follicle stages according to morphological criteria and counted them, comparing between four groups (Young Control, Young CR, Old Control, Old CR, n = 4-8 per group). Three individuals independently reviewed three ovarian sections per animal. As expected, there was a statistically significant decrease in follicle number between young and old NHPs for all follicle stages. Overall, there appeared to be no effect of diet on follicle number for all follicle stages. However, when only examining irregularly cycling old NHP, CR animals had significantly more primordial follicles than control ($p = 0.03$). Therefore, CR may preserve the ovarian reserve in NHP, but the timing of CR within the reproductive lifespan may be an important modulator of the effect. Further research on the optimal timing of CR is necessary before being used to promote reproductive longevity in women.



Natalie Sliskovich

Faculty Advisor: Lilah Shapiro

Performance-Based Anxiety in High-Achieving Students

This study aims to understand the impact of performance-based anxiety in academic settings on the social, emotional, and academic wellbeing of high-achieving students. Students who identify as high-achieving experience additional pressure to meet traditional academic markers of success, such as high grades and high GPA, as well as maintain the social respect of peers, teachers, and family members. Because high achieving students meet the aforementioned high academic standards, personal success, wellbeing, and quality of relationships is often not monitored, leading to potential increase in undiagnosed anxiety disorders, social anxiety, social withdrawal, and imposter syndrome. To examine the role of achievement pressure on general success and wellbeing for high-achieving students with

performance anxiety, I conducted 10 open-ended, semi-structured interviews with Northwestern University undergraduate students. I examined the relationship among high-achieving identity, experiences in early education and high school with performance pressure, social and familial relationships, and mental health education. Analysis indicates that high pressure academic environments encourage greater levels of academic anxiety, social anxiety, and competition, decreased overall satisfaction with school, longevity of social relationships, and student self-concept as it relates to intelligence and overall success. Potential implications of this study include heightened awareness of student wellbeing on high school and college campuses amongst faculty and peers, encouraging greater access to mental health resources and programming for students before college, and institutional support of healthy and balanced academic environments at Northwestern and its peer institutions.



Magda Slowakiewicz

Faculty Advisor: Adriana Weisleder

Gesture as a Compensatory Mechanism During Narrative Retell in Former Late Talkers

Narrative skills are an important component of developing language skills. Furthermore, children's use of gesture during storytelling is a predictor of more structured narratives. While the use of gesture has been studied in typically developing children, this has not been explored in children who have had language delays and are considered former late talkers. In our lab, we want to investigate whether former late talkers (fLTs) and typically developing talkers (TT) differ in gesture frequency, gesture type (deictic or representational) and the gesture's viewpoint (observer or character) during storytelling. We hypothesized that gesture use would be higher in fLTs, serving as a compensatory mechanism to support verbal language production. We also hypothesized that fLTs would use more deictic (pointing) gestures, as this is a compensatory mechanism to physically indicate objects they have trouble identifying and describing. In the study, four-year-old participants completed a narrative task after watching wordless cartoons by telling the story in their own words. We created a coding system in ELAN software to track gesture frequency and categorized the types of gestures as deictic (pointing) or representational. Preliminary data (n= 27, fLT n= 12, TT n= 15) show that fLT and TT do not differ in gesture use, type, or viewpoint. Our current findings do not support the hypothesis that gesture serves as a compensatory mechanism in storytelling. Understanding the role of gesture as a compensatory mechanism can determine if interventions that promote gesture use in late talkers are necessary for narrative skills.



Magda Slowakiewicz

Faculty Advisor: Brooke Pfister and Kevin Rak [Lurie Children's Hospital]

Universal Screening & Intervention for Formula Need in Pediatric Primary Care Clinics During the COVID-19 Pandemic (In Exhibition Only- Not for Judging)

Affording infant supplies, such as formula, has been a challenge for many families in Chicago, which the COVID-19 pandemic exacerbated. Food insecurity in children is associated with adverse health outcomes and our team sought to help alleviate the burden of formula need for our clinic families. The purpose of our study was to assess the feasibility and impact of universal screening and onsite intervention for formula need in families seeking primary care during the pandemic. Caregivers of patients 0-3 years old presenting to two pediatric primary care clinics received a 4-question screen for formula and diaper need. Positive screens were referred to social workers for connection to community resources, assistance with public benefits enrollment, and onsite infant supplies distribution. Of 1,769 eligible families seen from June 2020 to February 2022, 15.3% (270) screened positive for formula need. 79% of families referred more than once indicated that the pandemic made it more difficult to get infant supplies. WIC and SNAP enrollment increased by 9.2 and 10.3 percentage points, respectively, between first and second visits. This universal screening program effectively identified an unmet formula need in our communities. Beyond the immediate relief provided by supply distribution, the program helped families secure enrollment in public benefits programs, which can provide more sustainable sources of formula. Surveying caregivers also provided the opportunity to engage in counseling about infant nutrition best practices. Universal screening with in-clinic supply distribution is a feasible model to identify and temporarily relieve formula needs in conjunction with community resource referral.



Christopher Sollenberger

Faculty Advisor: Samuel Stupp

Evaluating Chondrogenic Potential of Chondroitin Sulfate Mimetic Peptide Amphiphiles

Articular cartilage degeneration is one of the leading causes of pain and disability for people over the age of 65 in the developed world. One of the most common treatments for articular cartilage degeneration is autologous chondrocyte transplantation, a treatment plagued with problems—such as long recovery times—that negatively affect clinical outcomes. Chondroitin sulfate (CS), as an important glycosaminoglycan component in extracellular matrix, plays a protective role by interacting with growth factors such as TGF- β 1. Here we synthesized a class of self-assembling molecules that are functionalized to mimic the chemical structure of CS and applied as biomaterials to potentially improve the outcome of chondrocyte transplantation. Three differentially sulfated *N*-acetyl galactosamine (GalNAc) peptide amphiphiles (PAs) were used to decorate the surface of human chondrocytes to enhance the interactions with growth factors. To examine whether these PA cell coatings enhance functionality of chondrocytes, western blots were performed to characterize the expression of various chondrogenic factors including CD44, Sox-9, Collagen II, and Aggrecan. Moreover, confocal imaging was used to confirm the presence and efficiency of the PA cell coating.

Initial results confirm the presence of PA coating after four days. Furthermore, preliminary examination of PA treatment in solution demonstrates that the PA treatment enhances chondrogenic activity of treated chondrocytes after three days. More *in vitro* evaluation of the biological efficacy of PA coating in stimulating chondrogenesis is ongoing. This work will motivate future *in vivo* studies to evaluate the use of PA cell coatings for clinical use in autologous chondrocyte transplantation.



Cece Stumpf

Faculty Advisor: Keara Lane

Impact of Regulatory Gene Expression on *Salmonella* Physiology

Salmonella enterica is a widespread bacterial pathogen that causes gastrointestinal disease. During an infection, *Salmonella* first invade, then replicate inside a host cell. Replication within a host cell requires specialized machinery controlled by a network of regulatory genes. One critical regulatory gene for this machinery, *svrB*, allows for replication within a host cell when expressed at high levels. While this is an essential function, *svrB*'s effects on other important stages of the *Salmonella* life cycle, including growth and invasion ability, remain ill-defined. To investigate these relationships, I created three plasmids, customized DNA that can be taken up and expressed by bacteria, each encoding for *svrB* at incremental levels. I inserted these plasmids into *Salmonella* to obtain strains with low, medium, and high *svrB* expression. Then, I measured the growth rate of each strain in high- and low-nutrient conditions. Although there was no difference in growth in high-nutrient conditions, there was a slight deficit associated with higher *svrB* expression when grown in low-nutrient conditions. This suggests that while *Salmonella* can grow normally while expressing *svrB*, there is a small energetic cost of expression that can inhibit population growth when resources are limited. Additionally, I infected mammalian cells with the *svrB* strains and found that all were ineffective at invading cells. Together, these results show that *svrB* expression limits growth and invasion ability, highlighting some adverse effects of a necessary gene. Continued investigation will illuminate the carefully balanced tradeoffs that determine infection outcomes, providing further insight to treat infections more effectively. This project was funded in part by the Office of Undergraduate Research's Academic Year Undergraduate Research Grant.



Felicia Tuchman

Faculty Advisor: Jennifer Tackett

Socioeconomic Status as a Moderator of Parenting and Child Externalizing Behavior

Child externalizing behaviors bear intricate associations with parenting strategies. However, parenting strategies do not exert the same influences on every child; sociodemographic variables modulate the variability of outcomes. In the present study, measures of externalizing behavior, socioeconomic status (SES), and parenting were administered to 292 primary caregivers of youths (158 females, $M_{\text{age}} = 9.79$, $SD_{\text{age}} = 0.656$) to elucidate whether associations between parenting and externalizing behaviors differ

depending on SES. Race and ethnicity were primarily split between white, Black or African American, and Latin American participants (32.9%, 27.7%, and 24.0%, respectively). Poor monitoring and supervision, inconsistent discipline, and corporal punishment were associated with higher incidence of varying types of child externalizing behaviors. Parental involvement was associated with lower incidence of rule-breaking behavior (RBB) and physical aggression (PA). Additionally, children of low family-level SES (F-SES) were more likely to exhibit RBB than those of high F-SES, while children of low neighborhood-level SES (N-SES) were more likely to exhibit RBB and relational aggression (RA) than those of high N-SES. F-SES and N-SES moderated the relationship between parenting and RA such that positive parenting was more strongly predictive of RA in children of low SES than in children of high SES. F-SES also moderated the relationship between parenting and RBB such that positive parenting was more strongly predictive of RBB in children of low F-SES than in children of high F-SES. These preliminary results indicate that positive parenting affects children of high and low SES differently with regard to the development of RA and RBB.



Anika Velasco

Faculty Advisor: Adriana Weisleder

Dual Language Input from Adults and Other Children in Two Communities

Children in bilingual families hear two different languages, but how much of each are they hearing across contexts? Are their languages similarly represented across interactional contexts, or does the particular language they hear depend on the specific context? The goal of this study is to better understand the distribution of dual language input across different speakers (adults, children) and addressees (child-directed, adult-directed speech) to infants in a Spanish-speaking immigrant community in the United States and a Quechua-Spanish community in Bolivia. We hypothesize that infants' exposure to each language will differ by speaker type, addressee, and the sociocultural community. Families completed daylong audio recordings using the Language Environment Analysis (LENA) system. The recordings were split into 30-second clips, which were then randomly selected ($M=100$ clips, 50 min) and annotated for language (Quechua/English, Spanish, Mixed), speaker (Adult, Other child), and addressee (Target child, Adult, Other child). Results revealed a significant 3-way interaction between speaker, addressee, and community. Among US families ($n=10$), other children used a higher proportion of English than adults ($M_{children}=0.324$, $M_{adults}=0.031$). In Bolivia ($n=10$), other children used a higher proportion of Spanish than adults ($M_{children}=0.773$, $M_{adults}=0.266$). Across the two samples, infants were exposed more to the societal language by other children and more to the minoritized language by adults. If children hear different languages in varying contexts, then it is possible that their knowledge of certain concepts is tied to a specific language.



Maxime Visa

Faculty Advisor: Daniel E. Horton

Air Quality Benefits and Tradeoffs from 30% Light-Duty Vehicle Electrification over the Midwest-Great Lakes Region

With the recent advent of automaker production commitments, increasing consumer options, and policy incentives, the United States' vehicle fleet is fast becoming more electric. Studies have largely borne out this assumption for greenhouse gases, but the net effect of widespread EV adoption on air quality depends on numerous nonlinear factors including the source of electricity used to charge EVs, the type, magnitude, and proximity of other emission sources, and local-to-regional scale meteorology. We use the two-way coupled Community Multi-Scalar Air Quality and Weather Research and Forecasting (CMAQ-WRF) modeling system to simulate changes in air quality that result from the instantaneous replacement of 30% of the ICE light-duty vehicle fleet with EVs. We scale tailpipe, power plant emissions, and EV battery charging demands using an emissions remapping algorithm that determines which power plants meet marginal demand needs using a series of weights designed to emulate U.S. grid behavior. Our simulations are run at neighborhood-scale (i.e., 1.3 km²) and are facilitated by high resolution emission surrogates produced by the Lake Michigan Air Directors Consortium (LADCO) which we process using the Sparse Matrix Operator Kernel Emissions (SMOKE) model. We compare our sensitivity experiments to baseline simulations to determine the changes in pollutant concentrations, and contextualize changes by computing the public health impacts across health endpoints. Analyzing the geospatial shift in pollutants as a function of vehicle electrification provides a better understanding of the benefits and tradeoffs of an EV transition, and provides decision-makers with context on how EV adoption impacts local air quality.



Amy Wang

Faculty Advisors: Netta Gurari and Michael Ellis

Extraction of a Robotic Measure of Joint Stiffness in Individuals Post Hemiparetic Stroke for Comparison with a Shear Wave Ultrasound Elastography Measure

After a stroke, structural changes in the skeletal muscle can lead to joint stiffness that impairs everyday arm function. The gold-standard measurement of joint stiffness requires a time-consuming procedure with an expensive robotic device that is impractical outside the laboratory. By contrast, current clinical measurement systems are subjective, limiting rehabilitative therapy efficacy. Ongoing works propose shear wave ultrasound elastography (SWUE) as an auxiliary measurement approach given its low barriers in cost, maintenance, and training for device setup. To provide evidence supporting its clinical use, SWUE must be evaluated against the laboratory gold-standard. My project focuses on extracting the robotic measurement of passive joint torque at seven distinct angles to reflect elbow joint stiffness. Each forearm of twelve individuals with moderate to severe hemiparetic stroke was rotated at a constant velocity by a robotic device to seven discrete angles. The robotic device held the forearm still at each angle, where angular position and joint torque were measured. Muscle quiescence was ensured with surface electromyography muscle activity measurements at the biceps brachii and triceps brachii.

For each angle, average joint torque was determined from a subsegment of data captured. Preliminary visual inspection suggests a positive correlation between average joint torque and angular position as the arm extends, and a negative correlation as the arm flexes. In combination with an observed lack of muscle activity throughout the subsegments, this result supports use of the extracted average torques as the gold standard robotic measure in further statistical analyses with SWUE measurements.



Danyi Wang

Faculty Advisor: Bin Jiang

Biophysical Forces on VSMC Nucleus Regulate the Onset of Vascular Calcification Through Epigenetic Remodeling

Pathological vascular calcification is the hardening of blood vessels into bone-like structures. Vascular smooth muscle cells (VSMCs), which normally constricts or dilates to regulate blood flow and pressure, are capable of transdifferentiating into the osteogenic/bone-like phenotype. Moreover, biophysical forces, or forces applied to induce a physical change, can alter chromatin (complex of DNA) structure within the nucleus and regulate cell fate for several cell lines. The aim of this project is to investigate how biophysical forces can impact VSMC phenotype and the onset of vascular calcification. To that end, biochemically induced biophysical forces are applied to VSMCs via the vasodilator Sodium Nitroprusside (1 μ M, 10 μ M, 100 μ M) and the vasoconstrictor Phenylephrine (0.1 μ M, 1 μ M, 10 μ M, 50 μ M). No-treatment control groups are included. Immunofluorescence of nuclear DNA was used to confirm that the biochemical treatments generated the nuclear morphological changes expected from the corresponding biophysical forces. Changes in epigenetics and transcriptional activity will be evaluated via Acetyl H3 Staining and immunofluorescence imaging. Lastly, VSMC cell fate will be determined via immunofluorescence imaging for myogenic/contractile versus osteogenic protein markers. Preliminary data collected confirm that SNP-treated cells display the elongated morphological changes expected with cellular dilation. PE validation assays are currently in progress, with histone acetylation immunofluorescence imaging and VSMC protein expression analysis due to follow. There is currently no known treatment for vascular calcification. Therefore, this project will not only increase fundamental knowledge concerning the mechanism of calcification and the role of mechanical forces on VSMC cell fate, but also introduce new therapeutic targets to combat vascular calcification.



Fiona Wang*Faculty Advisor: Chad Mirkin***Towards Functionalizing Water-Soluble Weak-Link Approach Complexes**

The Weak-Link Approach (WLA) is a versatile platform to prepare stimuli-responsive metal-organic compounds, constructed based on a metal center connecting to two organic molecules via four coordination bonds. These organic molecules are also called hemilabile ligands, which have an inert and labile site, each bound to the metal. The WLA compounds have two configurational states: the four sites fully occupied by the ligands, and two labile “weak-link” sites displaced by anionic effectors, such as Cl⁻. The exchange between these two states is reversible, but it has only been demonstrated in organic solvents previously. This project aims to design new WLA complexes that retain their dynamic functionalities in water, achieving reconfigurable Deoxyribonucleic Acid architectures with aqueous WLA-DNA constructs. I hypothesize that using weaker labile binders, such as ether instead of the previous thioether moieties, and water-soluble motifs such as amides will enable reversible control in water because anionic effectors will displace the labile sites more readily. I synthesized a series of ligand precursors using air-stable and air-free techniques and characterized the products using ¹H nuclear magnetic resonance spectroscopy, single-crystal X-ray diffraction, and electrospray ionization mass spectrometry. I discovered that the choice of water-soluble functionalities is important as my work showed that the amide functionality did not exhibit stability in strongly basic conditions necessary for the synthesis of the phosphino-ether and N-heterocyclic carbene-ether based ligands. Hence, another stable, water-soluble functional group that can be synthesized easily needs to be considered to formulate complexes capable of reversible binding behaviors in water.

**Rosalind Wang***Faculty Advisor: Richard B. Silverman***Synthesis of Protein Aggregation Inhibitors for the Treatment of ALS**

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease that affects both upper motor neurons (UMNs) and spinal motor neurons, causing rapid loss of muscle control and eventual paralysis. The two clinically approved treatments for ALS have limited efficacy, and there is an urgent need for a better treatment. Previously, a cyclohexane-1,3-dione (CHD) scaffold was identified as an inhibitor of mutant SOD1-dependent protein aggregation, which is a characteristic of a common type of ALS, through a cytotoxicity protection assay. Over the years, the scaffold has shown promise as a treatment for ALS, with some analogues improving UMN health more effectively than the current clinically approved treatments. My project aims to synthesize a new series of amide-containing CHD analogues, namely cyclic β -ketoamides. In general, incorporation of a tertiary amine/amide group has been reported to improve blood brain barrier (BBB) permeability. While current CHD analogs show good efficacy, good BBB permeability is necessary to treat neurological diseases. Two different synthetic routes have been explored to access the desired compounds, including a novel hydrogenation reaction. The compounds will then be assayed for their abilities to improve UMN health through mouse models.

Compounds that improve UMN health will serve as promising candidates for the treatment of ALS. They also help the study of target identification and guide further modifications to the CHD scaffold.



Suhao Wang

Faculty Advisor: Richard B. Silverman

Treatment of Epilepsy by the Inactivation of GABA-AT

Epilepsy is a chronic disorder, with recurrent, unprovoked seizures. One of the possible causes of epilepsy is the low level of the inhibitory neurotransmitter, gamma-aminobutyric acid (GABA) in the brain. When the GABA concentration drops below a certain threshold level, the balance between GABA and its corresponding excitatory neurotransmitter *L*-glutamate (*L*-Glu) is interrupted, and convulsion occurs. However, GABA cannot freely penetrate through the blood-brain barrier (BBB). Thus, direct administration of GABA cannot be used as a treatment for neurological disorders. Indirect methods have to be found to raise levels of GABA in brains. Gamma-aminobutyric acid aminotransferase (GABA-AT) regulates the GABA levels in the brain. Inhibition of GABA-AT has been shown to ameliorate low levels of GABA and stop convulsions. Currently, vigabatrin is the only FDA-approved drug that is an inhibitor of GABA-AT. However, research has shown that long-term use of vigabatrin causes retinal toxicity and does not readily cross the BBB. The Silverman lab developed two GABA-AT inactivators that are vigabatrin analogues known as CPP-115 and OV-329. However, both compounds still inhibit ornithine aminotransferase (OAT). My project primarily focuses on increasing the inhibitor selectivity for GABA-AT over OAT. My current work focuses on the synthesis of CPP-115 analogue. The bicyclic ketone intermediate can be converted to the alpha-hydroxyl ketone through Davis and Rubottom oxidations. Then, *O*-alkylation, followed by difluoroolefination and acid-catalysed ring opening of the lactam will give the final compound. The overall goal is to make alkyl derivatives of CPP-115, with selective binding interactions to GABA-AT.



Nina Wetoska

Faculty Advisor: David Rapp

The Effects of Power Dynamics in University-Community Partnerships

I am interested in exploring the undergraduate-community member relationship within university-community partnerships because it is a dynamic that has received little direct investigation. Neglecting the relationship between these parties creates a hole in the understanding of the historically imbalanced power relations on the leadership and success of partnerships. To understand the relationships, I will use the data, surveys, and focus groups, that were collected after the completion of the 2020-2021 YPRPT cohort in June and July 2021. I experienced the program as an undergraduate participant and the research component as a member of the research team, which allowed me convenient access to this data from this population and deep knowledge about the program's context. I am using a

partnership ran out of Northwestern as I intend to extend current scholarship and address the broader context of undergraduate-community member relationships in university-community partnerships. Though the data is still being analyzed, there have been a few key findings. The perspectives on power and the responsibilities of leading the weekly sessions were distinctly different between the undergraduates and community-members. The undergraduates felt they carried a great deal of the preparation and logistical burden, while the community-members felt they were more well-versed in the material and thus the primary instructor. Currently, most of the literature regarding university-community partnerships centers on the interactions between the undergraduate students and the programs' youth participants.



Christopher Woodard

Faculty Advisor: Erica Hartmann

Identification of Optimal BAL Sample Processing Strategy Through Quantitative and Descriptive Comparative Assessment

The lung microbiome is poorly defined and plays an unknown role in mediating disease. Next generation sequencing techniques unveiled novel insights into various human microbiomes; however, current sample processing methods limit the application of this powerful tool to lung microbiomes. Bronchoalveolar lavage (BAL), a common sampling method of the lower respiratory tract, yields abundant human DNA causing poor microbial genome assembly (i.e., metagenomes). To address these challenges, we are investigating the impact of different sample processing methods on microbial and human DNA yield, thereby optimizing strategies to sequence lung metagenomes. We are implementing a stepwise optimization strategy to process BAL samples through different treatment combinations to reduce human DNA carryover while maintaining microbial DNA concentrations. Enrichment of microbial DNA and depletion of human DNA are assessed by measuring the 16S and 18S ribosomal RNA genes, respectively, in each sample using quantitative PCR. Our results indicate that sample processing methods impact both microbial and human DNA content and that biological variation significantly influences yields. Future work will measure the bias between sample processing methods by performing beta-diversity analysis across sample metagenomes through 16S ribosomal RNA gene sequencing. The results of qPCR quantification and bias analysis will inform which method of BAL fluid preparation is most suitable for subsequent lung microbiome analysis through whole genome shotgun metagenomic sequencing, thus providing a tool for future research on lower respiratory tract infections and ecology. This research will ultimately aid the development of microbiome-targeted therapeutics for lung diseases such as pneumonia or cystic fibrosis.



Jessica Xia

Faculty Advisor: Lisa Beutler

Food Cues and Brain-to-Gut Communication

A food cue is an exposure to a sensory stimulus that predicts imminent nutrient intake and prepares the gastrointestinal (GI) tract to efficiently digest food. The brain's ability to engage the gut in response to a food cue requires many brain regions, however, little is known about these required regions. My project focused on identifying specific food cue-responsive brain regions using a taste cue. Last year, funded by a Summer URG, I studied whether a visual and olfactory food cue would activate food cue-responsive brain regions in mice. Overall, the results were inconclusive since key brain regions for feeding behavior had decreased activity. These results suggested that a gustatory cue, which is a stronger stimulus, may be needed to evoke anticipatory GI responses in mice. Therefore, I hypothesized that gustatory cues activate brain regions to facilitate cue-induced changes in glucose tolerance. To test this, I delivered nutrients directly into the stomach of mice via an intragastric (IG) catheter, which allows me to separate nutrient content from taste cues. Overall, the data I collected from this experiment were inconclusive since cued mice did not show a difference in glucose handling compared to control mice. Due to this I was unsure if this would allow me to pinpoint brain regions activated by the food cue. Ultimately, my findings suggest that gustatory food cues are not strong enough to cause anticipatory GI responses within mice. Future work will focus on different avenues to explore which upstream brain regions are responsible for this pathway.



Jiarui Yu

Faculty Advisors: Jolie Matthews and Megan Hyska

Impact of Benefit-Framed Messages on Public Attitudes Towards Prison Education

Prison education, which has a proven record of reducing recidivism rates, improving post-release outcomes, and achieving increased cost-effectiveness than reincarceration, is facing budget constraints throughout the United States. Public opinion plays a central role in the formulation of criminal justice policies and practices, according to existing research. As a result, both changing public perceptions and fostering support for prison education among the general population are essential to the success of criminal justice reform efforts. A total of 240 online participants were recruited from Prolific. Using a survey composed of a control group and three experimental groups that were exposed to different benefit-oriented messages, this study examines which type(s) of information is more effective in attracting public support for U.S. prison education programs. Combining a one-way ANOVA test and thematic analysis, we determined that (1) The control and experimental groups did not differ significantly in their scores after short exposure to three benefit-oriented messages; (2) Most participants were already aware of the benefits of prison education prior to being exposed to the messages given the high initial score; And, (3) the two most commonly cited reasons for support are education being a fundamental right for all and its effectiveness at reducing recidivism. The limit of short-term exposure is particularly relevant when considering how prison reformist organizations reach out to their targeted audiences through brief messages via email, websites, or flyers. Future

studies might be benefited from manipulating factors such as exposure time, delivery method, crime type, and sentence length.



Cindy Zhao

Faculty Advisor: Richard Morimoto

Designing Metastable Protein Biosensors for Quality Control in Stress and Aging

The functionality of the network of proteins and associated molecules used for protein homeostasis in cells, also known as the proteostasis network (PN), declines in aging leading to a variety of pathologies, including neurodegenerative diseases. Understanding the dynamics of this decline could reveal more about the process and mechanisms of aging and provide necessary information to combat disease development. Quantification of proteostasis capacity can be accomplished using biosensors in living cells. My project aims to generate a collection of metastable proteins as biosensors in the model organism *C. elegans* through rational design. The goal is to expand the toolbox of fluorescent proteostasis biosensors for monitoring the PN and tissue dynamics of PN decline. By using conditionally destabilized protein biosensors, a larger range of protein sensitivity can be detected. I introduce destabilizing mutations into the enzyme dihydrofolate reductase (DHFR) and plan to characterize the mutant DHFR proteins both *in vivo* and *in vitro*. The selection of destabilizing mutations was based on existing literature of DHFR mutagenesis studies and prediction programs of amino acid replacement stability. The tools and protocols used for the generation of new DHFR biosensors for *in vitro* and *in vivo* studies have been optimized for success and are outlined in this project. Experiments using assays to measure the functionality of the protein biosensors, such as enzymatic activity, are currently ongoing.



Ashley Zhu

Faculty Advisor: Kenneth Brockman [Medical College of Wisconsin]

The Non-Typeable *Haemophilus Influenzae* Phasevarion Regulates Macrophage-Mediated Phagocytosis

The phasevarion, or the phase variable regulon, is an epigenetic regulatory system that, through its spontaneous switching between its ON and OFF form, can increase the pathogenesis of bacteria that use it. The pathogen *Haemophilus influenzae* utilizes a phasevarion to evade immune clearance and increase persistence within its human host. However, the role of the *Haemophilus* phasevarion in altering the host's innate immune response is not fully understood. Given that macrophage-mediated phagocytosis is one of the first steps in the innate immune response, the purpose of this study was to determine if the non-typeable *Haemophilus influenzae* (NTHi) phasevarion affects this stage. THP-1 monocytes were differentiated into macrophages and infected with modA ON or modA OFF variants of four clinical NTHi strains, each with a different *modA* phasevarion type.

After 30-minute incubation to allow for phagocytosis, macrophages were lysed and intracellular NTHi were enumerated. We found that when the *modA2* gene of strain 723 was OFF, more bacteria were phagocytosed than when *modA2* was ON. However, two of the other variants, *modA4* and *modA9* exhibited the opposite pattern of *modA2*. Irrespective of phasevariation status, we observed that strains 477 and 1209 phagocytosed significantly less compared to strains 723 and C486, suggesting that the strains 477 and 1209 are overall more resistant to phagocytosis. Future studies aim to elucidate the mechanisms underlining phasevariation-dependent and independent phagocytosis of NTHi, as well as the effects of the ModA phasevariation on important steps of macrophage-mediated phagocytosis.



Jay Zou

Faculty Advisor: István Kovács

Multipartite Entanglement in the Random Ising Chain

Entanglement is a distinguishing property of quantum mechanics, offering fundamentally stronger correlations than classical physics. While entanglement of a single subsystem is well understood, quantifying entanglement of multiple subsystems is a challenging open problem in interacting quantum systems. For a single subsystem, both clean and random critical chains are known to show a similar logarithmic singularity in the entanglement entropy. Here, we consider two subsystems of length ℓ separated by a distance r and quantify two measures of multipartite quantum correlations, i.e. entanglement negativity (EN) and mutual information (MI), in critical random Ising chains. Both the disorder averaged EN and MI are found to be scale invariant and universal, i.e. independent of the form of disorder. When $r = \alpha\ell$, we find a constant EN and MI over any distances, using the asymptotically exact strong disorder renormalization group (SDRG) method. Our results are qualitatively different from both those in the clean Ising model and random spin chains of a singlet ground state, like the spin-1/2 random Heisenberg chain and the random XX chain. While $MI/EN=2$ for random singlet states, in the random Ising model this universal ratio increases strongly with α . For two finite subsystems far apart, EN decays as r^{-x} , with $x \approx 4$, different from the r^{-2} decay in a random singlet phase, or the exponential decay in the clean Ising model. Our numerical SDRG results are further supported by analytic bounds. The applications of this project can range from quantum communication to neuroscience.



∞ Creative Arts Festival

∞ 11th Annual Creative Arts Festival

May 19 | 7:00 – 8:30pm

Wirtz Center for the Performing Arts | Black Box 101

Eli Civetta and Finn Rollings – Emcees

VISUAL ARTS:

Nur Hussain – *Portraits of the People I Adore* (Photography)

Haris Bukaric – *The Face of Love* (Visual Art)

Chloe Chow – *The Face That Drew a Thousand Swords* (Visual Art)

PERFORMANCES:

Joyce Pu – *Why Is She Speaking?* (Poetry)

Andy Hartman – *All-In* (Staged Reading)

Olivia Yarvis – *La Casa del Migrante* (Documentary)

Laurisa Sastoque – *Light as He Willed (Excerpt)* (Short Story)

Yanis Cherif – *Melodies in Distance* (Video Journalism)

Samantha Cho – *Femme & Queer Asian American Narratives* (Creative Non-Fiction)

Lalla-Aicha Adouim – *Wahaya* (Poetry)

Abdullah Imran – *Against All Odds* (Short Film)

Olivia Pierce – *Toonana Mangwana* (Original Music)



Professional Jury

Bryce O'Tierney, Poet-Musician

Maris O'Tierney, Poet-Musician

Mickie Pascal, Pascal-Rudnicke Casting

Jennifer Rudnicke, Pascal-Rudnicke Casting



Stage Manager

Mikaela Fenn

VISUAL ART

Haris Bukaric

The Face of Love (Digital Art)

The Face of Love is a digital illustration, a piece done using the *Procreate* software on an iPad. The illustration features a blue background with small simplistic white flowers and red hearts. The background also uses transitions in lighting to add a sense of depth and put the foreground characters in focus. The characters, two lovers in the center, are drawn with pencil strokes that resemble charcoal qualities. In contrast to the background, the two figures are drawn so that the illusion of transitions, brightness values and edges come together to form a realistic look. Finally, in the center point of the drawing, the heads of the figures are left without any details on their faces – yet another contrasting quality of the piece, this specific feature is the most important symbol of the artwork, and therefore, the inspiration for its name.

As a Muslim from Bosnia and Herzegovina, an important part of my culture is the belief that depicting human faces in visual arts goes against the values of Islam, and is therefore considered a sin. This barrier has shaped my path as an artist from an early age. “The Face Of Love” is the first drawing I have made that does not try to work around this obstacle, but rather fully embraces the lack of facial features. This decision goes outside of my comfort zone, since blank heads could be interpreted as disturbing by the audience, or seem like an indicator of poor artistic skill. This risk is especially significant, as the two lovers are me and my girlfriend, so it was only appropriate to be fearless in order to express my emotions towards her. The drawing was made for her as a Christmas gift, and depicts us holding each other and posing for a “photo”. The colors of the background (blue, white, and red) were put together to create a wintery Christmas ambient. Specifically, the white flowers carry a significant importance. At the beginning of our relationship, my girlfriend took my tablet and doodled these flowers on my Chem lecture notes, and I copied those doodles and incorporated them into the drawing’s background. Even though my girlfriend did not directly participate in creating this drawing, I made sure to add both our signatures to the bottom left corner of the piece, to further symbolically represent “us standing together”.

Chloe Chow

Faculty Advisor: Angharad Darden

The Face That Drew a Thousand Swords (Digital Art)

This is a digital piece showing Helen of Troy and Menelaus at the end of the Trojan War. Helen has her back to the viewer and though Menelaus faces Helen, most of his face is out of frame. Menelaus is holding Helen's hand with his right hand. His sword is in midair, falling from his left hand. Menelaus wears heavy bronze armor covering his chest, shoulders, and upper legs. He also wears bronze greaves and sandals. Helen wears a sheer blue and gold dress with her chest exposed in the style of Bronze Age Minoan women. She also has gold jewelry and is not wearing shoes. Helen has red hair and her head is the center of the scene. The figures are placed on an empty field with mountains and a blue sky. The painting was completed digitally on Procreate with an effort to recreate a painterly style.

This piece is based on the story and images of Menelaus deciding not to kill Helen at the end of the Trojan War. Most depictions of the scene show Helen and Menelaus in clothing accurate to the artist's time period or to the artist's imagining of the Ancient Greeks rather than what is accurate to the Bronze Age, the time period of the mythic Trojan war. I also wanted to focus on Helen as the center of the scene. Helen has been attacked and defended throughout literature and art, so I wanted to highlight how she both does and does not choose to use her beauty and intellect to fight back against the men seeking to harm her in different iterations. Menelaus is often shown with his sword unsheathed, showing his intent to hurt his wife, but falling from his hand, showing that he has changed his mind for some reason. Though we cannot see the face of either figure, Helen is exposed in her dress while most of Menelaus' body is covered by his heavy bronze armor. Their respective clothing shows the power dynamic, yet it is unclear who is winning over whom. I used the Dendra Panoply as a reference for Menelaus and the Thera wall paintings as a reference for Helen. This piece was completed digitally on Procreate. In making this piece, I hope to add to the long history of showing Helen as a complex and interesting mythic figure, both victim and instigator.

Nur Munawarah Hussain

Faculty Advisor: João Queiroga

Portraits of the people I adore (Photography)

Portraits of the people I adore is an anthology series of portraits that showcase my friends and family in Singapore and Qatar. I wanted to capture them in a way that differs from what they are normally seen by others daily. Through this series of portraits, I want the viewers to imagine how they are like as individuals. Would they be projected like how they are on a regular basis through the photographs? *(Each photo are accompanied with their own description on how I met each individual.)*

I enjoy capturing moments and subjects as a photographer. I believe that a picture can be interpreted in different ways and that there are more to people than what we normally see of them. Hence, I was inspired to do this series with that belief in mind. Through these photographs, I hope the viewers could have their own interpretation. Afterwards, read the descriptions to see how I have known them over the years.

PERFORMANCE PIECES

Xinyuan (Joyce) Pu

Faculty Advisor: Natasha Trethewey & Kira Tucker

***Why Is She Speaking?* (Poetry)**

This poem is a protest. A song. An urgent cry. It inherits the agony of not being able to speak entirely in its mother tongue, but also the freedom to express itself in a state of foreignness that it keeps resisting and reconciling with. This poem is about the process – the bearing/witnessing, the writing, and the speaking up. It's about reclaiming female narratives that are outlawed and silenced and seeking agency in a voyeuristic, exploitative instead of restorative media environment. It refuses to be defined and outgrows itself each time it's going to be heard. It was written at a time of fear and confusion as well as foresight and clarity, and through writing, it shapes into a fearless voice on its own.

This poem would not have been born without the Chinese women who have screamed from the bottom of their hearts. A tribute to Her. And a question that demands an answer from us.

Andy Hartman*Faculty Advisor: Julie Marie Myatt****All-In (Play:Staged Reading)***

This past summer, I had the privilege of working on my project, “Where The 1% Meets The 99%: A Theatrical Exploration Of Income Inequality Through The Unlikely Friendship Between A Driving Instructor And A Student,” with the support of an Undergraduate Research Grant. Over the course of eight weeks, I researched not only what it generally means to be working-class in the United States by reading a variety of academic texts but also how the working-class experience manifests itself in the lives of driving instructors by talking to actual driving instructors. I completed this in hopes of answering: What does income inequality really look like in America? In what ways does income inequality pose a barrier to connection between people in different groups, and how can that barrier be broken, specifically between a driving instructor and their student? I wanted to then write a two-act play that would tackle socioeconomic status in a manner that did not let audiences continue to be passive about this injustice – and I did just that. I was able to complete a draft of a play I was extremely proud of for the way in which it centered the relationship between a driving instructor and student to make a statement about income inequality. No play even remotely similar exists in the canon, and I feel mine is a valuable addition as it synthesizes the in-depth research I did into a theatrical piece that audiences can understand and empathize with, no matter their own financial situation.

While I have performed my whole life, I did not get into playwriting until studying under Professor Myatt; it was in her Introduction to Playwriting class that I realized my passion for creating the stories told on stage rather than just being in them. With my first full-length play, “All-In,” I wanted to write a piece that would feel fresh but also still appeal to an array of audiences. I hoped to craft a play that made people laugh, cry, and question their beliefs as they walked out of the theater. I strove to present ideas to anyone who was willing to listen that were at the same time specific to who I am as a person and applicable to everyone else. Whenever I was having trouble writing, I always went back to my main two characters: driving instructor Carol and high school student Josh. These two are the center of my play and the real reason I believe it has been so well received by those I have shared it with. I tried hard to create very distinct voices for them and ensured that every line they spoke related to whatever they were after. We go to see a play not to see people living comfortably in their everyday lives, but because there is conflict in something they want. I hope I am able to share a scene from my play at the Creative Arts Festival and further spark conversation surrounding how we discuss wealth disparities in this country!

Olivia Yarvis, Yaakov Gottlieb, and Samuel Heller

Faculty Advisor: Brent Huffman

La Casa del Migrante (Documentary)

Piece Description: Inside the seemingly abandoned property at 3200 South Kedzie Avenue in the South Side of Chicago is La Casa del Migrante, a vibrant, bustling home of Mexican immigrant artists seeking to improve their native and local communities through their craft. Over the past four years, the Little Village-based building has become home to both the residents and their benefit concerts which raise funds for their communities in Mexico and Chicago. The documentary short, *La Casa del Migrante*, brings audiences into this community hub as its very existence is threatened after the Chicago Southwest Development Corporation (CSDC) bought the property from the city of Chicago and placed an order of demolition on its residents. CSDC's ultimate goal is to create a community campus and relocate a private hospital to the site, but not everyone in Little Village supports their endeavor. As the conflict continues to escalate, fears rise among community members that the plight of La Casa del Migrante is indicative of a larger wave of gentrification in the region. A story of clashing desires, *La Casa del Migrante* examines the fragility and sanctity of community spaces amid trends of displacement in the South Side.

Artist Statement: At its core, La Casa del Migrante is a human rights story that allows viewers to directly confront the realities of urban displacement. Although our film is Chicago-based, eviction and gentrification are issues that affect communities domestic and foreign, and which require community advocacy. By zooming into a shocking story that likely has not been heard beyond Chicago, we hope our film can give a personalized face to an issue that likely plagues a community close to each of our viewers. We hope that our film will show the immediacy of these issues and prompt audiences to advocate against such injustices happening in their own backyards. In viewing our film, we implore viewers to consider how we as a society, and more specifically how governments and cities, view community spaces. When spaces like Chicago Southwest Development Corporation's campus are installed, whose needs are we prioritizing? Those of the developer or those of the community in which these spaces are introduced? Our film is ultimately of and for the residents of La Casa del Migrante and their loved ones. As our subjects continue to protest in and outside of court, we hope our film will both bring awareness to their mission as a community hub and prompt viewers to reflect on the sanctity of the communities in their lives.

Laurisa Sastoque

Faculty Advisor: Sheila Donohue

Light as He Willed (Short Story)

This performance is an excerpt of my short story “Light as He Willed,” written during the first quarter of the creative writing fiction sequence with Prof. Sheila Donohue. This short story takes place in 2021 Cali, Colombia, during a time when massive protests against the government struck the city. It follows a group of college students from different socioeconomic backgrounds who became friends by chance, but all share a certain disappointment for the future prospects that their city offers them. One night after a particularly heated argument, three of them decide to participate in a major protest, leaving the rest behind in a luxurious apartment. During the protest, the police take Pacho, one of the friends, with them. As Pacho’s family and friends begin to notice his disappearance, the friends once more gather in their usual spot. Together, they try to cope with the night’s events, wondering whether they will see their friend again. Over the course of the story, the characters must come face-to-face with their family issues and their personal challenges. This story gives a peek into the lives of youth in a challenging environment, but it is also filled with vivid descriptions of the setting that remind the reader of our essential connection to our landscape, in spite of the different courses of our lives. This excerpt, which I am proudest of, captures the marvel of Cali’s landscape, while also providing a rendering of the heartbreaking violence that took place in Cali in 2021.

On May 11 of 2021, student leader Lucas Villa was gunned down by the police in Pereira, Colombia. Last year, the entire nation erupted in massive protests after the announcement of a series of reforms from President Iván Duque. The concerns of the protest included a lack of economic advancement, human rights violations, and government negligence. In many of the major cities in Colombia, these protests were met with brutal violence from the police and the army. Many disappeared never to be seen again. As I went to my bed in Evanston, Illinois, sometime in May of last year, I watched videos of the protests, and my heart filled with concern. Not only for my family members, who decided to stay at home but also for my friends whom I knew were attending the protests. It was a question that all the young people were asking themselves. Should we go protest, even though we may not come back? ‘But that’s the very reason we’re protesting,’ a friend said to me over text, ‘so they’ll stop killing us.’ These events inspired me to write a story set in Cali, one of the cities that was struck hardest by the violence. My aim was to capture the sense of hopelessness that many Colombian youth feel to this day, along with the beauty of the people and the land. This inescapable conundrum of violence and beauty is what marked my childhood, and what continues to mark Colombians to this day.

Yanis Cherif

Faculty Advisor: Eddy Borges-Rey

Melodies in Distance: Musicians in a Pandemic (Video Journalism)

This journalistic feature video explains the situation that Qatar's Philharmonic Orchestra (QPO) went through during the COVID-19 pandemic. It highlights the struggles that these artists went through and how they got over their creator's block. This video was motivated by the fact that QPO's artists had an important story to tell that was never covered in Qatar's mass media channels before. The video was entirely shot on an iPhone, which eased the process for easy access to the backstage venue and authentic responses from the musicians. QPO had a difficult last 2 years where they were stuck physically and mentally within the shallowness of their 4 walls. Which makes their success story interesting when one can see the emptiness inside of their hearts - being in the dark about when their next life performance would be. This feature helps creatives around the world how professional artists are able to deal with their creative blocks in the worst possible situations and recover from it in order to keep moving forward.

Samantha Cho

Faculty Advisor: Michelle Huang

Femme, Queer, or Both: Asian American Narratives in the Midwest

This project was inspired by the use of zines—independently published grassroots media covering a range of different topics—in the 1960s and 1970s Asian American student movements that explored “Asian American” identity as a new and developing concept. Zines allowed creators freedom to tell their stories and to protect the privacy of people whose stories are shared. The Asian American experience is often shared through East or West Coast lenses. This zine voices the experiences of Midwest Asian Americans who identify as femme, queer, or both. The 10 interviewees are people who responded to advertisements I sent out to community organizations in 12 Midwestern states. I asked them a series of questions that relate to my broader research question, “How can a diverse collective with distinct histories and cultures form lasting solidarity and connection with each other?” Although interviewees were prompted by pre-planned questions, what each interviewee chose to share and discuss was ultimately left up to them. Each interview lasted about an hour. The cover art was submitted by one of the interviewees. Two questions I heard echoed throughout the interviews were, “How can we as a society and as humans take better care of each other?” and, “How can we balance acknowledging our mutual interests while also honoring our individuality and uniqueness?” This project offers reflections from an Asian American perspective that may help us see ways we can create a society that attempts to answer these questions in an earnest and inclusive way.

I intended for this project to address what I perceived as a void in the Asian American narrative. I also wanted to bring a conversation *to* people, as a way of connecting with each other during the isolation of the pandemic. I hope this project helps to contribute something to the larger discussions of race in America, and to offer insights into how we might find kinship with another again despite the incredibly polarized current political climate in the US. Though this project is meant to honor the femme and queer Midwest Asian American communities and the individuals whose stories and reflections are shared, it only represents a small group of people at a certain time and place and I hope it is seen as part of a much larger movement where new ideas about race and identity are emerging and developing. Readers are encouraged to see themselves as a part of the movement no matter who they are. Identity-focused spaces can sometimes have the effect of making people who do not share that identity feel as if they don’t belong, and so this zine seeks to be as inclusive and welcoming as possible. In this vein, I left lots of space around the text on each page if people would like to write their own responses and reflections alongside ours.

Lalla-Aicha Adouim**“Eyes of *Wahaya*” (Poetry)**

This poem tells the story of Zarqa Al-Yamama, a mythical Arabian woman who had the power to see her enemies approaching a week ahead of time. The work begins with women narrating how this story is a forbidden one, yet they have the power to tell it through song. They then narrate how long ago, in the desert, Zarqa would sit and wait for the enemies of her tribe to approach. When she saw them, she would warn her people, eventually her enemies began to hide behind trees as they moved in order to hide themselves from her gaze. Again, she warned her people, but they did not listen, and as a result were all murdered. Zarqa herself had her eyes torn from her and was then crucified, however her spirit lives on through the earth.

Most literature taught in the United States derives from Christianity and the stories of the Bible, with very clear Christian influences. I sought out to bring light to the stories of my culture, of Arabia, and took inspiration from the myth of Zarqa Al-Yamama. While the story in my poem follows nearly exactly, I expanded on the ending so that she wasn't just another forgotten murdered woman in history, rather that her legacy lives on somehow, through the earth and through memory. My version of the story focuses more on her power rather than the terror of her enemies and the stupidity of the men around her. Like old medieval texts, I sought to make religious references to Islam, mainly through the use of language. The poem is littered with Arabic words, done to create a clear distinction between other religiously inspired texts such as *Paradise Lost*. Words such as *wahaya* are meant to highlight the language, but also add meaning. *Wahaya*, for example means oracle, emphasizing the power that Zarqa has. *Dum* translates to blood, but its pronunciation is similar to “doom,” and invokes that same environment.

Abdullah Imran

Faculty Advisor: Joao Queitoga

Against All Odds (Short Film)

A docufictional short film about early life of Malala Yousafzai and her fight against the terrorism in Pakistan and Education for all. Malala Yousafzai was awarded the Nobel Peace Prize for her fight for the right of every child to receive an education. She was born in the Swat Valley in Pakistan. When the Islamic Taliban movement took control of the valley in 2008, girls' schools were burned down. It was not long before the Taliban threatened her life. In 2012, Malala was shot in the head on a school bus by a Taliban gunman. In October 2014, Malala, along with Indian children's rights activist Kailash Satyarthi, was named a Nobel Peace Prize winner. Thus, the film tells her early life story and her fight for education and Taliban.

Moyana Olivia

Faculty Advisor: Patrice Michaels

***Toonana Mangwana*, or, “We’ll See Each Other Tomorrow” (Original Music)**

This performance consists of two original compositions. Moyana Olivia wrote the first, “Missing You,” in Fall of 2020. The meaning of this song has developed along with Olivia’s lived experiences. Initially about a high school relationship, the song now encompasses questions of how to navigate the grief and loss caused by the pandemic. There are many versions of this song, from acoustic to punk rock. These shifts in instrumentation allow for varied emotional expression. The rhythmic piano of this ballad arrangement engenders feelings of contemplation and longing, as if one is calling out for someone who they know cannot hear them. Moyana Olivia wrote the second piece, “Gogo’s Lullaby,” in Winter of 2021 for a composition course assignment. The piece originates from an acapella recording of the voice of Olivia’s grandmother, found within the archives of a family group chat. The text comes from a traditional hymn. Olivia composed the instrumentation around the recording, adding harmonies and embellishments from acoustic and electric guitar. While Olivia added production effects such as reverb to the orchestral elements, the original recording remains unedited, just as one would preserve an archival document. Therefore, this project serves as a combination of Olivia’s interests in Musicology and performance.

Toonana Mangwana means “We’ll See Each Other Tomorrow” in Shona. This is the language spoken in Zimbabwe where my maternal grandmother lived. Her influence remains present in my life—even the name “Moyana Olivia” comes from her. My grandmother, who I called Gogo, was an educator, a mentor, and a leader. She died of COVID-19 in January of 2021. The culture of the United States, as well as our university, pushes each of us to move forward despite the massive losses that we have experienced throughout the pandemic. Through music, I can create space for myself and others to pause and grieve the loved ones and experiences that we have lost. For example, my mother remains the top listener for “Missing You,” repeating it for hours as she moves throughout her day. This attests to music’s ability to allow us to process our emotions, even just three minutes at a time. When someone passes away in Black communities, it is common to say that they have transitioned. This challenges the idea that death represents finality. Similarly, I say “toonana mangwana” as opposed to “goodbye” because I feel that my grandmother is still with me. Although the knowledge that we will not meet in person again causes me to cry out to her in songs like “Missing You,” her presence is memorialized through recordings such as “Gogo’s Lullaby.” With each performance, she is brought into the present with me. Thus, we could very well see each other tomorrow.