

Northwestern

Undergraduate

**RESEARCH
& ARTS**

Exposition

MAY 29TH, 2019

TAKE THE LEAD IN YOUR EDUCATION!

THE OFFICE OF UNDERGRADUATE RESEARCH
OFFERS MANY OPPORTUNITIES TO GET INVOLVED:



Undergraduate Research Assistant Program

Assist faculty members on their research while learning the ropes yourself - learn how the process works!

Summer Undergraduate Research Grants

Get paid to do a research or creative project of your choice - a great way to develop your own ideas & interests!

Academic Year Undergraduate Research Grants

Money for research expenses for your research or creative project - expand your project in new and exciting ways!

Conference Travel Grants

Present your research or creative project at national or international conferences - meet the experts in your field, and show what you know!

UndergradResearch.Northwestern.edu/OUR

Northwestern

OFFICE OF

UNDERGRADUATE RESEARCH

Dear Members of the Northwestern Community:

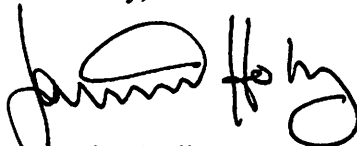
In the 2018-19 academic year, the Office of Undergraduate Research (OUR) has awarded funding to over 600 students; a majority of these students engaged in independent research and creative projects where they learned project management skills that will support their post-college aspirations. Students learned how to explore a topic of significant interest in-depth: first, they learned to collect and interpret scholarly literature to frame a rationale around their research question, supported by expertise from faculty experts (inside and outside the university) to determine what gaps in their field of study needed to be filled. Next, they learned how to develop a project and methodology that could potentially fill that gap, wrestling with the real-world limitations of time and their current skill level. They either worked directly with faculty on their research, or students learned how to write a competitive grant proposal (ultimately reviewed by multiple faculty across a range of disciplines) with iterative revisions based on feedback from faculty sponsors and OUR advisors. Once awarded, students learned that life rarely goes according to plan, even if the plan was meticulously constructed with expert advice. Consequently, they adjusted and revised their projects, learned to be creative and determined, and showed grit and imaginative resourcefulness. Finally, they learned to analyze and draw conclusions from their results and relevant findings. Many students rendered what they learned into posters and presentations for this event to share their new knowledge with the broader world, whatever that may be. Since many of our students are artists, they will be sharing their work at this evening's Creative Arts Showcase.

We hope that in the process they discover magnificent things, but we know that the true value is in the experience itself. Confident in the process of knowledge acquisition, curated by thinking in terms of questions and *how* to answer them (instead of existing answers), students are now more prepared for the life ahead of them, whether that be graduate school, industry, non-profit work, creative artistry, or entrepreneurship. It is this process that makes undergraduate research such a high impact practice, and it is our emphasis on helping students to gain this experience that makes Northwestern an innovative and leading voice in this field.

Northwestern has a long tradition of supporting student research in research group/lab environments. However, outside of these environs, there was no clear path for students to engage in research. OUR was created to build a parallel infrastructure of support in non-research group environments, seeking to enable and encourage students in all fields to pursue research. Northwestern is now a leader in supporting and funding students in all disciplines, and the results of this high impact practice on these students' lives is tremendous.

The Undergraduate Research and Arts Exposition, in many ways, serves as a culmination of all of these efforts, where students can showcase their work and share their new and innovative ideas. We hope you enjoy interacting with these tremendous students, who we feel can tell their own story far better than we can.

Sincerely,



Jonathan Holloway
Provost

2019 Program Front Cover Design
By
Phoebe Glowacki
School of Education & Social Policy, Class of 2019

The 2019 Undergraduate Research and Arts Exposition

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

In conjunction with Chicago Area High School students
and teachers participating in the NU High School
Project Showcase

Wednesday May 29, 2019

Norris University Center and
Wirtz Black Box 101



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Program of Events

Wednesday May 29, 2019

- 10:00-11:30 AM **Northwestern University Poster Session One**
Louis Room (205)
- 11:00-12:30 AM **Northwestern University Oral Presentation Session One**
Lake Room (203), Arch Room (206), Rock Room (207),
Armadillo Room (208)
- 1:00-2:30 PM **Northwestern University Oral Presentation Session Two**
Lake Room (203), Arch Room (206), Rock Room (207),
Armadillo Room (208)
- 1:30-2:40 PM **NU High School Project Showcase Poster Session**
Wildcat Room (101), Big Ten Room (104)
- 2:30-4:00 PM **Northwestern University Poster Session Two**
Louis Room (205)
- 8:00-9:30 PM **Creative Arts Festival**
Wirtz Black Box 101
- 9:30-10:30 PM **Post-Show Reception**, Open to all presenters and attendees
Outside Wirtz Black Box 101

Office of Undergraduate Research Advisory Council

Neal Blair, Professor, McCormick School of Engineering and Applied Science, Chair of the
Undergraduate Research Grant committee

Christian Bourdon, Student Representative, Arts and Humanities

Andrew Cao, Student Representative, Northwestern Undergraduate Research Journal

Eileen Chen, Student Representative, TedX

Ryan Dohoney, Assistant Professor, Bienen School of Music

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

Rebecca Fudge, Student Representative, Natural Sciences

Bill Haarlow, Director, Weinberg College – Admission Relations

Jiaxing Huang, Associate Professor, McCormick School of Engineering and Applied Science

Michelle Jorwic-Carr, Advisor, Athletics

Fidak Kahn, Student Representative, Chicago Area Undergraduate Research Symposium

Elizabeth Lance, Research Administrator, NU-Q

Megan Lee, Student Representative, TedX

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

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

Beth Osterlund, Program Coordinator, Office of Global Safety and Security

Beth Pardoe, Director, Office of Fellowships

Megan Powell, Program Coordinator, School of Professional Studies

Ken Powers, Advisor, School of Education and Social Policy

Jane Rankin, Associate Dean, School of Communication

Miriam Sherin, Associate Provost for Undergraduate Education

Jordyn Ricard, Student Representative, Social Sciences

Sky Patterson, Student Representative, Northwestern University Associated Student Government



Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta, Director

Megan Wood, Assistant Director

Tori Larsen, Advisor & Student Outreach Coordinator

Bryce O'Tierney, Administration

Evangeline Su, Advisor & Science Research Workshop Coordinator



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 (gro.northwestern.edu). 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 (northwestern.edu/fellowships) can help students identify these external opportunities.

Office of Undergraduate Research Programs

Academic Year Undergraduate Research Grants (AY URG):

undergradresearch.northwestern.edu/ayurg

Summer Undergraduate Research Grants (Summer URG):

undergradresearch.northwestern.edu/summerurg

Undergraduate Research Assistant Program (Academic Year and Summer):

undergradresearch.northwestern.edu/urap

Conference Travel Grants:

undergradresearch.northwestern.edu/ctg

Undergraduate Language Grants:

undergradresearch.northwestern.edu/ulg

Circumnavigators Travel-Study Grant:

undergradresearch.northwestern.edu/circumnavigators

Other University-Wide Programs and Resources

Center for Global Engagement: gesi.northwestern.edu/apply/application

Global Research Opportunities: gro.northwestern.edu

Institute for Policy Research: northwestern.edu/ipr/ugradresearch.html

Northwestern Scholars: scholars.northwestern.edu

Office of International Program Development: ipd.northwestern.edu/fellowships/index.html

Weinberg College of Arts and Sciences

African Studies: africanstudies.northwestern.edu/undergraduate/funding.html

Anthropology: anthropology.northwestern.edu/about/labs.html

Astrophysics: ciera.northwestern.edu/Education/REU

Biochemistry-Morimoto Laboratory Undergraduate Research Seminars:

groups.molbiosci.northwestern.edu/morimoto/morimotolab/murs.html

Guide to Undergraduate Research Programs at Northwestern University, *continued*

Biological Sciences: biosci.northwestern.edu/undergraduate/research.html

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

Chicago Field Studies Program: wcas.northwestern.edu/cfs

History: Leopold Fellows of the Center for Historical Studies:
historicalstudies.northwestern.edu/leopold-fellows

Mathematics: math.northwestern.edu/undergraduate/research-internships-study-abroad

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

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

Psychology: psychology.northwestern.edu/undergraduate/research

School of Communications

Film & Theatre Projects: Rick Morris (r-morris@northwestern.edu)

Undergraduate Research Grants and Fellowships:
Jane Rankin (j-rankin@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:

chem-biol-eng.northwestern.edu/undergraduate/current/research/index.html

Electrical Engineering and Computer Science:

eecs.northwestern.edu/2013-09-03-20-01-56/undergraduate-research

International Institute For Nanotechnology: iinano.org/northwestern-university-nanotechnology-reu

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

McCormick Office of Corporate Relations, Corporate Partner Undergraduate Research Grants: mccormick.northwestern.edu/companies/index.html

McCormick Opportunities: mccormick.northwestern.edu/undergraduates/research/index.html

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

Undergraduate Awards: undergraduateawards.com

Publish Your Research

Northwestern Undergraduate Research Journal: thenurj.com

Nanoscape (Journal of Undergraduate Research in Nanoscience): nanoscape.northwestern.edu

Directory of Undergraduate Research Journals (UNC Office for Undergraduate Research):
our.unc.edu/students/conducting-research/get-published/

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: northwestern.edu/fellowships/fellowships-by-award-type/tuition-support/index.html

Directory of Northwestern Student Presenters

Last Name	First Name	Session	Time	Location
Agarwal	Avrati	Morning Poster Session	10-11:30am	Louis Room - 31
Ajith	Ankita	Afternoon Poster Session	2:30-4pm	Louis Room - 60
Alamgir	Azmain	Morning Poster Session	10-11:30am	Louis Room - 32
Alaoui	Ömer	Oral Presentation Session Two	1-2:30pm	Lake Room
Al-Jahni	Hassan	Morning Poster Session	10-11:30am	Louis Room - 11
Allen-Niesen	Kelsey	Oral Presentation Session One	11-12:30pm	Armadillo Room
Almeida	Cesar	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Ansari	Sana	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Bal	Simran	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Bangura	Nadalyn	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Baran	Jacob	Morning Poster Session	10-11:30am	Louis Room - 38
Belson	Robert	Morning Poster Session	10-11:30am	Louis Room - 50
Bernett	Amanda	Afternoon Poster Session	2:30-4pm	Louis Room - 59
Beth	Eliza	Afternoon Poster Session	2:30-4pm	Louis Room - 66
Bisaga	Karol	Morning Poster Session	10-11:30am	Louis Room - 41
Bloch	Agneska	Oral Presentation Session One	11-12:30pm	Rock Room
Borgula	Isabella	Afternoon Poster Session	2:30-4pm	Louis Room - 97
Borland	Julia	Morning Poster Session	10-11:30am	Louis Room - 16
Borys	Nell	Afternoon Poster Session	2:30-4pm	Louis Room - 104
Brady	Mari	Morning Poster Session	10-11:30am	Louis Room - 45
Brieva	Tess	Morning Poster Session	10-11:30am	Louis Room - 27
Brooks	Jeremy	Oral Presentation Session One	11-12:30pm	Arch Room
Bugos	Claire	Oral Presentation Session Two	1-2:30pm	Lake Room
Buresch	Samantha	Afternoon Poster Session	2:30-4pm	Louis Room - 83
Callahan	Danny	Morning Poster Session	10-11:30am	Louis Room - 53
Carvalho	Keyla	Morning Poster Session	10-11:30am	Louis Room - 4
Casanova	Orazio	Afternoon Poster Session	2:30-4pm	Louis Room - 105
Cetrone	Hollyn	Oral Presentation Session One	11-12:30pm	Lake Room
Chanti	Alessandra	Oral Presentation Session One	11-12:30pm	Armadillo Room
Charendoff	Ruthie	Morning Poster Session	10-11:30am	Louis Room - 23
Chatterton	Courtney	Oral Presentation Session Two	1-2:30pm	Rock Room
Chen	Angie	Morning Poster Session	10-11:30am	Louis Room - 29
Chen	Vivian	Morning Poster Session	10-11:30am	Louis Room - 56
Chen	Sophie	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Chi	Yiran	Oral Presentation Session One	11-12:30pm	Armadillo Room
Choe	June	Oral Presentation Session Two	1-2:30pm	Rock Room
Coirier	Nathan	Morning Poster Session	10-11:30am	Louis Room - 56

Undergraduate Research and Arts Exposition 2

Collins	Jessica	Afternoon Poster Session	2:30-4pm	Louis Room - 70
Considine	Meghan Clare	Oral Presentation Session One	11-12:30pm	Armadillo Room
Conte	Katherine	Afternoon Poster Session	2:30-4pm	Louis Room - 72
Corrigan	Madeline	Afternoon Poster Session	2:30-4pm	Louis Room - 101
Costakis	Charles	Afternoon Poster Session	2:30-4pm	Louis Room - 88
Covey	Rae	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Cummings	Joseph	Morning Poster Session	10-11:30am	Louis Room - 39
Curtis	Jake	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Dasani	Div	Afternoon Poster Session	2:30-4pm	Louis Room - 91
Davis	Mandy	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Dinegar	Sarah	Oral Presentation Session Two	1-2:30pm	Rock Room
Dravid	Avi	Morning Poster Session	10-11:30am	Louis Room - 30
Duncker	Katherine	Afternoon Poster Session	2:30-4pm	Louis Room - 99
Emery	Amelia	Oral Presentation Session One	11-12:30pm	Lake Room
Epstein	Rachel	Afternoon Poster Session	2:30-4pm	Louis Room - 81
Essid	Maha	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Farkas	Alana	Oral Presentation Session One	11-12:30pm	Rock Room
Fields	Kelsey	Morning Poster Session	10-11:30am	Louis Room - 44
Foo	Christina	Afternoon Poster Session	2:30-4pm	Louis Room - 62
Fricton	Regina	Morning Poster Session	10-11:30am	Louis Room - 49
Glenn	Maya	Oral Presentation Session Two	1-2:30pm	Lake Room
Gordon	Shari	Afternoon Poster Session	2:30-4pm	Louis Room - 63
Grabowski	Aleksandra	Morning Poster Session	10-11:30am	Louis Room - 1
Gray	Robert	Morning Poster Session	10-11:30am	Louis Room - 38
Grimm	Charlotte	Morning Poster Session	10-11:30am	Louis Room - 7
Gutierrez	Pallas	Afternoon Poster Session	2:30-4pm	Louis Room - 80
Haddad	Helena	Morning Poster Session	10-11:30am	Louis Room - 37
Haile	Katherine	Morning Poster Session	10-11:30am	Louis Room - 43
Hilburger	Claire	Oral Presentation Session One	11-12:30pm	Arch Room
Holland	Chris	Morning Poster Session	10-11:30am	Louis Room - 53
Hong	Maddie	Afternoon Poster Session	2:30-4pm	Louis Room - 77
Hsu	Monica	Morning Poster Session	10-11:30am	Louis Room - 20
Hu	Sean	Morning Poster Session	10-11:30am	Louis Room - 52
Huang	Irina	Oral Presentation Session One	11-12:30pm	Lake Room
Hussain	Nur	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Hwang	Christine	Afternoon Poster Session	2:30-4pm	Louis Room - 63
Ingersoll	Brian	Morning Poster Session	10-11:30am	Louis Room - 5
Jedziniak	Annamarie	Afternoon Poster Session	2:30-4pm	Louis Room - 61
Jenz	Sophia	Morning Poster Session	10-11:30am	Louis Room - 54
Johnson	Gina	Afternoon Poster Session	2:30-4pm	Louis Room - 95
Johnson	Stephen	Afternoon Poster Session	2:30-4pm	Louis Room - 107

Undergraduate Research and Arts Exposition 3

Johnson	Alexandra	Oral Presentation Session One	11-12:30pm	Arch Room
Johnstone	Rachel	Oral Presentation Session One	11-12:30pm	Lake Room
Justice	Che	Morning Poster Session	10-11:30am	Louis Room - 8
Khan	Faraz	Afternoon Poster Session	2:30-4pm	Louis Room - 93
Kim	Seongsik	Morning Poster Session	10-11:30am	Louis Room - 25
Kim	Samuel	Morning Poster Session	10-11:30am	Louis Room - 51
Kurylo	Ulyana	Morning Poster Session	10-11:30am	Louis Room - 55
Leary	Erin	Oral Presentation Session Two	1-2:30pm	Rock Room
Lee	Annie	Morning Poster Session	10-11:30am	Louis Room - 3
Leslie	Kelsey-Ann	Oral Presentation Session Two	1-2:30pm	Arch Room
Levin	Jason	Morning Poster Session	10-11:30am	Louis Room - 13
Lewittes	Dani	Afternoon Poster Session	2:30-4pm	Louis Room - 90
Lin	Keldon	Morning Poster Session	10-11:30am	Louis Room - 17
Lin	Patrick	Morning Poster Session	10-11:30am	Louis Room - 21
Liou	Nicholas	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Littman	Erica	Afternoon Poster Session	2:30-4pm	Louis Room - 92
Lo	Katherine	Oral Presentation Session One	11-12:30pm	Rock Room
Loesberg	Lauren	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Loman	Tyus	Oral Presentation Session Two	1-2:30pm	Arch Room
Lombard	Ella	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Lucas	Madeleine	Oral Presentation Session Two	1-2:30pm	Arch Room
Luo	Wendy	Morning Poster Session	10-11:30am	Louis Room - 57
Martinez	Jennifer	Morning Poster Session	10-11:30am	Louis Room - 15
McDougald	Sarah	Oral Presentation Session One	11-12:30pm	Arch Room
McManus	Nicolette	Morning Poster Session	10-11:30am	Louis Room - 46
Medina	Ennely	Afternoon Poster Session	2:30-4pm	Louis Room - 67
Meyerhoff	Emma	Morning Poster Session	10-11:30am	Louis Room - 9
Millman	Ryan	Afternoon Poster Session	2:30-4pm	Louis Room - 82
Minor	Imani	Afternoon Poster Session	2:30-4pm	Louis Room - 69
Montoya	Michael	Afternoon Poster Session	2:30-4pm	Louis Room - 102
Montoya	Ryne	Afternoon Poster Session	2:30-4pm	Louis Room - 102
Morfis	Zoe	Oral Presentation Session One	11-12:30pm	Armadillo Room
Murthy	Prianka	Morning Poster Session	10-11:30am	Louis Room - 22
Neubert	Sarah	Morning Poster Session	10-11:30am	Louis Room - 24
Nutter	Kira	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Oberman	Samantha	Oral Presentation Session One	11-12:30pm	Rock Room
Owens	Brittany	Oral Presentation Session One	11-12:30pm	Rock Room
Ozsan	Alara	Afternoon Poster Session	2:30-4pm	Louis Room - 58
Padilla	Dayanara	Afternoon Poster Session	2:30-4pm	Louis Room - 65
Pahutski	Bill	Oral Presentation Session Two	1-2:30pm	Rock Room
Park	Grace	Morning Poster Session	10-11:30am	Louis Room - 36

Undergraduate Research and Arts Exposition 4

Parker	Mary	Afternoon Poster Session	2:30-4pm	Louis Room - 78
Pashankar	Neha	Afternoon Poster Session	2:30-4pm	Louis Room - 103
Patel	CJ	Morning Poster Session	10-11:30am	Louis Room - 33
Patnaude	Emily	Oral Presentation Session One	11-12:30pm	Arch Room
Pearl	Harrison	Afternoon Poster Session	2:30-4pm	Louis Room - 96
Peters	Daniel	Oral Presentation Session Two	1-2:30pm	Arch Room
Phua	Wan	Afternoon Poster Session	2:30-4pm	Louis Room - 108
Pritchard	Olivia	Morning Poster Session	10-11:30am	Louis Room - 47
Przybyl	Kasia	Morning Poster Session	10-11:30am	Louis Room - 54
Puleo	Peter	Afternoon Poster Session	2:30-4pm	Louis Room - 106
Raeder	Henry	Oral Presentation Session Two	1-2:30pm	Arch Room
Reddy	Grishma	Morning Poster Session	10-11:30am	Louis Room - 10
Riedel	Katherine	Afternoon Poster Session	2:30-4pm	Louis Room - 107
Rinne	Nicole	Afternoon Poster Session	2:30-4pm	Louis Room - 79
Rowghani	Kimberly	Morning Poster Session	10-11:30am	Louis Room - 18
Saltzberg	Joshua	Morning Poster Session	10-11:30am	Louis Room - 40
Saltzer	Sara	Oral Presentation Session Two	1-2:30pm	Lake Room
Sanabria	Juan	Afternoon Poster Session	2:30-4pm	Louis Room - 98
Saraiva	Augusta	Morning Poster Session	10-11:30am	Louis Room - 4
Schaack	Alice	Morning Poster Session	10-11:30am	Louis Room - 28
Schauer	Elizabeth	Morning Poster Session	10-11:30am	Louis Room - 35
Scott	Sloane	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Shah	Abhishek	Oral Presentation Session Two	1-2:30pm	Lake Room
Shehata	Christina	Oral Presentation Session One	11-12:30pm	Arch Room
Shenkman	Julia	Afternoon Poster Session	2:30-4pm	Louis Room - 71
Siddiqui	Sharmain	Morning Poster Session	10-11:30am	Louis Room - 26
Silver	Jamilah	Morning Poster Session	10-11:30am	Louis Room - 12
Skula	Courtney	Afternoon Poster Session	2:30-4pm	Louis Room - 64
Slowing	Valerie	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Snyder	Allyson	Morning Poster Session	10-11:30am	Louis Room - 2
So	Rachel	Morning Poster Session	10-11:30am	Louis Room - 48
Stark	Charles	Afternoon Poster Session	2:30-4pm	Louis Room - 89
Su	Katherine	Morning Poster Session	10-11:30am	Louis Room - 42
Thompson-Vasquez	Jennah	Morning Poster Session	10-11:30am	Louis Room - 14
Tolani	Serena	Morning Poster Session	10-11:30am	Louis Room - 53
Turkoglu	Deniz	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Valdez	Katia	Afternoon Poster Session	2:30-4pm	Louis Room - 73
VanTine	Kristen	Afternoon Poster Session	2:30-4pm	Louis Room - 74
Velazquez	Diana	Morning Poster Session	10-11:30am	Louis Room - 34
Walker	Catherine	Afternoon Poster Session	2:30-4pm	Louis Room - 87
Wallace	Avery	Afternoon Poster Session	2:30-4pm	Louis Room - 86

Undergraduate Research and Arts Exposition 5

Wang	Larry	Afternoon Poster Session	2:30-4pm	Louis Room - 100
Watts	Adam	Afternoon Poster Session	2:30-4pm	Louis Room - 85
Waxman	Talia	Afternoon Poster Session	2:30-4pm	Louis Room - 84
Weed	Mia	Morning Poster Session	10-11:30am	Louis Room - 19
Weston	Nathan	Morning Poster Session	10-11:30am	Louis Room - 53
Wilmouth	Carson	Oral Presentation Session One	11-12:30pm	Arch Room
Wirjawan	Gibran	Creative Arts Festival	8:00pm	Wirtz Black Box 101
Wong	Sophia	Afternoon Poster Session	2:30-4pm	Louis Room - 101
Worsfold	Fiona	Afternoon Poster Session	2:30-4pm	Louis Room - 94
Wuorinen	Lydia	Afternoon Poster Session	2:30-4pm	Louis Room - 76
Yang	Yufan	Oral Presentation Session Two	1-2:30pm	Arch Room
Yi	Hannah	Afternoon Poster Session	2:30-4pm	Louis Room - 68
You	Jun Kyung	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Zajac	Laura	Afternoon Poster Session	2:30-4pm	Louis Room - 75
Zola	Anne	Oral Presentation Session One	11-12:30pm	Lake Room
Zuckert	Carlyn	Morning Poster Session	10-11:30am	Louis Room - 6

∞ Guide to Poster Presentations

Poster Session One

10:00-11:30, Louis Room (205)

Humanities, Social Sciences, & Journalism

1. **Aleksandra Grabowski**, “Decolonizing Digging? Critical Approaches for Contemporary Archaeologies”
2. **Allyson Snyder**, “Preschoolers’ Creativity During STEM Play”
3. **Annie Lee**, “Interlocutor Identity and Proactive Control During Language Production”
4. **Augusta Saraiva and Keyla Carvalho**, “Spanish Speakers’ Perceptions and Performance When Learning Portuguese”
5. **Brian Ingersoll**, “Micromanaging Nature: Navigating Between Policy and Practice in Chicago Parks”
6. **Carlyn Zuckert**, “Organized for Harassment: Sexual Harassment Risk Factors and Organizational Configuration”
7. **Charlotte Grimm**, “Cognitive Fatigue and Ability to Regulate Eating Behavior”
8. **Che Justice**, “Effects of Verb-Definite Description Pairings on Acceptability in Frequency Adjective and Weak Definite Constructions”
9. **Emma Meyerhoff**, “An Exploration of the Instagram Body Positivity Movement”
10. **Grishma Reddy**, “Perceptual Illusion Performance in Non-Clinical Psychosis”
11. **Hassan Al-Jahni**, “Qatar’s Museum Landscape: A 12-Month Launch Campaign”
12. **Jamilah Silver**, “Examining Early Childhood Profiles that Reliably Differentiate Young Children at Highest Risk for Depression”
13. **Jason Levin**, “Cardiometabolic Risk as a Mediator Between Positive Affect and Memory”
14. **Jannah Thompson-Vasquez**, “The Allure of the Market: Navigating Indigeneity, Identity, and Inequality in the Bolivian Amazon”
15. **Jennifer Martinez**, “Examining the Downstream Effects of Sense of Belonging on Black Medical Students’ Psychological Well-Being”
16. **Julia Borland**, “A Comparison of Mother-Preschooler Book Reading Practices in Thailand and the United States”
17. **Keldon Lin**, “Controversial Topics Increase Skepticism of Data Visualizations”
18. **Kimberly Rowghani**, “Facial Expressivity in Non-Clinical Psychosis”
19. **Mia Weed**, “Gender Norm Consistency and Women’s STEM Engagement”
20. **Monica Hsu**, “Under Pressure: College Women in Sports”
21. **Patrick Lin**, “Challenges in Adjective Learning: An Investigation of how to Improve Adjective-Property Mappings in Children and Adults”
22. **Prianka Murthy**, “Racial Differences in Narrative Meaning-Making Based on Hardiness”
23. **Ruthie Charendoff**, “The Sexual Health of Modern Orthodox Jewish Women”
24. **Sarah Neubert**, “Understanding the Experiences and Triggers of Binge Eating and Obesity to Inform the Design of a Mobile Intervention”
25. **Seongsik Kim**, “Developing Measures of Human Autonomy in Relation to Assistive Agents”
26. **Sharmain Siddiqui**, “Unani Tibb as Resistance: Bodily Practice at the Intersection of Colonial and Postcolonial Systems of Power”
27. **Tess Brieva**, “Aspirational Careers and Representation: Is Numeric Representation of Collective Identity Important for Aspirational Career Choice Among Middle School Students?”

Poster Session One, *continued*

Natural Sciences & Engineering

28. **Alice Schaack**, “Acute Stress Alters Social Behavior in a Sex and Strain-specific Manner and Increases Aggression in Male Rats of a Genetically Stress-Reactive Strain”
29. **Angie Chen**, “Spoken Discourse Impairments in Vascular Cognitive Impairment (VCI)”
30. **Avi Dravid**, “Hygrosensation in the Fruit Fly *Drosophila*: Examining the Role of Sacculus Structure and the Hygroreceptor IR40a in Humidity Preference”
31. **Avrati Agarwal**, “Synthesizing Biomimetic Polymers using Photopolymerization”
32. **Azmain Alamgir**, “Label-Free Platform for High-Throughput Analysis of Analytes using SAMDI-MS”
33. **CJ Patel**, “The Role of Dop in Hedgehog Signaling in *Drosophila melanogaster*”
34. **Diana Velazquez**, “Comparing Aliphatic and Aromatic Content as a Function of Soil Depth across the Critical Zone Observatories”
35. **Elizabeth Schauer**, “Investigating soluble split-TEV protease to create new tools for synthetic protein circuits”
36. **Grace Park**, “Identifying Genetic Determinants of Avermectin Resistance in *Caenorhabditis elegans*”
37. **Helena Haddad**, “Assessment of pancreatic islet PEGylation for mitigating coagulation and complement activation upon transplantation”
38. **Jacob Baran & Robert Gray**, “Room Temperature MWIR Free Space Optical Communication System”
39. **Joseph Cummings**, “CLARK: Towards an Appraisal Based Model Exploring the Role of Context in Identifying Emotion in Conversation”
40. **Joshua Saltzberg**, “Engineering a Light-Responsive DNA Polymerase for Data Encoding”
41. **Karol Bisaga**, “Identifying the mechanisms of genetic interactions that impact *C. elegans* bleomycin response”
42. **Katherine Su**, “Chemical vapor deposition of large-area uniform monolayer molybdenum disulfide on soda-lime glass”
43. **Katherine Haile**, “Unusual coastal mangroves decoupled from marine tidal forcing: Yucatan Peninsula, Mexico”
44. **Kelsey Fields**, “Influence of Aging and Autoclave Sterilization on Mechanics of Silicone-Elastomers for Biomedical Wearable Devices”
45. **Mari Brady**, “The Role of the Super Elongation Complex in Epidermal Progenitor Maintenance”
46. **Nicolette McManus**, “The Impact of Habitat Degradation on the Gastrointestinal Microbiota of Black-and-White-Ruffed Lemurs (*Varecia Variegata Variegata*)”
47. **Olivia Pritchard**, “Catalytic ring-closing reactions of gold compounds containing bis(phosphino)ferrocene ligands”
48. **Rachel So**, “Soil and Sediment Carbonate Quantification by Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS)”
49. **Regina Fricton**, “ECM Proteins of Cortical and Medullary Ovarian Stromal Cells”
50. **Robert Belson**, “Examining Inflight Wi-Fi Performance”
51. **Samuel Kim**, “Effect of Colloidal Particles on a Drop”
52. **Sean Hu**, “Elucidating the Impact of Traceless Conjugation Chemistry on the Immunostimulatory Efficacy of Protein Spherical Nucleic Acids”
53. **Serena Tolani, Nathan Weston, Chris Holland, & Danny Callahan**, “Behavioral Contrast Threshold Detection in Mice with Intrinsically-photosensitive Retinal Ganglion Cells Subpopulations Ablated”
54. **Sophia Jenz and Kasia Przybyl**, “Prior Stress and Fear Conditioning Intensity Interact to Generate Sex-, and Strain- Specific Enhanced or Attenuated Fear Memory”

55. **Ulyana Kurylo**, “Computational Model of Gaze”
56. **Vivian Chen and Nathan Coirier**, “An Overview of Semiconductor Laser and Photodetector Technologies and their Application Towards the Detection of Art Forgery”
57. **Wendy Luo**, “Circadian Rhythm Disruption in Maternal Behavior Concomitant with Decreased Expression of Vasopressin Signaling and Litter Survival in a Genetic Rat Model of Depression”

Poster Session Two

2:30-4:00, Louis Room (205)

Humanities, Social Sciences, & Journalism

58. **Alara Ozsan**, “Exploring the Psychosis Continuum: Reward Processing in Non-Clinical Psychosis”
59. **Amanda Bernett**, “Self-Management Education to Reduce Frailty in Older Adults”
60. **Ankita Ajith**, “Project Thea: Morocco, an examination of female entrepreneurship”
61. **Annamarie Jedziniak**, “The Effects of Photography on Facial Reconstructive Plastic Surgery Between the 19th and 20th Century”
62. **Christina Foo**, ““There’s not many people who are willing to stand up these days”: Racial Counternarratives in Middle Childhood”
63. **Christine Hwang and Shari Gordon**, “The Role of Resistance: Black Adolescent Girls’ Reports and Responses to Discrimination and links to Mental Health”
64. **Courtney Skula**, “Mansplaining and Classroom Discourse: Interruptions and STEM Learning”
65. **Dayanara Padilla**, ““There’s Racist People Out There, Like Donald Trump”: Children’s Spontaneous Reflections on Current Politics”
66. **Eliza Beth**, “Challenging the Objectives of Sex Education: Themes of Pleasure and Desire in Comprehensive Sex Education Curricula”
67. **Ennely Medina**, “Preserving Best Interests: Unaccompanied Minors in Detention”
68. **Hannah Yi**, “Too distracted to listen? Investigating how young and older adults allocate attention to understand speech while multitasking”
69. **Imani Minor**, ““You’re pretty for a dark skin”: Rejecting and Endorsing Colorism in an All-Black, All-Girls High School”
70. **Jessica Collins**, “Constructing Successful Citizens: The EU, Erasmus+, and the Reproduction of Class”
71. **Julia Shenkman**, “Redefining the Borders of Medical Tourism: Navigating Healthcare in an Evolving Local Knowledge System”
72. **Katherine Conte**, “Impact of Political Candidates on Voter Engagement in Chicago Aldermanic Elections, 2003-2019.”
73. **Katia Valdez**, “Gesture Performance in a Sample of Clinical High-Risk Individuals”
74. **Kristen VanTine**, “The Calculative Mindset and the Propensity to Dehumanize Others”
75. **Laura Zajac**, “Learning from Whom and from What? How Performance Feedback Affects the Diffusion of New Practices”
76. **Lydia Wuorinen**, “Understandability and Title IX Compliance at the Undergraduate Level”
77. **Maddie Hong**, “Haptic Memories and Visualities in Film: How Films Touch and Feel”
78. **Mary Parker**, ““It’s Not Just, ‘Hey Cookie, Let’s Go Out.’ It’s More Like Being Shoved Against the Wall.” A Qualitative Exploration of Mechanisms of Sex Segregation in Fine-Dining Restaurants in Chicago”
79. **Nicole Rinne**, “Examining Conversation Breakdowns in Parkinson’s Disease Versus Alzheimer’s Dementia”

80. **Pallas Gutierrez**, “In the World We Manifested: Homonormativity, Gender Roles, and Sexism Within Queer Fan Fiction”
81. **Rachel Epstein**, “Cosmetics Use and Body Image in Women: Motivations Matter”
82. **Ryan Millman**, “Exploring the Use of Comparisons During Families’ Conversations at a Children’s Museum STEM Exhibit”
83. **Samantha Buresch**, “The First-Generation Student Transition Experience into the Working World”
84. **Talia Waxman**, “Chicago Teen Girls Participatory Photovoice”
85. **Adam Watts**, “Can Machine Learning Read CEO’s Better Than a Human: An NLP Analysis of Quarterly Earnings Calls and Stock Returns?”

Natural Sciences & Engineering

86. **Avery Wallace**, “Coral Bleaching in the Florida Keys: The Impact of Accumulated Heating Stress on Bleaching and Mortality in Corals”
87. **Catherine Walker**, “Increasing Stability of Iron Nanolayers for Use as Energy Transducers”
88. **Charles Costakis**, “Inverse Mapping in Resistance Tomography”
89. **Charles Stark**, “Small Molecule Synergy to Improve Protein Folding in Neurodegenerative Diseases”
90. **Dani Lewittes**, “The Effect of Intramolecular Hydrogen Bonding on the Solution-Phase Conformation of Tertiary Amines”
91. **Div Dasani**, “Image Colorization with Convolutional Neural Networks”
92. **Erica Littman**, “Efflux Pumps Contributing to Antibiotic Resistance are Conserved Across Pseudomonas Species”
93. **Faraz Khan**, “Super-resolution SERS—Investigation of Raman Image Dependence On Laser Wavelength”
94. **Fiona Worsfold**, “Relating the bleaching response of coral species to that of its assemblages”
95. **Gina Johnson**, “Concussed football players display enhanced sound processing compared to healthy, non-athlete peers”
96. **Harrison Pearl**, “Coordi: A Virtual Reality Application for Reasoning about Mathematics in Three Dimensions”
97. **Isabella Borgula**, “Effect of zinc on mouse spermatozoa function”
98. **Juan Sanabria**, “Injectable Biodegradable Elastomer to Aid in Healing of Bone Fractures”
99. **Katherine Duncker**, “Cell-free Glycoprotein Synthesis and Screening Platform”
100. **Larry Wang**, “Agent Orange Effects on Sensorimotor Function of Transtibial Prosthesis Users”
101. **Madeline Corrigan and Sophia Wong**, “Determining a model for harbor seal whisker geometry from extensive data analysis”
102. **Michael Montoya and Ryne Montoya**, “Anthropogenic Effect on Diversity in Cedar Glade Habitat”
103. **Neha Pashankar**, “Meta-analysis and Pathway Identification of Genes Associated with Anxiety Disorders”
104. **Nell Borys**, “Structural Elucidation of Regulatory Domains Found in ABC Transporters”
105. **Orazio Casanova**, “EMG signal processing of muscle activations during transtibial prosthetic gait”
106. **Peter Puleo**, “A ~14,500-year Paleoenvironmental and Paleoclimate Record from Sediments of Geneva Lake, Wisconsin”
107. **Stephen Johnson and Katherine Riedel**, “Sem(eye)conductors: Treating Ocular Diseases With Semiconductor Technologies”
108. **Wan Phua**, “Total Synthesis of (–)-trans-Solamin: A Bioactive Compound with Unique Stereochemical Properties”

Faculty Judges of Undergraduate Posters

Ange-Therese Akono, Civil and Environmental Engineering
Sam Asgari, Mechanical Engineering
Tuca Auffinger, Mathematics
Elisa Baena, Spanish and Portuguese
Henry Binford, History
Tabitha Bonilla, Political Science
Tony Chen, Sociology
Mango Curtis, Journalism
Chris Davidson, Journalism
Lloyd Davidson, Sigma Xi Representative
Joy Doan, Music, Radio/Television/Film
Mindy Douthit, Organizational Development & Change and Social Network Analysis
Michelle Driscoll, Physics and Astronomy
Erwin Goldberg, Sigma Xi Representative
Benjamin Gorvine, Psychology
Andrea K. Graham, Medical Social Sciences
Becca Greenstein, Biological Science, Biomedical Engineering, and Math & Statistics
Tina Grieco-Calub, Communication Sciences & Disorders
Michelle Guittar, Latina/o Studies, Spanish & Portuguese, Comparative Literature
Claudia Haase, Psychology
Tabassom Hamidfar, Physics
Shelby Hatch, Chemistry
Yuan He, Biological Sciences
Sara Hernandez, Economics
Stephen Hill, Anthropology
Philip Hockberger, Physiology
Daniel Horton, Earth and Planetary Sciences
Michelle Huang, Asian American Studies & Literary Studies
Seth Jacobson, Earth and Planetary Sciences
Mercouri Kanatzidis, Representative of Sigma Xi
Nial Klyn, Communication Sciences & Disorders
Stephanie Knezz, Chemistry
Kinga Kosmala, Slavic Languages and Literature
Jason Kruse, Sociology
Dana Lamparello, Northwestern History, architecture and design history
Candy Lee, Integrated Marketing, Communications and Journalism
Patty Loew, Journalism
Matty Major, Physical Medicine and Rehabilitation
Christine McCary, Biological Sciences
William Muller, Pathology
Stephen Nelson, Political Science

Faculty Judges of Undergraduate Posters, *continued*

Thomas Ogorzalek, Political science
Elizabeth Pardoe, History
Wendy Pearlman, Political Science
Sylvia Perry, Psychology
Andy Rivers, Physics and Astronomy
Andrew Roberts, Political Science
Onnie Rogers, Psychology
Terri J. Sabol, Human Development & Social Policy
Roberto Sarmiento, Transportation
Courtney Scherr, Communication Studies
Tiffany Schmidt, Neurobiology
Thomas Severini, Statistics
Lilah Shapiro, Education and Social Policy
Mark Sheldon, Philosophy, Medical Humanities and Bioethics
David Smith, Psychology
Karrie Snyder, Sociology
Simone Sredni, Neurological Surgery
Seth Stein, Earth and Planetary Sciences
Thomas Stoeger, Systems Biology and Data Science
Axel Mueller, Philosophy
Amy Kehoe, Latin American Studies
Elizabeth Norton, Communication Sciences & Disorders
Jason Roberts, Screen Cultures
Jean Clipperton, Political Science
Kim Suiseeya, Political Science
Hillary Swanson, Learning Sciences
Caroline Szczepanski, Chemical & Biological Engineering
Allen Taflove, President of Sigma Xi
Chloe Thurston, Political Science
Oya Topcuoğlu, Middle East and North African Studies
Keith Tyo, Chemical Engineering
Reza Vafabakhsh, Molecular Biosciences
Willie Wilson, Computer Science
Keith Woodhouse, History
Sera Young, Anthropology
Ji-Yeon Yuh, History
Brad Zakarin, History
Anne Zald, Social Science Data, Regulatory Compliance
Ingrid Zeller, German

∞ Poster Presentation Abstracts
Alphabetical by presenter's last name

Avrati Agarwal

Faculty Advisor: Caroline Szczepanski

Synthesizing Biomimetic Polymers using Photopolymerization

In nature, there exist many materials that have unique interfacial properties and behaviors. One such example is the lotus leaf which is strongly hydrophobic and water repellent. Microscopic analysis of the lotus leaf has revealed that a critical factor contributing to its behavior is the presence of three-dimensional topographical structures regularly spaced across this surface. Inspired by natural surfaces such as the lotus leaf, researchers seek to make use of these unique interfacial properties and behaviors for varied applications. However, a current challenge is to find efficient means to engineer materials that mimic these topographical structures. To overcome this challenge, my work explores how *in situ* crystallization of linear polymers can be used to influence the formation of coatings with microscale and nanoscale features using photopolymerizations. I have synthesized poly(stearyl methacrylate) homopolymers, which due to the repeat unit structure crystallize readily, and have integrated these polymers into heterogeneous cross-linked polymer coatings formed via photopolymerization. I demonstrate how crystallization of PSMA enhances the formation of rough, spherical, micron scale features across coatings after photopolymerization as verified via profilometry. I also demonstrate how this process can be manipulated by tailoring the photopolymerization protocol (e.g., light intensity, temperature, exposure time) and physical properties of PSMA (molecular weight). Water contact angles were measured, and the rough features formed from PSMA crystallization significantly impacted the wettability of the surfaces in a manner similar to what is observed on natural interfaces, increasing the apparent water contact angle compared to an analogous, smooth surface.



Ankita Ajith

Faculty Advisor: Michael Marasco

Project Thea: Morocco, an examination of female entrepreneurship

Women in developing countries occupy a unique role in the economy that is often underappreciated, informal, and highly vital to the country's economic stability. Despite their high productivity and output, women in countries such as Morocco lack support from their government and communities as well as the infrastructure necessary to develop and grow their businesses. Project Thea: Morocco addresses a current gap in the literature on the specific environment women in Morocco face. To answer this question, I conducted a field study by speaking with several organizations and women in Marrakech and Rabat to gain a more nuanced understanding of the business climate. Additionally, I built on and corroborated my findings with the help of peer-reviewed journal articles. My research found an astounding lack of support from the Moroccan government and a generally unwelcoming business environment for female entrepreneurs. My paper further confirms the notion that more infrastructure must be established in developing countries in order to empower the economic leaders of tomorrow.



Azmair Alamgir

Faculty Advisor: Milan Mrksich

Label-Free Platform for High-Throughput Analysis of Analytes using SAMDI-MS

Label-free assays, and particularly those based on the combination of mass spectroscopy with surface chemistries, enable high-throughput experiments of a broad range of reactions. However, these methods can still require the incorporation of functional groups that allow immobilization of reactants and products to surfaces prior to analysis. In this study, we report a traceless method for attaching molecules to a self-assembled monolayer for matrix-assisted laser desorption and ionization (SAMDI) mass spectrometry. This method uses monolayers that are functionalized with a reactive photochemical group that, when irradiated with UV light, inserts into a wide range of bonds to covalently immobilize molecules. Analysis of the monolayer with SAMDI then reveals peaks for each of the adducts formed from molecules in the sample. This method is applied to characterize a P450 drug metabolizing enzyme and to monitor a Suzuki–Miyaura coupling chemical reaction and is important because modification of the substrates with a functional group would alter their activities. The results of this study indicate that this method can be important for high-throughput experiments in many areas, including reaction discovery and optimization.



Hassan Al-Jahni

Faculty Advisor: Kirsten Pike

Advertisements as a counter-feminist catalyst: an analysis of two women’s magazines

Young girls are being exposed to many contradicting messages in the media, which leads to a social schizophrenia paradox for these girls. This research argues that while magazines like *Seventeen*, which accept advertisement, can be progressive in its choice of article topics, such as LGBTQ issues, its ties to advertising revenue ultimately constrains this potential; in contrast, *New Moon Girls* is able to focus on the empowerment of women, as well as racial and class equality, without these corporate constraints due to the magazines policy of not accepting advertisements. The research is an analytical look at two recent magazine issues and understanding the messages the texts put out about race, gender, class and sexuality. The findings conclude that magazines that accept advertisements as a source of revenue contain regressive messages towards girls in the advertisements but are more progressive in their original content. This creates a new space to explore the accountability, authenticity, and authorship of these messages. Furthermore, it highlights the importance of content creators, especially in the advertising world, on the importance of a girl’s agency and reinforcing girls’ identities and positive images.



Hassan Al-Jahni

Faculty Advisor: Ilhem Allagui

Qatar's Museum Landscape: A 12-Month Launch Campaign

The client, Qatar Museums, wants to understand how to generate interest for its upcoming sports museum. I conducted research to measure consumers' attitudes and beliefs towards the brand of the upcoming 3-2-1 Qatar Olympic and Sports Museum. The proposed campaign plan, based on research, deeply examines the museum market in Qatar, as well as in the larger region, to fully understand why people visit museums. Qualitative data were collected via a focus group that included questions about the museum and related topics intended to inform both the situation analysis and the strategy. I also conducted a survey to collect quantitative data, which I utilized to determine the common behavioral patterns of the public and to segment the audience to ascertain how to best reach them. The main idea of this campaign is to find inspiration through history of sports. The 3-2-1 Qatar Olympic and Sports Museum is both a source of information and a place where visitors can experience and try the sports themselves, a quality that I reflect in the campaign plan. The research results suggest that men aged 18 to 27 are most interested in visiting sports museums in this region. Due to cultural and religious reasons, women are willing to attend only if the museum includes a family area. Results also suggest that in addition to viewing and experiencing exhibitions, visitors want to take pictures. The findings provide marketers a deeper understanding of museum-goers' demographics and psychographics as well as their priorities when choosing museums.



Haya Al-Mannai

Faculty Advisor: Jocelyn Mitchell

The Politicization of Media

I created this project as a way to reflect on my experience as a media and politics minor candidate. The purpose of this project is to show to how media is politicized and how politics are mediated through an analysis of a documentary I helped produced as an intern at Al Jazeera English. The documentary, which is about the downfall of Muammar Gaddafi and the revolution in Libya, is presented as a form of media that creates and promotes a positive image of Qatar not only in relation to its presence in Libya during the revolution, but also in the ongoing diplomatic Gulf Crisis. I utilized the skills I developed in my media and politics courses in order to develop a deeper analysis of this documentary. Aspects such as the current political situation in Qatar and in Libya, as well as political theories such as nationalism and international relations theory of constructivism, combined with the concept of documentary filmmaking as a particularly powerful form of media messaging are presented as the foundation of my analysis of the documentary.



Jacob Baran & Robert Gray

Faculty Advisor: Manijeh Razeghi

Room Temperature MWIR Free Space Optical Communication System

Free space optical communication (FSO) offers a promising solution to the “last mile” bottleneck of high-speed telecommunications. Data is encoded using a modulated laser and optically sent through the air to a receiving photodetector. Although this requires FSO systems to have direct line-of-sight between the emitter and receiver, this is often much easier and more cost-effective than ripping up the streets to lay traditional copper wires or fiber optic cables. Today's cities are full of FSO communications links; however, most of these operate at the conventional fiber optic wavelength of 1.55 μm and face losses due to scattering in the presence of fog, heavy rain, or other inclement weather conditions. By shifting to the mid-wavelength infrared (MWIR) spectrum, the scattering losses can be significantly reduced which would allow a MWIR system to achieve better link uptime. We report the design and realization of a prototype room temperature MWIR FSO system using a room temperature MWIR quantum cascade laser (QCL) and a room temperature, type-II InAs/GaSb superlattice (T2SL) photodiode, both of which have been developed and fabricated at the Center for Quantum Devices (CQD). We designed printed circuit boards for laser modulation and detector signal amplification. We also used field programmable gate arrays (FPGAs) to serve as an interface for encoding and decoding data transmitted between computers and the FSO system. Our system provides an optical link between two computers suitable for ethernet data rates over a range of up to 1 kilometer.



Robert Belson

Faculty Advisor: Fabian Bustamante

Examining Inflight Wi-Fi Performance

In the wake of exciting changes to the telecommunications landscape today, inflight connectivity services (IFC) have fallen behind. Often featuring latencies 20x higher than those of metropolitan 4G LTE connections, IFC simply cannot keep up with rising network demands and user expectations; consumers can expect an order of magnitude poorer performance, while paying almost half of their monthly wireless bill in just 4 hours inflight. Moreover, users pay these exorbitant prices without any visibility into the services for which they pay. Across the research community, there is no publicly available data to characterize performance, understand the challenges in this space, and explore new approaches to address the fundamental limits imposed by such communication service. To address this challenge, we collected over 100 inflight browsing sessions, and develop a publicly available data visualization suite, AquaFlights, that allows users to understand their Wi-Fi experience in the context of other measurements collected across the globe. We highlight the domestic airline leaders in bandwidth and latency, common quality of service metrics to proxy quality of experience. Furthermore, we characterize trends across the airlines observed amidst a critical inflection point in the IFC industry — in migration from 3G to 4G radios in Direct Air to Ground Communication (DA2GC).



Amanda Bernett

Faculty Advisor: Margaret Danilovich

Self-management Education to Reduce Frailty in Older Adults

Frailty is a medical syndrome diagnosed by the presence of three or more of the following criteria: unintentional weight loss, self-reported exhaustion, weakness, slow walking speed, and low physical activity. Currently, interventions for frailty require comprehensive inter-professional assessment and treatment. However, no self-management programs have been developed and tested for frailty despite the benefits of these programs for other diseases. To address the need for this programming in a rapidly aging society, the purpose of this study was to 1) develop a physical therapist (PT)-led self-management intervention, 2) evaluate intervention feasibility through program satisfaction and adherence rates and 3) determine the impact of the self-management intervention on frailty classification, self-rated health, self-efficacy, and frailty knowledge. A self-management educational intervention was created through interdisciplinary collaboration of focus groups and interviews with physicians, social workers, PTs, and older adults. We recruited participants who were over the age of 60 from senior centers and retirement communities. Knowledge of frailty as well as physical condition was tested before, immediately after, and at varying time intervals following the set of educational sessions held once a week for four weeks. Results from open-ended frailty questions between baseline and the end of the intervention showed increased frailty knowledge and understanding of health management techniques. Frailty knowledge answers were also more specific, had greater detail, and had a more accurate and complete understanding of frailty post-intervention. Between baseline and the end of the intervention, there were statistically significant differences in PASE (Physical Activity Scale for the Elderly) scores ($p=0.015$) but no other outcomes. Frailty self-management interventions led by physical therapists present a novel way to engage older adults in health management and frailty education.



Eliza Beth

Faculty Advisor: Timothy Dobrer

Challenging the Objectives of Sex Education: Themes of Pleasure and Desire in Comprehensive Sex Education Curricula

The extant literature has consistently found that, within the US and Canada, sex education curricula have historically been designed from a sex-as-risk and adolescent-sexuality-as-taboo framework. This has resulted in a generation of curricula that fail to acknowledge or support female desire, pleasure, and sexual identity--trends which theorists have linked to the disempowerment of young women and the reaffirmation of toxic gender norms. This research analyzes six comprehensive high school sex education curricula from the US and Canada for themes surrounding female pleasure and desire, and uses these themes to explore what curricula communicate that sex and sexuality fundamentally "are" (whether a transactional exchange, a moral transgression, an expression of love, an experience of pleasure, etc). Curricula were analyzed using both emergent and a priori coding, after which dominant

themes and narratives were identified. The results show that contemporary curricula address sexual and dating violence in important and novel ways, thus providing more exploration of sexual dynamics than solely discussing sexual activity in the context of STI and pregnancy prevention. However, curricula largely continue to lack a corresponding discussion of positive sexuality--failing to equip students with tools to engage with pleasure, sexual identity, or sexual exploration. This study has implications for sex education research and design in that it highlights potential flaws in current practices, as well as challenges cultural conceptions of the “purpose” of sex education and the definition of “healthy” sexuality.



Karol Bisaga

Faculty Advisor: Erik Andersen

Identifying the mechanisms of genetic interactions that impact *C. elegans* bleomycin response

The aim of identifying the mechanism by which genes interact in order to cause differential N2 / CB strain reactions to the chemotherapeutic drug bleomycin is crucial to the fight for curing cancer as it attempts to answer the question, “How does bleomycin cause negative side effects in organisms?” Solving this question could help improve cancer treatment by helping scientists understand how multiple genes may come together to cause adverse reactions in human patients. The process of elucidating this mechanism has been long with many previous projects contributing but at the current moment a new near-isogenic line of *C. elegans* has been created and is ready to be amplified in order to determine its reaction to bleomycin which may lead to a final conclusion on how *C. elegans*’ genes interact with each other to form the reactions seen in other strains. Given this conclusion, scientists would be able to move forward and identify which proteins associated with the specific genes interact with bleomycin and thus would be able to formulate a 3D image of how possible the two may interact, and thus how negative side effects caused by the drug may be stopped.



Isabella Borgula

Faculty Advisor: Thomas O'Halloran

Effect of zinc on mouse spermatozoa function

After fertilization or chemically-induced egg activation, mammalian eggs release billions of zinc ions in events known as ‘zinc sparks’. This discharge of zinc has been shown to harden the zona pellucida, the protein coat protecting the egg, and is believed to be a mechanism that prevents supernumerary sperm from entering a fertilized egg. Whether there is a direct effect of zinc on sperm has not been explored. To become activated for fertilization, ejaculated sperm undergo several maturation processes, including the acrosome reaction. This reaction is a process by which a sperm releases proteolytic enzymes from the acrosome organelle to break down the protein matrix surrounding the egg, allowing fertilization to occur. Because the acrosome reaction occurs in close vicinity to the egg and facilitates fertilization, we hypothesize that high local zinc levels inhibit the acrosome reaction of

supernumerary sperm to prevent polyspermy. To investigate this question, the acrosome reaction was chemically induced and multiple concentrations of zinc were added to simulate the conditions after the zinc spark. Treated sperm were stained with Coomassie blue to highlight whether the acrosome reaction occurred and analyzed to determine the frequency of acrosome reactions under these conditions. Preliminary data suggests sperm treated with zinc exhibit a dose dependent suppression of the acrosome reaction. These data support our hypothesis that one function of zinc in the extra-zygotic environment is to signal suppression of the acrosome reaction in the subordinate sperm that bind the zona pellucida.



Julia Borland

Faculty Advisor: Viorica Marian

A Comparison of Mother-Preschooler Book Reading Practices in Thailand and the United States

Early language development is largely influenced by children's interactions with their parents. One common context of mother-child interaction that has been shown to promote children's language and literacy skills is joint book reading. The maternal language input that children receive during this activity is variable across different cultures. The present study aimed to examine cross-cultural differences in book reading practices of mothers and their children in Thailand and the United States. Participants were 21 Thai monolingual mother-preschooler dyads in Thailand and 21 American-English monolingual mother-preschooler dyads in the US. Mothers and children were given a wordless picture book, either *Frog, where are you?* or *Frog goes to dinner*. Dyads were asked to construct a story and engage in conversation as they normally would with picture books. Interactions were video-recorded. Recordings were transcribed and coded for linguistic measures using Codes for the Analysis of Human Language (CHAT), available through the Child Language Data Exchange System (CHILDES). Narrative samples revealed that Thai mothers talked more about behavioral expectations and social norms and used more attention directives than American mothers. Conversely, American mothers used more affirmations and discussed their own and their children's thoughts and feelings more than Thai mothers. Thai children spoke less than American children, but repeated their mothers' speech more. Results suggest that the Thai and American dyads have distinct book reading practices. More broadly, findings suggest that linguistic and cultural background can influence communicative patterns during dyadic interactions.



Nell Borys

Faculty Advisor: Heather Pinkett

Structural Elucidation of Regulatory Domains Found in ABC Transporters

From bacteria to humans, transport proteins play an important role in nutrient uptake and cellular detoxification. The ATP-binding cassette (ABC) transporter ProVWX is responsible for transporting osmoprotectants--molecules that maintain cellular balance under stress. Part of the ProVWX

transporter, ProV, contains a regulatory domain, which is classified as a cystathionine- β -synthase (CBS) domain. CBS domains appear to play regulatory roles in enzymes and channels. Mutations in CBS domains have been shown drastically altering the function of the protein. While the regulatory mechanism and role of the CBS domain in ProV is unknown, it has been hypothesized that the CBS domain may regulate the transport of osmoprotectants by shutting off the ProVWX transporter. This is of particular interest for this project because of its potential impact on bacterial survival. Understanding the CBS domain's role in transport will help us understand how the bacteria maintains proper osmotic concentration, possibly leading to drug development to prevent bacterial proliferation from occurring in host organisms. The focus of this ongoing project is structural and functional characterization of the ProVWX transporter by X-ray crystallography. Thus far, this project has been able to successfully express and purify ProV along with one of its other transporter components, ProW, which is the transmembrane protein. These two proteins have been shown to form a complex together after purification and size-exclusion chromatography. Based on these results, future work includes crystallization trials, activity assays, and structural determination of ProVW complex to decipher the regulatory mechanism.



Mari Brady

Faculty Advisor: Xiaomin Bao

The Role of the Super Elongation Complex in Epidermal Progenitor Maintenance

The basal layer of human epidermis is composed of progenitor cells that both self-renew and differentiate to form stratified epidermal tissue; this process requires strict, dynamic regulation of gene expression. The Super Elongation Complex (SEC) regulates gene expression at the level of transcription elongation by releasing RNA Polymerase II from its paused state. Dysregulation of the SEC has been identified in leukemia and fragile X syndrome, but how the SEC functions in somatic tissue homeostasis has not been characterized. To better understand the role of the SEC, we performed a knockdown and an evolutionary analysis of the SEC's mutually exclusive scaffolding subunits, AFF1 and AFF4. Our data revealed a difference in function between AFF1 and AFF4. Knockdown of AFF1, but not AFF4, resulted in increased expression of epidermal differentiation genes, suggesting that AFF1-SEC may function as a transcription inhibitor to promote progenitor maintenance. The evolutionary analysis revealed that Homo sapiens AFF1, but not AFF4, has a region of homology to both the Atrophin and Herpes ICP4 protein domains, both of which possess inhibitory activity. Given that *Drosophila melanogaster* has only one AFF homologue, this analysis suggests that AFF proteins evolved novel functions to promote more complex patterns of gene expression in higher-order species. The observed differences between AFF1 and AFF4 suggest a mechanism through which the SEC selectively utilizes AFF1 to suppress expression of differentiation genes in order to maintain cells in the progenitor state.



Tess Brieva

Faculty Advisor: Mesmin Destin

Aspirational Careers and Representation: Is Numeric Representation of Collective Identity Important for Aspirational Career Choice Among Middle School Students?

Past research suggests that stereotypes about collective identities (i.e. race, ethnicity, and gender) shape aspirations. However, less is known about how actual representation of collective identity relates to aspirations. The proportion of an identity in a given career will be used as an indicator of numeric representation and I hypothesize that it relates to aspirations of middle school students. In the present thesis, I investigate how the pattern of representation in middle school students' aspirational careers varied by race and gender groups. Two samples of middle school students were surveyed, and the data were paired with census data from the Bureau of Labor Statistics (BLS) 2012 Report. Our results revealed that, on average, Latinx and Black students chose aspirational careers in which their groups are underrepresented in comparison to their national proportion, White students chose careers in which their group representation mirrors their national proportion, and Asian students chose careers in which their group is overrepresented in comparison to their national proportion. No significant gender differences were found. Additionally, the role of perceived fit of collective identity and aspirational identity (i.e. future self) was evaluated but analyses revealed no significant findings. This study suggests that numeric representation is a relevant factor for middle school students' aspirations, and it functions differently for different identities.



Samantha Buresch

Faculty Advisor: Mesmin Destin

The First-Generation Student Transition Experience into the Working World

In the realms of higher education, the term “first-generation” is a buzzword and many universities pride themselves on the amount of first-generation students that inhabit their campuses. Broadly, first-generation college students are students whose parents did not attend nor graduate from a 4-year institution. First-generation students face unique challenges when compared to their continuing-generation peers and this can sometimes stem from a cultural mismatch. While there is much research done on the first-generation experience transitioning to college, there exists very little research to understand the first-generation experience transitioning out of college. This is startling as it could provide insights as to why first-generation students have difficulties finding high-quality job opportunities upon graduation. My project focused on these transitional experiences for first-generation students, as informed by eight 60-minute semi-structured interviews with recent graduates from a selective, research institution who are currently working full-time. To make sense of the interviews, I coded using grounded theory. My data provided insights to confirm a cultural mismatch between the values of first-generation individuals and the values of their university and workplaces. There also existed and currently exists strong knowledge gaps between the individuals and their institutions. Nonetheless, the alumni were motivated by their collective purpose and were supported by their communities, many of which were identity based. Additionally, their narratives shared they would have benefited from a stronger first-generation senior specific community. These findings can

be useful for both higher education institutions and workplaces in developing inclusive strategies to best support first-generation students and alumni.



Orazio Casanova

Faculty Advisor: Matthew Major

EMG signal processing of muscle activations during transtibial prosthetic gait

Transtibial prosthesis users demonstrate compensatory gait mechanisms to account for lost active ankle joint function which is reflected in muscle activation patterns that differ from non-amputee controls. Furthermore, it is essential to understand how older age affects the muscle efforts of persons with transtibial amputation to inform rehabilitation interventions. The overall purpose of this study was to characterize the muscle effort of older transtibial prosthesis users and age-matched controls during gait. This paper describes the development of the electromyography (EMG) filtering technique and future work. EMG data were captured at 960 Hz in accordance with established protocols. Representative EMG data were converted into the power domain with a Fourier transformation using custom MATLAB (MathWorks, MA) software and power spectral density (PSD) plots were created to estimate primary EMG signal frequency. Three 4th-order bandpass filters (Least-squares, Equiripple, and Butterworth) were systematically tested to ascertain the relevant literature and explore novel signal processing methods. The low-cutoff frequency of 40 Hz and high-cutoff frequency of 440 Hz were determined from analysis of the power spectral density (PSD) to be most effective for a bandpass filter. Of the three filters, it was determined that the 4th order bandpass Butterworth filter stood out as the most suitable filtering technique for this study. Future work will include data rectification and estimation of muscle effort during different gait phases (stance, swing) through integrated EMG (i.e., integration of EMG signals with respect to time).



Ruthie Charendoff

Faculty Advisor: Lilah Shapiro

The Sexual Health of Modern Orthodox Jewish Women

The Modern Orthodox Jewish (MO) community currently functions on the fantasy that MO teens are receiving all their messaging around sex from their Jewish schools and communities. The messaging these students receive tells them to refrain from sex and touching people of the opposite sex, until marriage. This messaging can be confusing for young people who live in both the secular and religious worlds and don't know which religious laws or cultural norms to conform to. This study seeks to find the impact that growing up in this community and attending these high schools has on young MO women. The study was conducted through 17 interviews with unmarried MO young women ages 18-25 about their sexual health and past experiences. Participants were recruited through Facebook groups and participated in an hour-long Skype interview that focused on interviewees' perceptions of their sexual health and experiences. The data was analyzed through a process of open coding which were turned into analytic categories leading to the final analysis of the full dataset. This study found

that participants strongly identify with being Jewish but are simultaneously figuring out what that means to them; they all feel a pressure to be shomer negiah (refrain from sexual activity) to some extent; they feel that sexuality is not talked about enough; and they want to talk more about sexuality. The data from this study could be particularly meaningful to therapists and school administrators in helping religious women better understand their own sexual health and engage in healthier practices.



Angie Chen

Faculty Advisor: Angela Roberts

Spoken Discourse Impairments in Vascular Cognitive Impairment (VCI)

Vascular Cognitive Impairment (VCI) is cognitive impairment resulting from stroke and/or vascular disease. Thirty percent of adults >65 with stroke develop VCI. There are limited biomarkers predicting which individuals with stroke will develop dementia. Studies in Alzheimer's disease suggest that changes in spoken language discriminate at-risk individuals in prodromal states. The objective of this study was to identify potential information-content spoken language markers of at-risk individuals with VCI. Transcribed spoken language data from 154 participants (excluded=5; N=149) elicited using a standardized picture-supported narrative sampling approach were extracted from the Ontario Neurodegenerative Disease Research Initiative VCI cohort. Of these, 67 participants had mild cognitive impairment (MCI). The remaining were at risk but did not meet neuropsychological criteria for MCI. Transcribed language data were coded for correct information units (CIU; Nicholas & Brookshire, 1993). A CIU is a word that is correct, relevant to elicitation stimulus, and non-redundant. A random sample of files (68%) were re-coded for CIU inter-rater reliability (ICC(3,1)=0.97). Participants in the MCI group produced fewer words (M=123.85, SD=53.77) than the unimpaired group (M=155.30, SD=64.06), $df=147$, $F=10.248$, $p=0.002$. The MCI group produced lower %CIUs (M=67.5%, SD=14.3) than the unimpaired group (M=72.6%, SD=11.4, $df=147$), $F=5.861$, $p=0.017$. They also produced fewer CIUs/min (M=90.1, SD=30.5) than the unimpaired group (M=107.3, SD=29.4, $df=147$), $F=12.215$, $p=0.001$. Individuals with VCI-MCI evince information content impairments in spoken language that discriminate them from individuals at risk but without cognitive impairment. This research supports the potential viability of spoken language biomarkers of dementia in VCI.



Vivian Chen & Nathaniel Coirier

Faculty Advisor: Manijeh Razeghi

An Overview of Semiconductor Laser and Photodetector Technologies and their Application Towards the Detection of Art Forgery

This project is comprised of primary source research on the field of semiconductor microscopy. We were interested in determining a more interdisciplinary application of this technology, as the most frequently cited applications are for defense purposes such as drug screening or infrared imaging. When we researched, we found that these technologies have been used in detecting art forgery and

were intrigued to find that laser imaging boasts remarkable benefits over prior methods, as they are not destructive and offer large amounts of information beyond what surface level techniques can provide. The intent of the project was to come up with a 30-minute presentation outlining current technologies and possible improvements to the technology. Due to the scientific properties of different colors of lights, lasers of different colors can be used to determine chemical composition of paints without destructive chemical processes and can also be used to find hidden signatures or features underneath other layers of paint. This is because certain colors can see through certain layers, exactly like an X-Ray, and display features at varying depths below the surface. We briefly discuss using more advanced light sources and the types of advantages they can offer, in addition to possible improvements allowing for lower cost and higher temperature operation of these kinds of systems. There is currently a barrier to commercialization both in cost and in temperature which can be resolved by some of the methods we propose for laser and detector construction.



Jessica Collins

Faculty Advisor: Caroline Bledsoe

**Constructing Successful Citizens:
The EU, Erasmus+, and the Reproduction of Class**

In the wake of the 2008 economic crisis and rising anti-EU sentiment the European Union has changed its approach to its European educational programming, trying to reach those most disenfranchised by the economic and educational system of their home countries. In 2014, in response to critiques of elitism the European Union opened up educational programming to “all”, by combining seven educational mobility programs under the umbrella of Erasmus+. In 2017, the European Union celebrated 30 years of Erasmus and Erasmus+, the European Union’s intra-European exchanges programs. The European Commission produced a series of spotlight stories to celebrate the successes of Erasmus+ programming. In tandem Frédéric de La Mure, with the support of the commission, created a mural of Erasmus families showing the “future of Europe”. Highlighting the EU’s conception of a successful European Identity, these two exhibitions serve as case studies to understand what the European Commission, and by extension the EU, thinks of success particularly in relationship to class hierarchies. While the merger of seven different programs, including Erasmus under the umbrella of Erasmus+ shows a nominal desire of the EU to promote the development of all Europeans equally, its approach to Erasmus+ and its celebration of success demonstrates a structural class bias.



Katherine Conte

Faculty Advisor: Jaime Dominguez

**Impact of Political Candidates on Voter Engagement in Chicago Aldermanic Elections,
2003-2019**

Before the mid-20th century, voter turnout was not an area of inquiry in political science. It took the polling failure of the 1948 presidential election before scholars took an interest in the importance of

accurate turnout prediction. It's been known for years in political science that incumbent candidates have a huge advantage over their challengers—and that advantage is even greater at the local level. What has been studied less is the impact that candidates have on voter turnout. This research project examines the impact challengers have on voter turnout in Chicago's Aldermanic elections from 2003-2019, the impact open seats have on voter engagement, and the impact Aldermanic runoff elections have on ward turnout for the runoff Mayoral election. In 2019, wards in Chicago where there was a runoff saw, on average, a 9.04 percent greater turnout rate in the runoff election than in wards where there was no aldermanic runoff. Between wards where the incumbent alderman either won or was unseated (ignoring open seats and uncontested elections), there was an average of a 3.86 percent greater turnout rate in wards where there was a runoff as opposed to wards where there was no runoff—a statistically significant difference. This work may be extrapolated to help political candidates in runoff elections campaign smarter by capitalizing on districts that will have predictably higher levels of voter engagement on election day.



Mattlyn Cordova

Faculty Advisor: Nick Davis

Walking the Borderlands: A Framework of Trans* Latinx World-Making in Film

This project offers an analysis of films with transgender Latinx protagonists. Most popular transgender films focus on white trans* people, while many Latinx films do not have queer, gender non-conforming characters. The related film scholarship follows these same trends. This project brings together scholarship from Latinx Studies, Trans* Studies, and Film Studies, fields which historically have not intersected. It seeks to span these disparate fields, offering critical analysis of the intersection of marginalized racial and gender identities as presented on screen. The project spans three case studies, each a trans*-Latinx film on which I employ a close reading (examination of the formal aspects of the films, such as cinematography, editing, and sound). Through these close readings, I have developed my own theoretical framework, “walking the borderlands.” This framework builds off of Gloria Anzaldúa’s theory of borderlands as a space “in-between,” and José Muñoz’s theory of disidentification, which proposes a survival strategy for queer of color individuals. Walking the borderlands acknowledges the violence that exists within the kinds of geographically and culturally liminal spaces conceptualized by Gloria Anzaldúa, but also thinks of them as productive spaces for disidentificatory queer and trans* world-making processes. From these close readings, I show how walking the borderlands highlights particular intersections of transness and Latinidad and how filmmakers are using formal elements of film to make these experiences and feelings palpable for the audience.



Madeline Corrigan & Sophia Wong

Faculty Advisor: Mitra Hartmann

Determining a model for harbor seal whisker geometry from extensive data analysis

Harbor seal whiskers exhibit a tapering elliptical geometry uniquely suited to detect wakes (trails of water produced by upstream bodies) in ways a regular, tapering, or elliptical cylinder cannot. Previous studies into the matter have relied on idealized representations of the geometry the whiskers seem to take on and have tried to use these poor models to extrapolate information about the effects this geometry has on their fluid mechanics, including velocity sensing, optimizing the signal-to-noise ratio, and reduction of vortex-induced vibrations. The goal of our investigation is to determine whether it is possible to mathematically model the seven varying parameters of seal whisker geometry: the periods of undulation (or waves), the wide and narrow diameters of the major and minor axes, and the angles at which maxima and minima occur. Additionally, measuring base diameter and whisker lengths will be useful in creating a model. To collect data, we are using high-resolution flatbed scans to determine basic geometric features, such as length, undulations, and medula length, and computer-tomography (CT) scans to analyze out-of-plane curvature. With 500 seal whiskers, a nearly twentyfold increase over previous work in the number of samples we are using, this project is producing the most comprehensive results to date, allowing us to validate, refute, or replace existing models with a high degree of certainty. From a neuroscience perspective, producing an accurate model for seal whisker geometry also motivates further sensory and neural systems research into seal whiskers.



Charles Costakis

Faculty Advisor: Matthew Grayson

Inverse Mapping in Resistance Tomography

2-D resistance tomography is an exciting field with potential applications in a variety of biomedical devices. An electrically conductive elastomer membrane, such as a rubber sheet impregnated with carbon nanotubes, can serve as a sort of durable touchpad device for spatial pressure sensing. Such a device would be especially well-suited for pediatric biometrics, where patients with sensitive skin would benefit from the uniquely soft and flexible sensor technology. The operating principle is that regions of applied pressure induce regions of altered conductivity, forming a 2-D map of local electrical conductivity. The challenge of obtaining the pressure data lies in extracting the conductivity map from a set of electrical measurements, which is the focus of my research. By solving Laplace's equation over a finite-element mesh, I was able to simulate a set of electric potential maps that represent an orthogonal basis for the forward tomography problem. Then, using a linearized least-squares minimization approach, I wrote a Python script that inverted the forward data and predicted the location of applied pressure with less than 5 percent error. This result shows promise in making improvements in accuracy and speed over traditional resistance tomography inversion methods.



Joseph Cummings

Faculty Advisor: Jason Wilson

CLARK: Towards an Appraisal Based Model Exploring the Role of Context in Identifying Emotion in Conversation

With text lacking valuable information available in other modalities, context may provide useful information to better detect emotions. In this research project, we do a systematic exploration of the role of context in recognizing emotion in a conversation. We use a Naive Bayes model to show that inferring the mood of the conversation before classifying individual utterances leads to better performance. Additionally, we find that using context while training the model significantly decreases performance. Our approach has the additional benefit that its performance rivals a baseline LSTM model while requiring fewer resources. Currently, we are also doing an investigation into two different theories of emotion: appraisal theory and discrete category theory. Both will be implemented into the core model and our hypothesis is that the appraisal theory model will perform better.



Div Dasani

Faculty Advisor: Ying Wu

Image Colorization with Convolutional Neural Networks

Image colorization is the process of artificially coloring a black and white image such that this fabrication appears realistic and authentic to the viewer. There are many nontrivial applications of this process, such as the colorization and augmentation of historical photos as well as the removal of color tone filters from images. This research employs a unique architecture of a convolutional neural network, a type of artificial neural network, to train a machine to identify patterns within images and color them accordingly. However, in place of a traditional regression-based application of this model, a novel classification-based approach is implemented through the use of a cross-entropy loss function and a discretized color space. After training this algorithm using either approach, the model is able to take grayscale images as input and output images representing attempts at their colorized counterparts. Images produced using the latter approach far outperform those produced using the former in terms of the plausibility of the coloring, as determined by user interaction. The presentation highlights implementation of this architecture, as well as the key differences between the baseline approach and the novel method. Additionally, sample colorized images are examined from both methods to understand the cases in which the different implementations succeed and fail.



Avi Dravid

Faculty Advisor: Marco Gallio

Hygrosensation in the Fruit Fly *Drosophila*: Examining the Role of Sacculus Structure and the Hygroreceptor IR40a in Humidity Preference

Fruit flies of the genus *Drosophila* are found on all continents except for Antarctica. As small ectotherms that face the constant threat of desiccation, the ability of fruit flies to sense humidity (hygrosensation), is critical to their survival. Humidity preference represents an important adaptation to specific environments. *D. melanogaster* is found in temperate climates, whereas *D. mojavensis*, a desert fly, prefers lower humidity conditions. In *Drosophila*, humidity is sensed by the sacculus, a pit-like antennal organ containing hygrosensory neurons. To understand whether sacculus structure co-evolved with humidity preference, the sacculus anatomy of *D. melanogaster* and *D. mojavensis* was analyzed using confocal microscopy. *D. melanogaster* has a more complex sacculus compared to *D. mojavensis*. However, after analyzing other species, it appears that a simple sacculus is not evidence of desert adaptation. This calls into question the idea that differences in sacculus structure underlie differences in humidity preference. I also examined the role of the sacculus hygroreceptor IR40a in determining species-specific humidity preference. We hypothesized that IR40a is tuned to different humidity levels in different species. To test this idea, an Ir40a ortholog from *D. mojavensis* was expressed in an Ir40a mutant *D. melanogaster*. Expression of *D. mojavensis* Ir40a produced only weak dry avoidance in the *D. melanogaster* Ir40a mutant but was not sufficient to switch the fly's behavior from dry avoidance to dry preference, the normal behavior of *D. mojavensis*. The absence of this change suggests that IR40a-mediated signaling is likely context-dependent, working alongside other factors to generate innate humidity preferences.



Katherine Duncker

Faculty Advisor: Michael Jewett

Cell-free Glycoprotein Synthesis and Screening Platform

Sugar structures (glycans) can be attached to proteins in a process called glycosylation, which plays important roles in determining protein activity, structure, and function. Glycans are present on most protein therapeutics, including those used for life-threatening diseases such as cancer. However, standard protein synthesis and glycosylation methods rely on natural processes in cells that are expensive, slow, and difficult to control, yielding unpredictable mixtures of glycoprotein structures. To address these limitations, we developed a cell-free synthesis and screening platform to rapidly construct and discover biosynthetic pathways which reproducibly create a variety of uniform glycan structures. I expressed proteins and enzymes through cell-free protein synthesis and installed glycans onto target proteins using glycosyltransferase enzymes through in vitro glycosylation. For all structures, a glucose followed by galactose was installed onto the protein. This base glucose-galactose structure was elaborated with various glycosylation pathways to generate a variety of glycans. To confirm pathways, I used mass spectrometry to observe the mass shift between the original structure and the modified glycoprotein with an additional glycan installed. We built 36 different protein glycosylation pathways resulting in 23 unique glycan structures including therapeutically relevant sialic

acid and α -galactose structures, constructed in vitro for the first time. Sialic acid improves stability, movement and activity of therapeutic proteins in the body, and α -galactose increases vaccine effectiveness by promoting a greater immune response. We anticipate our cell-free rapid prototyping platform will be used to build, discover and study a wide variety of glycans that are useful in protein therapeutic development.



Ryder Easterlin

Faculty Advisor: Richard Carthew

Cryptic Small Peptides in Drosophila Oogenesis

Genes are far more complex than once thought, with their corresponding RNA transcripts serving diverse functions beyond the coding of proteins. One relatively unexplored class of genes makes large RNAs (greater than 200 nucleotides) that code for small proteins (less than 30 amino acids). However, computational tools often mischaracterize these genes as non-coding due to the short length of their open reading frames (ORFs). Thus, there are only a few known examples of these small proteins in all models, and their molecular functioning is still largely obscure. Among these putatively mischaracterized genes is CR43834, a transcript expressed in stage 12 of *Drosophila* oogenesis that likely produces a 21 amino acid peptide. Two pieces of evidence point to CR43834's protein coding capacity: CR43834 has a conserved ORF across several species of *Drosophila*, indicating that the ORF is undergoing purifying selection in a manner similar to protein-coding genes and may be important in development; second, a fluorescently-tagged CR43834 protein is detectable in *Drosophila* S2 cell culture, indicating that the peptide is stably produced. In addition, sequence-based predictions of protein structure indicate that CR43834 belongs to a class of peptides known as antimicrobial peptides, which are identifiable by their amphiphilic alpha-helical structure and length of 5-70 amino acids. Given these data and observable transcriptional activation in stage 12 ovaries, we hypothesize that CR43834 is secreted with other protein components of the eggshell as an innate immune mechanism in *Drosophila* ova. To confirm the presence and level of expression of the peptide in the eggshell, mass spectrometry will be performed on isolated eggshell tissue extract. Successful confirmation of peptide translation will confirm CR43834's place in the short list of peptides confirmed to be translated from transcripts previously annotated as non-coding RNAs and establish a precedent that cryptic small peptides may play a significant role in the normal development of complex eukaryotes.



Rachel Epstein

Faculty Advisor: Renee Engeln

Cosmetics Use and Body Image in Women: Motivations Matter

Makeup habits are known to be related to body image variables as well as attitudes regarding societal pressures about appearance. However, there is a lack of existing research on how motivations for wearing makeup relate to a woman's view of her body. In the present study, two-hundred forty women (ages 24-39) completed a survey with scales measuring different aspects of body image. In addition,

we presented participants with a list of motivations for wearing makeup that completed the sentence, “When I wear makeup, I wear it to...”. Women indicated how frequently each item described why they wore makeup. Response options ranged from 1 – never to 5 – always. Exploratory factor analysis showed three main categories of motivations: “everyday presentable,” creative expression,” and “sex appeal.” “Everyday presentable” scores showed significant, moderate, positive correlations with unease when not wearing makeup, lack of confidence when not wearing makeup, and body surveillance, but were not significantly correlated with body appreciation. Scores for the “sex appeal” subscale followed a similar pattern. However, “creative expression” scores showed significantly lower correlations with unease when not wearing makeup and lack of confidence when not wearing makeup and were not significantly correlated with body surveillance. Further, “creative expression” scores were significantly and positively correlated with body appreciation. Overall, results suggest that different motivations for wearing cosmetics have different implications for body image. Future researchers should use a larger sample size and confirmatory factor analysis to determine whether our proposed factor structure replicates.



Grant Everly

Faculty Advisor: Galya Ben-Arieh

The United States’ Vertical Border: A Case Study of the July 2016 Mass Detention and Deportation of 121 US-Bound Cubans from Ecuador

Previous work on migration and border studies has identified the geographic region between the US-Mexico and Mexico-Guatemala borders as a “vertical border” (frontera vertical) that effectively filters US-bound migrants before they arrive in the United States. Taking the July 2016 mass detention and deportation of 121 US-bound Cubans in Quito, Ecuador as a case study, I argue that the United States’ vertical border is more extensive than previously considered, stretching all the way to Ecuador. I further argue that the vertical border is comprised of multiple tiers characterized by decreasing direct US influence and increasing indirect influence with waning proximity to the US-Mexico border. In the Ecuadorean case, this indirect influence was found in the “wet foot dry foot” amendment of the Cuban Adjustment Act. This policy pushed US-bound Cubans through Central and South America, causing countries like Ecuador to filter these migrants before arriving in the United States. This argument is grounded in Latin American state discourses (e.g. press releases) on the 2013-2016 influx in Cuban migrants, media coverage of the mass deportation in Quito, and 16 qualitative interviews with ex governmental officials, Ecuadorean legal experts, and lawyers who worked on the cases of the 121 deportees. This project builds on the work of border theorists and scholars of international relations by offering a framework for understanding contemporary US hegemony in border security.



Kelsey Fields

Faculty Advisor: John Rogers

Influence of Aging and Autoclave Sterilization on Mechanics of Silicone-Elastomers for Biomedical Wearable Devices

Soft materials are a rapidly growing research area due to their unique mechanical properties that match those of skin, tissues and other parts of the human body. Consequently, they have a wide range of applications from skin-mounted or implantable diagnostic devices to replacement joints. Researchers of the Rogers' Group are developing wearable sensors for wireless, non-invasive vital signs monitoring. The sensors are ideal for populations with underdeveloped, fragile skin such as premature babies due to the good skin conformability. To achieve soft yet robust devices, a silicone elastomer is used to encapsulate the sensors. There is limited literature on the evolution of mechanical properties of these materials and this study aims to fill this gap by investigating the effects of room temperature aging and device sterilization on silicone-based elastomers. We conducted hardness measurements for different silicone elastomers to evaluate if there were significant changes in material performance. Elastomer samples were prepared under three conditions: cured at room temperature, cured in a 70°C oven for 2 hours and cured in a 70°C oven for 2 hours with white dye. Measurements were performed with a Shore OO durometer mounted on a stand. For all elastomers tested, adding white dye increased hardness. This poster presents experimental results around aging and sterilization of silicone-based elastomers to provide insight when developing new technologies with soft materials.



David Fishman

Faculty Advisor: Laura Nielsen

The Guise of Brotherhood: Exploring Men's Vulnerability to Intrafraternal Sexual Violence

Though sexual assault disproportionately impacts female, non-binary, and queer individuals, it also includes cis-men victims. However, little research—particularly on Greek life—has explored the victimization of men. This thesis provides empirical evidence of the structural and cultural factors in fraternities that make members vulnerable to sexual violence. I use in-depth interviews with fifteen men from a midwestern university who experienced sexual misconduct by a fraternity brother. Doing so fills a gap in research at the intersection of “fraternity” and “man” and “survivor”—three areas usually studied in isolation. Intrafraternal sexual misconduct is itself a significant social problem, but its study also provides insight into fundamental law and society questions: When and where does the law matter? I find fraternities create spaces in which social norms render the law unimportant. Rather than bargaining around legal entitlements using judicially-enforced rules, fraternities create their own norms to handle grievances.



Christina Foo

Faculty Advisor: Leoandra Rogers

“There’s not many people who are willing to stand up these days”: Racial Counternarratives in Middle Childhood

Children come to understand race within a historically-established racial hierarchy, but they have the agency to accommodate or resist this establishment as they form their own racial identities. Previous research has identified distinct narrative types that either reinforce existing societal structures (Master Narratives) or disrupt them (Alternative Narratives). The Counternarrative (CN) is the most assertive Alternative Narrative where children reference the structural consequences of race, and explicitly name and challenge racism in their own lives. This analysis drew from a larger longitudinal interview study (N= 105) to examine the content of race CNs. Thirty-two children (4th to 8th grade) told CNs and their interviews were coded for references to race as individual (self), interpersonal, and structural (historical, political). Results revealed that CN children discussed race on the individual (29%) and interpersonal levels (26%), but mostly on the structural level (45%). Comparatively, non-CN Children spoke mostly about race at the individual level (42%), and less on the interpersonal (28%) and structural level (30%). Changes in CNs from Year 1 to Year 3 showed that 24 of the 32 CN children moved from other narrative types; only 8 told CNs consistently. Analysis revealed that racial encounters were pivotal to this shift, increasing by 40% overall and by 85% among children who moved to CN. These results underscore children’s positive agency to injustice, which is critical for deconstructing racial hierarchy, and suggests that concrete racial experiences may catalyze this resistance.



Regina Fricton

Faculty Advisor: Monica Laronda

ECM Proteins of Cortical and Medullary Ovarian Stromal Cells

Like other organs in the body, the ovary is divided into two compartments: the cortex and the medulla. During the maturation of the ovarian follicle, or folliculogenesis, the extra cellular matrix (ECM) stiffness governs follicle movement. The cortex and the medulla have varying rigidities because of different ECM densities where the cortex is more rigid than the medulla. Stromal cells are the cells responsible for creating the ECM proteins and related proteins. My primary question was to test if when stromal cells from the compartments are isolated from the ovaries and grown in culture, do they continue to demonstrate this difference in rigidity. I used bovine (cow) ovaries as my model and chose to focus on 4 proteins: Fibronectin, Laminin, Collagen I and Collagen IV. I measured the amounts of these proteins between the two compartments using qPCR to determine relative expression of RNA, Immuno-PCR to measure the relative expression of protein and Immuno-Cyto Chemistry to observe localization. I determined that isolated stromal cells are capable of producing extracellular matrix proteins that they also produce in normal tissue. Although results were close to significant, there was no statistical difference between the protein expression of these 4 proteins for isolated cells compared to intact tissue between the compartments. Learning more about the cells that compose the ovary is

important when considering the creation of a 3-D printed ovary, which is the primary goal of the Laronda Lab.



Shari Gordon & Christine Hwang

Faculty Advisor: Leoandra Rogers

The Role of Resistance: Black Adolescent Girls' Reports and Responses to Discrimination and Links to Mental Health

Racial discrimination is overwhelmingly negative for adolescents' mental health, and Black girls face the compounded consequences of racial and gender discrimination. Few studies have examined how Black adolescent girls' responses to these discrimination experiences are related to their mental health outcomes. Gilligan's (1990) theory suggests two response patterns: psychological resistance is an internalizing response that increases vulnerability to negative psychological outcomes; political resistance is an external response that holds the perpetrator responsible and in turn protects psychological integrity. Our analysis examined Black adolescent girls' responses to discrimination and links to mental health. Data were drawn from an ongoing longitudinal, mixed-method study at a predominantly Black, all-girls, high school. Fifty-nine Black/African-American girls, 14 to 19 (Mage = 16.97, SD = 1.84), completed survey measures of well-being and were individually interviewed about their social experiences. We first coded each interview for events of discrimination. The majority of girls (73%) reported at least one event of racial (88%) or gender (28%) discrimination. Using Gilligan's framework, we coded how Black girls responded to these events: 74% used political resistance and 11% used psychological resistance as coping strategies. An independent-samples t-test compared the well-being scores (self-esteem, depression, loneliness) for each group, revealing a significant difference for depression, $t(40) = 2.13$, $p = 0.039$. Contrary to theory, political resistance was related to higher reports of depression. Our findings underscore the salience of discrimination for Black girls, and the importance of identifying protective strategies that help them unpack such discriminatory experiences.



Aleksandra Grabowski

Faculty Advisor: Cynthia Robin

Decolonizing Digging? Critical Approaches for Contemporary Archaeologies

The roots of archaeology lie within colonialism, with foreign researchers traditionally being the ones to discover, write the story of, and, in a wider sense, gain ownership over the past. As such, indigenous, local, and descendant communities have often been deprived of power in the study and creation of their own—and/or their surrounding areas'—pasts. This fundamental power imbalance poses urgent challenges for the future of archaeology, namely: How can archaeology be restructured in an ethically engaged way? My thesis grapples with this question using the lens of ancient Maya archaeology. I pull from academic literature and my participant observation at the Aventura Archaeology Project in San Joaquin, Belize. In addition, I code and analyze qualitative data from exit surveys and interviews after two community archaeology education programs in Belize, gaining insight on their effectiveness and

areas for improvement. Integrating this data, I investigate archaeologies drawing from decolonizing frameworks by aiming to conduct research in equal partnership with local and indigenous communities. My analysis highlights the need of employing ethnography to build local relationships and understand social dynamics as well as what is important to stakeholders before any digging begins. This necessitates researching what communities find interesting and fulfilling in order to create flexible structures where constant communication and the coproduction of relevant knowledge frame every step. In this way, archaeological data, its stories of the past, as well as its economic benefits will be created with and for the communities it is most associated with and/or relevant to.



Charlotte Grimm

Faculty Advisor: Daniel Molden

Cognitive Fatigue and Ability to Regulate Eating Behavior

People often attempt to control their eating behavior in an effort to eat more healthy foods and avoid unhealthy foods. My research explored how people's beliefs, experiences, and motivations about self-control interacted with their experiences of exerting such control to affect how well they regulated their eating. Two studies investigated how the cognitive effort exerted on a laboratory task predicted the subsequent consumption of unhealthy snacks. In both studies, participants performed repeated blocks of an n-back task, which is designed to require sustained attention and concentration, in a one-hour session. During a "rest period" after each block, they reported their experiences of cognitive effort. In Study 1 participants had the opportunity to eat unhealthy snack foods that were ostensibly left over from a previous activity in the lab during each rest period, while in Study 2 the snacks were only presented after the final block. Study 2 also varied whether participants were randomly assigned to an easier or harder version of the n-back task. Although Study 1 showed some evidence that people's beliefs about the limits of self-control, their experiences of effort during the n-back task, and their motivations to regulate their eating interacted to predict snack consumption, Study 2 failed to replicate these findings.



Pallas Gutierrez

Faculty Advisor: Paola Zamperini

In the World We Manifested: Homonormativity, Gender Roles, and Sexism Within Queer Fan Fiction

This project was originally motivated by a life-long love of the Harry Potter series and a teenage love for fan fiction and other fan-created works. I was motivated to do research when I stumbled upon the lack of inclusivity in many fan communities, which I found to be shocking. In attempting to learn more about the harmful homonormativity, gender roles, and sexism that I had come across within works of queer fan fiction, I analyzed the website 'Archive of Our Own', a large fan fiction host site, to develop statistics on representation of gay and lesbian relationships within popular fandoms. I read through several works to learn about how these relationships are depicted within fan work, and did

close readings to parse usage of words, themes, and stereotypes. I plan on continuing my research in this area, examining other hubs of fan fiction and doing close readings of popular pieces in order to examine the prevalence of homonormativity, gender roles, and sexism. My research so far agrees with and expands on previous work done on how fan fiction portrays queer relationships. In her article “The Sex Lives of Cult Television Characters,” Sara Gwenllian Jones discusses whether fan fiction depicting gay male couples successfully subverts conventional constructs of gender and sexuality, and my continued research provides more information on this, as well as expanding the argument to include queer female couples.



Helena Haddad

Faculty Advisor: Guillermo Ameer

Assessment of pancreatic islet PEGylation for mitigating coagulation and complement activation upon transplantation

Type I diabetes is a chronic, autoimmune disease, characterized by the destruction of insulin-producing pancreatic β -cells. A promising, long term alternative to the current treatment, multiple daily insulin injections to control blood sugar, is the transplantation of functional pancreatic islets. However, transplanted islets are subject to the host’s inflammatory and immune response due to complement activation, a main part of the blood-mediated inflammatory reaction (IBMIR) that is crucial to the body’s defense against foreign bodies, but can rapidly destroy islets upon transplantation. To mitigate this, a physical barrier can be created by attaching poly(ethylene glycol) (PEG), a non-toxic polymer known to reduce immune response, onto the surface of the islets. The goal of this study is to assess the ability of PEGylation to reduce coagulation and complement activation upon islet transplantation. To do so, we incubated isolated murine islets in a solution containing NHS-mPEG to PEGylate them. As a control, islets were incubated in a solution without PEG. To assess coagulation, both groups were placed in murine serum, and clotting time was measured. After incubation, islets were also tested for complement activation by detecting C3a, a proinflammatory molecule consequent from activated complement. Results from these assessments are ongoing. We expect that PEGylated islets will undergo reduced coagulation and complement activation, as PEG would reduce the IBMIR. Since the IBMIR causes about 60% of islets to die after transplant, PEGylation could enhance islet survival and reduce the number of transplanted islets to maintain normoglycemia, therefore improving the treatment and patient well-being.



Katherine Haile

Faculty Advisor: Patricia Beddons

Unusual coastal mangroves decoupled from marine tidal forcing: Yucatan Peninsula, Mexico

Mangroves ecosystems are globally important as they protect against storm erosion, regulate sediment flux, play a large role in the global carbon cycle, act as nurseries for young fauna, and are critical to the

coastal ecology of oceans. Mangrove systems are typically flooded by marine water, with mangroves with restricted circulation being stressed or marginal. The Yucatan Peninsula is situated between the Gulf of Mexico and the Caribbean Sea and is rimmed by varied coastal mangrove systems, including surprisingly thriving mangrove with no apparent marine circulation. Three months of water level and temperature data from restricted circulation mangroves is analyzed against data from coastal outlets and inland sinkholes in order to determine marine and groundwater connectivity. The mangroves on the North coast demonstrate a partially coupled system, with tidal influence once the water level surpasses a threshold, but at lower water levels the mangrove is decoupled from the tides. The mangroves on the eastern/Caribbean coast are at least partially decoupled from the tides, and here, barometric pressure appears to be the diurnal control on mangrove water level, with overprinting week-month scale level changes tied to events. The results of this study have implications on the mangrove systems and coastal ecosystems as a whole. The decoupled nature of the systems indicates that the basins are mantled by impermeable fine-grained sediments. And with the increase in blasting and dredging channels in the coastline to further development, the perched systems would be breached and change the nature of the systems and the coastline.



Maddie Hong

Faculty Advisor: Ariel Rogers

Haptic Memories and Visualities in Film: How Films Touch and Feel

Film as a medium is one of visual languages and meanings. Oftentimes, these meanings are described in the realm of metaphor and semiotics, with cognitive visual associations held on the pedestal of meaning. However, in the human experience memory-recording is inherently multisensory, one of touch and smell and taste—not just sight. Why then must film, as a recording, be limited to visual metaphor as meaning alone? Within a section of film study, there are some scholars who embrace the multisensory experience of filmmaking and watching. Over the summer, I studied the writings of such scholars like Laura Marks, Vivian Sobchak, and Jennifer Barker. I also observed new media works and created my own images to further embrace their phenomenological approach to film. I determined that the sharing of experiential knowledge through the filmic image is related to the use of time, movement, sound, and space. The aesthetics of image may be used abstractly to evoke a haptic memory, inciting the audience to want to touch and taste and smell the screen based off of a triggering image. This desire to feel is itself meaningful. Now, I want to take these tools further. The rise of new technologies in screens, computer graphics, and augmented and virtual reality bring us closer than ever to digitally simulating the experience of touch, but at this point, these tools are still imperfect. As we are developing this technology, how might the technology and aesthetics work together to create impactful new media works?



Monica Hsu

Faculty Advisor: Aaron Miller

Under Pressure: College Women in Sports

Transitioning from adolescence into adulthood, many college students are facing stressors such as leaving the safety and supervision of their homes for the first time, as well as dealing with academic, social, and personal difficulties. Resilience to stresses faced in college is crucial to a student's wellbeing. Among adolescents, team sports involvement has been linked to improvements in stress resilience with increased social support as a potential casual factor. However, it is unknown if this impact of team sport participation continues into early adulthood. Using a mixed-methods approach, I investigate the effect of sports participation on general perceived stress, social support, and resilience to social stressors in college women. Quantitative results showed no significant difference in the three areas of interest between sports involved and sports uninvolved groups. However, qualitative results revealed positive aspects of sport participation to be physical activity as a positive stress reliever, accountability to engage in physical activity, and having fun, while negative aspects include time conflicts and competitiveness. Broader implications of this study relate to gender inequalities within sport, as participants noted discrepancies between male and female athletes in attention and funding for intercollegiate sports. I argue that sports teams can be a space for positive socialization, which can lead to increased resiliency; however, lack of attention and encouragement towards women in college sports have resulted in low participation rates. Therefore, more attention and opportunities should be opened up for college women to allow them to reap potential benefits if they choose to do so.



Sean Hu

Faculty Advisor: Chad Mirkin

Elucidating the Impact of Traceless Conjugation Chemistry on the Immunostimulatory Efficacy of Protein Spherical Nucleic Acids

The recent excitement behind immuno-oncology revolves around a compelling question: how can a patient's immune system be utilized to destroy cancer cells? One promising approach is the protein spherical nucleic acid architecture (ProSNA) pioneered by the Mirkin lab. A ProSNA consists of a nanoparticle protein-core with oligonucleotides densely conjugated to the surface, forming a radially oriented shell. Given that certain oligonucleotides (CpG sequence DNA adjuvants) and proteins (such as the model protein ovalbumin) combinations are sufficient to stimulate an immune response, the architecture offers the makings of an efficient immunotherapeutic. The overall ProSNA structure has been found to protect the individual components from degradation while enhancing co-delivery of both components into immune cells. However, the DNA shell may hinder crucial processing of the protein-core and the anchoring of the adjuvant may decrease its function. To explore this potential pitfall, a traceless linker that is cleaved in response to intracellular reducing agents and regenerates the native protein while liberating the DNA strands, was utilized to synthesize a ProSNA. The synthesis and purification conditions were optimized for these ProSNAs and their formation was visualized through an increase in size with the addition of DNA. Additionally, the traceless functionality imparted

by the linker was demonstrated. Following characterization, preliminary in vitro T-cell proliferation studies suggest that ProSNAs synthesized using the traceless linker generate a more robust immune response compared to ProSNAs with a non-cleavable linkage. These initial results encourage further study in more complex models, such as in vivo mice tumor growth inhibition studies.



Sana Hussain

Faculty Advisor: Sami Hermez

Aggressive Femininity: an understanding of the creation of gender through hegemonic discourses in sports

The aim of this ethnographic study is to explore the construction of gender of the women on a college basketball team in Qatar. For female sportspersons, gender is an inherent topic of conversation; more often than not, their gender is used against them in the sports arena. This paper tackles the issue of women's identity as sportspeople intertwined with the analyses of the women's masculine and feminine behaviors in different situations, remaining particularly attuned to the very construction of both masculinity and femininity. The study uses an existing body of knowledge about gender identity, such as Judith Butler's gender performance theory and Raewyn Connell's theory of hegemonic masculinity, and through one-on-one interviews and participant observation delves into the women's own gender identity. The participants were asked about their on-court and off-court behavior, their clothing and the language they use while playing among other topics. Analysis of conversations suggested that the women tend to perform their identity by emulating male behavior, which is considered to be the correct way of doing sport, on the court and around the team while behaving in a quintessentially feminine way off-court, because of the societal expectations to be feminine. While there has been extensive research about women as sportspeople, not much research has allowed women to express their own opinions about how their gender affects (or does not) their identity as a sportsperson, if they consider that a source of tension and how they tend to reconcile the two identities nor has much research been done in the context of Qatar, in which mostly orientalist stereotypes of gender proliferate and where the country is investing a lot in promoting sports.



Brian Ingersoll

Faculty Advisor: Caroline Bledsoe

Micromanaging Nature: Navigating Between Policy and Practice in Chicago Parks

People don't always follow rules or expectations, and their navigation through space is more complicated than obeying or disobeying what a sign's instructions say. Through renovation and restoration projects, designers and conservationists sustain dichotomies separating nature and non-nature. Yet, the ways in which parkgoers use the park crosses the constructed boundaries separating their urban life from nature. The literature on the relations of humans and nature shows that humans frequently place themselves outside of nature when discussing preservation and natural environments. While some work has been done on parks in urban environments, most work has focused on large

ecotourism sites like national parks and larger scale environments around cities. By contrast, this project looks at the relationships occurring in people's backyards, and the relationship between humans and Chicago parks designed by renowned Landscape architects. Studying historical documents, park signage and amenities, conservation and renovation news, material remains, and the ways park goers use space this project aims to analyze the way landscape design reinforces separations of humans and nature, but that actual use does not fall simply into this dichotomy. Possibly encouraging people to rethink modern landscape design, what the purpose of restoration projects are, and encourage further looks at nature in urban areas.



Annamarie Jedziniak

Faculty Advisor: Christine Bell

**The Effects of Photography on Facial Reconstructive Plastic Surgery
Between the 19th and 20th Century**

Historically, plastic surgery commonly used clinical photographs in its field as a way to document surgeries and teach students. As photography was an integral part of early plastic surgery, this project posed the questions: what aspect(s) of photography allowed physicians to realize what treatment was best and what aspects of photography caused plastic surgeons to find photographing their patients an important tool for their own practice. The project was narrowed to facial reconstructive plastic surgery between the 19th and 20th century. The surgeons studied were William J. Brown, Jacques Joseph, Gurdon Buck, Harold Gillies, Archibald McIndoe, Leonard Colebrook, and Victor Veau. I relied on documents written by the surgeons, photographs, plastic surgery journals, and clinical photography articles during the time period, which were accessible through the Wellcome library, British Association of Plastic Reconstructive and Aesthetic Surgeon, and Royal Society of Medicine archives. I found that only Harold Gillies actively used photography in addition to other art forms of sculptures, paintings, and drawings, while others used it for general recordkeeping, publications, or were required by the army. Gillies, unlike other surgeons, liked to thoroughly plan and evaluate his work, so art provided multiple ways to view and understand the patients' surgical needs and progress. Furthermore, artwork aided the patient as he would describe his plans to the patient with the material, and the patient could see their progress. The use of art was a way for the patients to cope with the psychological trauma of their injuries, which only he and Archibald McIndoe focused on. McIndoe accomplished this through allowing patients to socialize more instead of artwork of the patients' surgeries.



Sophia Jenz & Kasia Przybyl

Faculty Advisor: Eva Redei

Prior Stress and Fear Conditioning Intensity Interact to Generate Sex-, and Strain- Specific Enhanced or Attenuated Fear Memory

In humans, posttraumatic stress disorder (PTSD) is co-morbid with major depressive disorder. Individuals who are exposed to stress prior to a traumatic event have an increased likelihood of developing PTSD. To study this increased vulnerability, a rat model was developed using the Stress Enhanced Fear Learning (SEFL) paradigm. This study aims to show how SEFL's consequences can differ depending on the sex, stress-reactivity of the animal, and intensity of fear conditioning. Wistar Kyoto (WKY) rats were bred based on their extremes in a test used to measure depression-like behavior. WKY More Immobile (WMI) strain mirrors human major depressive disorder, and the isogenic WKY Less Immobile (WLI) strain acts as a control. In the study, 16 groups of rats were used, strains (2) by sex (2) by stress (2) by shock intensity (2) with 7-8 animals in each group. Rats in the stress group received acute restraint stress 48 hours prior to contextual fear conditioning (CFC). During CFC, WLI and WMI rats received either 0.6 mA or 0.8 mA intensity foot shocks and their freezing response was measured. WLI rats showed no effect due to SEFL, while WMI males exhibit enhanced fear memory after greater intensity CFC. In contrast, WMI females show enhanced memory after 0.6 mA, but attenuated fear memory after 0.8 mA intensity CFC. Expression of target genes in the blood and brains of these animals could identify biomarkers aligned to the behavior, with potential to identify mechanisms underlying the modulation of SEFL.



Gina Johnson

Faculty Advisor: Nina Kraus

Concussed football players display enhanced sound processing compared to healthy, non-athlete peers

Playing sports can boost cognitive and physical health. However, some high-contact sports, such as football, have come under recent scrutiny because the head trauma sustained by athletes during participation is believed to result in impaired health later in life. In the auditory system, we have found that sound processing is enhanced in expert, collegiate athletes and separately, that concussion, a type of mild traumatic brain injury, can impair sound processing. This study aimed to investigate the intersection between the athlete effect and sports-related concussion. To understand how auditory enhancements and impairments intersect within an individual, we compared sound processing in acutely-concussed (i.e. 24-48 hours post-concussion) NU Football players (n=24) to healthy, non-athlete, age- and sex-matched controls (n=21) using the frequency following response (FFR), an objective neurophysiological assessment of midbrain processing of complex sounds, such as speech. We found that despite suffering from a concussion, the football student-athletes displayed more robust sound processing than their non-athlete peers, suggesting that the cumulative effects of sports participation are maintained acutely following an injury. These findings are important in the debate on the risks of football participation. Specifically, they may shed some light on why impairments do not manifest until later in life, as they provide initial evidence that the processing enhancements believed

to result from sports participation can, at least for a while, offset the impairments associated with head injury. Future studies should examine the long-term interaction of enhancements and impairments in athletes.



Stephen Johnson & Katherine Riedel

Faculty Advisor: Manijeh Razeghi

Sem(eye)conductors: Treating Ocular Diseases With Semiconductor Technologies

Over recent years, semiconductor technology has improved to aid in the treatment of degenerative eye diseases. The use of semiconductor lasers has become a cornerstone in ophthalmic surgery. Excimer or exciplex lasers, a type of laser that only functions in the UV range, are commonly used to perform LASIK. Recent research has also been looking into new forms of using lasers that will result in surgeries with fewer side effects and a faster healing time. Additionally, electronic retinal implants have been developed to help restore sight to visually-impaired individuals who could previously see. Current studies involve improving retinal prosthesis, a technique that uses electrodes to stimulate parts of the retina. This oral presentation will delve into both the currently established uses of these semiconductor lasers and electronic retinal implants, potential future uses, and how their success links to their semiconductor materials.



Lauren Ché Anderson Justice

Faculty Advisor: Brady Clark

Effects of Verb-Definite Description Pairings on Acceptability in Frequency Adjective and Weak Definite Constructions

Weak definites are a type of definite description that do not seem to have the same uniqueness requirements as other definite descriptions. For example, the weak definite “the hospital” may be used in a VP-ellipsis construction like “John went to the hospital and Mary did too”. This sentence may be interpreted such that John and Mary went to different hospitals. The availability of weak definite readings depends on both the noun and the verb paired with it, so “go to the hospital” can take a weak definite reading, but “drive to the hospital” cannot. If weak definites refer to event kinds, rather than individuals, some of these properties may be explained. The concept of event kinds is also relevant to frequency adjectives, specifically in constructions like “the occasional cup of coffee is good for the health”, which may be interpreted as “drinking a cup of coffee occasionally is good for one’s health”. This interpretation, known as the generic reading, is only available with event kinds. This research examines which verbs allow for weak definite readings by placing them in VP-ellipsis constructions, and then examines which of these verb-definite description pairings are most acceptable in generic readings of frequency adjective constructions. These questions are examined through surveys distributed on Amazon Mechanical Turk. Although research is still ongoing, if the verbs that are most acceptable for generic readings of frequency adjectives also allow for weak definite readings, this would support the idea that weak definites refer to event kinds rather than individuals.



Faraz Khan

Faculty Advisor: George Schatz

Super-resolution SERS—Investigation of Raman Image Dependence On Laser Wavelength

For decades, scientists have improved imaging techniques to increase image resolution: the ability to discern two separate objects in an image. During image acquisition, two nearby objects appear as a single blurred spot due to diffraction, the bending of light around nano-sized objects. Modern imaging techniques, like super-resolution SERS, aim to overcome these localization limits. Previous research has elucidated the coupling between a single nanoparticle, a nano-sized piece of silver, and a single molecule. However, more complex nanostructures, e.g. nanoparticle aggregates, have become common in super-resolution SERS experiments. Also, large numbers of molecules surround these nanostructures, which complicates images. The relationship between laser wavelength and Raman images remains unknown. This computational investigation of Raman image dependence on laser wavelength during super-resolution SERS employs Mie theory to calculate light scattering from nanoparticle aggregates and molecules. The point spread functions from each molecule are superimposed coherently to generate Raman images observed at a detector. Results demonstrated that the Raman images are strongly influenced by the plasmon modes excited during the initial plane wave excitation. Thus, the wavelength of the laser, and its frequency relative to the resonant frequency of the emitter strongly affected the image. These results will aid experimentalists in selecting a laser wavelength that simplifies image analysis and allow them to identify the localization of molecules with less uncertainty. Therefore, this project moves scientists in the field closer to the development of super-resolution SERS, which if perfected can be a transformative tool in molecular biology and analytical chemistry.



Samuel Kim

Faculty Advisor: Michelle Driscoll

Effect of Colloidal Particles on a Drop

According to the principle of free fall, only gravity acts upon an object in midair. However, as with all scientific principles, free fall plays out differently in practice. In my experiment, I first tested to see the effect of changing the glycerol weight-percentage of a drop of glycerol-water on its maximum spread when dropped onto smooth glass at each given height, greater spread indicating greater kinetic energy present within the drop. Turns out, glycerol weight-percentage is inversely related to maximum spread. Moreover, the greater the glycerol weight-percentage, the higher the viscosity of the drop due to higher friction between drop particles, and the smaller the potential spread of the drop. Next, I performed a similar experiment on colloidal suspensions. Colloid weight-percentage is also inversely related to maximum spread of the drop at each height dropped. However, as colloidal suspensions are non-Newtonian fluids, they lack a linear relationship between viscosity and shear stress, which results in equal spread for a dilute colloidal suspension and water, disrupting the trend of greater spread for lower colloid weight-percentage. Also, due to the fact that colloidal suspensions are composed mainly

of water with particles suspended and that water has low viscosity relative to glycerol-water, colloidal suspensions show greater maximum spread than does glycerol-water at each height dropped. As a result of completing this project, I primarily gained a first-hand understanding of how the principle of free fall plays out in real life using different concentrations of glycerol and colloids in water.



Seongsik Kim

Faculty Advisor: Jason Wilson

Developing Measures of Human Autonomy in Relation to Assistive Agents

Many cognitive systems such as autonomous driving systems have been developed to fully automate a process. However, in many cases, it is preferred to enable a person to make decisions independently and fully automated systems may not be desirable. For example, in the case of a tutoring system, the teaching agent shouldn't completely take over the student's autonomy in completing a task. Doing so could actually result in negative effects such as the student becoming more dependent on the teaching agent on subsequent tasks. The purpose of this project was to study and develop valid measures of human autonomy in relation to assistive agents. We selected 100 questions that could be used to measure human autonomy in relation to assistive agents. To determine which of the questions best measure autonomy, we are conducting an experiment in which participants played an Online Room Escape Game while being assisted by a person. After successful completion of the game, each participant completed the survey. Analysis of the results so far have shown that there may be two factors to represent the data, which is similar to the two factors found in the Index of Autonomous Functioning (IAF) paper. Once we complete the study, we will have a validated measure of human autonomy when being assisted by an assistive agent. This work can be an asset in many different areas of research including but not limited to, evaluating the performance of assistive agents, cognitive systems, occupational therapy, education, and medicine.



Ulyana Kurylo

Faculty Advisor: Jason Wilson

Computational Model of Gaze

With current growth in robot supported collaborative work comes a need for well developed and fine tuned agents which respond to the user in a seamless and intuitive manner. Socially assistive robots in particular have come to be more popular for their uses in care for older adults, including for medication adherence and socializing. Since eye gaze cues are important mediators in human-human interactions, we hypothesize that gaze patterns can be applied to human-robot interactions to identify when the user may need assistance. In this paper, we reviewed videos (N=16) of robot supported collaborative work to explore how recognition of gaze patterns for an assistive robot in the context of a medication management task can help predict when a user needs assistance. We find that mutual gaze is a better predictor than confirmatory request, gaze away, and goal reference. While eye gaze serves as an important indicator for need for assistance, it should be combined with other indicators,

such as verbal cues, facial expressions, or gestures, to sufficiently represent assistance needed within the interaction as well as provide timely assistance.



Annie Lee

Faculty Advisor: William Horton

Interlocutor Identity and Proactive Control During Language Production

In recent years, bilingualism has been a popular topic of research in the field of human cognition and communication. The control of two languages serves as a unique construct of cognition, useful in the observation of effective communication. Several theories of language production suggest contextual cues can proactively activate language in bilingual individuals. Previous studies have explored the identity of the interlocutor—a person with whom a conversation is had—as the contextual cue for language comprehension. Instead of language comprehension, this study aims to explore language production as a function of interlocutor identity. Does the knowledge of the interlocutor’s monolingual/bilingual status function as a cue for the strength of proactive control during language production? To explore this question, a digit-naming task was designed to measure response times of English-Spanish bilinguals in four different conditions. The English-Spanish bilingual subjects performed this digit-naming task in four blocks with images of virtual interlocutors introduced as: a monolingual English-speaker, a monolingual Spanish-speaker, an English-Spanish bilingual speaking English, and an English-Spanish bilingual speaking Spanish. A significant difference in response times between monolingual interlocutor and bilingual interlocutor conditions would suggest that interlocutor identity serves as a contextual cue for language production. Significant results may prompt further exploration of the mechanisms involved in the proactive control of language. Larger implications of contextually activated language production include the potential for a bilingual advantage in certain cognitive processes such as theory of mind—the ability to understand the other’s perspective.



Jason Levin

Faculty Advisor: Claudia Haase

Cardiometabolic Risk as Mediator Between Positive Affect and Memory

Positive affect has been shown to predict better memory functioning, but biological mediators have remained understudied. Drawing from a US national sample of middle-aged and older adults (N = 571), the present study examined cardiometabolic risk as a mediator of the relationship between positive affect and memory. Positive affect was measured using an abbreviated version of the Positive and Negative Affect Schedule (i.e., asking how often in the past 30 days participants felt enthusiastic, active, proud, and attentive; $\alpha = .85$). Memory was measured using an immediate and a delayed recall test. Cardiometabolic risk was measured using a composite score (following established procedures; Boehm et al., 2016) of systolic blood pressure, diastolic blood pressure, triglycerides, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, glycosylated hemoglobin, waist

circumference, and C-reactive protein. Mediation analyses revealed that cardiometabolic risk mediated the relationship between positive affect and memory ($b = .0133$, $SE = .0077$, $95\% \text{ CI} = [.0017, .0317]$). Results remained robust when controlling for age, gender, race, and negative affect. Interestingly, mediation effects did not emerge for any individual indices of cardiometabolic risk ($ps > .05$) but only when analyzing the composite cardiometabolic risk score. These results contribute to our understanding of the link between positive affect and memory by showing that this link may be driven by dysregulation across multiple biological pathways.



Dani Lewittes

Faculty Advisor: Frederick Northrup

The Effect of Intramolecular Hydrogen Bonding on the Solution-Phase Conformation of Tertiary Amines

The reactivity and chemical properties of a molecule are largely defined by its conformation, or physical orientation, in the solution. Therefore, understanding the conformation of a molecule is crucial for understanding its reactivity. While solution conformation can be influenced by the properties of the solvent and temperature of the system, more interesting conformational changes are caused by intramolecular hydrogen bonding, which hinders internal rotation in the molecule. Our research group has used variable-temperature nuclear magnetic resonance (VT NMR) spectroscopy to study this effect in N-(2-hydroxybenzyl)-N-methyl-methylbenzylamine (2-HBMMB) and other derivatives which exhibit intramolecular hydrogen bonding between the amine nitrogen and hydroxyl group proton. As the temperature of these solutions is lowered toward -50°C , significant NMR peak broadening is observed, eventually leading to splitting of the proton NMR signals into multiple peaks representing different stable conformations, at the lowest temperatures. We have varied molecular composition to study the effects of mass, steric hindrance and pK_a (acidity) of the hydroxyl group on the hindered rotation barriers in these molecules. Estimates of the rotation barriers have been calculated from the observed peak broadening. Recently, derivatives of 2-HBMMB with multiple competing hydrogen bonding sites have been synthesized. This has allowed us to tune molecular composition to direct the competitive hydrogen bonding thereby forcing the molecule into specific conformations. Furthermore, some solid-state conformations have been elucidated by single-crystal X-ray diffraction studies, giving further insight into the absolute molecular conformations when rotation is hindered, and displaying how conformation is affected by subtle chemical changes between the molecules.



Keldon Lin

Faculty Advisor: David Rapp

Controversial Topics Increase Skepticism of Data Visualizations

With the rise of fake news, critical analysis of information is becoming increasingly necessary. People tend to interpret information in accordance with their existing beliefs, which makes reaching conclusions about controversial information difficult. This study examines whether this is true of

interpreting visual information in the form of graphs. Seventy-one adults were presented with an ambiguous graph and were told that it depicted data about either a controversial topic (gun control) or non-controversial topic (employee turnover at a made-up business). The three descriptions were (1) homicide rates after legislation made guns harder to access (politically left-leaning), (2) homicide rates after legislation made guns easier to access (politically right-leaning), and (3) a business's turnover rates after an employee training program (control). Participants were then asked whether the intervention was effective and if they would recommend it. Open-response justifications from each participant were also recorded. Despite being presented the same graph, the proportion of individuals who judged the intervention as effective in the control condition ($M = 0.83$) was significantly higher than that of the controversial gun control conditions ($M = 0.49$), but there was no significant difference in the intervention's perceived effectiveness between the two gun control conditions. Likewise, a greater proportion of individuals recommended the intervention in the control condition ($M = 0.89$) than either of the gun control conditions ($M = 0.47$). These results demonstrate how visual information about controversial topics can create a greater divide in interpretation than the same information on a topic devoid of prior biases.



Patrick Lin

Faculty Advisor: Sandra Waxman

**Challenges in Adjective Learning:
An Investigation of how to Improve Adjective-Property Mappings in Children and Adults**

Adjectives are a common part of all people's vocabularies, but their acquisition is not as straightforward as many may believe. It has been demonstrated that children struggle with adjective learning tasks even at 3 or 4 years of age. This raises the question of whether this is due to their stage in development or is simply an inherent difficulty with learning adjectives. To determine this, I tested the performance of adults on similar adjective learning tasks. Results indicated that adults also struggled with these tasks, suggesting children's struggles may not be due to their earlier developmental stage. In order to better understand the connection between the performance of children and adults on these tasks, strategies that have been proven to improve the performance of children were tested on adults. Across two experiments, I found that adults' performance could be improved in a similar manner to children: adults learned adjectives more accurately when given noun support or less salient alternative property matches. I then tested a novel way to improve the performance of adults on these tasks, revealing that directing attention toward the target property's importance to the object kind enhanced adults' adjective learning. I am continuing to test whether this technique could also help with improving adjective learning in children. By better understanding the reasons that children struggle with adjectives, we can better facilitate their language learning as a whole.



Erica Littman

Faculty Advisor: Erica Hartmann

Efflux Pumps Contributing to Antibiotic Resistance are Conserved Across Pseudomonas Species

Antibiotic resistance has created a public health crisis because humans rely on antibiotics to treat infectious diseases. My project helped to better understand antibiotic resistance in *Pseudomonas*, which are widespread in the environment and can be the causative agent of infection, particularly in people with cystic fibrosis. I identified the mechanisms of antibiotic resistance in *P. stutzeri* and *P. fulva* by knocking out candidate genes thought to be involved in resistance mechanisms. Previous research has characterized an efflux pump encoded for by the *mexAB-oprM* operon in *P. aeruginosa*, a model organism genetically similar to *P. fulva* and *P. stutzeri*. The specific candidate gene I knocked out in this experiment was previously identified as one such homolog. Putative resistance genes were knocked out using a transposable element, which inserted into one of 161 possible insertion sites in the *Pseudomonas* genome. The resulting 4,101 mutant cultures were grown in the presence of triclosan, an antibiotic to which both strains were previously resistant. *P. fulva* mutant colonies were only able to grow at a triclosan concentration of 8.0 mg/L, while the wildtype was able to grow at 128.0 mg/L, indicating a decrease in resistance activity after mutagenesis. Eight of the successfully mutated colonies were sequenced, and it was determined that the transposable element was inserted into the *mexAB-oprM* homolog in one *P. fulva* colony. This information is important as it gives insight into the conservation of resistance mechanisms across strains of bacteria as well as into ways to treat antibiotic-resistant infectious.



Wendy Luo

Faculty Advisor: Eva Redei

Circadian Rhythm Disruption in Maternal Behavior Concomitant with Decreased Expression of Vasopressin Signaling and Litter Survival in a Genetic Rat Model of Depression

Depression alters maternal behavior with major consequences on the neurodevelopment of the offspring. To understand the contribution and biological underpinning of depression to maternal behavior, dams of the inbred Wistar Kyoto More Immobile (WMI) rats with enhanced depression-like behavior and stress-reactivity were studied. Maternal behaviors of WMI dams and dams of their isogenic control strain, the Wistar Kyoto Less Immobile (WLI), were observed for 10 days postpartum in the morning and the evening. Hypothalamic expression of specific target genes and their receptors was also evaluated in these dams post-weaning, or earlier if litters did not survive to be weaned. WMI neonates were significantly less likely to survive to weaning than the WLIs, yet the difference in neglect and passive maternal behavior was not statistically different between the strains. WMI dams did not show diurnal variation in maternal behaviors while WLI dams did. This lack of diurnal variation in the WMI dams coexisted with higher hypothalamic expression of Lysine Demethylase 5A (*Kdm5a*), Period Circadian Regulator 2 (*Per2*), and Arginine Vasopressin Receptor 1A (*Avpr1a*) compared to that of WLIs'. As the expression of these genes in the hypothalamus correlates significantly with

evening passive nursing, this may present a hitherto unknown molecular mechanism of this behavior. The WMI dam may function as an animal model that can mirror some characteristics of postpartum depression in humans and may be useful in identifying drug targets.



Jennifer Martinez

Faculty Advisor: Sylvia Perry

Examining the Downstream Effects of Sense of Belonging on Black Medical Students' Psychological Well-Being

Sense of belonging is known to be positively correlated with academic motivation, individual effort, and participation in academics. Furthermore, sense of belonging increases when students are in environments in which teachers are encouraging and promote mutual respect. While much work on sense of belonging within academic environments has focused on adolescents (from middle school to early college), the current study focuses on a unique and understudied population for which belonging has important consequences: Black medical students. Specifically, the present study examines sense of belonging in Year 2 of medical school its subsequent downstream effects in Black medical students who attend Historically Black Colleges (HBCUs) versus Predominately White Institutions (PWIs) in Year 3. Our findings show that Black medical students at HBCUs self-report a higher sense of belonging than students at PWIs. Subsequently, we investigated whether, as a result of this increased belonging, students at HBCUs had more positive psychological outcomes. Results indicated that HBCU students' (vs PWI students') sense of belonging in Year 2 was associated with decreased self-reported anxiety, and an increased perception that they would be competitive for residency in Year 3, even when controlling for these factors in Year 2. Thus, our findings provide support that, because they reported a greater sense of belonging, Black medical students at HBCUs (relative to PWIs) reported increased psychological well-being and greater self-efficacy about their success after medical school across multiple time-points. Other outcomes and the implications for increasing diversity in medicine will be discussed.



Nicolette McManus

Faculty Advisor: Katherine Amato

The Impact of Habitat Degradation on the Gastrointestinal Microbiota of Black-and-White-Ruffed Lemurs (*Varecia Variegata Variegata*)

Anthropogenic habitat disturbance and associated diet changes have been shown to impact the gut microbiomes (GMs) of many species of wild primates, which may have important health consequences. However, to date, most primate GM studies target primates with either a specialized folivorous diet or an omnivorous diet. Much less is known about the GM of specialized frugivores despite a potentially larger opportunity for nutritional stress in disturbed habitats with fewer large fruit trees. Here, I examine the impact of anthropogenic habitat disturbance on the diet and GM of the critically endangered black-and-white ruffed lemur (*Varecia variegata variegata*). I hypothesized these

populations would have distinct gut microbiome compositions. Specifically, I predicted decreased dietary and gut microbial diversity as forest degradation increased. Between June and August 2018, I collected fecal samples from three populations: a primary forest, a moderately disturbed forest, and a heavily disturbed forest. I also collected behavioral data using full day follows at each site. Between the forest sites, the diversity of plants consumed varied, with the highest diversity consumed in the primary forest and the lowest in the moderately disturbed forest. Statistical analysis revealed a higher incidence of microbial diversity in the primary and heavily disturbed forests than in the moderately disturbed. Additionally, diet and microbe data were found to be positively correlated. Overall, the trend of decreased diet and microbial diversity in degraded forest sites, along with evidence of dependence on specific fruit trees, can help put conservation and restoration efforts for *Varecia* into place.



Ennely Medina

Faculty Advisor: Galya Ben-Arieh

Preserving Best Interests: Unaccompanied Minors in Detention

For decades, legal advocates have fought in both the judicial and legislative arenas to protect the best interests of children in detention. Despite their efforts to halt unnecessary child detention, the rates continue to increase. With these rates in mind, I raise my first question: why has child detention increased? Considering the role of lawyering and legal advocacy plays in policymaking, I pose my second question: How was the increase possible despite the enactment of policy protections for the best interests of unaccompanied minors? Current public debate about child detention has focused primarily on the actions of the Trump administration, assuming this problem originated in 2017. Through my analysis, I show that the origins of child detention pre-date the Trump administration and are related to the reframing of immigration as a national security issue following the tragedies of September 11th, 2001.



Emma Meyerhoff

Faculty Advisor: Lilah Shapiro

An Exploration of the Instagram Body Positivity Movement

Prevalence of negative body image among women is high, and exposure to images of thin women contributes to this negativity. Viewing underrepresented body types may promote positive body image, and many women turn to social media to do so through the body positivity movement. However, little research has been done to understand the impact of this movement. Through a series of semi-structured interviews, I explored perceptions of the body from women who engage with “body positive” and “fat acceptance” accounts on Instagram. Using a grounded-theory approach for my analysis, I found that these women tended to have a positive body image and to show a high level of acceptance of larger bodies. There was a considerable amount of variation in their conceptualization of the body positivity movement, with some taking a more radical position on what it should be. While

some women believe the movement is only about loving one's own body, others emphasize the importance of eradicating the stigma against larger bodies and advocating for equal treatment. Additionally, health was a divisive issue, with some women expressing concerns for others' health based on their body size. Other women explained how the movement taught them that body size does not equate to health and that regardless of health status, all people deserve respect. This research suggests some potential benefits of the body positivity movement, including greater acceptance of all bodies, including one's own. The discrepancies in responses when describing the body positivity movement highlight a need for further research.



Ryan Millman

Faculty Advisor: David Uttal

Exploring the Use of Comparisons During Families' Conversations at a Children's Museum STEM Exhibit

There is great interest in young children's learning in museums. One reason is to introduce them to science, technology, engineering, and mathematics (STEM) concepts. In museums, parent-child conversations help promote children's STEM learning. One important aspect of these conversations is comparative language, in which features within the exhibit are related to one another, and to events outside the exhibit. For example, at a car exhibit, "that car looks like ours at home." In highlighting these relationships, comparisons clarify complex content and help children learn. This study explores parents' and children's use of comparisons within a STEM-oriented exhibit at the Chicago Children's Museum. 61 6- to 8-year-old children and their parents were video recorded in the exhibit while working with real tools and materials (e.g., wood, bottle caps) to complete an engineering challenge to make a moving vehicle. Video recordings were coded for comparisons to the exhibit's activities (e.g. "Flying vehicles are easier to make than rolling vehicles."), to other visitor's creations, and to experiences the families had had in the past and might have in the future. On average, parents used 7.62 comparisons (range: 0 - 31) and children used 3.74 comparisons (range: 0 - 15). Additionally, parents used significantly more comparisons than children, $t(120) = -4.67$, $p < .0001$. Finally, parents who made more comparisons had children who made more comparisons, $r(59) = .59$, $p < .0001$. Our findings may provide insights into the types of parent-led interactions that bolster children's learning from museum experiences.



Imani Minor

Faculty Advisor: Leoandra Rogers

"You're pretty for a dark skin": Rejecting and Endorsing Colorism in an All-Black, All-Girls High School

Racism effects the daily experiences of black adolescents and negatively impacts their psychological well-being. Most research examines racism between groups, but white supremacy also permeates racial attitudes within groups. Colorism is a form of intra-group racism where Black people show preference

for lighter skin and other physical attributes associated with Whiteness. Colorism has been linked to the perceived attractiveness, femininity, and desirability of Black girls, and negatively linked to Black girls' well-being. Is colorism relevant among Black adolescent girls attending an all-Black, all girls high school? If so, how do they negotiate it? Fifty-nine Black girls (Mage = 16.97) at an all-Black girls high school completed one-on-one semi-structured interviews and surveys. Interviews were analyzed to assess whether and how Black girls reference colorism when discussing their racial and gender identities. We found that 64% (n = 38) of the sample spontaneously mentioned colorism, specifically regarding: skin color (68%), attractiveness/femininity (47%), hair texture/style (42%), skin tone (42%), and body type (21%). Most girls (74%) were rejecting colorism with only 16% endorsing it. On the survey, girls who scored higher on colorism rejection also scored significantly higher on self-esteem ($r = .769, p < .0001$). Our mixed-methods findings suggest that colorism is relevant to Black girls, specifically in their rejection of it. Although previous studies focus on how girls, particularly those of a darker complexion, are disadvantaged by colorism in romantic relationships and self-esteem, our data suggest that Black girls in this school successfully negotiate colorism in a journey to self-acceptance.



Michael Montoya & Ryne Montoya

Faculty Advisor: Donna Jurdy

Anthropogenic Effect on Diversity in Cedar Glade Habitat

The impact of insects provides the ecosystems they inhabit with numerous benefits that assist their communities. These insects provide an excellent source of instinct and an important characteristic of predator and prey in leaf litter habitats of deciduous forests. These insects, formally called macroinvertebrates, were studied for biodiversity counts in multiple areas in the Middle Tennessee Cedar Glades during the spring and fall seasons of 2017. The insects were counted and indexed for biodiversity to examine possible human effects on these cedar glades as residential interests and commercial development increase in the area. The fall collections yielded a higher biodiversity index compared to the spring collections; however, the most developed site surveyed recorded the highest biodiversity index in their respective seasonal collections. There are a variety of inferences that can be concluded from the biodiversity indexes, but two important conclusions can be inferred: the weather played a significant role in the psychological behavior of the macroinvertebrates and the government protections enforced on a park do not protect the park from exotic species or an influx in biodiversity.



Prianka Murthy

Faculty Advisor: Dan McAdams

Racial Differences in Narrative Meaning-Making Based on Hardiness

Through this project, I set out to explore racial differences in narrative meaning-making, and how these differences relate to levels of hardiness. Hardiness is a personality trait that explains resilient actions in the face of difficult circumstances. Based on previous literature that links hardiness with

racial identity, this project set out to examine how levels of hardiness may differentiate the ways in which African American individuals narrate positive and negative experiences in their lives from how European Americans narrate these same experiences. The participants were all mid-life adults who were interviewed extensively on different memories and experiences in their lives as a part of the Foley Longitudinal Study of Adulthood. I first coded the interviews for 2 different themes: overcoming adversity and growth and recovery. Overcoming adversity is a code that is predicted to be more common among African Americans, where the narrator is faced with a difficult situation that they are able to persevere through. Growth and recovery is a code that is predicted to be more prevalent in European Americans, where through a certain experience, the narrator is able to develop and self-actualize. I then examined a hardiness self-report measure that participants took before the initial interview and analyzed whether higher hardiness related to higher rates of overcoming adversity in African Americans and higher rates of growth and recovery in European Americans. The analysis showed that while this specific relationship was not statistically significant, it led to discovering the possible significance of a relationship between hardiness and themes of agency and communion, which I'm currently working on.



Sarah Neubert

Faculty Advisor: Andrea Graham

Understanding the Experiences and Triggers of Binge Eating and Obesity to Inform the Design of a Mobile Intervention

To design a mobile app for binge eating and obesity, we qualitatively assessed how target users experience these conditions. Adults (N=22) with self-reported obesity and recurrent binge eating (≥ 12 episodes in 3 months) completed a 4-week digital diary study of their experiences with binge eating and obesity. Two themes emerged: 1) triggers for binge/excess eating, and 2) experiences and impacts of binge eating and obesity. Internal triggers included various emotions, excessive thoughts of food or hunger, anticipating a binge, difficulty with motivation/goals, and a perceived need to consume available food. External triggers were situational (e.g., eating alone, unstructured eating pattern, eating outside the home, eating-related activities, access to certain foods, inactivity/boredom, late night eating, interpersonal problems) and physical (i.e., lack of sleep, health problems). Experiences and impacts had 4 sub-themes: experiences during a binge (i.e., distracted eating, rapid intake), socialized experiences/environmental impacts (e.g., negative body image, negative food judgments, feeling excluded, perception that home hinders healthy behaviors, health responsibility for others, financial burden), mental health impacts (i.e., guilt, failure, low self-esteem, low mood), and physical health impacts (e.g., fatigue, pain). Understanding how target app users experience binge eating and excess weight helps inform intervention targets.



Alara Ozsan

Faculty Advisor: Vijay Mittal

Exploring the Psychosis Continuum: Reward Processing in Non-Clinical Psychosis

Literature suggests that individuals in the general public report psychotic-like experiences (PLEs) that include both positive (e.g. fleeting hallucinations) and negative (e.g. lack of pleasure from social activities) subclinical symptoms, supporting the theory that psychosis exists on a continuum. The individuals who endorse high levels of non-clinical psychosis (NCP) have a higher risk of converting to a psychotic disorder. Studies indicate that abnormalities in reward processing might contribute to some of the symptoms observed in psychotic disorders and in individuals with non-clinical PLEs (i.e., NCP). Specifically, reward processing has been found to be impaired in psychosis, and an important factor that might be driving negative symptoms of psychosis (e.g. low motivation). However, the underlying pathophysiological mechanisms of reward deficits remain unclear. Given that NCP samples lack confounding variables typical to psychosis research (e.g. medication), examining the NCP population enables research without such limitations. This study examined reward-related processing in individuals who report frequent PLEs making use of event-related potentials (ERPs). ERPs, which have excellent temporal resolution, are employed to investigate if higher frequency of PLEs are associated with more deficits in reward processing, further supporting the psychosis continuum theory. To establish ERPs, electroencephalography (EEG) data was collected as the participants completed the Time Estimation task, processed, and statistically analyzed. The results suggested that higher frequency of positive PLEs correlated with an abnormally small P300 and a more negative Feedback Related Negativity (FRN) ERP component, indicating abnormalities in the reward processing system. These findings were supportive of the psychosis continuity theory.



Dayanara Padilla

Faculty Advisor: Leoandra Rogers

“There’s Racist People Out There, Like Donald Trump”: Children’s Spontaneous Reflections on Current Politics

Does the political context influence how children think about who they are and will become? This study analyzed longitudinal data to explore children’s references to sociopolitical events, such as presidential elections, when they described their own social identities and future aspirations. Children (7-14 years old; N = 245) were individually interviewed on two separate occasions: Time 1 interviews coincided with Barack Obama’s seventh year of presidency (May, 2014); Time 2 interviews happened after Donald Trump launched his presidential campaign (May, 2016). Content analysis revealed that 20 participants spontaneously made political/presidential references; 10 participants made political/presidential references at Time 1 and 12 participants made references at Time 2. Two participants made such references in both of their interviews. At Time 1, political/presidential references covered a wide range of topics: social justice advancements (30%), governmental facts (20%), presidential responsibilities (20%), racial inequalities (10%), fears of the future (10%), and gender inequalities (10%). At Time 2, during Trump’s presidential campaign, all political/presidential references made by participants centralized under two themes: racial inequalities (50%) and fears of

the future (50%). Moreover, there were 11 specific references to Donald Trump, suggesting the prevailing salience of this presidential campaign. Such findings are notable because children were discussing their views of their own racial and gender identities and their future aspirations. This study contributes to our understanding of the impact of politics on development and how children may engage macro-level issues as they make sense of their micro-level social identities and experiences.



Grace Park

Faculty Advisor: Erik Andersen

Identifying Genetic Determinants of Avermectin Resistance in *Caenorhabditis elegans*

Parasitic nematodes cause neglected tropical diseases (NTDs) in a significant proportion of the human population and can be treated with anti-parasitic drugs, or anthelmintics. However, we have seen a rise in nematode resistance to anthelmintics in veterinary and human medicine, and little is known about the genetic basis for this resistance. To understand the genetic mechanisms underlying resistance, we used the model non-parasitic nematode *Caenorhabditis elegans* to identify regions of the genome that cause resistance to the avermectin, a critical anthelmintic drug class. Using genetic mapping as an unbiased approach, three regions of chromosome V of the *C. elegans* genome correlated with abamectin resistance were identified by measuring sensitivity to abamectin between two genetically diverse strains of *C. elegans*. This correlation means that a gene (or genes) within each of these regions additively promotes resistance to abamectin. Based on our mappings, one of these regions in *C. elegans* overlaps with a region for avermectin resistance in the related hookworm parasite *Haemonchus contortus*. Discovered through abamectin drug assays with *C. elegans* strains that differ only within this one chromosome V region that overlaps with *H. contortus* abamectin resistance, a 640 kb region from 5.26 Mb to 5.90 Mb in chromosome V might harbor abamectin resistance genes. Within the 640 kb region, variation in three genes *ncx-2*, *C10G8.2*, and *T09D3.8* could have high impacts on the fitness of *C. elegans* through splicing effects, improper positioning of stop and start codons, and alternate structural interactions of proteins. Of the three genes, *ncx-2* and *C10G8.2* are potential candidate genes for abamectin resistance. Future studies on these candidate genes and on 5.26 to 5.90 Mb region will allow for greater understanding of mechanisms of anthelmintic resistance in the context of human health.



Mary Parker

Faculty Advisor: Anthony Chen

“It’s Not Just, ‘Hey Cookie, Let’s Go Out.’ It’s More Like Being Shoved Against the Wall:” A Qualitative Exploration of Mechanisms of Sex Segregation in Fine-Dining Restaurants in Chicago

In American restaurants, there is a disproportionately high number of women working as pastry chefs and a disproportionately high number of men working in the leadership positions of chef de cuisine

and executive chef. This pattern constitutes sex segregation within the restaurant industry. Recent literature in sociology on the topic of sex segregation highlights industry-specific mechanisms behind the channeling of women and men into different roles. There is not sufficient research, however, on the causes of sex segregation in the fine-dining restaurant industry. In order to help fill this gap in the literature, this thesis utilizes life course theory to explore the pathways that men and women take to restaurant careers, the critical moments in the professional kitchen that affect career trajectory, and the different experiences and choices men and women face along the way. Using interview data from a non-random sample of seven chefs working in Chicago, I conclude that women are 1) pushed toward pastry chef roles because of the masculine culture of the savory “hot line” and the persistence of sexual harassment in professional kitchens, and 2) blocked from upward mobility on the savory pathway because of informal discriminatory hiring and promotion practices. Several ideas for future research that build upon my findings are discussed.



Neha Pashankar

Faculty Advisor: Thomas Fernandez

Meta-analysis and Pathway Identification of Genes Associated with Anxiety Disorders

Anxiety disorders are the most common class of psychiatric disorders and include general anxiety disorder, panic disorder, agoraphobia, social anxiety disorder and specific phobias. Most psychiatric disorders follow a diathesis-stress model, in which the etiology of a disease is a combination of environmental stressors and genetic influences. One way to study the genetic transmission of anxiety disorders is through genome-wide associations studies (GWAS), which evaluate the effect of single-nucleotide polymorphisms (SNP) within the whole genome to study if any variants are associated with a trait or disorder. The aim of this project is to identify the genes associated with anxiety disorders and analyze these genes for enrichment in biological pathways and in known interacting biological networks. A secondary aim is to compare genes associated with anxiety and anxiety-related traits such as neuroticism to help explain the overlap between these disorders. In order to identify genes, a literature search was conducted on Pubmed for GWAS of anxiety disorders and anxiety-related traits. Pathway analyses on identified genes was conducted using Gene Mania for protein-protein interaction and enrichment analysis was conducted using DAVID. A total of 18 papers were identified, and after strict specifications for the SNPs, 38 genes for anxiety disorders and 157 genes for anxiety-related disorders were identified. Initial results show genes for anxiety disorders being coexpressed and colocalized in overlapping pathways and diseases. This study is very important in progressing the field of psychiatry to better understand the networks and pathways of anxiety disorders and improve diagnosis and treatments.



CJ Patel

Faculty Advisor: Robert Holmgren

The Role of Dop in Hedgehog Signaling in *Drosophila melanogaster*

Much has already been discovered about the Hedgehog (Hh) signaling pathway and its involvement in patterning and tissue development in embryos, but the specific functions its key components play has not yet been fully elucidated. One potential component is the protein kinase Dop, which is involved in cellular trafficking. Here, I examine whether Dop's role in cellular transport has an impact on Hh signal transduction. Immunofluorescent staining experiments were carried out on wing imaginal discs in which dop gene expression was knocked down by RNAi or removed in clones mutant for dop. Discs were assayed for their morphology, the distribution of Hh pathway components and the expression of Hh target genes. Results show that clones mutant for dop have peculiar phenotypic effects including long actin rich projections, while dop knockdown in the posterior compartment seems to specifically affect short-range Hh signaling and the activation of ptc. Through these experiments, Dop's role in the Hh signaling pathway as it relates to cellular trafficking was better delineated.



David Pe

Faculty Advisor: John Rogers

Effect of polymer encapsulation on biomedical acceleration sensing

Small and non-invasive electronic devices are of increasing interest for medical application. Wireless microelectronics are encased in a soft polymer packaging to provide an interface for contact between sensors and skin. This interface mitigates issues involved with mechanical transduction of signals through the skin that are present with traditional diagnostic tools and is critical for reliable data collection. One class of such devices utilizes an accelerometer as its sensor and provides insight by measuring acceleration values resulting from an applied force- in this case movement and acoustic vibrations. These devices have medical applications that rely on sensing vibrations such as those associated with speech or gastrointestinal movements that are often subtle. It is for this reason that it is of great interest to engineer a packaging for this class of device that maximizes the sensitivity of the accelerometer. My research investigated how the geometry and composition of a device's encapsulation effect its sensitivity to applied oscillatory forces in the frequency range of 0-800 Hz. This was achieved by analyzing acceleration data from accelerometers with varying packaging. In order to control the testing conditions for each accelerometer, data collection was conducted on a vibration stage that provides uniform vibrations of specified frequencies. Additionally, accelerometers were mounted on a speaker that played a frequency sweep of 0-800Hz to provide an additional means of comparison. It was found that the mass, thickness, and polymer choice of the packaging has a significant impact in an accelerometers ability to detect vibrations in this frequency range.



Harrison Pearl

Faculty Advisor: Michael Horn

Coordi: A Virtual Reality Application for Reasoning about Mathematics in Three Dimensions

The goal of our research has been to create software that extends the benefits of virtual reality (VR) to mathematics education. We report on the design and evaluation of a VR application meant to support students' reasoning about objects in three-dimensional (3D) coordinate systems and to explore the possibilities of the application for mathematics education in high school classrooms.



Wan Phua

Faculty Advisor: Regan Thomson

Total Synthesis of (–)-trans-Solamin: A Bioactive Compound with Unique Stereochemical Properties

The solamin acetogenins are a group of highly desired natural compounds that exhibit strong antitumor bioactivity. A survey of the literature reveals that (–)-trans-solamin has not been synthesized nor naturally isolated. This project focuses on developing a total synthesis of (–)-trans-solamin, which will fill the gap in the data set of the solamin isomers' intriguing bioactivity. The asymmetric traceless Petasis reaction developed by Thomson and coworkers is a novel method that can be used to access the structural core of the solamin isomers. 2 possible pathways of the Petasis reaction have been explored, of which one shows promise for this specific work. Through this work, reliable synthesis and purification methods for the building blocks of the Petasis reaction have been developed. This project significantly contributes towards the eventual synthesis of (–)-trans-solamin, which is potentially useful for medicinal purposes.



Olivia Pritchard

Faculty Advisor: Thomas Meade

Catalytic ring-closing reactions of gold compounds containing bis(phosphino)ferrocene ligands

Catalytic reactions are important in the field of synthetic chemistry for a wide variety of reactions. Our reaction of focus closes a linear carbon compound to a ring-shaped carbon compound, a procedure similar to that of tying a loop in a piece of string. A previously studied iron-based backbone system has been used to catalyze this reaction. The role of the catalyst is to decrease the amount of energy required to wrap the carbon chain into a ring shape. Six different catalysts, all variants on the iron-based backbone with different side groups, small molecules instrumental to the catalytic reaction, were synthesized. To test how well the catalysts promoted the ring-closing reaction, catalyst was added to

a prepared sample of a linear carbon chain and the results were analyzed by nuclear magnetic resonance. An ideal catalyst would create 100% ring shaped carbon compounds after the reaction, leaving no linear carbon compounds in the final sample. The side groups on the different catalysts were of varying sizes, from small and flat to large and bulky. This was important in the determination of a size-related trend, where smaller side chains contributed to a higher percentage of ring-closing after a reaction. The efficiency of the catalysts ranged from 8% to 100% ring shaped carbon compound, the most effective catalysts being ones with very small side chains. From this research, it was determined that this family of catalysts is highly effective with small side chains.



Peter Puleo

Faculty Advisor: Yarrow Axford

A ~14,500-year Paleoenvironmental and Paleoclimate Record from Sediments of Geneva Lake, Wisconsin

Geneva Lake of southeastern Wisconsin, USA (42.561812oN, 88.537083oW) is useful for reconstructing environmental change due to its old age (formed ~29,000-20,500 cal yr BP by the retreating Laurentide Ice Sheet; cal yr BP = calibrated years before 1950 AD), 30 meter laminated sediment record shown by acoustic imaging, and abundance of ostracodes (small crustaceans with calcareous valves) that record lakewater chemistry over time. A ~4.5-meter sediment profile records ~14,500 years of sediment deposition based on six radiocarbon dates. Sediment chemistry and mineralogy are used to infer changes in dominant sediment sources over time. This included evidence of humans changing surface sediment chemistry, deposition of a unique, lake-wide minerogenic unit at about ~8,200 cal yr BP, and a major transition in sediment composition ~13,400 cal yr BP from a changing influx of reworked glacially-derived loess. Using isotopic ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) and trace metal ratio (Sr/Ca and Mg/Ca) analyses of valves of a single abundant ostracode species (*Candona ohioensis*), we infer environmental and hydrological change throughout the past ~11,800 years at millennial scale resolution. Changes in these values between 11,800 and 9,700 cal yr BP indicate the lake was influenced by a long-term shift in seasonality of precipitation, evaporation, temperature, or dominant precipitation source (Arctic or Pacific vs. Gulf of Mexico). From 9,700 cal yr BP to the present, changes were relatively small and possibly driven by small variations in temperature and seasonality of precipitation. Studies like this are critical for understanding past and future climate change in the Midwest.



Grishma Reddy

Faculty Advisor: Vijay Mittal

Perceptual Illusion Performance in Non-Clinical Psychosis

Evidence suggests individuals diagnosed with psychotic disorders exhibit perceptual processing deficits (e.g., reduced susceptibility to visual illusions suggestive of a broader top-down modulatory

impairment). However, our understanding of perceptual processing earlier on the psychosis continuum is limited among the non-clinical psychosis (NCP) group (i.e., individuals considered otherwise healthy but report infrequent and fleeting symptoms). Data amongst this group has the potential to inform our understanding of the etiology of psychosis while having fewer confounds (e.g., medication and substance use). In this study, participants were administered a perceptual illusion task and asked to view and make judgments (moving or not moving) on 15 motion illusions (images that appear moving, which is reflective of expected top-down regulated perceptual processing) and 15 no-motion images. Then, the number of correct responses were summed and the percent accuracy of identifying the images as moving was calculated. Based on prior research, we predict that the NCP group would report less susceptibility to the motion illusions compared to controls and no difference in the no motion (control) condition. Our preliminary findings, from a total of 12 NCP and 12 controls, show a pattern in which the NCP group exhibited higher scores on the motion condition and lower scores in the no-motion condition (i.e., the NCP group reported seeing illusions more often across both conditions, regardless of whether they were present). Data collection is ongoing but our findings, though speculative, have the potential to shed light on perceptual processing abnormalities in the lower end of the psychosis continuum.



Nicole Rinne

Faculty Advisor: Angela Roberts

Examining Conversation Breakdowns in Parkinson's Disease Versus Alzheimer's Dementia

Both Alzheimer's dementia (AD) and Parkinson's Disease (PD) have a substantial life impact and are associated with differing profiles of motor, cognitive, and language impairments, which may affect these groups' ability to converse with others. Though research exists on conversation difficulties, no studies have examined conversation breakdown and repair behaviors in a PD cohort. Further, no comparisons of conversational difficulty have been made between AD and PD populations. This research uses conversation analysis (CA) approaches to investigate whether patterns of conversation breakdowns and their repairs have distinct profiles in conversations between family interlocutors where one individual has AD versus dyads where one individual has PD. Conversation breakdowns and their repairs were examined in videotaped samples of spontaneous mealtime conversations between eight dyads including an individual with PD and a family conversation partner. PD data were compared to previously published data from eleven dyads, six comprised of two healthy adult controls and five comprised of an individual with AD and their family interlocutor. This observational, cross-sectional study specifically examined the frequency of utterances related to conversation breakdowns, the frequency of trouble source types, and the frequency of successful and complex repairs across groups. A significant difference was found in the frequency of discourse-related trouble sources between AD ($M = 6.7, SD = 3.7$) and PD ($M = 2.9, SD = 1.1$) dyads; $t(11) = 2.78, p = .018$. No other significant differences were found between groups. Data are interpreted within a CA framework and informed by theories of person-centered communication.



Kimberly Rowghani

Faculty Advisor: Vijay Mittal

Facial Expressivity in Non-Clinical Psychosis

Research has found that both individuals diagnosed with psychotic disorders such as schizophrenia and those at clinical high-risk show alterations in facial expressivity. However, it is unknown whether these alterations occur on the lower end of the psychosis continuum among individuals described as non-clinical psychosis (NCP; those who experience infrequent and fleeting experiences such as hearing their name being called 1-2 times per year) and whether there are links with emotion regulation strategies, another emotional processing domain. In the current study, a total of 25 participants, 11 NCP and 14 controls, completed the “B” module from the Structured Clinical Interview for the DSM-IV Axis I Disorders (SCID-B) which were video-recorded. One-minute clips were submitted into an automated facial analysis that detects for the presence of six facial expressions (e.g., joy, anger, contempt, fear, surprise, and sadness). Additionally, the Emotion Regulation Questionnaire (ERQ) and the Response to Positive Affect (RPA) were given to participants to assess for potential correlations between facial expressions and emotion regulation strategies. Results, though non-significant, hint that NCP groups may experience differences in facial affect expressions compared to controls, with the NCP group showing increased facial expressivity overall (e.g., joy expressions). Furthermore, in the NCP group, increased contempt expressions were associated with increased cognitive reappraisal, and decreased dampening. These findings, though contrary to what was expected given evidence from CHR populations, may provide preliminary evidence for links between facial affect expression abnormalities and emotional regulation strategies on the psychosis continuum.



Joshua Saltzberg

Faculty Advisor: Keith Tyo

Engineering a Light-Responsive DNA Polymerase for Data Encoding

DNA has emerged as an attractive medium for long term data storage due to its exceptional data density, stability, and replicability. However, DNA synthesis methods that rely on solid-phase oligonucleotide synthesis are slow and expensive. An alternative would be to engineer an enzyme that can respond to a non-chemical input to encode information in changes in activity or fidelity as it synthesizes DNA. Here we describe the use of domain fusion to attempt to engineer a light-modulable DNA polymerase for molecular data encoding. Light was selected as the ideal input as it enables unmatched spatiotemporal control and does not require the addition or removal of reagents during synthesis. A library of insertion sites within the Klenow fragment of E. coli DNA polymerase I was generated using MuA transposon mutagenesis. AsLOV2, a photo-sensitive domain, was inserted at these sites, and the library was screened for active variants using an in vivo selection. The resulting candidates were screened for photo-responsive modulation in either polymerase activity or exonuclease activity using a fluorescent primer extension assay. By tuning the properties of promising

variants, we aim to design a polymerase that will encode the presence, absence, and intensity of blue light into error rates, providing a novel method for rapid, cost-effective encoding of data into DNA.



Juan Sanabria

Faculty Advisor: Guillermo Ameer

Injectable Biodegradable Elastomer to Aid in Healing of Bone Fractures

For successful bone healing, a key challenge is mechanical stability of the injury, as well as biodegradability of the mechanical support to reduce stress shielding. Commercial products exist to aid in bone defects, such as calcium phosphate cement (CPC), but are limited in clinical use for bone fractures due to weak mechanical properties. A product that may address these issues is a biodegradable elastomer called POC (poly(1,8-ocatanediol-co-citratre)), which was developed in the Ameer lab. This study tests a POC composite with hydroxyapatite (HA), a mineral found in bone, to determine the fractural strength provided by different POC-HA composites. First, a POC prepolymer was formed, methacrylated (into mPOC) to provide structural reinforcement, and characterized using ¹H-NMR and FTIR. mPOC-HA and CPC composites were then created using weight % formulations. Bone samples were prepared two ways, undergoing an initial bone fracture or sawed in half. Samples had polymer applied at the fracture site, were placed in an incubator for 24 hours, and then underwent a 3-point flexural bending test. None of the mPOC-HA composites provided a mechanical reinforcement greater than 5% of a bone's initial fractural strength. mPOC-40% HA was the only composite to successfully connect bone pieces in both bone groups, and it provided the highest fractural strength, ~2 MPa. There was also no statistically significant difference in fractural strength for bone specimens prepared in a fractured vs. sawed manner. Overall, mPOC-40% HA performed the best out of all composites but needs greater adhesion properties to be used in clinical applications.



Augusta Saraiva & Keyla Carvalho

Faculty Advisor: Ana Williams

Spanish Speakers' Perceptions and Performance When Learning Portuguese

When it comes to language acquisition, the learner's perception of their knowledge and linguistic background actively impacts this process. In our previous research, we analyzed a group of Northwestern students learning Portuguese and aimed to understand how their knowledge of Spanish influenced their acquisition of vocabulary. Now, seeking to contribute to Psycholinguistic studies in Language Learning and help to enhance the didactic approach of the "Portuguese for Spanish Speakers" course, we took another approach. By comparing the performance of students who took the Spanish for Portuguese Speakers sequence at Northwestern and their perceptions surrounding their learning of Portuguese, we aimed to understand how expectations and performance are related. Our hypotheses were (1) that students' perceptions of how their knowledge of other languages affect their learning of Portuguese are directly related to their level of Portuguese and also that (2) heritage

speakers of Spanish, ignoring how their reliance on the language might impair their learning of Portuguese, would have results contrary to their beliefs. Hypothesis (2) comes from the fact that fossilization, a process in which features of their L1 (Spanish) become permanent errors in their L2 (Portuguese), is a reality for learners since both languages share 89% of lexical similarity. Our primary results support Hypothesis (1), showing that Spanish speakers of all levels believed that knowing Spanish helped them learning Portuguese, but do not support Hypothesis (2), as students seemed to be aware of their difficulties in discerning between Portuguese and Spanish. These results can be refuted with further research.



Alice Schaack

Faculty Advisor: Eva Redei

Acute Stress Alters Social Behavior in a Sex and Strain-specific Manner and Increases Aggression in Male Rats of a Genetically Stress-Reactive Strain

Stress is known to affect social behavior, but it is unknown how acute stress might differentially affect the social behaviors of males and females of a genetically stress-susceptible strain. The Wistar-Kyoto more immobile (WMI) and less immobile (WLI) sub-strains were selectively bred to show polarized stress-reactivity and despair-like behaviors. The WMI strain consistently demonstrates increased stress reactivity and depression-like behaviors compared to the WLI isogenic control, and thus, represents a genetically stress-susceptible rodent model. Adult males and females of both strains were exposed to a 30-minute restraint stress. Immediately following the acute stress, a purposefully non-threatening social behavior paradigm was administered using 25-26 days old pups. Social behaviors of the WLI males and WMI females are significantly impacted by acute stress. Additionally, WMI males show significantly increased aggression after acute stress. The rapid strain and sex-specific effects of acute stress suggest hormonal stress responses and expression of immediate early genes in relevant brain regions may play a role in the divergence of these social behaviors.



Elizabeth Schauer

Faculty Advisor: Joshua Leonard

Investigating soluble split-TEV protease to create new tools for synthetic protein circuits

Cell-based therapies are arising as promising technologies for a range of applications from cancer immunotherapy to regenerative medicine. Integral to cell-based therapies are synthetic gene circuits, which allow for programmable cellular response to external and internal signals. The ability to engineer and control protein-based signaling in cells is important for developing therapies that can respond quickly to the desired cues. Some recently developed protein-based circuits utilize split proteases, specifically, the tobacco etch virus protease (TEVp). TEVp has been split into two halves that reconstitute and maintain protease activity. To add new tools to the split-protein toolbox the function of different splits of TEVp were investigated. Soluble split-TEVp constructs with different positions

of splits were developed. Upon addition of a small molecule, the split protease reconstitutes and releases a signaling molecule, through protease cleavage, that activates YFP reporter expression. The constructs were expressed in HEK 293FT cells and their expression was confirmed using a Western blot. To functionally test the panel of split-TEV_p, the constructs were transfected into HEK 293FT cells, treated with the small molecule, and analyzed for YFP reporter expression through fluorescence microscopy and flow cytometry. I compared these results with membrane bound split-TEV_p results from the Leonard Lab and determined what trends persist and what new insights can be gained with how split-TEV_p functions in the soluble environment. Researching soluble split-TEV_p allows for a full investigation of the split-TEV_p system and will add much needed insight and tools useful in protein-based circuits and cell-based therapy applications.



Julia Shenkman

Faculty Advisor: Ana Aparicio

Redefining the Borders of Medical Tourism: Navigating Healthcare in an Evolving Local Knowledge System

Medical tourism, as a phenomena, exists in many forms and is dependent on the setting it is used in. Current definitions of medical tourism understand it as people travelling internationally for medical care because of insurance policies, high costs, and long wait times, however studies have shown that this definition has gaps. To evaluate the definition in an atypical setting, I utilized El Paso, TX as a research site. Through this, I sought to understand the motivating factors behind why people travel, and how people know where to travel, answering the questions of why and where people go. Understanding the questions of why and where allows us to redefine the practice in a way that is more suitable to the changing global environment. To do this, I conducted fieldwork in El Paso, studying cross-border and domestic medical tourism. This involved interviews with public health professionals to understand the trends of medical tourism in the region, and interviews with participants to analyze the process by which they travelled. Ultimately, the data showed that no single motivating factor played a role, but rather multiple factors based on individual experiences collectively led them to travel. To do so, participants relied on “common knowledge” and referrals within the community to external locations, to serve as points of knowledge production and transfer, ultimately situating the practice of travel within the local knowledge system. With further evaluation, this study will provide important information to public health professionals on ways to address barriers to care in El Paso.



Sharmain Siddiqui

Faculty Advisor: Daniel Majchrowicz

Unani Tibb as Resistance: Bodily Practice at the Intersection of Colonial and Postcolonial Systems of Power

Medical tourism, as a phenomena, exists in many forms and is dependent on the setting it is used in. Current definitions of medical tourism understand it as people travelling internationally for medical

care because of insurance policies, high costs, and long wait times, however studies have shown that this definition has gaps. To evaluate the definition in an atypical setting, I utilized El Paso, TX as a research site. Through this, I sought to understand the motivating factors behind why people travel, and how people know where to travel, answering the questions of why and where people go. Understanding the questions of why and where allows us to redefine the practice in a way that is more suitable to the changing global environment. To do this, I conducted fieldwork in El Paso, studying cross-border and domestic medical tourism. This involved interviews with public health professionals to understand the trends of medical tourism in the region, and interviews with participants to analyze the process by which they travelled. Ultimately, the data showed that no single motivating factor played a role, but rather multiple factors based on individual experiences collectively led them to travel. To do so, participants relied on “common knowledge” and referrals within the community to external locations, to serve as points of knowledge production and transfer, ultimately situating the practice of travel within the local knowledge system. With further evaluation, this study will provide important information to public health professionals on ways to address barriers to care in El Paso.



Jamilah Silver

Faculty Advisor: Terri Sabol

Examining Early Childhood Profiles that Reliably Differentiate Young Children at Highest Risk for Depression

There is increased concern for depression in children, with 1 out of every 150 children diagnosed with depression. The traditional approach to identifying precursors of childhood depression is to focus on depressive behaviors at an early age, including sadness, inability to enjoy play activities, and decreases in activity level. However, there is little information on the co-occurrence of depression in young children with other types of disruptive behaviors (e.g., tantrums, aggression) that are linked to later outcomes. This study employs data from the Multidimensional Assessment of Preschoolers Study to explore patterns of children's depression, anxiety, and externalizing behaviors and relations to children's development throughout early elementary school. Latent profile analysis was used to examine parent reported depression, anxiety, aggression, irritable mood, and tantrums among 326 preschoolers. At age three, a 3-class solution fit the data best; (1) “High Depression and Anxiety” group characterized by high depression and anxiety (2) “High Behavioral Problems” group characterized by high tantrums, irritability, and aggression, and (3) “No depression, Anxiety, or Behavioral Problems” group. Profiles characterized by high behavioral problems at age three, even in the context of low depression or anxiety, predicted a higher likelihood of receiving a diagnosis of Major Depressive Disorder at age seven. The absence of a distinct subset of individuals with only depression symptoms suggests that depression and behavioral problems may be manifestations of early markers for depression rather than distinctly depressive symptoms. Integrated treatments targeting both internalizing and externalizing symptoms may therefore prove more efficient and effective.



Courtney Skula

Faculty Advisor: David Uttal

Mansplaining and Classroom Discourse: Interruptions and STEM Learning

Women are not always welcome and accepted in science, technology, engineering, and math (STEM) fields. Although there are many reasons women may not want to pursue these fields, the conversation dynamics between men and women may contribute to the lack of confidence some women feel in STEM. Men who constantly interrupt women can reduce women's confidence in STEM fields. This reduction in confidence can then force women out of STEM fields, which continue to be male-dominated. To determine if interruptions affect women's confidence in STEM, an exploratory study was conducted focusing on high school students helping to design a new physics curriculum. Their conversations were recorded, transcribed, and analyzed for interruptions. Using linguistics software, the number of times each participant was interrupted or interrupted another participant was recorded, as well as how many times they used STEM words. Interruptions were coded into three categories: interruptive, supportive, and clarifying. The general trend shows males are more likely to take speaking power away from women whereas women are more likely to continue male ideas. Furthermore, women exposed to more interruptions tend to use less STEM related words than women exposed to fewer interruptions. This pattern of interruptions may make it difficult for women to ask questions and speak freely in STEM classrooms.



Allyson Snyder

Faculty Advisor: Ellen Wartella

Preschoolers' Creativity During STEM Play

In the past few years, educators have been pushing for an integration of the arts into science, technology, engineering, and math (STEM) learning in order to promote innovation and creativity in these fields. The present study explores the relation between creativity and STEM learning among young children in digital and non-digital contexts, and how creativity affects STEM engagement. Parent-child dyads ($n = 31$) consisting of one parent and one child aged four-and-a-half- to five-years old participated in a repeated measures experiment during which they played with magnetic tiles (an activity that is similar to blocks) and then with a coding application on a tablet. This study analyzes secondary data by measuring creativity during the non-digital play, child task performance on the coding application, and parent report of children's STEM engagement to better understand the relation between these variables. Results show that there may be a connection between creativity and STEM learning, but this relation is still unclear. This study will contribute to the development of STEM curriculum and its incorporation of creative activities in the preschool years.



Rachel So

Faculty Advisor: Neal Blair

Soil and Sediment Carbonate Quantification by Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS)

Carbonates are the most abundant form of carbon in the Earth's crust and their mineralogy and abundance provide information about surficial processes. The ability to reliably and rapidly identify and quantify them is of interest to the fields of inorganic carbon and carbon cycle research. A method to study carbonates in soil and sediment samples was developed using Diffuse Reflectance Infrared Fourier Transform spectroscopy (DRIFTS). DRIFTS is a fast, efficient, and non-destructive way to analyze carbonates in small samples. In order to quantify unknown amounts of carbonate in a sample, separate calibrations were made using the two most abundant carbonate minerals, calcite and dolomite. Calibration curves were created using known mixtures of carbonate (calcite or dolomite) and carbonate-free, lake bed sediment. The quantification methods were tested on stream bank samples from the Sangamon River in Illinois, and sediment samples from the adjoining Lake Decatur. DRIFTS revealed that the stream bank carbonate was dolomite and the lake sediment carbonate was calcite. DRIFTS results were compared to estimates made using the more traditional technique of acidification. The correlation between the two techniques was good with DRIFT estimates being higher for the majority of analyzed samples. The good correlation between the DRIFTS and acidification estimates indicate DRIFTS to be a reliable method to quantify calcite and dolomite in sediments and soils. The proposed method will be useful for initial sample analyses, providing basic information such as estimates of carbonate mass in samples as well as mineral identity.



Charles Stark

Faculty Advisor: Richard Morimoto

Small Molecule Synergy to Improve Protein Folding in Neurodegenerative Diseases

Some of the most impeding limits to human longevity are neurodegenerative diseases such as Alzheimer's disease and Huntington's disease. These protein conformational diseases can arise from genetic mutations in specific aggregation-prone proteins resulting in protein misfolding and neuronal death. The cell controls protein quality through stress responses to prevent misfolding; one major stress response, the heat shock response (HSR), induces chaperone proteins that protect proteins from misfolding or aggregating following a stressful condition. To identify small molecules that enhance folding through the HSR, a screen was performed using a human embryonic kidney cell line expressing a luminescent sensor where increased luminescence corresponded to increased HSR activation. The screen identified a group of bromodomain and extra terminal domain (BET) and histone deacetylase (HDAC) inhibitor compounds that individually tripled luminescence. Because BET inhibitors and HDAC inhibitors may regulate HSR activity through different mechanisms, we test the hypothesis that combining these inhibitors can synergistically activate the HSR and further improve folding. Our data indicates that combining one BET and one HDAC inhibitor can activate the HSR by up to four times more than individual inhibitors. These compounds were further tested on a rat neuronal Huntington's disease model cell line to determine their impact on protein aggregate formation. Here,

we show that combining BET and HDAC inhibitors can reduce protein aggregation by 50%, suggesting that BET and HDAC inhibitors could be used at low doses to activate the HSR and therefore be used in future therapeutics to treat neurodegenerative diseases.



Katherine Su

Faculty Advisor: Mark Hersam

Chemical vapor deposition of large-area uniform monolayer molybdenum disulfide on soda-lime glass

Monolayer molybdenum disulfide (MoS₂) is a promising material for next-generation, low-power electronics due to its desirable properties (i.e., high ON-OFF current ratio, low subthreshold swing, and immunity to short-channel effects). However, the synthesis of large-area, uniform monolayer MoS₂ remains a challenge. In this project, we report highly-reproducible growth of large-area, uniform monolayer MoS₂ on soda lime glass (ordinary glass slides) via chemical vapor deposition (CVD). We tune various CVD parameters (gas flowrate, chamber pressure, and precursor temperatures) to reduce the nucleation and growth of bilayer and multilayer MoS₂. Finally, we present optical and structural characterization of the MoS₂ films, direct fabrication of MoS₂ heterostructures on soda lime glass, and a transfer process for transferring MoS₂ to target substrates.



Jennah Thompson-Vasquez

Faculty Advisor: William Leonard

The Allure of the Market: Navigating Indigeneity, Identity, and Inequality in the Bolivian Amazon

The Tsimané are an Indigenous group of the Bolivian Amazon that is experiencing dramatic socio-cultural changes as they integrate more deeply into a market economy. Their nomadic subsistence lifestyle resulted in low levels of acculturation until late in the twentieth century. Although the amount of contact they have with dominant Bolivian influences is undoubtedly increasing, the Tsimané still demonstrate great variation in acculturation and economic integration. Within the majority population, the Tsimané are racialized and regarded as an ethnic minority. Together with other factors, this has resulted in high levels of distrust towards a range of institutions of governance and state centralization including modern medicine. This research examines patterns of variation in levels of market integration among the Tsimané and how that shapes identity-based experiences, aspects of their physical health, and health-seeking practices. I draw on semi-structured interviews and participant observation to document how changes in Tsimané life ways shape health-seeking behaviors and measures of well-being. This work adds to a growing body of research highlighting the diverse pathways through which acculturation and market economies impact health-seeking practices and transform the experiences of the Tsimané as they relate to one another and other (non)Indigenous Bolivians.



Serena Tolani, Nathan Weston, Chris Holland, & Danny Callahan

Faculty Advisor: Tiffany Schmidt

Behavioral Contrast Threshold Detection in Mice with intrinsically-photosensitive Retinal Ganglion Cells Subpopulations Ablated

Melanopsin-expressing, intrinsically photosensitive retinal ganglion cells (ipRGCs) were previously thought to only play a role in non-image-forming vision behaviors, such as circadian photoentrainment and pupillary light reflex. However, new evidence has determined that ipRGCs influence image-forming vision, specifically contrast detection and pattern recognition. There are 5 distinct subpopulations of ipRGCs (M1, M2, M3, M4, and M5), and the goal of this study was to explore the role of the M4 ipRGC subpopulation in behavioral contrast sensitivity in mice. *Kcng4Cre/+; Brn3bzDTA/+* mice, whose M4 ipRGCs were ablated, and *Kcng4Cre/+; Brn3b+/+* control mice were placed into a Bussey Touchscreen system. The mice were trained to perform a two-alternative forced choice task; they chose between a gray screen and a sine wave grating image. The contrast of the sine wave image was lowered until the mice fell below a 70% accuracy level and the contrast sensitivity threshold of each mouse at each of four frequencies was determined.



Katia Valdez

Faculty Advisor: Vijay Mittal

Gesture Performance in a Sample of Clinical High-Risk Individuals

Gesture performance (e.g., conveying gestures with coordinated hand and finger movements) is an integral aspect of nonverbal communication. There is evidence to suggest that patients with psychotic disorders such as schizophrenia exhibit reduced gesture behavior as compared to controls, and these impairments have been linked to symptomology, cognition, and lower cerebellum volumes (suggestive of a broader motor deficit). Currently, however, our understanding of gesture performance prior to the onset of psychosis is limited. Further understanding of gesture functioning among this population may elucidate the etiology of motor dysfunction and of psychosis as a whole. In the current study, 21 clinical high-risk (CHR) individuals and 16 controls were presented with a total of 32 words spanning four different categories: icons (e.g., “dog”), metaphors (e.g., “aging”), emblems (e.g., “hello”), and emotions (e.g., “angry”). Participants were asked to naturally gesture the presented word using their hands. Two trained raters then coded each gesture for accuracy (inaccurate gestures being gestures that do not clearly depict the presented word). Gesture errors for each word category were summed and calculated into a percentage of total errors. While data collection is ongoing, our preliminary findings indicate significant group differences in the total number of errors made in that the CHR group made more accuracy errors than the controls. Furthermore, while nonsignificant, the CHR group exhibited less accurate gestures for metaphor and icon words as compared to controls. Additionally, the CHR group exhibited less accurate gestures in response to emotion and emblem words presented. Taken together, these data hint towards possible gesture performance abnormalities prior to psychosis.



Kristen VanTine

Faculty Advisor: Adam Watz

The Calculative Mindset and the Propensity to Dehumanize Others

In the midst of the Great Recession of 2008, corporate scandals overflowed newspaper headlines. Companies such as Enron, WorldCom, Tyco and others contributed to the most recent stock market crash on Wall Street. There is some evidence that the calculative mindset may have contributed to these corporations' decisions to act unethically. An individual with a calculative mindset analyzes non-quantitative problems, such as social and moral issues, mathematically. When individuals crunch numbers, the mechanical, mathematical problem-solving techniques they employ may carry over to other decisions they make, including decisions about moral and social matters. Past research has shown that a calculative mode of thinking can lead people to behave more greedily and lie more than non-calculative modes of thinking. Calculative mindsets also lead people to feel detached from their own feelings. This detachment from the self may spillover to feeling detached from others. Additionally, the calculative mindset causes individuals to act more self-interestedly. As a result, calculative individuals may reduce others to the means they serve for the calculative individual's own goals rather than recognizing other people as intrinsically valuable. Lacking empathy for another person's feelings and perceiving another person solely as a mean to an end can facilitate the dehumanization of that person. The present study investigates whether calculative mindsets incite people to dehumanize others.



Diana Velazquez

Faculty Advisor: Neal Blair

Comparing Aliphatic and Aromatic Content as a Function of Soil Depth across the Critical Zone Observatories

Soil organic carbon is an essential component of soil as it regulates the distribution and retention of nutrients as well as overall structure of soil. However, the process through which carbon is sequestered in soil remains unresolved. Chemical reactivity as a factor of soil carbon storage was investigated through the analysis of aliphatic and aromatic functional group abundance with soil depth. Diffuse Reflectance Infrared Fourier Transform (DRIFT) spectroscopy was used to determine the presence of aliphatic C-H and aromatic C=C bonds within soil samples derived from the U.S NSF National Critical Zone Observatory (CZO) Program. DRIFT provides an efficient non-destructive method for the detection of functional groups within samples due to its high sensitivity to sample surfaces. FTIR spectra from all ten CZO locations were analyzed at centimeter intervals down a soil profile. Generated FTIR spectra were deconvoluted with a spectroscopy software, PeakFit, in the aliphatic C-H region, 2980-2825 cm^{-1} , and the aromatic C=C region, 1760-1500 cm^{-1} . Integrated areas of peaks within band assignments were derived from PeakFit and used for aliphatic-aromatic calculations. Aliphatic and aromatic functional group abundance and therefore, chemical reactivity down a soil profile presented no uniform pattern across CZO samples. Differences may be attributed to varying

sample environmental conditions such as location elevations. Inspection of other FTIR regions is needed to develop a greater understanding of functionality, reactivity, and soil carbon sequestration.



Catherine Walker

Faculty Advisor: Franz Geiger

Increasing Stability of Iron Nanolayers for Use as Energy Transducers

Global energy consumption is projected to grow by 28% by 2040. To meet this demand, new materials are being explored which induce electricity by moving ionic fluids over electrically conductive or semi-conductive layered surfaces, such as carbon nanotubes, graphene, and dielectric-semiconductor structures. Although up to 30% of energy conversion has been reported for some of these devices, the structures are difficult to prepare on a large scale. The Geiger group recently invented a promising energy transducer that works similarly by pumping saltwater over thin nanolayers, which are prepared in a single step over large areas from earth-abundant metals, like iron. This transducer could be implemented under flowing water at water treatment plants, as well as in estuaries, fjords and even living bodies, to passively generate power and monitor the environment. However, preliminary data indicated that saltwater tends to erode iron nanolayers at high flow rates, ruining their capacity for energy transduction. To tackle this problem, inert organic and inorganic nanolayers have been successfully placed atop the iron nanolayers. Inorganic nanolayers, primarily made of nickel, were deposited using electron-beam physical vapor deposition, a method that allows for low-purity starting materials and quick synthesis of large samples. Organic nanolayers were laid by spreading olive oil on iron nanolayers and heating the samples in an oven to bake the oil into the metal, like seasoning a cast iron pan. Both methods protect the iron nanolayers from erosion with minimal loss of electrical activity, moving this energy transducer closer to eventual real-world applications.



Avery Wallace

Faculty Advisor: Luisa Marcelino

Coral Bleaching in the Florida Keys: The Impact of Accumulated Heating Stress on Bleaching and Mortality in Corals

With the rise of anthropogenic climate change the survival of coral reef systems, known as the “tropical rainforests of the sea” due to their high biodiversity and productivity, is greatly threatened. As temperature anomalies increase, the algal symbionts that feed the corals through photosynthesis begin producing toxic products and are expelled from the coral in a process known as coral bleaching. Without their main source of food, corals will often die if the temperature anomalies do not subside. A robust analysis of coral reef assemblage over a significant span of time encompassing multiple bleaching events is essential for identifying and predicting the effect that anthropogenic climate change driven thermal stress is having on coral reef bleaching. We analyzed bleaching and mortality responses from 159 coral assemblages in the Florida Keys from 2005 to 2015 with their corresponding thermal

anomalies using linear regressions and other statistical analysis and mapped their responses along with the corresponding thermal anomalies using ArcMap GIS processing. We detected a significant correlation between bleaching and thermal stress ($r^2=0.276927$, $p<0.001$), characterized the bleaching response of coral assemblages over time as they experience multiple bleaching events to analyze the impact of a coral's thermal history on their current and predicted bleaching response and mapped the thermal stress anomalies and their resultant bleaching responses throughout Florida Keys. This data has major implications for identifying the severity with which anthropogenic climate change is triggering bleaching and mortality and predicting how a coral assemblage will respond to varying levels of thermal stress.



Larry Wang

Faculty Advisor: Matthew Major

Agent Orange Effects on Sensorimotor Function of Transtibial Prosthesis Users

Existing literature has shown that Vietnam War veterans exposed to Agent Orange (AO) suffer from systemic effects such as immune-system disorders, cancers, and overall sensory loss. To date, there has been little research conducted on the effects of Agent Orange on sensorimotor function and especially on persons with secondary lower limb amputation. This pilot study compared the sensorimotor and balance factors of persons with transtibial amputation with and without exposure to AO and compared these cohorts to age-matched controls. As evidence suggests that AO exposure results in lost sensorimotor function, we expected that this cohort would demonstrate reduced sensation and balance performance. We found that the able-bodied individuals performed better on every sensorimotor function test compared to prosthesis users. Passive range of motion, muscle strength, and balance confidence were not noticeably different between prosthesis users with AO exposure and without exposure. However, prosthesis users with AO exposure demonstrated reduced deep and touch sensation on their sound limb compared to users without AO exposure. Similarly, prosthesis users with AO exposure demonstrated worse proprioception on the sound side than those without AO exposure as well as poorer functional comorbidity. The results supported current literature, which found that transtibial prosthesis users with Agent Orange exposure demonstrate reduced sensory function. However, our results did not suggest that Agent Orange exposure leads to limited range of motion or muscle strength as some literature suggested.



Adam Watts

Faculty Advisor: William White

Can Machine Learning Read CEO's Better Than a Human: An NLP Analysis of Quarterly Earnings Calls and Stock Returns?

As Quarterly Earnings Calls have become an increasingly important tool for public company CEO's to communicate information, they have become a target of intense investor scrutiny. The content of these calls causes dramatic swings in stock prices after, and even during the call. Traditionally, humans

have done this analysis, parsing the exchanged language in search of any information that changes the stock's value. As Natural Language Processing (NLP), a machine learning technique designed to analyze text, has become increasingly relevant in financial literature and practice, investors have begun to use NLP to analyze these calls in real time. We investigated if NLP tools could uncover latent information in the text of the calls that would be gradually incorporated into the stock price. Using a basket of NLP techniques, including sentiment and personality trait analysis, to predict 20-day returns, we were able to generate 18.3% annualized returns with 13% of alpha, or “edge” to the market, on an out-of-sample set. This shows that the NLP scores reflect latent patterns in these calls that the market is missing. Traditional investors have cautioned that machine learning may have an ability to handle large, quantitative datasets but lack a necessary understanding of the human, behavioral forces at work in the market. However, these results, along with similar NLP research, suggest that machine learning and Natural Language Processing may already be better at interpreting the human, behavioral forces in the market than even sophisticated Wall Street investors.



Talia Waxman

Faculty Advisor: Rebecca Seligman

Chicago Teen Girls Participatory Photovoice

In this senior thesis, I aim to explore how the process of community-based participatory research centers marginalized voices and illuminates important kinds of knowledge. I draw on my experience facilitating a multiweek Photovoice project in the fall of 2018 with a research team of teenage girls in Chicago. Our photographs and group discussions investigated the ways that young women respond to, resist, and heal from impacts of violence. I argue that the process of this participatory research is in itself transformative, by building community, challenging power dynamics, and producing unique and embodied narratives. In this way, the transformative nature of the participatory research process is in itself a form of responding to, resisting, and healing from structural violence.



Mia Weed

Faculty Advisor: Allison Skinner

Gender Norm Consistency and Women's STEM Engagement

When people experience social exclusion or rejection they may seek to maintain positive self-esteem by aligning themselves with the ingroup. Here we examine 1) whether feeling socially ostracized leads women STEM majors to show increased gender-normative responding and 2) whether women STEM majors who tend to make gender norm-consistent (STEM-inconsistent) choices have a higher estimated likelihood of switching majors. In this study, female students were recruited from introductory STEM university courses to play a game in which they experienced a randomized series of social inclusions (50%) and exclusions (50%). Throughout the game, women were provided opportunities to behave gender stereotype-consistently (by making STEM-inconsistent choices, such as literature) or avoid behaving gender stereotype-consistently (by making STEM-consistent choices,

such as chemistry). Immediately following the game, participants completed a series of dependent measures assessing perceived ostracism during the game and estimated likelihood of continuing as a STEM major. Our results indicated that greater perceived social exclusion was associated with increased gender norm-consistent responding $t(120) = 2.02, p = .046$. We also found that participants who made gender norm-consistent choices reported a higher likelihood of switching majors in the future $t(125) = 3.12, p = .002$. We conducted this research to explore one possible contributor to gender disparities in scholarly and professional STEM fields. Our findings suggest that together the exclusionary environment in STEM fields and group-based self-esteem processes might contribute to the low representation of women in STEM.



Fiona Worsfold

Faculty Advisor: Luisa Marcelino

Relating the bleaching response of coral species to that of its assemblages

The foundations for the majority of oceanic life are large, productive ecosystems that many food webs rely on, otherwise known as coral reefs. Reefs are made up of assemblages of individual coral species, which in turn form a symbiotic partnership with dinoflagellate algae. Thermal stress on coral reefs has increased due to the rising impact of climate change, leading to the breakdown of this partnerships in a phenomenon called bleaching. Bleaching is often a precursor to coral death, and thus collapse in reef systems. However, species response to thermal stress is highly variable due to both internal and external influences. Our lab has developed two bleaching response indices that relate the bleaching response of a coral species to that of its assemblages. While taxon beta measures the differences in rate of response of the species with the rest of the communities under high thermal anomalies, taxon alpha compares those differences under the absence of thermal anomalies. In this project, I calculated these indices for 25 species across 60-200 assemblages, depending on the species and year, throughout the Florida Keys from surveys encompassing 11 years (2005-2016). From this, I separated species into over and under responders by comparing their taxon alpha and beta to reveal response in both high and low stress. The results of this research can improve the efficiency of coral conservation, and builds upon existent databases for global comparison.



Lydia Wuorinen

Faculty Advisor: Laura Nielsen

Understandability and Title IX Compliance at the Undergraduate Level

A substantial body of research has assessed the relationship between legal policies and the underreporting of sexual assault on university campuses, however, there is a lack of understanding in how Title IX policies resonate with students. Discrepancies in how students perceive sexual assault reporting and proceedings at universities suggest a gap in translation not only from the federal government to university authorities but also from universities to students. We study this phenomenon using an innovative dual-coding design. Employing a team of trained researchers, we

code a random sample of 300 Title IX policies for +70 criteria, evaluating the level to which they seem to comply with federal recommendations. We then recruit undergraduate students on Amazon Mechanical Turk to perform the same coding task, conceptualizing the difference between the results as cognitive dissonance in undergraduate understanding of Title IX policies. A quantitative analysis determines most institutions appear to be compliant with Title IX. However, we hypothesize that there is a significant gap between using compliant language and communicating understandable and enforceable policy. Combining survey methods with computational text analysis, we explore how Title IX compliance is not necessarily sufficient for student understanding. Preliminary results suggest that legally coded language within policies significantly affects and limits students' ability to understand Title IX policy. We draw conclusions about how different audiences interact with sexual assault policies, what potential methodological flaws exist in prior research, and to what degree universities effectively convey policy to students.



Hannah Yi

Faculty Advisor: Tina Grieco-Calub

Too distracted to listen? Investigating how young and older adults allocate attention to understand speech while multitasking

Listeners are often tasked with understanding speech in noisy environments, such as a busy restaurant. In these environments, the presence of background noise can make focusing on a desired speech stream challenging. This is especially true for older adults who experience age-related loss of hearing as well as decreases in domain-general cognitive processes, such as attentional control. As a result, older adults may have more difficulty allocating their attention to target speech, which is critical for successful communication. The purpose of the present study was to test the extent to which age-related changes in attentional control contribute to the difficulty that older adults have understanding speech in noise. In this study, younger adults (18-25 years of age) and older adults (55-80 years of age) participated in a dual-task paradigm consisting of a digit recall task and a sentence recognition task. All participants completed the paradigm in two listening conditions (i.e., quiet, noise) and, in each listening condition, were instructed to prioritize either the speech recognition task or digit recall task. In addition, all participants completed a standardized measure of attentional control and working memory. Preliminary results suggest that young adults are able to allocate their attention to maintain performance on the speech recognition task, as instructed, in quiet as well as in the presence of background noise. Discussion will include findings from older adults, which will contribute evidence regarding the effect of age on listeners' ability to allocate attention to understand speech while multitasking.



Laura Zajac

Faculty Advisor: Jeannette Colyvas

Learning from Whom and from What? How Performance Feedback Affects the Diffusion of New Practices

Listeners are often tasked with understanding speech in noisy environments, such as a busy restaurant. In these environments, the presence of background noise can make focusing on a desired speech stream challenging. This is especially true for older adults who experience age-related loss of hearing as well as decreases in domain-general cognitive processes, such as attentional control. As a result, older adults may have more difficulty allocating their attention to target speech, which is critical for successful communication. The purpose of the present study was to test the extent to which age-related changes in attentional control contribute to the difficulty that older adults have understanding speech in noise. In this study, younger adults (18-25 years of age) and older adults (55-80 years of age) participated in a dual-task paradigm consisting of a digit recall task and a sentence recognition task. All participants completed the paradigm in two listening conditions (i.e., quiet, noise) and, in each listening condition, were instructed to prioritize either the speech recognition task or digit recall task. In addition, all participants completed a standardized measure of attentional control and working memory. Preliminary results suggest that young adults are able to allocate their attention to maintain performance on the speech recognition task, as instructed, in quiet as well as in the presence of background noise. Discussion will include findings from older adults, which will contribute evidence regarding the effect of age on listeners' ability to allocate attention to understand speech while multitasking.



Carlyn Zuckert

Faculty Advisor: Mindy Douthit

Organized for Harassment: Sexual Harassment Risk Factors and Organizational Configuration

Nearly half of all women in corporate America will experience sexual harassment at work at some point during their career, and yet limited progress has been made to mitigate these occurrences of sexual harassment. Gender inequalities (i.e. the male dominated workforce, lack of female leadership, and large power differentials between men and women) have been regarded as the key factors that lead to sexual harassment and sexual misconduct in the workplace. This study propels this area of research by considering how elements of organizational configuration -- an organization's cultural values, office layout, human resources practices, and organizational structure -- contribute to the occurrence of sexual harassment or sexual misconduct. The study leverages a mixed method design by surveying 162 participants with a variety of quantitative and qualitative questions that provide an understanding of their workplace configuration and experiences with sexual harassment. The quantitative data found significant correlations between eight organizational variables and incidence rates of sexual harassment some of these variables reduce the risk of harassment whereas others increase the risk of harassment. The prevention factors are employees' emotional and physical safety, an organization's sexual harassment policies, the likelihood that an organization will respond positively

to reports of harassment, gender equality, and access to privacy at work. The risk factors are gender inequality, excessive social stimulation, and reporting relationships with high power differentials between managers and their subordinates. These findings are further explained and supported by the qualitative data, which provide insights into what elements of organizational configuration can be altered to reduce the risk of sexual harassment.



∞ Guide to Oral Presentations

Oral Presentation Session One

11:00-12:30

Cognitive Insights and Social Impacts: Developments in Mental Health

Lake Room (203)

Moderator: Renee Engeln, Psychology Department

Hollyn Cetrone, “Participating in Agriculture and Nutrition Workshops Decreases Depression among Female Farmers in Singida, Tanzania”

Amelia Emery, “White Fragility and Lay Theories of Racism”

Irina Huang, “‘I’m So OCD:’ Obsessive-Compulsive Disorder as a ‘Model Minority’ of Mental Illness”

Rachel Johnstone, “Prevalence and Etiology of Depression in U.S. Symphonic Orchestra Musicians”

Anne Zola, “Brains Over Beauty: A Conceptual Replication of the Effect of Objectification on Women’s Cognitive Performance”

Innovations in Science and Engineering

Arch Room (206)

Moderator: Anis Contractor, Physiology Department

Jeremy Brooks, “How Moon Orbits Have Changed Over Time: The Gravitational Influence of Close Encounters”

Claire Hilburger, “Controlling Secretion from Vesicles through Remote Control of Membrane Protein Insertion”

Alexandra Johnson and Emily Patnaude, “Fabrication of Soft, 3D Microfluidic Coolers for Peripheral Nerve Blocking”

Sarah McDougald, “Applying Statistical Learning to Personality Psychology: BISCUIT and Other Methods”

Christina Shehata, “Applying a Novel Bioinformatic Method to Study Plant Evolution”

Carson Wilmoth, “Characterization and Correction of Sensory and Social Processing Deficits in a Whisker-Dependent Behavioral Task in a Mouse Model of Fragile X Syndrome”

Combatting Injustice

Rock Room (207)

Moderator: Ji-Yeon Yuh, History and Asian American Studies Departments

Agneska Bloch, “Combatting Epistemic Injustice through (Epistemic) Affirmative Action”

Alana Farkas, “Rape Culture and Institutional Response: Perspectives from Men in Greek Life”

Katherine Lo, “Orientalism in Mexican Imaginaries of Indigeneity”

Samantha Oberman, “Evaluating Interactive Social Justice Education: An Analysis of the Relationship between Responsive Fiction on Social Empathy”

Brittany Owens, “Examining Cross-Racial Linked Fate and Immigration Reform: Evidence from the 109th and 111th Congresses”

The Influence and Impact of Art

Armadillo Room (208)

Moderator: James Hodge, English Department

Kelsey Allen-Niesen, “Chinese Contemporary Art as Soft Power: How the Biennale Shaped Chinese Contemporary Art”

Yiran Chi, “‘Now You Have No Gender’: CGI Feet, China’s Digital Working Class, and a New Bodily Discourse in Li Shuang’s T”

Meghan Considine, “Demythologizing Art and Artist: The Revolutionary Pedagogy of the Chicago Mural Movement”

Alessandra El Chanti, “Lebanon's Politics, Economy, and Art - Revive The Lira's Glory”

Zoe Morfas, “Techno from Production to Performance”

Oral Presentation Session Two

1:00-2:30

Government of the People?

Lake Room (203)

Moderator: Jennifer Nash, African American Studies and Gender & Sexuality Studies
Departments

Omer Alaoui, “Marriage in Qatar: An Intimate Choice or a Sociopolitical Duty?”

Claire Bugos, “Creating a Wilderness Park: How the Sierra Club Saved and Shaped Kings
Canyon National Park”

Maya Glenn, “A Critical Look at Breastfeeding Discourse and its Meaning-Making Work
for Mothers”

Sara Saltzer, “The Year of the (Democratic) Woman?: Partisan Voter Responses to
Female Candidates”

Abhishek Shah, “Winning Whose Hearts and Minds? Counterinsurgency in India-
Administered Kashmir”

Advancements in Science and Engineering

Arch Room (206)

Moderator: Tina Grieco-Calub, Communications Sciences and Disorders Department

Kelsey-Ann Leslie, “Birefringence of Polymer Gels Under Stress”

Tyus Loman, “Investigating the Effect of Bilingualism on Auditory Selective Attention”

Madeleine Lucas, “Improving Seismic Hazard Forecasts in California and Surroundings
Using Historical Documentation of the 1918 San Jacinto Earthquake”

Daniel Peters, “Public Health and Climate Co-Benefits of U.S. Vehicle Electrification
Scenarios”

Henry Raeder, “Redundant Functions of PduA and PduJ in Bacterial Microcompartment
Formation”

Yufan Yang, “Rational Design of Nanocarrier Morphology and Surface Charge for
Targeted Cellular Delivery”

Processing Information/Processing Experience

Rock Room (207)

Moderator: Kelly Wisecup, English Department and the Center for Native American and Indigenous Research

Courtney Chatterton, “‘Music Was Life!’: An Examination of Music and Memory in the Holocaust”

June Choe, “Social Information in Sentence Processing”

Sarah Dinegar, “Type 2 Diabetes Care in Germany and the U.S. Compared”

Erin Leary, “(Re)imagining the Upper Mississippi River Valley: From the Colonial Roots of Climate Change to Contemporary Indigenous Artistic Interventions”

William Pahutski, “294,094 Minutes, or Seasons of (TV) Love: Using Qualitative Characteristics to Create Linear Models, Predicting Television Show Longevity”

How Do We Know Ourselves?

Armadillo Room (208)

Moderator: Wendi Gardner, Psychology Department

Sophie Chen, “Black and White: Exploring African American disillusionment with the USSR from 1932-1939”

Amanda Davis, “Challenging Traditional Dating Scripts: Female Initiator Requirements in Dating Apps”

Nicholas Liou, “Looking Homeward: The Troubled Nostalgia of Chiang Kai-shek Memorial Hall”

Ella Lombard, “One Person, Many Groups: Collective coherence in LGBTQ+ individuals”

Jun You, “The Prospect of Moral Artificial Agents”

Oral Presentation Judges

Rives Collins, Theater

Jaime Dominguez, Political Science

Jennifer Lackey, Philosophy

Candy Lee, Journalism

Elizabeth Pardoe, History/Office of Fellowships

Saiying Steenbergen-Hu, Education and Social Policy

Patricia Vitt, Plant Science and Conservation



∞ Oral Presentation Abstracts

Alphabetical by presenter's last name

Omer Alaoui

Faculty Advisor: Jocelyn Mitchell

Marriage in Qatar: an Intimate Choice or a Sociopolitical Duty?

This analytical essay explores the social and legal elements of the practice of marriage in Qatar. The paper argues that marriage in Qatar, rather than an individual choice, has become a sociopolitical duty that both the family and the state control for cultural and strategic reasons. It relies on a qualitative database of anonymized oral history interviews conducted by the author and other students of the Gulf Society and Politics class, as well as other secondary sources, to explore the challenges associated with marriage for Qataris--especially when these partnerships are transnational. The paper uses literature and theory regarding rentier state societies with significant expatriate populations to explore how marriage intersects with social choices, gender roles, economic rentier benefits, and citizenship. Each interview employs pseudonyms to protect the informants' right to confidentiality. The paper concludes that while both family and the state seek to control marriage choices in Qatar, the state plays a stronger role in censoring marriage choices through laws and regulations that reinforce certain social norms even when the latter are challenged or disregarded by Qatari individuals and families. This paper challenges the common misconception that attributes censorship over transnational marriages for Qataris solely to social factors by shedding light on the state's politicization of social norms to serve its nation-building vision, through a patriarchal form of 'population engineering'.



Kelsey Allen-Niesen

Faculty Advisor: Corey Byrnes

Chinese Contemporary Art as Soft Power: How the Biennale Shaped Chinese Contemporary Art

Contemporary art has become a new form of Chinese soft power (a country's persuasive, instead of coercive, power to influence others). In order to understand how this happened, we need to go back to the 1990s. Chinese contemporary art exploded onto the international art scene in the '90s, but it wasn't until the following decade that these rising stars could exhibit at home. Working towards their own agendas, the international art world and the Chinese art world facilitated two separate emergences of Chinese contemporary art, first internationally in the '90s, then domestically in the 2000s. The ways in which Chinese contemporary art developed are well documented, but the existing literature stops short of fully investigating the institutional mechanisms that affected the process, particularly that of the biennale (a biannual exhibition of contemporary art). These two global actors co-opted the biennale format in order to promote their own goals. For the international world, Chinese art became an exciting form of "dissident" art. For the Chinese, contemporary art became a way to assert China as a growing international power. By using the 1999 Venice Biennale to examine Chinese contemporary art's first emergence and the 2000 Shanghai Biennale to investigate its second emergence, this research identifies and analyzes the ways that the biennale complicated the presentation of contemporary art from China. These impacts still reverberate today within the art world and beyond as China uses contemporary art as a form of soft power.



Agneska Bloch

Faculty Advisor: Axel Mueller

Combatting Epistemic Injustice through (Epistemic) Affirmative Action

Not being heard or not having a voice can be a collective epistemic problem of justice. Miranda Fricker's recently developed paradigm of epistemic injustice offers a powerful elucidation of this problem as systematically threatening the individual agency of knowers in our epistemic communities. She, and many following her, argue that we should correct these injustices by cultivating epistemic virtue. My review of the philosophical literature on epistemic injustice, however, revealed that this paradigm has important limitations. For this reason, I propose that combatting epistemic injustice requires not only virtue, but crucially, reform at the interpersonal, institutional, and supra-institutional levels through affirmative action. Such measures change both the material conditions in which knowledge is produced and disseminated, and seek to amplify the voices of marginalized knowers. Through a case study of the discipline of academic philosophy, my talk will illustrate how epistemic affirmative action can begin to correct injustices in knowledge production and sharing. In seeking to center and amplify the voices and conceptual frameworks of the systematically oppressed that are routinely pushed to the margins, I seek to dismantle hierarchies of race, gender, sexuality, ability, etc., that continue to shape both who gets to create and share knowledge, and what counts as knowledge. My epistemic defense of affirmative action thus gives us the tools to critically examine and combat continuing epistemic injustices within academia and beyond.



Jeremy Brooks

Faculty Advisor: Seth Jacobson

How Moon Orbits Have Changed Over Time: The Gravitational Influence of Close Encounters

During the first 100 million years of the solar system, the four terrestrial planets (Mercury, Venus, Earth, and Mars) accumulated via a series of chaotic collisions between protoplanetary masses. Some of these collisions also formed moons from planetary debris. Even more common than collisions were gravitational "close encounters", in which large masses passed very close to planets without colliding. While collisions are extensively studied, close encounters have largely been ignored in the scientific literature. However, close encounters may explain important features of our solar system. First, close encounters gravitationally perturb moon orbits, which potentially explains current unexpected orbital characteristics of Earth's moon. Second, the combined influence of numerous subsequent close encounters may even permanently release moons from their orbits into space. Here, we use an n-body orbital integrator (a program that computes orbital motion) to model close encounters in the chaotic early solar system. We show that close encounters significantly alter moon orbits and that they are plausible mechanisms for moon removal. We apply these results to conclude why some planets (such

as Venus) do not have moons despite the pervasive moon-forming giant impacts during the early solar system. These results contribute to an underdeveloped body of research on moon orbital evolution and retention.



Claire Bugos

Faculty Advisor: Keith Woodhouse

Creating a Wilderness Park: How the Sierra Club Saved and Shaped Kings Canyon National Park

Kings Canyon is a “wilderness park” in relation to its better-known and relatively more developed neighbor to the north, Yosemite. Its vastness, limited accessibility, and relative lack of infrastructure was ensured through the close personal relationships between conservationists and the National Park Service, and legislative actions spearheaded by the Sierra Club over a 50-year period. The Sierra Club’s vision that the Kings Canyon region should be preserved with little human traffic is reflected in the photographs captured and distributed by artists such as Ansel Adams and Cedric Wright. The somewhat limited accessibility to the most pristine parts of the park ensures their preservation, but it also raises questions of how fully it can be enjoyed by the public for whom it is supposedly protected. Unlike Yosemite, whose history is well-documented, the Kings Canyon creation story is relatively unknown, and focuses primarily on the legislative battle. Broadening the history to include internal memos, correspondences, conservation campaign information, and oral histories, reveals the great personal significance of the Kings Canyon project to the Sierra Club leaders. In studying the history of Kings Canyon, as with other preservation movements, conservationists must consider the degree to which they should garner broad public support without encouraging the overuse of public parks.



Hollyn Cetrone

Faculty Advisor: Sera Young

Participating in Agriculture and Nutrition Workshops Decreases Depression among Female Famers in Singida, Tanzania

Depressive disorders are prevalent among women in low income countries and are risk factors for many adverse maternal and child health outcomes. Recently, nutrition and agriculture interventions (NAI’s), which involve teaching agricultural and nutritional lessons, have been proposed to decrease depression since having access to food (food security) is linked to better mental health. However, this relationship has never been directly studied. Therefore, I worked with the research team of the Singida Nutrition and Agroecology Project (SNAP-Tz), which is an NAI aiming to improve sustainable agriculture, nutrition, and gender equity in Singida, Tanzania, to evaluate the project’s impact on maternal depression. Additionally, we ran a mediation analysis to identify the pathways through which SNAP-Tz impacts depression. SNAP-Tz participants are food insecure farming households with

children who were less than 1 year old in January 2016 (n=596). They were exposed to workshops on nutrition, gender equity, and agricultural lessons and then interviewed in February 2016 and 2018 on questions including food security, gender equity, and mental health. First, we found SNAP-Tz women were at an additional 11% decrease for being at risk of probable depression compared to women in the control group. From mediation analysis, the improvements SNAP-Tz interventions had on food security and domestic violence experience are what led to the depression impact (22%, 18%). This is the first finding indicating that an NAI can decrease maternal depression. Because of this, NAI's should be adopted in food insecure areas as a method of mitigating maternal depression.



Courtney Chatterton

Faculty Advisor: Lauren Stokes

“Music was life!”: An Examination of Music and Memory in the Holocaust

As a student in both the School of Communication and Weinberg College of Arts and Sciences, my research bridges across both of my general fields of interest: rhetorical studies and German history. The question I sought to answer was how Jewish culture was depicted both during and after the Holocaust, especially in terms of the visual. In exploring this issue, I traveled - funded by an Academic Year Research Grant - to the United States Holocaust Memorial Museum to perform archival research. Based on my research, I chose to center my thesis on photographs of musical performances in the concentration camps, ghettos, and post-war displaced persons camps. What I found was the use of music in three specific manners: as a tool for dehumanization by the Nazis; as a source of spiritual resistance by persecuted Jews in ghettos and concentration camps; and, as a means of documenting, commemorating, and memorializing the victims and culture lost in the Holocaust. Over the course of my project, I was able to observe the symbols and icons once used to persecute European Jewry being re-appropriated as a means to perform Jewish visibility in the post-war world. While my research works to expand on the limited study of music in the Holocaust, it also aims to bridge a gap in Holocaust visual studies, filling in the holes left by scholars who focus on atrocity images and mass death by instead highlighting the importance of embracing culture and life in the face of utmost tragedy.



Sophie Chen

Faculty Advisor: Leslie Harris

Black and White: Exploring African American Disillusionment with the USSR from 1932-1939

In the 1930's, many African Americans notables of the Black Internationalist movement sought paradise in the Soviet Union. Yet many Blacks in 1930s Harlem who had once gazed upon the USSR as a utopia because of its promise of economic and racial quality, found that the Soviet Union acted

in a way antithetical to concurrent movements—such as Black Internationalism, anti-nationalism, and the New Negro cultural movement—happening in Harlem. This research seeks to overturn notions that 20th-century African Americans allied (or not) with the Soviet Union because of their disappointment in US federal policy. It also reveals some of the internal political struggles that occurred among leftists in Harlem. This research draws from primary source materials gathered at the Rose Library at Emory University and the Schomburg Center for Research in Black Culture in New York City through an Academic Year Undergraduate Research Grant.



Yiran Chi

Faculty Advisor: James Hodge

**“Now You Have No Gender”: CGI Feet, China’s Digital Working Class,
and a New Bodily Discourse in Li Shuang’s T**

This paper argues that Chinese artist Li Shuang’s 2018 video T offers a visceral depiction of the subjectivities of China’s digital working class (DWC) and reflects the distraught exploitation that are built in the social relations of China’s online commercial communities. As a salient example of the aesthetic of “digital grotesque” in post-internet art, T offers a bodily discourse of China’s DWC that goes beyond the masculine-feminine opposition. The video does so, rather provocatively, through a lengthy view of computer-generated feet as well as through its use of multiple and contrasting political voices. In articulating the bodily discourse presented by Li Shuang, I refer to the concept of the grotesque body to arrive at an understanding of how the digital feet overturn existing gender binaries and offer a chilling depiction of the cyberspace. The stakes of T’s unusual combination of aesthetics and politics are to be found in its representation of cyberspace’s articulation of the relation between gender and labor: as both a site of fluidity as well as a compromised site of labor exploitation.



June Choe

Faculty Advisor: Annette D’Onofrio

Social Information in Sentence Processing

While the dominant model of sentence processing holds that the parser incrementally generates a structure in accordance with syntactic principles, extra-syntactic factors such as world knowledge have been reported to play a significant role. However, the nature of world knowledge and the extent to which it can influence initial parsing decisions is unclear. This study investigated the effect of socially-specified agents in the resolution of verb transitivity ambiguity. Experiment 1 found that persona types bias the interpretation of ambiguously transitive verbs in a sentence completion task (n=150). Experiment 2 found that this bias is reflected in small but significant ($p < .0001$) differences on a scale of naturalness in a rating task, which suggests that incongruent personae-verb pairings do not

constitute complete violations of world knowledge (n=120). Experiment 3 used these materials in an eye-tracking paradigm (n=55) to construct garden-path sentences that manipulated personae and the presence of a disambiguating comma, such as: While the [craftsman/surfer] was tanning[,] the leather bracelet on the table fell onto the ground. Reading time measures indicate that transitive-biasing personae led readers to adopt transitive interpretations at a cost even when this possibility was ruled out by the comma. This suggests that readers prefer to ignore orthography if it allows them to construct an event that matches stereotypical expectations. Because social information shows robust effects in the early stages of sentence processing despite subtle differences in preference reported in the off-line tasks, world knowledge appears to be more complicated than just semantic plausibility.



Meghan Considine

Faculty Advisor: Rebecca Zorach

Demythologizing Art and Artist: The Revolutionary Pedagogy of the Chicago Mural Movement

This project highlights the role of education in both the processes and completed artworks of Chicago's urban muralists from roughly 1968-1973. Throughout this period, a mural craze swept through the United States in a fervor inspired by a comparable Mexican mural movement and Franklin Delano Roosevelt's New Deal Works Progress Administration cultural projects of the 1930s. This trend was particularly well documented in Chicago, the home of the majority of the movement's leaders. Each mural offers a spectacular object of individual study and warrants further scholarship, but this project endeavors to situate both the practice of mural making and the completed object itself as opportunities for revolutionary pedagogy, insurgent forms of teaching and learning. In fact, the educational potential was ever prioritized and consciously articulated by the movement's leaders. Mobilizing theorists such as Frantz Fanon and Paulo Freire as interlocutors, as well as firsthand accounts from muralists, I situate Chicago's public artmaking tradition within a broader international postcolonial pedagogical rhetoric. I argue in addition that the Chicago Mural Movement rests on histories of mentorship and generosity that endured, and perhaps were even strengthened by, the institutionalization of the movement. With a the case study of the Museum of Contemporary Art's 1971 exhibition Murals for the People, the paper examines the implications of transporting an inherently site-specific methodology inside the museum space, which is often framed and understood as sterile and neutralizing. Overall, I argue the edificatory quality of this movement has created a tradition of Chicago public art and artmaking that prioritizes specific marginalized populations who are typically involved with the work from its inception. These murals and more contemporary social practice projects stand in staunch opposition to a more conventional image of what public art in Chicago looks like: namely, alienating modernist sculpture like the Chicago Picasso or Anish Kapoor's Cloud Gate ("The Bean") which bear little relevance to or intimacy with the populations that interact with the objects on a daily basis.



Amanda Davis

Faculty Advisor: Jeremy Birnboltz

Challenging Traditional Dating Scripts: Female Initiator Requirements in Dating Apps

Expectations for cross-sex first dates still commonly reflect traditional gender roles. Actions that reflect dominance, such as paying the bill, are the man's role. Contrarily, the woman's role is to demonstrate affiliation, which includes being personable and affectionate. Challenging these gender roles, a female initiator requirement (FIR) in a dating app requires women to send the first message in a cross-sex match. This online experiment contributes to the literature by providing expectations for a date organized on a dating app and by including a FIR, not just female initiation, as the independent variable. Participants (N=113) rated the dominance and affiliation of a female initiator and the man she communicated with through a dating app, which either included a FIR or did not. Results suggest that a FIR does not influence these perceptions, but overall, women rated the female user's dominance higher than men did. Participants also wrote scripts containing the events they expected to occur on a face-to-face date between the two dating app users. An analysis of one hundred scripts suggests that a FIR impacts neither men's expectations for sexual activity on a face-to-face date nor the expectation that the man and woman will exhibit similar levels of dominance on the date; although, the female user's dominance was expected to be higher if she used an app with a FIR rather than a control app. These results demonstrate the previously unexplored and complex relationship between FIRs, perceptions of in-app dominance, and expectations for gender roles on first dates.



Sarah Dinegar

Faculty Advisor: Franziska Lys

Type 2 Diabetes Care in Germany and the U.S. Compared

Type 2 diabetes (T2D) affects over 422 million people worldwide. Within their multi-payer healthcare system, Germany has used standardized, evidence-based interventions called Disease Management Programs ("DMP"s) to manage T2D since 2002. Studies have shown markedly improved health care delivery and health outcomes, including reduced incidence of diabetic secondary complications, decreasing financial burdens of T2D in Germany. No such programs exist in U.S. healthcare. In 2017, diabetes care for 29 million T2D Americans cost \$327 billion. Clearly needed reform warrants examination of and comparison with German T2D DMPs' successful methods. This study employed interviews and surveys to investigate German and American primary care physicians' opinions of their nation's T2D management methods' efficacy in improving health outcomes, healthcare costs, and quality of care. While German physicians reported similar protocol and resource availability for T2D management, American physicians' responses varied widely by clinical network and individual insurance plans. Strengths of Germany's T2D DMPs included regularity of visits and the accountability inherent to this structure, while weaknesses included lack of customization and excessive bureaucratic documentation for minimal added value. Strengths of American methods included increasing utilization of technological tools and motivational interviewing techniques, while weaknesses included systematic inequality, lack of insurance-covered diabetes education, and

prohibitively high costs of medication. This study provides new insight into primary care physicians' opinions on best directions forward for chronic care management, which include subsidized diabetes education courses, coverage of dieticians and counselors, and increased implementation of team-based care, telemedicine & apps to improve patient accountability, and value-based care.



Alessandra El Chanti

Faculty Advisor: Scott Curtis

Lebanon's Politics, Economy, and Art - Revive The Lira's Glory

This project is about the Lebanese political and economic crises, and how the role of art as a soft power attempts to change perceptions linked to the country. This work attempts to show how the Lebanese youth deals with the aftermath of the 1970s civil war that took place in Lebanon, through art. They were not a part of the civil war, yet they are impacted by it until today by the sectarianism of the country which results in political, societal, and economical downfall. A popular medium amongst Lebanese youth for voicing their opinions about these implications is art. For this project, I filmed a short documentary called "Revive The Lira's Glory," which features a young Lebanese artist named Ibrahim Sultani who paints Lebanese icons on the Lebanese banknote, in order to give the currency back its value, metaphorically. Prior to filming the documentary, I conducted research by looking into books and journal articles on the political and economical status of the country, in order to understand the artist's concept better. What I found was that the root of all economical and political crises that exist within Lebanon is the sectarianism of the country. The civil war erupted due to the sectarianism, and the aftermath that the country still faces until today politically and economically is due to that sectarianism. The artist paints Lebanese icons such as singers, actors, designers, athletes, filmmakers, etc. on the banknote, as they are the only figures that Lebanese people have mutual love and respect towards and unify the country, as opposed to politicians who tear the country apart with their sectarian agendas and politics.



Amelia Emery

Faculty Advisor: Galen Bodenhausen

White Fragility and Lay Theories of Racism

Most White Americans express support for egalitarian values and strive to avoid racial biases. Because their mental images of racism are quite negative, any implication that they might possess racial biases can create distress and defensiveness, a pattern called "White fragility." The current research sought to examine these reactions through 2 correlational studies. We examined participants' mental images of someone with racial bias and measured their defensiveness when confronted about the possibility of holding racial biases themselves (personal bias allegation) versus the possibility of White people in general holding racial biases (impersonal bias allegation). In Study 1, participants read a blog post

arguing that White people are generally racially biased, after first reporting their mental image of a racist. Participants with a more negative image of racists were less dismissive of the post's arguments. Study 2 replicated this pattern but also measured participants' reactions to a personal bias allegation. Here we found evidence consistent with White fragility: in this case, people who viewed racial biases in more negative terms expressed greater upset, denial, and desire to disprove the allegation. These results indicate that the negativity of White people's mental images of racism works in opposite ways when it comes to reactions to personal versus impersonal bias allegations. Viewing racial biases in a more negative way is associated with greater receptiveness to the possibility that White people generally tend to be biased, but it is also associated with greater defensiveness toward the possibility of one's personal racial biases.



Alana Farkas

Faculty Advisor: Lilah Shapiro

Rape Culture and Institutional Response: Perspectives from Men in Greek Life

On college campuses, one in five women will experience sexual assault in some capacity over the course of their undergraduate experience. College men in fraternities are three times more likely to commit sexually assaultive acts than non-Greek students. Despite pervasive knowledge that fraternity members are often involved in rape on college campuses, research has not fully examined the norms, attitudes, and behaviors that might underlie and perpetuate sexual assault in fraternities. Further, few studies have covered what constitutes effective sexual assault prevention workshops in the organizations. The present study examined the sociocultural narratives and scripts that perpetuate rape culture in Greek fraternities using in-depth interviews with fraternity members (n=12) at a mid-sized private university. Analytic open-coding of data established major themes to include social power and privilege, emphasis on image, homogeneity, and hypermasculinity, all which contribute to the objectification of women and the perpetuation of rape culture in fraternities. Further, this study sought to identify how prevention workshops can better align with the perspectives and experiences of fraternity men by examining current rape prevention workshops in place at this university and interviewing administrators and student facilitators (n=4) involved in the design and content of these programs. Finally, this study assessed how workshops can be more effective in preventing sexual assault in college. It can be concluded that workshops are designed in order to address rape culture; however, there is reason to believe these measures may not be sufficient.



Maya Glenn

Faculty Advisor: Jennifer Nash

A Critical Look at Breastfeeding Discourse and its Meaning-Making Work for Mothers

The decision to breastfeed or formula feed is a largely contested one by mothers, healthcare administrators, and politicians. Yet, research suggests that both breastfeeding and formula feeding are

healthy ways to provide nourishment to newborn babies. Considering this, I sought to analyze why this decision is such a site of contestation. I did this by critically analyzing the meaning-making work that breastfeeding discourse had for women during the historically significant moment when Rhode Island, Massachusetts, and New York implemented measures limiting mothers' ability to access formula in hospitals between 2011 and 2012. I identified and analyzed recurring themes in blog posts and articles on news websites that highlighted how both the healthcare administrators and politicians in favor of these pro-breastfeeding efforts and their critics discussed breastfeeding and formula feeding. I found that the pro-breastfeeding politicians and healthcare administrators did not meaningfully center the desires of the very bodies being discussed - the mothers. They also positioned formula feeding mothers as immoral and lazy. I argue that both of these sentiments discursively dehumanize mothers. Even whilst the critics provided critiques that meaningfully recentered mothers' desires, they also made discursive choices that epitomized breastfeeding in ways that supported the pro-breastfeeding discourse that dehumanized women. This research is of significance because it helps us understand that institutional pro-breastfeeding efforts are less about the nourishment of infants and more-so about disregarding the desires that mothers have for their bodies, life experiences, and children, as well as placing moral judgements onto mothers in ways that dehumanize them.



Claire Hilburger

Faculty Advisor: Neba Kamat

Controlling Secretion from Vesicles through Remote Control of Membrane Protein Insertion

The design of a stimuli-responsive carrier is an important step towards the design of vesicle-based technologies for an application such as targeted drug delivery to tumor sites. One way to make such a carrier is by controlling the release of encapsulated cargo within a vesicle, a bubble-like vehicle traditionally made from biologically relevant phospholipids. Controlled drug release from these vesicles can be achieved by selectively triggering when pores insert into the membrane. Here, we showcase vesicles temporally form protein pores using channel protein α -hemolysin, which only forms pores in the presence of a critical amount of bilayer cholesterol. This property allowed us to design membranes below the critical cholesterol threshold level that barred pore formation or were "inactive". We hypothesized we could trigger pore insertion by increasing membrane fluidity in these inactive membranes because this would cause the membrane cholesterol to be more accessible to the protein. We chose oleic acid (OA) as our membrane fluidizer because when added externally to vesicle membranes, OA spontaneously inserts in the bilayer and increases membrane fluidity. We first confirmed that increasing amounts of OA in sub-cholesterol membranes modulates pore insertion, and subsequent cargo release. Next, we confirmed that we could temporally control pore insertion and secretion by adding OA exogenously to preformed vesicles. In summary, we showcased that remote changes in membrane composition offers a new handle to control membrane protein integration. Towards the design of vesicle-based technologies, directing membrane protein activity will be significant for applications such as sensing or drug delivery.



Irina Huang

Faculty Advisor: Justin Tse

“I’m so OCD”: Obsessive-Compulsive Disorder as a ‘Model Minority’ of Mental Illness

Like many others who have Obsessive-Compulsive Disorder (OCD), I am unsettled when someone—who doesn’t have clinical OCD—uses ‘OCD’ frivolously (e.g. “I’m so OCD”). This project explores what OCD has come to mean in our everyday vernacular. I argue that OCD is a “model mental illness”—that is, a ‘model minority’ of mental illness, parallel to the way Asian Americans are seen as the model minority, in the arena of race. Currently, though there are many blog posts about it, there is very little to no academic literature on how OCD is referenced and widely (mis)understood. Utilizing literature about the Asian American model minority myth as a framework, I am able to better comprehend—and scrutinize—how OCD exists in our daily vocabulary. Posts (that include keywords like #OCD) on social media platforms of Twitter, Instagram, and Reddit capture that OCD has become synonymous with cleanliness, tidiness, attention to detail. Labeling Asian Americans as the model minority is a faulty, incomplete understanding of Asian Americans and their experiences, ultimately making the model minority theory a myth. Similarly, seeing OCD as a “model mental illness” is problematic because it tells a skewed, partial story of how debilitating OCD can be for sufferers. This project puts in conversation sources from traditionally disparate fields of Asian American Studies, psychology, and philosophy. I hope that this project can educate and clarify what OCD is, and advocate—on behalf of OCD (and more broadly, mental illness) sufferers—for a world freer of ableist microaggressions.



Alexandra Johnson & Emily Patnaude

Faculty Advisor: John Rogers

Fabrication of Soft, 3D Microfluidic Coolers for Peripheral Nerve Blocking

Neural blocking is an important neuroscience research tool used in the analysis of the peripheral and central nervous systems, as well for clinical chronic pain management. Cooling as a neural block technique has been researched for several decades, but drawbacks such as mechanical rigidity and a lack of spatial and temporal precision make previous solutions inept for longitudinal in vivo study. Here, we demonstrate strategies for developing soft, 3D microfluidic nerve cooling cuffs that provide an intimate thermal interface to small peripheral nerves. The fabrication process utilizes a bas-relief methodology to form molded channels which are then laminated to a flat layer integrated with a thermal sensor. A cooling effect is generated using forced evaporation of pentafluorophenol (PFP) through the constructed channels. This fabrication has employed a silicone elastomer (polydimethylsiloxane), and ongoing work aims to translate these processes into bioresorbable models that eliminate the need for extraction surgery. Testing for cooler efficacy involves submerging completed devices in a simulated biological environment, then combining air and PFP within the channels to induce an isenthalpic phase change. Changes in temperature at the point of nerve contact are determined as a function of air and PFP flow rates, and testing results have shown deltas up to of 30 °C. Successful cooling in vitro allows progression to the in vivo phase, in which we will establish a

protocol for cooling-induced block in rat sciatic nerves, followed by performing longitudinal studies to determine efficacy and risks of cooling-based pain management.



Rachel Johnstone

Faculty Advisor: Benjamin Gorvine

Prevalence and Etiology of Depression in U.S. Symphonic Orchestra Musicians

Orchestral musicians experience extraordinary emotional, cognitive, and social demands in the service of their craft due to intense competitive pressures that are exacerbated in U.S. orchestras. Research conducted on orchestras internationally has found elevated rates of anxiety and depression among elite musicians when compared to the general population. Unfortunately, previous research has failed to use standardized, clinical scales and has relied solely on self-report. Research on U.S. orchestral musicians has been stymied due to stigma and lack of interest in understanding the unique problems musicians face. This study examined musicians in ICSOM orchestras (n=395) using standardized clinical scales. We found that rates of clinically significant depression and anxiety were elevated beyond previously reported values for musicians. Levels of self-compassion and perfectionism, the use of psychiatric medication, or the use of off-label beta blockers (drugs often used by musicians to combat performance anxiety), were predicted to affect depression levels. Performance anxiety had the largest correlation with depression and, unexpectedly, beta blockers were correlated with higher depression and anxiety scores. This study reconfirmed the link between perfectionism and depression, yet due to the necessity of perfectionism in a professional music career, common perfectionism-focused interventions are not viable for musicians. However, self-compassion and psychosocial stress were significantly related to depression scores and may be viable targets for intervention. We suggest that these stark findings indicate that psychologists should develop targeted self-compassion interventions and orchestral management should work to minimize psychosocial stressors to possibly reduce the rampant mental health issues seen in the industry.



Erin Leary

Faculty Advisor: Kelly Wisecup

(Re)imagining the Upper Mississippi River Valley: From the Colonial Roots of Climate Change to Contemporary Indigenous Artistic Interventions

The colonial “development” of the Upper Mississippi River valley by U.S. settlers often began with colonists imagining the valley in a way that aligned with colonial goals. Contemporary Indigenous scholars critique concepts of the Anthropocene, pointing to the progression from colonialism to capitalism, which jointly provided the foundation for the industrialism and militarization that have led to anthropogenic climate change. In this project, I explore how colonial imagination has shaped human interaction with the valley, as well as how Indigenous art and scholarship offer different

understandings of the river's social and environmental histories. I undertake literary analyses of a U.S. colonial narrative and two contemporary Indigenous visual artworks, using a multi-disciplinary framework that draws on scientific, humanities, literary, and historical scholarship. First, I examine the colonial narrative of Zebulon Pike whose 1805 exploratory mission marked the start of an official U.S. presence in the valley as he designated locations for military forts. Then, I analyze art pieces by two Ojibwe artists: Andrea Carlson's 2018 projection exhibit "The Uncompromising Hand" and Heid Erdrich's 2018 poem (poem video) "Pre-Occupied." Both works recall Indigenous histories while advocating for Indigenous rights in the present and future, thereby subverting acts of colonial imagination that seek to erase the Indigenous presence. I demonstrate that Indigenous artistic acts intervene in a long history of colonial imaginations that have, in connection with capitalism and industrialism, had real impacts on the social and environmental landscape of the Upper Mississippi River valley. Indigenous erasure and climate change began with the same acts of colonial imagination; through Indigenous artworks, it is possible to revisit Indigenous and environmental histories in order to reimagine a more mutually-beneficial, sustainable future.



Kelsey-Ann Leslie

Faculty Advisor: Michelle Driscoll

Birefringence of Polymer Gels Under Stress

When materials are subject to large stress, they break apart; I am currently studying the rupture of hydrogels under large compressive stress. To better visualize the rupture process, we use photo elastic imaging, as hydrogels are highly birefringent. Birefringence is an optical property of transparent materials whose refractive indices depend on the polarization and propagation direction of light. Birefringence can tell you how the material reacts due to stress or strain, and when enough force is applied, observing the birefringence in a material can give much insight on how materials break. I am currently observing how the polymer gels break and fracture in a variety of ways by compressing, stretching, and observing the gels as they absorb water, while also looking at different conditions such as varying the surface area ratio of the gels and the mole concentrations of the monomers. By observing how these materials break, we can gain further insight on the mechanical properties of these polymer gels, and possibly use this data to predict how other materials and structures will fail under stress.



Nicholas Liou

Faculty Advisor: Jun Hu

Looking Homeward: The Troubled Nostalgia of Chiang Kai-shek Memorial Hall

Situated in the heart of urban Taipei, the capital of Taiwan, Chiang Kai-shek Memorial Hall (1976) stands as a monument to the eponymous first president of the Republic of China (ROC). Consisting of a main memorial hall, opera theater, Western concert hall, and surrounding gardens, the memorial complex was constructed to commemorate Chiang's life and to secure his role in Taiwanese history. Existing literature in English on the memorial is scarce and scholars who do write about the monument discuss its political and social histories without focusing on the architectural style itself. I conduct a formal analysis of the various buildings and gardens, comparing their visual styles to those of earlier mainland Chinese buildings and structures. By looking at style, I position Chiang Kai-shek Memorial Hall as a site of colonial nostalgia. The combination of Chinese palatial and ROC-era architecture represents an attempt to reconcile a historical conflict between imperial China and the ROC, a move that articulates Chiang's nostalgic and quixotic political claims to the now Communist mainland. This homesickness is a colonial one, since Chiang and the ROC government came from mainland China and, in doing so, oppressed native Taiwanese populations. Thus, while Chiang Kai-shek Memorial Hall represents the ROC's homesickness, it is also a symbol of the regime that deprived local Taiwanese people of their native homeland. Through my analysis of Chiang Kai-shek Memorial Hall, I ultimately reposition Chiang's ROC government as a colonial one, a framing that is lacking in existing scholarship.



Katherine Lo

Faculty Advisor: Ji-Yeon Yuh

Orientalism in Mexican Imaginaries of Indigeneity

Two popular critiques of Asian American Studies are its US-centrism within the Americas and its inherent valorization of race/ethnicity and racial/ethnic difference in its endeavors to critique and liberate its subjects from the same system. Though not able to fully tackle the latter, this project aims to address both of these issues by locating Asian American Studies theory in Mexico in regard to indigenous, not Asian, communities. During a four-month span in Yucatán, Mexico in the fall of 2018, this project developed out of the observations, interactions, and experiences of everyday life. Continued reflections upon return have culminated in a performance studies approach that relates Orientalism—a foundational concept of Asian American Studies—and national abjection to four unique enactments of indigenous fantasies and indigeneity in Mexico. This project complicates and disrupts the nation's romantic mestizaje ideology, showing how colonial subjects internalize and re-distribute the colonial gaze and colonial fantasies. Colonialism, then, is not simply a moment in history, but a structure that actively guides and shapes daily life. By emphasizing the underlying structures shared by phenomena specific to group and/or region, this project demonstrates the versatile and collaborative possibilities of ethnic studies fields in creating globalized understandings of race and racial formation.



Tyus Loman

Faculty Advisor: Tina Grieco-Calub

Investigating the Effect of Bilingualism on Auditory Selective Attention

Everyday environments often contain multiple sound sources, including different groups of talkers and background noise. In these environments, listeners must extract and attend to important sounds, such as their friend's voice, from other sounds. This ability is referred to as auditory selective attention and is crucial to successful communication. The ability to selectively attend to target speech is likely influenced by an individual's general cognitive control, which changes with development and is influenced by experience. For example, bilingual individuals typically demonstrate better cognitive control than their monolingual peers. The purpose of the present study is to test the hypothesis that bilingual children and adults have greater auditory selective attention than monolinguals. To test this hypothesis, we implemented an auditory selective attention task in which English monolingual and Spanish-English bilingual children and adults were asked to attend to frequency deviants in a target auditory stream while ignoring those in a competing auditory stream. To quantify how aspects of the auditory input affect auditory selective attention, participants performed this task with clear and degraded stimuli across three conditions that varied based on the availability of acoustic cues. Preliminary findings indicate that bilingual children respond to deviants in the target and distractor streams more frequently than monolingual children, regardless of stimulus quality or acoustic cue condition. Discussion will include findings from monolingual and bilingual adults, which will contribute additional evidence regarding the effects of bilingualism on auditory selective attention.



Ella Lombard

Faculty Advisor: Wendi Gardner

One Person, Many Groups: Collective Coherence in LGBTQ+ Individuals

Individuals belonging to multiple groups whose cultures do not align often struggle to achieve collective coherence, or the sense that these groups' characteristics complement one another. Achieving collective coherence is associated with better wellbeing, but little is known about how such coherence is created. An interview study uses the life-story narrative method to investigate the process of achieving collective coherence in LGBTQ+ individuals who are members of two other identity-central groups. Qualitative analysis reveals that participants identify multiple life events as crucial to coherence, including discovering affirming communities and encountering peers who share aspects of identity. Quantitative analysis demonstrates that coherence increases post-interview and that cognitive interdependence, or the extent to which participants conceive of their collective identities as inextricably linked and influencing one another, predicts coherence. Future work should explore whether increasing interdependence may act as a novel pathway to achieving coherence and should continue to consider more than two group memberships.



Madeleine Lucas

Faculty Advisor: Seth Stein

Improving Seismic Hazard Forecasts in California and Surroundings Using Historical Documentation of the 1918 San Jacinto Earthquake

Seismologists say that “earthquakes don't kill people, buildings kill people.” Hence it is crucial to predict the shaking that buildings should be built to withstand. Thus, much as how meteorologists try to predict weather, seismologists forecast seismic hazard using probabilistic seismic hazard assessments (PSHA). PSHA maps display the expected level of ground shaking over a long time period (buildings have useful lives greater than 50 years) by considering all possible earthquakes that could affect a location. These maps use instrumental data from recent earthquakes, but not historical shaking data from moderate to large earthquakes. However, moderate to large earthquakes control seismic hazard. To address this issue, we are compiling a dataset for California and surroundings showing maximum shaking at points within the region over the past 170 years by including “Did You Feel It?” reports collected since 1924 and historical accounts of earthquakes since 1850. My role in this research used historical documentation to conduct archival research of the 1918 San Jacinto earthquake to extract intensity values, which describe the severity of shaking, from newspaper and citizen reports. I assigned intensity values using the MMI scale, which measures the effect an earthquake had on people, man-made structures, and the landscape. I will be working with colleagues at NU and the U.S. Geological Survey to combine these data and those for other earthquakes. We will then compare the shaking dataset to current USGS seismic hazard maps to explore aspects of how the maps perform and how to improve them.



Sarah McDougald

Faculty Advisor: William Revelle

Applying Statistical Learning to Personality Psychology: BISCUIT and Other Methods

Over the past few decades, statistical learning (SL; known in computer science as machine learning) has grown as a subfield in statistics. Recently, SL's popularity has exploded; researchers have begun to apply SL methods in many different fields, including psychology. In order to conduct the most efficient and scientifically accurate studies, psychologists need baseline research demonstrating which statistical methods are appropriate for their data. Our research addressed this need: we developed a methodological study that tested the predictive power of several well-known statistical learning methods, using a large dataset from the Synthetic Aperture Personality Assessment (SAPA). We controlled for both the specific outcome variables being predicted as well as the amount of missing values in the dataset, using the correlation between predictions and reality as a metric of model success. We also introduced a new method developed in our lab: BISCUIT, a Best Items Scale that is Cross-validated, Unit-weighted, Informative and Transparent. This method merits investigation because of

its simplicity, speed, and functionality even on missing data (other SL methods required imputation). Our preliminary results show that while the LASSO method best predicted human characteristics in almost all situations, BISCUIT performed nearly as well. The demonstrated predictive power of all the SL methods is impressive and offers a promising avenue for psychology research. We also argue that based on our results, BISCUIT is a valuable new alternative to more complex SL methods and may present an easier entry point for psychologists into the world of statistical learning.



Zoe Morfas

Faculty Advisor: Hans Thomalla

Techno From Production to Performance

For producers of electronic music, it is necessary to understand the role of a DJ in live performance. The musical relationship between producers, DJs, and live audience shapes the composition of electronic music in the Berlin techno scene. A producer makes stylistic choices in their music considering how DJs might manipulate their tracks. Interviews were conducted with DJs and producers, asking about the creative and technical methods they used to create and modify tracks during performances. Producers cited targeting the stylistic expectations of certain venues, creating “DJ-friendly” tracks, and appealing to local record labels as external influences on their compositional processes. DJs listed responding to the energy of an audience and following the larger musical structure of an evening as guidelines for how they modify tracks during a performance. One consensus of the interviewees is the belief that the institutions of the techno scene (Berghain, Tresor, etc.) are in the business of preserving their sound. Older, established techno institutions hire DJs whose sound evokes a feeling of nostalgia back to early 90s techno, after the fall of the Berlin wall. Often, producers who hope to have their tracks performed at such institutions may feel compelled to compose their tracks accordingly, reminiscing about this period of time.



Samantha Oberman

Faculty Advisor: Danny Cohen

Evaluating Interactive Social Justice Education: An Analysis of the Relationship between Responsive Fiction on Social Empathy

The theorists who developed Social Justice Education (SJE) claim that its goals are: to critically analyze how oppression operates on an individual, cultural, and institutional level, to harness empathy and respect for others, and, ultimately, to commit to working for lasting change. Despite having established goals, the literature lacks research on how to evaluate such programs. Social empathy—empathy that takes into account contextual understanding and social awareness—is associated with higher engagement in social action and helping behaviors. Based on this research, I used a mixed method design to analyze the affect SJE has on participants. I analyzed Tomorrow, a social justice program on

mental health in high school, by having participants take the Social Empathy Index (SEI) before and after the workshop. They then participated in a group interview. Participants were randomly assigned to facilitated or online versions of Tomorrow to assess the differences between the pedagogies. The coding scheme consisted of established subscales of empathy, Bloom's taxonomy of the four dimensions of knowledge, and codes on general feedback established through grounded theory. Using a paired t-test between pre- and post- SEIs, a significant difference between social empathy after participating in Tomorrow was established. However, no difference was found between the online and facilitated conditions. Participants reported an understanding of new perspectives related to mental health and social justice. This study not only analyzes the strengths and weaknesses of Tomorrow but also proposes a novel and robust method for creating and evaluating SJE in the future.



Brittany Owens

Faculty Advisor: Anthony Chen

Examining Cross-Racial Linked Fate and Immigration Reform: Evidence from the 109th and 111th Congresses

Does a sense of cross-racial linked fate shape the political behavior and substantive representation of racial-minority members of the House on questions of immigration reform? Prior research has not studied in-depth whether an existence of cross-racial alliances shape the substantive representation of racial minorities. As such, I explore the existence of cross-racial linked fate, which I define as the notion that one's racial minority group's political fate is tied to the political fate of other racial minorities, by hypothesizing that racial-minority members of the House are more likely to cast a liberal vote on immigration reform than white members, *ceteris paribus*, and are more responsive to increases in the racial minority share of their district than white members, *ceteris paribus*. To test my theoretical hypotheses, I constructed an original dataset of roll-call votes on five immigration reforms across the 109th and the 111th Congresses with member-level and district-level information, and used multivariate regressions to analyze the likelihood that a racial minority member casts a liberal vote on immigration reform as well as the responsiveness of racial minority members to increases in their district's racial minority concentration. While I find some evidence of cross-racial linked fate that supports the notion that descriptive representation leads to the substantive representation of racial minorities, the evidence is mixed. Overwhelmingly, the results indicate that the American political system is highly segregated both within the House and across districts, which has broader implications for the study of racial politics and representation in the current U.S. political system.



William Pahutski

Faculty Advisor: Hongmei Jiang

294,094 Minutes, or Seasons of (TV) Love: Using Qualitative Characteristics to Create Linear Models, Predicting Television Show Longevity

In 2015, over 200 new television shows premiered, resulting in 294,094 minutes of television. Almost 70% of these minutes occurred in shows that lasted for more than two seasons. The purpose of this study is to provide concrete models and data trends that could be used by producers to maximize profitability of their programming. This study was done by using the inherent qualitative features of every television show that premiered in 2015 to create accurate predictive models, revealing the factors that contribute to multiple-season runs. Although creating a strong linear model for all the shows collectively was not possible, more specific models were created that more accurately predicted the number of seasons a show was on air. While each model was far from perfect, trends in the data were used to offer suggestions to producers and production studios as to which shows might be worth more of their time and money to invest in.



Daniel Peters

Faculty Advisor: Daniel Horton

Public Health and Climate Co-Benefits of U.S. Vehicle Electrification Scenarios

Vehicle electrification is a common strategy for climate change mitigation, with policymakers and environmentalists invoking associated reductions in carbon dioxide (CO₂) and air pollutant emissions. However, previous electric vehicle (EV) adoption benefit work remains equivocal; studies indicate significant CO₂ mitigation benefits, but the few studies on air quality predict more variable outcomes – to date, no studies have provided a comprehensive analysis of both climate and health co-benefits of EV adoption. Here, I analyze climate and health co-benefits of U.S. vehicle electrification using model-simulated changes in CO₂, ozone, and fine particulate matter (PM_{2.5}). I consider two EV penetration fractions and three energy generation regimes for EV charging. I quantify the avoided premature mortality associated with each scenario using health impact functions. Nationally, scenarios result in 458 to 3305 deaths avoided per year and CO₂ emissions reductions of 217 to 796 million tons per year. Peak CO₂ reductions and health benefits occur with 75% EVs and doubled emission-free energy sources. The 75% EV scenario with combustion-only energy sources exacerbates adverse health outcomes in some regions; in this scenario Texas and Florida each mitigate more than 50 million tons of CO₂ while PM_{2.5} changes cause dozens of additional deaths per year, highlighting the importance of emission-free power generation for health benefits. My results give a new understanding of the relationship between climate change mitigation and health impacts in the transportation sector, demonstrating that while electrifying vehicles consistently reduces CO₂ emissions, public health co-benefits are spatially variable and depend on the charging energy mix.



Henry Raeder

Faculty Advisor: Danielle Tullman-Ercek

Redundant Functions of PduA and PduJ in Bacterial Microcompartment Formation

Bacterial microcompartments (BMCs) are proteinaceous organelles contained within prokaryotes used to facilitate reactions with increased efficiency, or to carry out reactions with intermediates that are harmful to the cell if released into the cytoplasm. Oftentimes, compartments are used to metabolize unique carbon sources, such as 1,2-propanediol (1,2-PD), whose metabolic pathway contains intermediates toxic to cell growth. These compartments are a kind of metabolic workshop in that they localize necessary substrates into a specific area, and they can isolate their work from the surrounding cellular noise. This could make them useful for drug delivery or self-contained synthesis reactions. My work focuses on two proteins that make up the shell forming the boundary between the microcompartment and the cytoplasm, PduA and PduJ. By manipulating the genes that code for these proteins, I have investigated how each can form a functional compartment independently of the other, meaning that they hold redundant function. To do this, I used a 1,2-PD-based assay to test the growth of individual pduA and pduJ gene knockouts, and observed no difference in growth compared to the Wild Type. Furthermore, I created a double knockout strain using genetic recombineering, and used my growth assay and fluorescence microscopy to assess disruption of microcompartment formation. No previous research has been committed to the redundant function of PduA and PduJ, and if this connection can be confirmed, it would open the door for dozens of other experiments into how the microcompartment shell can be altered to control molecular transport into/out of the microcompartment.



Sara Saltzer

Faculty Advisor: Mary McGrath

The Year of the (Democratic) Woman?: Partisan Voter Responses to Female Candidates

The number of Democratic female elected officials, particularly at the federal level, has skyrocketed in the last several decades, while the number of Republican women holding elected office has stagnated. This study seeks to uncover the source of this partisan disparity in electing female candidates (specifically, whether either gender stereotypes or desires for descriptive representation play determinative roles in vote choice), and examine if there is variance in these outcomes based on whether the candidate is seeking legislative or executive office. In a set of survey experiments administered to a sample of 440 registered voters, participants were presented with two pairs of candidates (one male, one female) running in hypothetical party primaries for gubernatorial and state representative offices (the order of which was randomized). For each race, participants were randomly assigned to a condition in which their presumed assumptions about women's policy stances and competency areas were either reversed or reinforced, or to a control group. The findings suggest that Democratic voters are more likely to vote for female candidates; however, Republican voters were no more or less likely to vote for female candidates, and no significant difference was found between responses to female candidates running for legislative or executive office. This study contributes to

our understanding of how partisanship interacts with vote choice when voters are presented with female candidates, and has implications for how female candidates of both parties can better leverage gender considerations to run more effective campaigns and increase gender parity in governmental representation.



Abhishek Shah

Faculty Advisor: Daniel Majchrowicz

Winning whose hearts and minds? Counterinsurgency in India-administered Kashmir

Pictures of 21-year old Kashmiri footballer Afshan Ashiq throwing stones at police forces in April 2017— after she said a policeman verbally and physically abused her teammates— went viral on social media through news articles. Images of Ashiq also denaturalized the prevailing icon of the Kashmiri stone thrower in the Indian zeitgeist as male masculine. Given that publications actually gave space for the dissident to voice her anger against the state, coverage of the incident marked a break from the patterns of representation usually offered by Indian publications that describe Kashmiris as undifferentiable masses of fundamentalist (or paid) stone-pelting Muslim men. To gain a better understanding of the implications of these representations, I applied a qualitative analysis to Indian print media’s English language coverage of the incident and events that followed over an eight month period. I employed feminist theories on belonging and counterinsurgency to understand dynamics and recurring tropes in the data collected. Based on the findings, I argue that publications emphasize four layers of exceptionality that cohere to reinforce India’s counterinsurgency goals in Kashmir. These goals target winning “hearts and minds” of Indians rather than Kashmiris, pushing them to condone the occupation of Kashmir. This finding contributes to the literature on conventional counterinsurgency practices. Other findings also contribute to the literature on Indian media coverage of Kashmir by articulating the ways that counterinsurgency practices and news agencies respond to and represent masculine forms of women’s resistance.



Christina Shehata

Faculty Advisor: Norman Wickett

Applying a Novel Bioinformatic Method to Study Plant Evolution

The study of local adaptation in plants is critical for understanding the evolution of traits that contribute to survival in a dynamic environment, the genes underlying them, and the general process of adaptation. However, in the study of natural, non-model plant species, population-level whole-genome sampling is not always feasible and can be costly. Therefore, there is a need for methods based on population-differentiation that can take a reduced representation of whole-genome data to identify loci under selection within or among populations. Levels of Exclusively Shared Difference (LSD) is a method developed using human genomic data that can detect signatures of selection along the

branches of a population tree (phylogeny). Here, I show how LSD can be used to identify candidate genes under selection within genomic, transcriptomic, and discrete gene data sets collected from multiple plant populations. I compare the candidate genes under selection identified by LSD to those identified by traditional methods and show how this novel method can be adapted for use plants to overcome some of the limitations of other selection detection methods. Using LSD on plant population genomic data will expand the ways in which adaptively evolving genes can be identified. Identifying adaptive candidate genes has a range of implications for plant research and LSD expands the types of datasets that can be used to elucidate patterns of plant evolution, inform the development of improved cultivars, and guide conservation efforts for endangered species.



Carson Wilmouth

Faculty Advisor: Anis Contractor

Characterization and Correction of Sensory and Social Processing Deficits in a Whisker-Dependent Behavioral Task in a Mouse Model of Fragile X Syndrome

The Fragile X Syndrome (FXS) is a neurodevelopmental disorder that causes intellectual, sensory and social impairments. This disorder is especially interesting, because FXS patients can exhibit some or all the features of the autism spectrum disorder (ASD). This makes it the largest known cause of autism in humans. Today, there is no known cure for FXS, but it has been extensively studied using a reliable mouse model of FXS, which recapitulates several of its neurological, sensory and social deficits. Recent studies of the Contractor Laboratory have shown that a drug, Bumetanide, could reverse synaptic impairments of FXS mice if injected from birth for two weeks. My project aims to study if this drug's effect goes beyond the cellular level and could also correct FXS mice's whisker-dependent sensory deficits. This is assessed in a test, which allows us to determine whether mice are able to recognize a new texture in their environment using only their whiskers. So far, this project has encouraging preliminary data. Bumetanide seems to enhance these mice's sensory capabilities, but this study is still on-going to determine statistical significance. Recently, I have also started to study Bumetanide's effect on FXS mice's social deficits. This research project is especially important, because it could present new avenues for ASD research. It is the first study looking at the effect of this drug at the sensory and social level in FXS mice. In the future, it could be a stepping-stone for exciting treatments offered to ASD patients suffering from such impairments.



Yufan Yang

Faculty Advisor: Evan Scott

Rational Design of Nanocarrier Morphology and Surface Charge for Targeted Cellular Delivery

Nanocarriers have been utilized as drug delivery vessels in many novel therapeutic treatments, due to the ability to engineer nanocarriers with unique functional components that allow for cell-specific targeting: drugs delivered via nanocarriers have a much higher likelihood of reaching their intended targets. However, a major obstacle that prevents the widespread clinical use of nanocarriers is removal by the body's immune system, which clears from circulation all foreign material. Fortunately, it is possible for nanocarriers to avoid circulatory clearance—and prime specific immune responses beneficial for immunotherapy—if they are delivered to specific cells called dendritic cells (DCs). Herein, we formed nanocarriers with unique combinations of morphology and surface chemistry to explore the extent that physicochemical nanocarrier modifications can enhance targeted delivery to DCs. The nanocarriers were assembled from poly(ethylene glycol)-block-poly(propylene sulfide) (PEG-b-PPS), which was synthesized through chemical means. Through the technique flash nanoprecipitation, PEG-b-PPS copolymers were self-assembled into nanocarriers. In total, nine distinct nanocarrier classes were formulated, each with a unique combination of morphology and surface chemistry; this was confirmed following an extensive verification process featuring cryo-TEM and other assays. Each nanocarrier class, loaded with fluorescent dye, was incubated in human blood samples and then added to DC cultures. Analysis via flow cytometry revealed that differing morphology and surface chemistry combinations synergized to create unique nano-bio interfaces that varied DC targeting rates significantly. These results offer incredible insight into how nanocarriers interact with biological systems at the cellular level, creating a foundation for future targeted therapies to build from.



Jun You

Faculty Advisor: Axel Mueller

The Prospect of Moral Artificial Agents

Artificial agent development is motivated by the dream of making machines perform undesirable labor instead of humans. To replace humans in undesirable labor, it follows that the machines should not engage in actions that will lead to devastating consequences. They should be “moral” artificial agents. In my paper, I deal with two questions on this concern: 1. What should be the direction of moral artificial agent development? 2. Is the idea of a moral artificial agent coherent? The paper gets to the perhaps more compelling second question by eliminating possible answers to the first question: which includes most current AI Ethics projects. Since there are limited desirable options in developing artificial moral agents, possible conceptions of moral artificial agents are also limited. In these limited possible conceptions of moral artificial agents, the justificatory process provided by the artificial moral agents can only be unreliable. Therefore, it is impossible to attribute to artificial agents independent moral agency.



Anne Zola

Faculty Advisor: Renee Engeln

Brains Over Beauty: A Conceptual Replication of the Effect of Objectification on Women's Cognitive Performance



The present study was a pre-registered, high-powered conceptual replication of findings related to the effect of state self-objectification and the anticipation of the sexualized male gaze on women's cognitive performance. Consistent with the tenets of Objectification Theory, previous work has suggested women experience reduced cognitive performance when put in objectifying environments because their attention is usurped by thoughts about their appearance. However, much of this research was conducted prior to psychology's increased emphasis on statistical power, and many of these studies employed insufficient sample sizes for the effects found. In the current study, three-hundred and seventy-six college women were randomly assigned to one of three conditions: self-objectification, male gaze, or a control. All participants completed a series of mental math problems. In the experimental conditions (self-objectification and male gaze), participants completed the problems while being video recorded. In the male gaze condition, women were led to believe their videos would be later be looked at by men in a dating study. We hypothesized women in more objectified contexts would experience increased state self-objectification and consequently, reduced cognitive performance. Results indicated women experienced a moderate increase in state self-objectification in experimental conditions, but did not experience reduced cognitive performance, increased body satisfaction, or increased negative mood compared to the control. Results are discussed in terms of the need for additional, high powered work in this area.



∞ Guide to Creative Arts Festival

Creative Arts Festival

8:00-9:30pm, Wirtz Black Box 101


Emcee
Morgan Buckley


Visual Art Showcase

Kira Nutter – Spacing Out (painting)

Valerie Slowing – Behind My Smile (painting)

Nur Munawarah – What I Learned in School (photography)

Deniz Turkoglu – By the Water (video/sound installation)

Performances

(in scheduled order of appearance)

Gibran Wirjawan – Gibs: Live (Music)

Nadalyn Bangura – Rainy Season (Poetry)

Sana Ansari – Batch 10 (Documentary Film)

Lauren Loesberg – Janek to the River (Narrative Film)

Simran Bal – a nomadic woman’s journey back home (Staged Reading)

Jake Curtis – Adult Foleys (Web Series)

Maha Essid – 426 (Narrative Film)

Rae Covey – Focus On Your Hands (Staged Reading)

Sloane Scott – Ode to Times Beach, MO: 1925-1985 (Poetry)

Cesar Almeida – The Drummer’s Spotlight (Music)



Stage Manager
Olivia Zapater-Charrette



Jury

Tara Mallen, Rivendell Theatre
AJ Links, Pascal-Rudnicke Casting
Charles Murphy, Chicago Musician
Mickie Pascal, Pascal-Rudnicke Casting



VISUAL ART SHOWCASE

Kira Nutter

Spacing Out (painting)

Description and Artist Statement

In Sherwin Ovid's Introduction to Painting class, we were challenged to explore vexed portraiture: essentially, capturing a being's essence while obscuring their face. It was an exercise in skill and imagination, yet to me it had something more to say. Questions of identity seemed to be intertwined in this art of masking individuals. By taking away the physical landmarks that define someone, you begin to focus and rely on other outlets of identification, which leads to the bigger questions: how do we identify one another? How do we identify ourselves? Thus, "Spacing Out" was born. As a self-portrait, I hoped to explore the ways that I - as well as the world at large - may identify myself, and how that can be communicated through oil paint. Space is where I found my answer. The course of planets seems to resonate with my experience as an artist, adrift in a lifestyle defined by color just as much as it is by darkness. I also think that it speaks to the day-dreamer in me; my head is constantly stuck in space, thinking of bigger things - or "spacing out" - rather than being weighed down by the minute cracks in the world around me. While this painting is inspired by me and my identity, though, one of the beauties of vexed portraits is that truly anyone can be behind the mask. It's all a matter of identifying with the piece, and I'm interested to see how "Spacing Out" may reveal the intersection of my identity with those of many others.



Valerie Slowing

Behind My Smile (painting)

Description

My motivation for this piece was to create an immersive environment within a painting that can make you reflect on how the work relates to your own life experience. It touches upon the idea of trauma to the body and the ways in which it is usually hidden from the public eye, confronting the viewer with a complex subject matter which they have no control over. The piece was created by exploring different gestures made on absorptive and non-absorptive material. I noticed interesting patterns that started forming on the different surfaces, as distinct gestural, paint and drip marks occurred, which made for an intriguing aesthetic that I wanted to expand on. By focusing on the process to give meaning to the piece, I was able to provide a unique perspective that draws the viewer into a different world. It adds to the existing body of knowledge in art history as it gets inspiration from the traditional process artists' and splatter painters' ideologies and creations, yet it incorporates a new narrative by referencing the body, powerful emotions and using a non-conventional palette within its context. I believe it provides a different process and use of materials presented against a backdrop of power dynamics. This work represents important moments in my life and the ways in which art has been my freedom and liberation from hardship.

Artist Statement

I am a multidisciplinary artist who explores issues of race, labor, abuse, and traumatic experiences through video, painting, drawing, sculpture and installation. I was born in Guatemala, but I am currently a Chicago based artist double majoring in Communication Studies, and Art Theory & Practice at Northwestern University. My background as an Olympic swimmer, having competed at the Rio 2016 Olympic Games, and experiencing a devastating shoulder injury that led to my retirement from the sport, inspire my artistic practice. I have had a passion for art since I was little and have always wanted to put into my work what the world looks like through my eyes. My practice incorporates elements of identity and the exploration of subjectivity through different means of expression, breaking down ideas of confinement, cultural hegemony, and giving power to the unheard voices. Life doesn't come around every time we need it, but we have art that brings everything back together when we need it the most.



Nur Munawarah

What I Learned in School (photography)

Description and Artist Statement

“What I Learned in School” is a photo series that showcases the sense of community in a school at Naivasha, Kenya. Schools are usually interpreted as an educational institution where we educate ourselves in subjects such as mathematics and science. However, schools are more than that. It is a place where we build friendships, develop interpersonal and intrapersonal skills, and also a place where we find our identity in the community. That being said, this sense of community is something that I want to portray in this photo series. The students there have taught me the importance of helping out the community and that every individual has a part to play to make the community and country grow. They took great pride in their school and helped in the development of the school even though it is something that is out of their curriculum. Each student there complimented each other, something I genuinely admired in being there.



Deniz Turkoglu

By the Water (video/sound installation)

Description

“By the water” is a 2 channel video and sound installation. It aims to break the boundaries between the art work and the viewer. Being projected onto a white fabric stretched over a wooden tent structure that the public can enter, the piece immerses the audience. Inside, the audience is governed by the stimulations of the installation, while still inhabiting their own body and perceiving through their own senses. Therefore, the audience can interact with the piece and have their own unique experience. Although, it can also be presented in a single channel on a projection screen if necessary. The moving image viewed is a combination of three separate videos layered on top of each other. Each of these videos bring one channel of color in order to all together form an image in full color. Working with

video in this way unraveled for me the different layers that go into forming a single full color image. This is very similar to how our own thought processes and memories are formed. Our lived experiences pile on top of one another and create the perspective through which we view life. This works adds on to the quality of video in documenting life by exposing the layers that go into forming a full color image. It alludes to the idea that how we perceive now is a collection of what we have perceived in the past. Today is actually a combination of many layers coming from our past.

Artist Statement

As an artist I explore how and why we perceive the world the way we do. Exploring this idea in many of my works, in mediums including photography, video, and sculpture, I have become a captive of the idea that our present perception is dominated by our past. Throughout our lives we have become unconsciously programmed through what we have experienced. As a result every decision we give every day is actually a result of what we have lived through in the past. Therefore, we perceive today through the lens of the past, which also determines our future. Working with perception, color has become a very significant tool for me to allude to these ideas of the past, present, and the future actually happening simultaneously. While dealing with how colors literally have an effect on how we perceive in my sculptural work, I created colorful tents and tinted sunglasses. In video and photographic work, I played with colors through separating the red, blue, and green color channels that come together to form a full color picture. These edits allowed me to see color ghosts that emerge when the layers of the image are not in sync. This discovery made me draw a connection between the image, which is in its simplest form a documentation of life, and how our perception is formed. Similar to these edited images, our perception is altered through different layers and combined to create our full color perception of life.



PERFORMANCE SHOWCASE in scheduled order of appearance



Gibran Wirjawan

Gibs: Live (Music)

Description and Artist Statement

The performance will emphasize the integration of old and new techniques of music performance, utilizing live instruments in a fashion that can be translated and transcended to another level with the help of technology. I hope to bring a happy medium between using the new advancements and innovation to practically create any type of music you want with just a small laptop as the hub of all sounds, and the classic feel of experienced musicality.



Nadalyn Bangura

Rainy Season (Poetry)

Description

My work in Freetown, Sierra Leone, which saw twenty qualitative interviews with native healthcare professionals who practiced during the 2014-16 Ebola outbreak, initially hypothesized that the collective experiences of this particular people group helped establish significant and lasting changes to their greater healthcare infrastructure. While lasting changes to healthcare were sparse, I did find individual and collective trauma left out of current literature on the epidemic. Cultural or collective memory can be defined as the interaction between past and present within the minds of the people who lived it. How a community chooses to engage in remembering certain events, particularly those that were traumatic or profoundly and widely negative, are vitally important in preserving historical truth. This collective process of remembering also plays a large role in shaping the memory itself. Surprisingly, despite the prevalent culture of storytelling and verbal connection, no one I encountered has ever sought space to talk about Ebola— including my own family members from Freetown. From the recent civil war to epidemics to mudslides, how will Sierra Leone remember and grow from, or despite, its trauma? Who will tell those stories if the heroes that lived through it will not? The work I am currently producing seeks to name the traumas experienced by the people of Sierra Leone from their own mouths (rather than from Anglo-Western onlookers) and ranges from traumas at the individual and familial level to national heartaches. I am returning to Freetown this summer to research the new identity of Ebola survivor.

Artist Statement

The performance will consist of my reading of a selection of the poetry I have written inspired by the research I have conducted. I will briefly explain the background and inspiration behind each poem and then read the selected work. I believe there is power in poetry out loud, particularly about the most grievous and heavy things in life. I am a citizen of Sierra Leone, descended from the Krio and Limba tribes, and the purpose of my creative writing has been to share the history of Sierra Leone individuals, families, and communities from the mouths of someone that looks like them. The poems selected highlight the trauma of Sierra Leone (Salone) as small as my own family and as wide as the nation itself, and work to explore the intersections between these histories.



Sana Ansari

Batch 10 (Documentary Film)

Description and Artist Statement

The documentary is a personal journey of two soldiers, Saleh Al-Shebani and Gibran Al-Bader, in the military service and the obstacles they face through it. This film focuses on the changes the participants faced. It shows the impact of the mandatory military service in Qatar and the way it changes young Qatari males' lives. This is an interview-based documentary with footage of the military service, the process of preparing for it, what happens when they leave the service, as well as interviews with loved ones.



Lauren Loesberg

Janek to the River (Narrative Film)

Description and Artist Statement

When Náda receives news of a family tragedy, she is forced to reconnect with her estranged sister. This is an extremely personal story for my co-writer and cinematographer, Riona Oshima-Ryan, as well as myself, due to our experiences with loved ones who struggle with addiction. We wanted to make a film that explored the grief faced by those whose friends and family suffer, because this isn't a topic that is often addressed in the mainstream media. As aspiring professional filmmakers, we put our classroom learning into practice through writing, revising, pitching to a room of professors, picking crew members, casting, location scouting, applying for permits, budgeting, creating a shot list, scheduling the shoot, physical production, syncing the sound with the footage, editing, re-editing, getting feedback, color correcting, sound designing, and finding music all before the end of the semester at FAMU International Prague. We also shot on 16mm film, which added additional challenges since we only had 800ft, or about 25 minutes, of footage that we could physically shoot. We learned how to overcome unforeseen obstacles and learned resiliency through a particularly difficult production. Such obstacles included denied permits, unpleasant weather conditions, unforeseen expenses, and translating the film into another language. Ultimately, these challenges significantly changed the film from the initial script to the final product, but we learned how to embrace the challenges and turn them into advantages for the final product. As my high school film teacher always said, whatever can go wrong, will go wrong. When you learn to embrace that, it is when you can transcend your limits.



Simran Bal

a nomadic woman's journey back home (Staged Reading)

Description

The play explores the concept of home through both an international and modern-day feminist lens. In the wake of the Me Too movement and a newfound surge of women's activism as well as heightened awareness of the plight of immigrants, I wanted to research a niche but globally widespread group of people—nomadic pastoralists, (specifically women,) and how they navigate identity and advancement in a society that contrasts heavily with “modern civilization,” for lack of a better word. Though my research has extended to a variety of pastoral communities, my play focuses specifically on women inhabiting the India Tibetan region. The work is still in editing, as I have just finished conducting my interview with my high school instructor Chime (who lived as a pastoralist in Tibet before moving to the USA), and am currently incorporating her notes into my script. What I found most compelling was her fluctuating idea of “home” throughout her journey, and what women's roles often look like in a modern-day yet heavily patriarchal society, specifically the one she called home.

Artist Statement

My story was inspired by a high school teacher with whom I am close and have gotten the opportunity to interview for my project. She escaped persecution from Tibet and went to India to pursue education, then she immigrated to the USA and is now a graduate student with her own nonprofit to assist other Tibetan children in their education. Throughout my research and conversations with Chime, I was struck by her fluctuating idea of “home,” and what a compelling metaphor can be drawn from this experience into the overall characteristics of nomadic pastoralists—an ever changing “home” and the inherent strength and resilience of womanhood that accompanies this exploration of identity.



Jake Curtis

Adult Foleys (Web Series)**Description**

The first episode of *Making Ends Meet* follows Brian, a recent UCLA film graduate who through some bad luck has ended up working as a foley (sound production artist) for adult films. The entire series is short mockumentary episodes drawing on the online mini-docs of sites like Vox and Vice. Through this fake documentary lens, we get an insight into the bizarre, isolated world of foleys and in particular those in the adult industry. Along the way we meet Jessie, the studio mixer, and get to see her and Brian’s friendship and possible romance unfold in this atypically romantic environment.

Artist Statement

“Adult Foleys” is the first episode in a mockumentary webseries entitled *Making Ends Meet* created through the RTVF MAG program. Our university has one of, if not the best, improv comedy scenes in the nation, with improvisers frequently going on to perform at Second City, the iO, and even SNL. And yet with all this extraordinary talent there’s very little filmed comedy content, that isn’t sketched based, that comes out of the school. I wanted to use the abundance of talented improvisers to create an improvised web series in the style of Christopher Guest or Armando Iannucci that allowed these performers to flourish. After workshoping ideas with a group of selected improvisers, we decided to create a series of mockumentaries pastiching the recent wave of online mini-docs spread by companies such as Vox and Vice. The documentary form allowed us to shoot with a multi-camera set-up meaning we could get full coverage on totally improvised scenes. The characters were developed with the improvisers and scripts were crafted largely using material formed in hour long improvising sessions in the weeks approaching the shoot. At the end of two weeks we had three five minute shorts that truly existed as testaments to the talent at the school and the functioning possibilities of collaborative environments. I hope the work has done something to show the Northwestern comedy community that not only is filmed material not off limits, but that the best way for us to make this content is by styling it to the talent and resources we have, as opposed to trying to mimic multi-million dollar Hollywood productions. As a team we wanted to make shorts that were funny and at points heartfelt, and we were overjoyed with the process and the outcome.



Maha Essid

426 (Narrative Film)

Description and Artist Statement

The film follows two women prisoners in Tunisia, coming from different social backgrounds, whose only way of communication is through their common wall. When news comes of their releases, they plan to finally meet despite the social expectations enforced by their respective families. The film discusses the social constraints in a society that's so ideologically diverse yet still expects every individual to conform to a certain image and be disconnected from the "other," who exists next door. Through working on the script, pitching it, and developing it to a film on screen, we conducted a lot of research on the Tunisian society and how the political and the religious scenes in the country affected the social interactions and the expectations that have to be met. Trying to present that in a short film was definitely challenging, however, the film played a huge role at its premiere to present an issue that is not limited to any geographical limitation. A lot of the viewers, coming from different cultural backgrounds, expressed that they relate to the characters in the film. The film won an Enthusiast grant (15,000QAR/4,000USD) from Studio 20Q, a student-led production organization in Northwestern University in Qatar, where it premiered in April 2018. It was screened in Los Angeles CineFest, Rome Prisma Film Festival, and MENA Association Film Festival in San Antonio, Texas.



Rae Covey

Focus On Your Hands (Staged Reading)

Description

When Dr. Kenton begins conducting a study on college students with a family history of Bipolar Disorder, one student participant strikes her as familiar. We see Dr. Kenton grapple with the dark implications of her work, alongside flashes of another story: two college students who strike an unlikely friendship with a troubled undercurrent. As these stories unfold and begin to echo one another, lines blur between the past as we remember it, and the future as we fear it. This project began as an exploration of the ways in which themes of Fate and Free Will are manifested in today's social psyche, through the lens of modern medicine. From calculating the age we'll start spotting grey hairs, to detecting a predisposition to a disease or disorder, we've made great strides in the ability to predict our biomedical futures. This piece unpacks the scope and limits of these advancements in the face of the human desire to predict and prepare. This excerpt comes at a saturation point in this story. We've watched Dr. Kenton's fixation on a young man participating in her study intensify, crossing professional lines with increasingly serious repercussions. Bubbling up throughout the narrative are glimpses of Madeline and Drew, college students whose newfound friendship has taken on an unsettled quality. By the time the severity of the situation clicks for Madeline, it's too late. This scene follows Madeline's processing of a tragedy for which she missed every warning sign.

Artist Statement

Rae Covey is an aspiring playwright and composer, studying theatre and sociology. I began this project as an exploration of the ways in which the themes of Fate and Free Will that ancient Greek dramatists grappled with are manifested in today's social psyche, through the lens of modern medicine. I've found

that the strides we've made in our ability to predict biomedical futures — from calculating the age we'll start spotting grey hairs, to detecting a predisposition to a disease or disorder — have contributed to a cultural obsession with being “one step ahead,” medically, and otherwise. I am particularly interested in what happens when this social fixation is met with scientific limitations. This intersection is where my musical takes place. Over the past six months, through research on the complicated nature of predetermination of psychological disorders, conversations on the interplay between Diathesis and Stress in the leading psychopathological model, and even exploring the school of thought known as “Biological Determinism,” coupled with several courses in New Musical Development at the Chicago Dramatists Guild, I've developed a full draft of the piece. Since its inception, this project has become something much more complicated, and has expanded to touch on questions I do not have answers to. Throughout its development, I've found myself in conversation with people I never thought I'd meet, discussing subjects that range from incredibly personal to wildly theoretical, often falling into both categories at once. I look forward to further exploring the conflict within the human desire to predict and prepare for that which we may one day be able to predict - but may never be able to prepare for.



Sloane Scott

Ode to Times Beach, MO: 1925-1985 (Poetry)

Description and Artist Statement

Ode to Times Beach, MO (1925-1985) is a research poem written in Prof. Rachel Webster's class during the winter quarter of the creative writing poetry sequence. Times Beach, MO was a rural, primarily agricultural town of over 2,000 people, evacuated in 1983 just before the largest flood in the town's history, and after 260,000 gallons of waste oil containing dioxin were sprayed over the town's roads from 1972-1976. The town was declared a Superfund site, and the EPA finished decontaminating it, along with the entire state of Missouri, in 1997. I was drawn to Times Beach because I'm from Missouri but was prior to now unaware of the town's existence. My poem aims to recall and revitalize the memory of a crucial piece of Missouri history that the entire country was once aware of, making extensive use of interviews and newspapers from the time period. Since, in the words of e.e. cummings, feeling is first, I wrote into the poem starting with the emotional logic of a people facing environmental crisis, their government repeatedly failing to save them. By centering the emotional logic of a sensationalized and forgotten story, my poem found a greater understanding and clarity. My poem asks—what is at stake when we sacrifice the remembrance of our uglier history in exchange for the benign, or even a blank period where a town once was? To not write this poem would have been, for me, to let the town die a second death, and make its repetition more likely.



Cesar Almeida

The Drummer's Spotlight (Music)

Description and Artist Statement

When interviewing drummers in Ghana, they often presented a common problem. Often times pop artists (vocalists) dominate the spotlight leaving drummers as background musicians. They are not considered artists in the public eye, although they have the knowledge, talent, and experience that allows them to perform many different traditions of music. In an effort to find ways to bring the drummer to the spotlight, we found that certain hip-hop technologies can enable this. The digital beat pad provides an innovative way of working with drum ensembles. For example, it can give the drummer an opportunity to digitally loop supporting rhythms while at the same time acoustically perform the master drum. So instead of relying on an entire ensemble to play support drums, the master drummer could use the digital beat pad instead, therefore highlighting his performance. Before assuming that the drummer can do this, I had to find out whether it was possible to accurately recreate traditional rhythms on the beat pad. My research project showed that it is possible. The ideal performance would involve playing the bell, shaker, and supporting drums on the digital beat pad while performing the master drum live. Our team will recreate this methodology as a live music performance while adding a flavor of Hip-Hop into it.



**∞ Guide to High School Showcase ∞
Presentations 2019**

NU High School Project Showcase Presentations

Wildcat Room (101), Big Ten Room (104) & McCormick Auditorium 1:30 - 2:40 pm

Adlai E. Stevenson High School

Caimin Xi, “Generation of a Neuron Model for Spinal Muscular Atrophy with Induced Pluripotent Stem.”

Jyotsna Harikrishna, Saanvi Juneja, “The Effect of Non-Triclosan Soaps on S. Epidermidis.” Advisor: Christina Palffy.

Shreya Kurup, “The Effect of Magnetized Water on the Growth of Brassica Rapa.”

Back of the Yards College Prep

Juan Robledo, Eduardo Jacobo, Edwin Lopez, “Stress Relieving Massage Roller”
Advisor: Michelle Morris.

Jose Villegas, Felix Flores, Steve Perdomo, “Helper Drone” Advisor: Michelle Morris.

Carl McNickles, Daniela Valdes, Zhiwei Zhong, “Solar Power Phone Charger Circuit”
Advisor: Michelle Morris.

Haleem Selenica, Jonathan Guillen, Ashley Gallegos, “Flight 101” Advisor: Michelle Morris.

Brian Mendoza, Gabriel Calvillo, Frank Romero, “Website-Controlled Robot” Advisor: Michelle Morris.

Ariana Flores, Kaleb Harrison, Alejandro Delgadillo, “Solar Powered Portable Charger” Advisor: Michelle Morris.

Angie Luna, Erick Lucero, “Filtered Aquarium” Advisor: Michelle Morris.

José García, Kenneth Moran, José López, “Better Filtration” Advisor: Michelle Morris.

Barrington High School

Om Gandhi, “The Effects of Metal Ions and Chelation Using Antioxidants and EDTA on Catalase Activity: Implications in Alzheimer’s Treatment.” Advisor: Polly Foley.

Chicago Academy High School

Dua’a Hussein, Fatima Awad, “Does Caffeine Affect the Developmental Rate of Drosophila Melanogaster?” Advisor: Saswati Koya.

Karolina Wojciak, Nicole Stoklosa, “Does Temperature Affect the Rate of Fruit Fly Production?” Advisor: Saswati Koya.

Chicago Vocational Career Academy

Toriano Jackson, Daniel Harris, Alana Thomas, Neoko Higgins, Airika Carr, “The Mesh Internet Solution for the Digital Divide.” Advisor: Lillian Perteete.

NU High School Project Showcase Presentations *Continued*

Evanston Township High School

Abigail Israeli, Aedan Croft, “Male Breast Cancer.” Advisor: Marla Isaacs.
Asher Webb, Ashony Lindsay, “Spreading Awareness about Epilepsy.” Advisor: Karen Johnson.

Glenbrook South High School

Mykyta Solonko, Amil Dravid, “College Advising Tool.” Advisor: Michael Sinde.
Daniel Hamill, Tommy Accardo, Michael Polinski, “EduSchedule.”
Amil Dravid, “Increasing Biological Imaging Throughput via Deep Nets.” Advisor: Karl Hujzak.

Harry D. Jacobs High School

Kris Shah, “Characterizing the Genotoxicity of Synthetic Food Preservatives with Rat Liver S9 Fraction.” Advisor: Conrad Rogers.

Illinois Mathematics and Science Academy

Prarthana Prashanth, “Effects of Naturally-Occurring Resveratrol on *Drosophila melanogaster* exposed to Dental Resin.”

James B. Conant High School

Sahithi Ankireddy, “A Novel Approach to the Diagnosis of Heart Disease Using Machine Learning and Deep Neural Networks.” Advisor: Adi Kadimetia.

John Hersey High School

Lauren Balla, Winter Ly, “Winter and Lauren's Rocking Chair.” Advisor: Richard Hyde.

Lane Tech College Prep

Luke Lattyak, “Effect of Artificial Sweeteners on Plant Growth.” Advisor: Lucy Young.

Lincoln Park High School

Gabriela Gross, Mackenzie Stockton, Katelyn Shelton, Jazhel Navarro, Nomubari Kaka, “Aquaporin-4's Role in Cerebral Edema.” Advisor: John Cabey.

NU High School Project Showcase Presentations *Continued*

Lindblom Math and Science Academy

Ranya Perry, “Body Image and Media.”

Kejaha Shelton, “There Is No Place Like Home.”

Jade Jackson, “Plantastic Growth.” Advisor, Elizabeth Copper.

Maine South High School

Reema Al-koubaytari, “Finding a Way Out.”

Lydia Keller, “The Effect of Compounds of Martian Regolith on Plant Growth in Earth Soil.” Advisor: Kay Orosz.

Metea Valley High School

Pravallika Padyala, “How Does Chelation On Catalase Activity Impact Alzheimer's Patients.” Advisor: Vanessa Troiani.

Naperville North High School

Mona Fang, “Brain Waves and Sound Waves.”

Niles North High School

Rushi Bhatt, “Improving Minority Carrier Lifetime of CdTe Solar Cells.”

Hassam Uddin, “Using Machine Learning to Predict Likelihood of Pneumonia.” Advisor: Susie Posnock.

Victor Piechowiak, Nicholas Precht, “Designing 3D Printing Robots for Exoplanetary Construction.” Advisor: Christine Camel.

Divy Kumar, “Effects of Serial Passage on Viral Mutations for an Antibiotic Alternative.” Advisor: Constantine Theodoropoulos.

Niles West High School

Yusra Aftab, “The Potential of Quercetin as a Cancer Drug.” Advisors: Parin Patel and Miranda Becker.

Rija Qureshi, “The Effect of Natural & Artificial Dye on the efficiency of DSSC Solar Cell.” Advisor: Parin Patel.

Hina Haider, “Investigating Carvedilol as a Realistic Alternative to Insulin in Treating Type 2 Diabetes.” Advisor: Sarah Lloyd.

Muhammad Afzal, “Photoluminescent Downshifting of Cadmium Selenide Quantum Dots to Maximize Silicon Solar Cell Efficiency.” Advisor: Samantha Harvey.

NU High School Project Showcase Presentations *Continued*

RISE Online STEM Research Institute

Stephanie Wang, “The Effects of Natural Foods on Lactose Decomposition.” Advisor: Jacklyn Naughton.

Rishi Ray, “The Effects of *Bacillus thuringiensis* and *Lysinibacillus sphaericus* on Low-Density.” Advisor: Jacklyn Naughton.

Avanish Narumanchi, “The Effect of Thiothymidine on the Photodegradation Rate of High-Density Polyethylene.” Advisor: Jacklyn Naughton.

Yashas Mattur, “The Effect of Different Types of Irrigation Systems on the Growth of *Lepidium sativum*.” Advisor: Jacklyn Naughton.

Von Steuben Metropolitan Science Center

Markel Venson, “Mosquito CO₂ Trap.” Advisor: Urik Halliday.

Sofia Rogel, “Thermo-Dynamic Joint Contracture Brace.”

Christopher Moret, “Gear Shift for VEX.” Advisor: John Thode.

Casey Witkowski, “What Type of Wood Is the Strongest?”

Wendall Phillips Academy High School

Sean Waight, “Austin.”

Whitney M. Young Magnet High School

Kayla Huang, “K-edge X-ray Absorption Near Edge Structure Analysis Methodology: A Case Study on Thiophenic Sulfur Compounds.”

Margo Cicero, “6-year College Business Program.”

Mercy Oladipo, “Saving Skin Year Two: A Model of Optimal Sunscreen Reapplication Time, Integrated into a Pre-Existing Mobile Application.”

Steven Lane, “*Procambarus Clarkii* as a model for neurological study.”

Makynna Waller, “Solar Hybrid.”

☞ **Judges for the NU High School Project** ☛
Showcase Presentations

Srutarshi Banerjee, Electrical & Computer Engineering, Northwestern University Graduate School

Eve Chase, Physics and Astronomy, Northwestern University Graduate School

WeiTing Chen, Molecular Biology, Northwestern University Graduate School

Roman Grigorii, Mechanical Engineering, Northwestern University Graduate School

Zachary Hafen, Physics and Astronomy/CIERA, Northwestern University Graduate School

Jenna Logsdon, Chemistry, Northwestern University Graduate School

Saoirse McSharry, Molecular Biosciences, Northwestern University Graduate School

Y'Shanda Rivera, Learning Sciences, Northwestern University Graduate School

Marc Royster, CIERA, Northwestern University Graduate School

Len Sun, Materials Science, Northwestern University Graduate School



∞ NU High School Project Showcase ∞ Planning & Organization

Office of Community Education Partnerships

Natalie Bueno, Program and Partnership Coordinator

Emily DePalma, Research Program Coordinator

Emily Ferrin, Program Director and Resident Scientist

Jenny Grist, ETHS-NU Partnership Program Assisant

Jen Lewin, D65-NU Partnership Coordinator

Kristen Perkins, ETHS-NU Partnership Coordinator

Amy Pratt, Assistant Dean for Community Education Partnerships

Ashley Walter, Program and Partnership Coordinator



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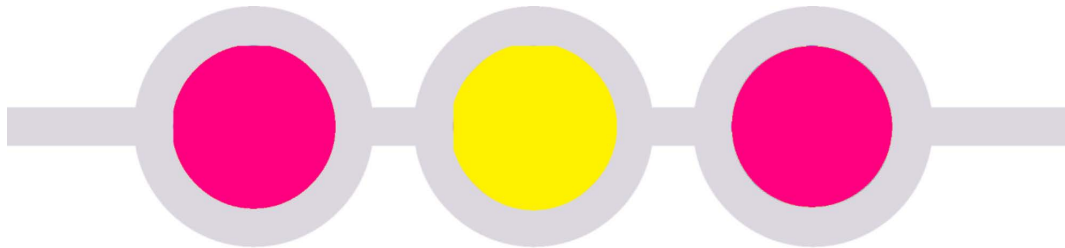
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