

**NORTHWESTERN**  
**RESEARCH**  
**& ARTS**  
**UNDERGRADUATE**  
**EXPO**

**MAY 30TH, 2018**

# 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](http://UndergradResearch.Northwestern.edu/OUR)

Northwestern

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Evanston, Illinois 60208

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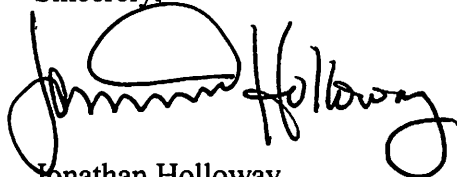
Dear Members of the Northwestern Community:

At Northwestern, we want to empower students to take the lead in their education through independent research and creative projects, propelling their own passions and interests forward into the world of making a difference. Our Office of Undergraduate Research, which sponsors this event, has three core programs designed to help students transition from focusing on finding fixed *answers* (school-based learning) to learning how to ask the right *questions* (how the real world works). First, we have the Undergraduate Research Assistant Program (URAP). Students come to us bright and passionate, but without the know-how to conduct research in their given field. With URAP, faculty apply for funding to hire assistants to help with their own projects in a formal mentoring environment designed to foster rapid development. The program focuses on assisting students just getting started in research and prefers disciplines where funding for undergraduates is hard to get, such as in the humanities or creative arts.

The second core program is the Undergraduate Research Grant program. The program funds independent research and creative projects across all disciplines. The 35+ member faculty review committee is currently charged with offering a strictly merit-based review of grant proposals. This process means that the committee can fund any and all projects that they feel are worthy. If a student has a solid idea, works with faculty mentors, and uses the Office's advising to learn how to write a successful grant proposal, then s/he should receive funding. The competition is not *between* students, but rather challenges the individual student to discover what is needed in a field and create a project to potentially address this need. These grants regularly transform a students' experience of college and beyond. Across our Academic Year and Summer URG programs, we had almost 500 applications this year, funding well over 300.

Once students complete their projects, the opportunity to prepare for the real world isn't over. Knowing something deeply is not the same thing as communicating it effectively. We challenge students to gain this distinct skill with today's event: the Undergraduate Research and Arts Exposition, our third core program. For all participants, we run workshops designed to help students develop strong and effective communication skills, specifically for an audience that isn't already familiar with their field of interest. The Expo is an amazing showcase of student work and, importantly, teaches communication skills crucial to students' professional development. We hope you enjoy seeing and hearing about the fruits of our students' labors this year as much as we do.

Sincerely,

A handwritten signature in black ink, appearing to read "Jonathan Holloway". The signature is fluid and cursive, with a large loop at the end.

Jonathan Holloway  
Provost

2018 Program Front Cover Design  
By  
Emma Kumer  
Medill School of Journalism, Class of 2020

# **The 2018 Undergraduate Research and Arts Exposition**

Northwestern University's  
sixteenth 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 30, 2018**

Norris University Center and  
Wirtz Black Box 201





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## Program of Events

### Wednesday May 30, 2018

- |                |  |
|----------------|--|
| 10:00-11:30 AM | <b>Northwestern University Poster Session One</b><br>Louis Room (205)  |
| 11:00-12:30 AM | <b>Northwestern University Oral Presentation Session One</b><br>Lake Room (203), Arch Room (206), Rock Room (207),<br>Armadillo Room (208) |
| 1:00-2:30 PM   | <b>Northwestern University Oral Presentation Session Two</b><br>Lake Room (203), Arch Room (206), Rock Room (207),<br>Armadillo Room (208) |
| 1:30-2:40 PM   | <b>NU High School Project Showcase Poster Session</b><br>Wildcat Room (101), Big Ten Room (104)  |
| 2:30-4:00 PM   | <b>Northwestern University Poster Session Two</b><br>Louis Room (205)  |
| 8:00-9:30 PM   | <b>Creative Arts Festival</b><br>Wirtz Black Box 201   |
| 9:30-10:30 PM  | <b>Post-Show Reception</b> , Open to all presenters and attendees<br>Outside Wirtz Black Box 201   |



## Office of Undergraduate Research Advisory Council

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

**Ron Braeutigam**, Associate Provost for Undergraduate Education

**Emily Comstock**, Student representative, Arts and Humanities

**Ryan Dohoney**, Assistant Professor, Bienen School of Music

**Renee Engeln**, Professor of Instruction, Weinberg College of Arts and Sciences

**Rebecca Fudge**, Student and TEDx Representative, Natural Sciences

**Bill Haarlow**, Director, Weinberg College – Admission Relations

**Sean Hu**, Student Representative, Northwestern University Associated Student Government

**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

**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

**Eric Patrick**, Associate Professor, School of Communication

**Megan Powell**, Program Coordinator, School of Professional Studies

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

**Jane Rankin**, Associate Dean, School of Communication

**Joshua Shi**, Editor in Chief, Northwestern Undergraduate Research Journal

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

**Imani Wilson**, Student Representative, Social Sciences

**Ashley Wood**, 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

**Bryce O'Tierney**, Administration

**Evangeline Su**, Advisor



## **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](http://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](http://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](http://undergradresearch.northwestern.edu/ayurg)

**Summer Undergraduate Research Grants (Summer URG):**

[undergradresearch.northwestern.edu/summerurg](http://undergradresearch.northwestern.edu/summerurg)

**Undergraduate Research Assistant Program (Academic Year and Summer):**

[undergradresearch.northwestern.edu/urap](http://undergradresearch.northwestern.edu/urap)

**Conference Travel Grants:**

[undergradresearch.northwestern.edu/ctg](http://undergradresearch.northwestern.edu/ctg)

**Undergraduate Language Grants:**

[undergradresearch.northwestern.edu/ulg](http://undergradresearch.northwestern.edu/ulg)

**Circumnavigators Travel-Study Grant:**

[undergradresearch.northwestern.edu/circumnavigators](http://undergradresearch.northwestern.edu/circumnavigators)

### **Other University-Wide Programs and Resources**

**Center for Global Engagement:** [gesi.northwestern.edu/apply/application](http://gesi.northwestern.edu/apply/application)

**Global Research Opportunities:** [gro.northwestern.edu](http://gro.northwestern.edu)

**Institute for Policy Research:** [northwestern.edu/ipr/ugradresearch.html](http://northwestern.edu/ipr/ugradresearch.html)

**Northwestern Scholars:** [scholars.northwestern.edu](http://scholars.northwestern.edu)

**Office of International Program Development:** [ipd.northwestern.edu/fellowships/index.html](http://ipd.northwestern.edu/fellowships/index.html)

### **Weinberg College of Arts and Sciences**

**African Studies:** [africanstudies.northwestern.edu/undergraduate/funding.html](http://africanstudies.northwestern.edu/undergraduate/funding.html)

**Anthropology:** [anthropology.northwestern.edu/about/labs.html](http://anthropology.northwestern.edu/about/labs.html)

**Astrophysics:** [ciera.northwestern.edu/Education/REU](http://ciera.northwestern.edu/Education/REU)

**Biochemistry-Morimoto Laboratory Undergraduate Research Seminars:**

[groups.molbiosci.northwestern.edu/morimoto/morimotolab/murs.html](http://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](http://biosci.northwestern.edu/undergraduate/research.html)

**Chemistry:** [chemistry.northwestern.edu/undergraduate/programs/index.html](http://chemistry.northwestern.edu/undergraduate/programs/index.html)

**Chicago Field Studies Program:** [wcas.northwestern.edu/cfs](http://wcas.northwestern.edu/cfs)

**History: Leopold Fellows of the Center for Historical Studies:**  
[historicalstudies.northwestern.edu/leopold-fellows](http://historicalstudies.northwestern.edu/leopold-fellows)

**Mathematics:** [math.northwestern.edu/undergraduate/research-internships-study-abroad](http://math.northwestern.edu/undergraduate/research-internships-study-abroad)

**Physics and Astronomy:** [physics.northwestern.edu/undergraduate/research.html](http://physics.northwestern.edu/undergraduate/research.html)

**Political Science:** [polisci.northwestern.edu/undergraduate/research-opportunities](http://polisci.northwestern.edu/undergraduate/research-opportunities)

**Psychology:** [psychology.northwestern.edu/undergraduate/research](http://psychology.northwestern.edu/undergraduate/research)

### **School of Communications**

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

**Undergraduate Research Grants and Fellowships:**  
Jane Rankin ([j-rankin@northwestern.edu](mailto:j-rankin@northwestern.edu))

### **School for Education and Social Policy**

**Research in SESP:** [sesp.northwestern.edu/ugrad/opportunities/research.html](http://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](http://mccormick.northwestern.edu/biomedical/undergraduate/research-opportunities/index.html)

**Chemical & Biological Engineering:**

[chem-biol-eng.northwestern.edu/undergraduate/current/research/index.html](http://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](http://eecs.northwestern.edu/2013-09-03-20-01-56/undergraduate-research)

**International Institute For Nanotechnology:** [iinano.org/northwestern-university-nanotechnology-reu](http://iinano.org/northwestern-university-nanotechnology-reu)

**Materials Research Science and Engineering Center:** [mrsec.northwestern.edu/undergraduate-opportunities](http://mrsec.northwestern.edu/undergraduate-opportunities)

**McCormick Office of Corporate Relations, Corporate Partner Undergraduate Research Grants:** [mccormick.northwestern.edu/companies/index.html](http://mccormick.northwestern.edu/companies/index.html)

**McCormick Opportunities:** [mccormick.northwestern.edu/undergraduates/research/index.html](http://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](http://undergradresearch.northwestern.edu/expo)

**Chicago Area Undergraduate Research Symposium:** [caurs.com](http://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](http://undergradresearch.northwestern.edu/ctg)

**Undergraduate Awards:** [undergraduateawards.com](http://undergraduateawards.com)

### **Publish Your Research**

**Northwestern Undergraduate Research Journal:** [thenurj.com](http://thenurj.com)

**Nanoscape** (Journal of Undergraduate Research in Nanoscience): [nanoscape.northwestern.edu](http://nanoscape.northwestern.edu)

**Directory of Undergraduate Research Journals** (UNC Office for Undergraduate Research):

[our.unc.edu/students/conducting-research/get-published/](http://our.unc.edu/students/conducting-research/get-published/)

### **Transform Your Research**

**Apply for National & International Research Grants:** [northwestern.edu/fellowships](http://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](http://northwestern.edu/fellowships/fellowships-by-award-type/tuition-support/index.html)



## Directory of Northwestern Student Presenters

Last Name	First Name	Session	Time	Location
Abass	Habibah	Oral Presentation Session Two	1-2:30pm	Lake Room
Adler	Rebecca	Oral Presentation Session One	11-12:30pm	Armadillo Room
Akolawala	Sahil	Oral Presentation Session One	11-12:30pm	Arch Room
Arwah	Ifath	Morning Poster Session	10-11:30am	Louis Room - 1A
Ayersman	Brandon	Oral Presentation Session Two	1-2:30pm	Rock Room
Azim	Tasfia	Morning Poster Session	10-11:30am	Louis Room - 24A
Banerjee	Dipayan	Oral Presentation Session Two	1-2:30pm	Arch Room
Boukather	Cody	Oral Presentation Session One	11-12:30pm	Lake Room
Brauer	Sophie	Afternoon Poster Session	2:30-4pm	Louis Room - 24B
Braun	Katherine	Oral Presentation Session Two	1-2:30pm	Arch Room
Broeren	Theodore	Oral Presentation Session Two	1-2:30pm	Arch Room
Brown	Taylor	Morning Poster Session	10-11:30am	Louis Room - 25A
Cameron	Elizabeth	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Campbell	Michael	Afternoon Poster Session	2:30-4pm	Louis Room - 25B
Carvalho	Keyla	Morning Poster Session	10-11:30am	Louis Room - 2A
Chia	Zer	Afternoon Poster Session	2:30-4pm	Louis Room - 26B
Choi	Jueun	Oral Presentation Session One	11-12:30pm	Armadillo Room
Choi	Jueun	Morning Poster Session	10-11:30am	Louis Room - 1A
Cianciotto	Adina	Morning Poster Session	10-11:30am	Louis Room - 26A
Cohen	Gabriel	Afternoon Poster Session	2:30-4pm	Louis Room - 7B
Cooley	Camille	Afternoon Poster Session	2:30-4pm	Louis Room - 8B
Danbury	Emma	Oral Presentation Session Two	1-2:30pm	Rock Room
Daniels	Jake	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Dion-Kirschner	Hannah	Oral Presentation Session One	11-12:30pm	Arch Room
Dravid	Avi	Afternoon Poster Session	2:30-4pm	Louis Room - 27B
Dubner	Rachel	Morning Poster Session	10-11:30am	Louis Room - 27A
Estey	George	Oral Presentation Session One	11-12:30pm	Lake Room
Everly	Grant	Oral Presentation Session Two	1-2:30pm	Rock Room
Feiler	Maria	Afternoon Poster Session	2:30-4pm	Louis Room - 1B
Feit	Shara	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Fraser	Emily	Afternoon Poster Session	2:30-4pm	Louis Room - 9B
Furrukh	Anam	Afternoon Poster Session	2:30-4pm	Louis Room - 28B
Goldman	Adina	Oral Presentation Session One	11-12:30pm	Rock Room
Griffin	Matthew	Oral Presentation Session One	11-12:30pm	Lake Room
Guo	Michelle	Afternoon Poster Session	2:30-4pm	Louis Room - 29B
Hammersmith	Chelsea	Oral Presentation Session One	11-12:30pm	Rock Room

Han	Yuxi	Afternoon Poster Session	2:30-4pm	Louis Room - 30B
Harriott	Emily	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Hesch	Erin	Afternoon Poster Session	2:30-4pm	Louis Room - 10B
Hilburger	Claire	Morning Poster Session	10-11:30am	Louis Room - 28A
Hoeflich	Jacob	Morning Poster Session	10-11:30am	Louis Room - 5A
Holubecki	Anna	Afternoon Poster Session	2:30-4pm	Louis Room - 11B
Hong	Joanna	Afternoon Poster Session	2:30-4pm	Louis Room - 12B
Huffman	Alex	Afternoon Poster Session	2:30-4pm	Louis Room - 31B
Hussain	Zaki	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Imundo	Megan	Oral Presentation Session One	11-12:30pm	Armadillo Room
Inwald	Joshua	Morning Poster Session	10-11:30am	Louis Room - 6A
Ippolito	Katherine	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Isaac	Kimani	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Jang	In Jung (Lizzy)	Morning Poster Session	10-11:30am	Louis Room - 7A
Jenz	Sophia	Afternoon Poster Session	2:30-4pm	Louis Room - 32B
Juliano	Theresa	Morning Poster Session	10-11:30am	Louis Room - 8A
Kaspi	Evan	Afternoon Poster Session	2:30-4pm	Louis Room - 33B
Katta	Meghna	Afternoon Poster Session	2:30-4pm	Louis Room - 34B
Kaunas	Caylin	Afternoon Poster Session	2:30-4pm	Louis Room - 13B
Kim	Elina	Afternoon Poster Session	2:30-4pm	Louis Room - 35B
Kim	Seongsik(Joseph)	Afternoon Poster Session	2:30-4pm	Louis Room - 36B
Kittleson	Andrew	Afternoon Poster Session	2:30-4pm	Louis Room - 14B
Kliman	Max	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Kukushliev	Vasil	Afternoon Poster Session	2:30-4pm	Louis Room - 37B
Kuttner	Emily	Oral Presentation Session One	11-12:30pm	Rock Room
Larios	Alyssa	Oral Presentation Session One	11-12:30pm	Arch Room
Lee	Keishel	Afternoon Poster Session	2:30-4pm	Louis Room - 15B
Levenson	Frederick	Afternoon Poster Session	2:30-4pm	Louis Room - 2B
Lewittes	Daniella	Afternoon Poster Session	2:30-4pm	Louis Room - 38B
Licht	Yadid	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Lieberman	Amy	Oral Presentation Session Two	1-2:30pm	Arch Room
Liu	Christine	Oral Presentation Session Two	1-2:30pm	Arch Room
Liu	Xinyi	Afternoon Poster Session	2:30-4pm	Louis Room - 16B
Liu	Suwei	Morning Poster Session	10-11:30am	Louis Room - 29A
Loach	Ryan	Morning Poster Session	10-11:30am	Louis Room - 9A
Loi	Maria	Afternoon Poster Session	2:30-4pm	Louis Room - 17B
Lu	Jiayi	Oral Presentation Session One	11-12:30pm	Rock Room
Luo	Wendy	Afternoon Poster Session	2:30-4pm	Louis Room - 39B
Lynch	Colin	Morning Poster Session	10-11:30am	Louis Room - 30A
Maloney	Jacqueline	Morning Poster Session	10-11:30am	Louis Room - 10A
Marin	Stephanie	Morning Poster Session	10-11:30am	Louis Room - 3A



Masoom	Sumaia	Oral Presentation Session One	11-12:30pm	Armadillo Room
McGrattan	Katlyn	Afternoon Poster Session	2:30-4pm	Louis Room - 45B
Mirza	Anzish	Oral Presentation Session One	11-12:30pm	Lake Room
Moosa	Ibtesaam	Oral Presentation Session Two	1-2:30pm	Lake Room
Moses	Aimee	Afternoon Poster Session	2:30-4pm	Louis Room - 18B
Mulaikal	Nirmal	Afternoon Poster Session	2:30-4pm	Louis Room - 3B
O'Donnell	Ally	Oral Presentation Session One	11-12:30pm	Arch Room
Odunsi	Elizabeth	Afternoon Poster Session	2:30-4pm	Louis Room - 4B
Park	Grace	Afternoon Poster Session	2:30-4pm	Louis Room - 40B
Park	David	Afternoon Poster Session	2:30-4pm	Louis Room - 41B
Patel	Vinay	Oral Presentation Session One	11-12:30pm	Rock Room
Pechianu	Grace	Oral Presentation Session One	11-12:30pm	Lake Room
Peretz	Logan	Oral Presentation Session One	11-12:30pm	Armadillo Room
Petit	Manon	Afternoon Poster Session	2:30-4pm	Louis Room - 48B
Pfalzgraf	Hadley	Oral Presentation Session One	11-12:30pm	Arch Room
Procopio	Lucia	Afternoon Poster Session	2:30-4pm	Louis Room - 19B
Quinn	Liz	Oral Presentation Session Two	1-2:30pm	Lake Room
Rashid	Neha	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Regan	Sylvia	Oral Presentation Session Two	1-2:30pm	Lake Room
Ricard	Jordyn	Oral Presentation Session Two	1-2:30pm	Rock Room
Rogge	Carson	Morning Poster Session	10-11:30am	Louis Room - 11A
Rosenbloom	Alana	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Salamanca	Paul	Oral Presentation Session Two	1-2:30pm	Lake Room
Saraiva	Augusta	Morning Poster Session	10-11:30am	Louis Room - 2A
Savitz	Hannah	Afternoon Poster Session	2:30-4pm	Louis Room - 20B
Schecter	Sarah	Afternoon Poster Session	2:30-4pm	Louis Room - 21B
Schlaug	Christine	Morning Poster Session	10-11:30am	Louis Room - 12A
Schroeder	Zachary	Afternoon Poster Session	2:30-4pm	Louis Room - 22B
Schroeter	Abigail	Afternoon Poster Session	2:30-4pm	Louis Room - 42B
Sedeno	Nina	Oral Presentation Session Two	1-2:30pm	Rock Room
Shankarappa	Priya	Afternoon Poster Session	2:30-4pm	Louis Room - 43B
Shay	Olivia	Morning Poster Session	10-11:30am	Louis Room - 13A
Shehata	Christina	Morning Poster Session	10-11:30am	Louis Room - 31A
Shi	Kelly	Morning Poster Session	10-11:30am	Louis Room - 14A
Silver	Jamilah	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Silver	Jamilah	Morning Poster Session	10-11:30am	Louis Room - 15A
Sinard	Rebecca	Morning Poster Session	10-11:30am	Louis Room - 16A
Sitar	Evan	Afternoon Poster Session	2:30-4pm	Louis Room - 44B
Slowing	Valerie	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Spears	Sophie	Afternoon Poster Session	2:30-4pm	Louis Room - 5B
Spikner	Caroline	Creative Arts Festival	8:00pm	Wirtz Black Box (201)

Spikner	Caroline	Oral Presentation Session One	11-12:30pm	Lake Room
Steigerwald	Victoria	Morning Poster Session	10-11:30am	Louis Room - 17A
Strohbach	Angelina	Morning Poster Session	10-11:30am	Louis Room - 18A
Teoh	Dominique	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Tepper	Jacquelyn	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Thakkar	Akshar	Afternoon Poster Session	2:30-4pm	Louis Room - 45B
Tolley	Anna	Morning Poster Session	10-11:30am	Louis Room - 4A
Valencia	Maria	Creative Arts Festival	8:00pm	Wirtz Black Box (201)
Vilarello	Brandon	Afternoon Poster Session	2:30-4pm	Louis Room - 46B
Vogt	Emily	Morning Poster Session	10-11:30am	Louis Room - 19A
Walema	Angela (Sarah)	Morning Poster Session	10-11:30am	Louis Room - 32A
Wang	Yilan	Oral Presentation Session One	11-12:30pm	Arch Room
Wang	Shiwei	Morning Poster Session	10-11:30am	Louis Room - 33A
Wayne	Elizabeth	Afternoon Poster Session	2:30-4pm	Louis Room - 6B
Webb	Kandace	Morning Poster Session	10-11:30am	Louis Room - 20A
Wee	Victoria	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Weinberg	Benjamin	Morning Poster Session	10-11:30am	Louis Room - 21A
Weinstein	Mariani	Morning Poster Session	10-11:30am	Louis Room - 22A
Wilson	Imani	Oral Presentation Session Two	1-2:30pm	Armadillo Room
Worsfold	Fiona	Afternoon Poster Session	2:30-4pm	Louis Room - 47B
Xu	Kenneth	Afternoon Poster Session	2:30-4pm	Louis Room - 23B
Yang	Yufan	Morning Poster Session	10-11:30am	Louis Room - 34A
Ye	Chelsea	Afternoon Poster Session	2:30-4pm	Louis Room - 48B
Yoo	Alberta	Morning Poster Session	10-11:30am	Louis Room - 35A
Zblewski	Emma	Morning Poster Session	10-11:30am	Louis Room - 23A
Zilberstein	Shira	Oral Presentation Session Two	1-2:30pm	Lake Room
Zola	Anne	Oral Presentation Session Two	1-2:30pm	Armadillo Room

## **∞ Guide to Poster Presentations**

## Poster Session One

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

### Humanities, Social Sciences, & Journalism

1. **Ifath Arwah & Jeun Choi**, “Marginalized in Malaysia: The Refugee Child’s Struggle for Survival”
2. **Keyla Carvalho & Augusta Saraiva**, “Intercultural exchange in Portuguese: the importance of linguistic background for meaning negotiation of language learners”
3. **Stephanie Marin**, “Between the Quechua and Spanish in Poetry Language of the Soul”
4. **Anna Tolley**, “A Salty Survival: An Exploration of Resilience and the Maya Marketplace”
5. **Jacob Hoeflich**, “The Impact of Shale-Based Energy Development on Local Politics”
6. **Joshua Inwald**, “The Effects of Meta-Cognitive Priming on Hiring Discrimination”
7. **In Jung (Lizzy) Jang**, “Associations between Physiological Linkage and Relationship Adjustment: Effects on Marital Satisfaction and Emotional Experience”
8. **Theresa Juliano**, “Does race modify the relationship between mental health disorders and opioid prescription among patients with pain?”
9. **Ryan Loach**, “Social Media, Social Comparison, and College Student Body Image”
10. **Jacqueline Maloney**, “Psychological Characteristics of Problematic Internet Use”
11. **Carson Rogge**, “Defining Micro-Practices of Computational Thinking in the Context of STEM Classrooms”
12. **Christine Schlaug**, “Children’s Word Learning At Different Ages”
13. **Olivia Shay**, “Psychological Well-Being and Cognitive Functioning in Mid- to Late Life: Findings from a National Sample”
14. **Kelly Shi**, “The Modern Imaginary Friend: Parasocial Relationships Through Face-to-Face Screen Interactions”
15. **Jamilah Silver**, “Thematic Analysis: Implications for a Behavioral Intervention Technology for Bipolar Disorder”
16. **Rebecca Sinard**, “Effects of Chronic Family Relationship, Friendship, and Home Life Stress on Childhood Asthma”
17. **Victoria Steigerwald**, “Investigating Self-Compassion and Empathy in the Context of an Internet-Delivered Mindfulness-Based Exposure Intervention”
18. **Angelina Strohbach**, “Reproducing Inequality: Disparities in Mobile Technology and Pregnancy Care for Low-Income Women in Chicago”
19. **Emily Vogt**, “The Cognitive and Economic Implications of Non-Medical Adderall and Related Prescription Stimulant Usage on College Campuses”
20. **Kandace Webb**, “The Relationship Between Cognition and Violent Offending in a Prison Population”
21. **Benjamin Weinberg**, “Ballot Challenge: Explaining Voting Rights Restrictions in 21st-Century America”
22. **Mariani Weinstein**, “Metaphors Across Languages: Conventional and Novel Metaphors among Monolingual and Bilingual Speakers of Spanish and English”

## Poster Session One, *continued*

23. **Emma Zblewski**, “Safe Enough? Constructing Accessible, Inclusive Spaces at the Intersection of Queer Identity and Trauma”

### Natural Sciences & Engineering

24. **Tasfia Azim**, “Lost in Translation: Mapping the Ribosomal Active Site”  
25. **Taylor Brown**, “Mobile Antibiotic Resistance Genes in the Indoor Microbiome”  
26. **Adina Cianciotto**, “Does Retinal or Perceived Space Affect Eye Movements?”  
27. **Rachel Dubner**, “In Vitro Production of Conjugate Vaccines Directed Against Diverse Pathogenic Bacteria”  
28. **Claire Hilburger**, “Hybrid Membrane Interactions with Fatty Acids”  
29. **Suwei Liu**, “Engineering Bioinspired Underwater Adhesives based on Mussel Foot Protein-5”  
30. **Colin Lynch**, “Synthesis of a Lanthanide-Cryptate Magnetic Resonance Spectroscopy Probe”  
31. **Christina Shehata**, “Comparing Bioinformatic Methods to Detect Selection in the Brighamia Genome”  
32. **Angela (Sarah) Walema**, “Understanding the Role of Flowers in Climate-Vegetation Feedbacks: A Case Study with a Subalpine Sunflower”  
33. **Shiwei Wang**, “Self-assembly of imine-linked macrocycles related to 2D Covalent Organic Frameworks”  
34. **Yufan Yang**, “Modifying Nanoparticle Morphology and Surface Charge to enhance APC Targeting”  
35. **Alberta Yoo**, “Development of Reclamation and Reuse System in Agricultural Areas through the Use of IoT Communication and Drones”

## Poster Session Two

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

### Humanities, Social Sciences, & Journalism

1. **Maria Feiler**, "Variation of Sexual Dimorphism Due to Climatic Stress"
2. **Frederick Levenson**, "Creationist Rhetoric in 21st Century American Public Discourse"
3. **Nirmal Mulaikal**, "Once They Were Heroes: Changing Coverage of Baseball Stars in the Steroids Era"
4. **Elizabeth Odunsi**, "Droppin' Knowledge: Hip Hop's Portrayal of the Criminal Justice System"
5. **Sophie Spears**, "Good Girls Go To Heaven, Bad Girls Go Everywhere: A History of the Sex Workers Rights Movement in Post-War America."
6. **Elizabeth Wayne**, "Misrepresentations of the Irish Republican Army: A Critical Examination of Labeling Extremist Groups"
7. **Gabriel Cohen**, "First Year Fraternity Membership: Tracking Attitude Change"
8. **Camille Cooley**, "Illinois Intellectual and Developmental Disability State Policy: Helping or Hurting?"
9. **Emily Fraser**, "Individualized Cognitive Behavioral Therapy and Changes in Couple Functioning"
10. **Erin Hesch**, "Nevertheless, She Persisted: A Study of Perceived Progress and Motivated Self-Regulation"
11. **Anna Holubecki**, "Defining the Neuropsychological Profile of Individuals with Autism Spectrum Disorder and Their Parents"
12. **Joanna Hong**, "The effects of state and trait anxiety on implicit reactions to ambiguous emotional faces"
13. **Caylin Kaunas**, "All My Best Friends are Online: The Effects of MMO's on the Development of Social Skills in Adolescents"
14. **Andrew Kittleson**, "Uncovering Neural Correlates of Anxious-Apprehension in Anticipation of Rewards with Electroencephalogram"
15. **Keishel Lee**, "The role of iconic gesture in facilitating memory and recall of lyrics"
16. **Xinyi Liu**, "College Major Choice under Financial Constraint: How do low income students choose majors compared to the representative student body at Northwestern?"
17. **Maria Loi**, "Creating Leaders of Learning Organizations"
18. **Aimee Moses**, "The Impact of STEM Curriculum on Student Perceptions of Computational Thinking"
19. **Lucia Procopio**, "Curating Racism: Understanding Field Museum Physical Anthropology from 1893 to 1967"
20. **Hannah Savitz**, "Obscuring the self by choosing a partner: The challenge of identity denial for bisexuals in romantic relationships"
21. **Sarah Schecter**, "Sexual Assaults on College Campuses: Practices that Can Fix the Problem of Underreporting"
22. **Zachary Schroeder**, "Lovingkindness Meditation and Racial Prejudice: Maybe love really IS all you need"

## **Poster Session Two,** continued

23. **Kenneth Xu**, “The Role of Exposure to Biased Nonverbal Signals in Acquisition of Implicit Social Bias”

### **Natural Sciences & Engineering**

24. **Sophie Brauer**, “Gentle Oxidative Depolymerization of Lignin for Value-Added Chemicals”
25. **Michael Campbell**, “Earthquakes And Moneyball: Explaining Cascadia Earthquake Probabilities To Students And The Public Using Baseball Analogies”
26. **Zer Chia**, “Development of Near Zero Background MRI Contrast Agents”
27. **Avi Dravid**, “The Evolutionary Bases of Hygrosensation in the genus *Drosophila*”
28. **Anam Furrakh**, “Investigation the influence of Heparin on Kinetic Parameters of DNA Endonuclease Cas9”
29. **Michelle Guo**, “Vasculogenic collagen/elastin scaffold for islets enhanced engraftment and function in an extrahepatic site”
30. **Yuxi Han**, “Polygons, Companion Shapes, and the Construction of Polyhedra”
31. **Alex Huffman**, “Mapping of Neuronal Activity Following Seizures in a Mouse Model of Dravet Syndrome”
32. **Sophia Jenz**, “Modeling Posttraumatic Stress Disorder and Transcription Factor Levels”
33. **Evan Kaspi**, “Thermosensory Effects on *Drosophila* Circadian Rhythms”
34. **Meghna Katta**, “Coronary Vasculature and Conduction System Development in Settings of Ventricular Noncompaction”
35. **Seongsik (Joseph) Kim**, “Hint Engine”
36. **Elina Kim**, “Nuclear pore-dependent transcriptional memory and transcriptional activation in budding yeast”
37. **Vasil Kukushliev**, “Oxygen consumption of hematopoietic stem progenitor cells differentiating into megakaryocytes in culture”
38. **Daniella Lewittes**, “Hindered Rotation in Tertiary Aromatic Amines Due to Intramolecular Hydrogen Bonding”
39. **Wendy Luo**, “Identification of behavioral and transcriptomic differences in an animal model of postpartum depression”
40. **David Park**, “Quantification of Antibiotic Resistance Gene *mdtK* Expression in Dust-cultivated *Pseudomonas monteilii*”
41. **Grace Park**, “Identifying Genetic Determinants of Avermectin Resistance in *Caenorhabditis elegans*”
42. **Abigail Schroeter**, “Kinetics Studies of Cu (II), Zn (II), and ethylenediamine tetraacetate (EDTA) and Cu (II), Ca (II), and EDTA for the development of a greener calibration technique for Rapid Freeze Quench for Electron Paramagnetic Resonance Spectroscopy”
43. **Priya Shankarappa**, “Structural and Physicochemical Characteristics of CYP2D6 Substrates and a Case Study of Aminopyridazine Compounds”

## Poster Session Two, continued

44. **Evan Sitar**, “Effects of practice on Lukacs’ (2016) countermeasures (CMs) to the P300-based Complex Trial Protocol (CTP) for detection of concealed episodic information from a mock crime”
45. **Akshar Thakkar & Katlyn McGrattan**, “Optimal Nipples for Efficient Barium Expression During the Videofluoroscopic Swallow Exam”
46. **Brandon Vilarello**, “Neurophysiology in HIV+ individuals suggests a central auditory processing deficit”
47. **Fiona Worsfold**, “Expansion and Analysis of new coral bleaching data for the 2016 Bleaching Response Index”
48. **Chelsea Ye & Manon Petit**, “Growth and Characterization of Gallium Oxide and Fabrication of Transistors”



## Faculty Judges of Undergraduate Posters

**Danny Abrams**, Engineering and Applied Mathematics  
**Erik Andersen**, Molecular Biosciences  
**Tuca Auffinger**, Mathematics  
**Elisa Baena**, Spanish and Portuguese  
**Galya Ben-Arieh**, Political Science  
**Veronica Berns**, Chemistry  
**Cindy Blanco**, Linguistics  
**Sarah Bouchat**, Political Science  
**Sara Broaders**, Psychology  
**Karen Brunssen**, Voice and Opera  
**Steve Carr**, Materials Science and Engineering  
**Venkat Chandrasekhar**, Physics and Astronomy  
**Robert Chatterton**, Emeritus  
**Diane Claussen**, Theatre  
**Cynthia Coburn**, Human Development & Social Policy  
**Cindy Conlon**, Education and Social Policy  
**Sumit Dhar**, Communication Sciences and Disorders  
**Jaime Dominguez**, Political Science  
**Mindy Douthit**, Organizational development and change and social network analysis  
**Judy Franks**, Journalism  
**Jean-Francois Gaillard**, Civil and Environmental Engineering  
**Myrna Garcia**, Latina and Latino Studies Program  
**Benjamin Gorvine**, Psychology  
**Susannah Gottlieb**, English; German  
**Tina Grieco-Calub**, Communication Sciences and Disorders  
**Jie Gu**, Computer Engineering  
**Erica Hartmann**, Civil and Environmental Engineering  
**Shelby Hatch**, Chemistry  
**Nell Haynes**, Anthropology  
**Larry Hedges**, Education and Social Policy  
**Kyle Henry**, Radio/Television/Film  
**Sara Hernandez**, Economics  
**Maud Hickey**, Music Education/Music Studies  
**Stephen Hill**, Anthropology; Office of Fellowships  
**Philip Hockberger**, Physiology  
**Daniel Horton**, Earth and Planetary Sciences  
**Jiaxing Huang**, Materials Science and Engineering

## **☞ Faculty Judges of Undergraduate Posters, continued**

**Elizabeth Hurd**, Political Science  
**Golnaz Arastoopour Irgens**, Educational Psychology  
**Neha Kamat**, Biomedical Engineering  
**Pedram Khalili**, Electrical Engineering and Computer Science  
**Ihnhee Kim**, Asian Languages & Cultures  
**Patrick Kiser**, Biomedical Engineering  
**Stephanie Knezz**, Chemistry  
**Kinga Kosmala**, Slavic Languages and Literature  
**Hilarie Lieb**, Economics  
**Franziska Lys**, German  
**Daniel Majchrowicz**, Asian Languages and Cultures  
**Matty Major**, Physical Medicine and Rehabilitation  
**Luisa Marcelino**, Civil and Environmental Engineering  
**Juan Martinez**, English  
**Amanda Mathew**, Preventive Medicine  
**Jennifer Novak-Leonard**, RTVF  
**Elizabeth Pardoe**, History  
**Susan Pearson**, History  
**Beth Redbird**, Sociology  
**Erin Reitz**, Art History  
**Christiane Rey**, French and Italian  
**Jason Roberts**, Screen Cultures  
**Onnie Rogers**, Psychology  
**Tiffany Schmidt**, Neurobiology  
**Helen Schwartzman**, Anthropology  
**Lilah Shapiro**, Education and Social Policy  
**Mark Sheldon**, Philosophy, Medical Humanities and Bioethics  
**Karen Smilowitz**, Industrial Engineering  
**David Smith**, Psychology  
**Simone Sredni**, Neurological Surgery  
**Noelle Sullivan**, Global Health Studies, Anthropology  
**Ronen Sumagin**, Pathology  
**Caroline Szczepanski**, Chemical & Biological Engineering  
**Allen Taflove**, Electrical Engineering and Computer Science  
**Jason Tait Sanchez**, Communication Sciences and Disorders  
**Mitali Thakor**, Anthropology/Gender and Sexuality Studies  
**Oya Topçuoğlu**, Middle Eastern and North African Studies  
**Claire Sufrin**, Jewish Studies

## Faculty Judges of Undergraduate Posters, continued

**Keith Tyo**, Chemical Engineering  
**Paul Umbanhowar**, Mechanical Engineering  
**Reza Vafabakhsh**, Molecular Biosciences  
**Patricia Vitt**, Plant Science and Conservation  
**Petia Vlahovska**, Engineering Sciences and Applied Mathematics  
**Mitchell Wang**, Chemical and Biological Engineering  
**Emily Weiss**, Chemistry  
**Ana Williams**, Spanish & Portuguese  
**LaTanya Williams**, Biological Sciences  
**Lisa Wilsbacher**, Cardiology Division; Feinberg School of Medicine  
**Willie Wilson**, Electrical Engineering and Computer Science  
**Mark Witte**, Economics  
**Brad Zakarin**, History



## **Poster Presentation Abstracts**

*Alphabetical by presenter's last name*

## **Ifath Arwah & Jueun Choi**

*Faculty Advisor: Abraham Abusharif*

### **Marginalized in Malaysia: The Refugee Child's Struggle for Survival**

The world is currently experiencing the largest refugee crisis in history and many displaced people are scrambling for asylum and relief. Children, the primary victims of war, often have to bear the brunt of this conflict. The illegal status of refugees in Malaysia exacerbates their struggles—they cannot work, obtain institutional schooling, or access healthcare. They live in constant fear of arrests and deportation. In our journalist project comprising of photo, video, and written elements, we explore the impacts of the crisis on refugee children in Malaysia from various countries such as Somalia, Myanmar, Iraq, and Syria. The project portrays the day-to-day struggle of refugee families as they adjust to a foreign society and attempt to provide their children with “an ordinary childhood.”



## **Tasfia Azim**

*Faculty Advisor: Michael Jewett*

### **Lost in Translation: Mapping the Ribosomal Active Site**

The ribosome, a molecular machine that polymerizes  $\alpha$ -amino acids into proteins, is the catalytic workhorse of the translation apparatus. The catalytic capacity of the ribosome has attracted efforts to repurpose it for novel functions. One key idea is that the ribosome can be harnessed to synthesize polymers containing non-natural building blocks. Expanding the repertoire of ribosomal substrates and functions is a difficult task, however, because the requirement of cell viability constrains the alterations that can be made to the ribosome, a catalyst that sustains cell life. These constraints have made the ribosome nearly unevolvable and, so far, no generalizable approach for modifying its catalytic peptidyltransferase center (PTC) has been advanced. We addressed this challenge by using cell-free systems that harness the biosynthetic potential of cellular machines without using intact cells, thus removing cell viability constraints. Here, we use our own in vitro ribosome synthesis, assembly, and translation system (iSAT) to generate variant ribosomes in the A- and P-loops of the PTC and inquire how these modifications affect translation. By successfully quantifying full-length protein synthesis kinetics of iSAT-assembled wild type and mutant ribosomes, we unexpectedly found many PTC mutations, which were expected to abolish ribosomal activity, still permitted ribosome assembly and full-length protein synthesis. There is currently no literature on the responses of A- and P-loops to single-base mutations, thus, these studies not only provide insight into the basic biochemistry of these nucleotides in translation, but also provide the groundwork for engineering the catalytic center of the ribosome.



## Sophie Brauer

*Faculty Advisor: Kimberly Gray*

### **Gentle Oxidative Depolymerization of Lignin for Value-Added Chemicals**

As the environmental issues surrounding climate change and fossil fuel extraction have become more apparent, there has been increased interest from the chemistry field in switching to renewable “green” feedstocks. Lignin, a major structural component of plants, is the largest renewable source of aromatic moieties. However, lignin is extremely resistant to degradation, and current depolymerization technologies require harsh and energy-intensive conditions. Gentle oxidation with hydrogen peroxide at ambient conditions can substantially reduce the molecular weight of lignin solids and increase aqueous solubility of lignin, while photocatalytic treatment with TiO<sub>2</sub> results in an increase of water-soluble aromatic carbon content in solution. We combined the softening effect of neutral H<sub>2</sub>O<sub>2</sub> with the oligomer production of TiO<sub>2</sub> photocatalysis to generate value-added aromatic chemicals. Irradiation for too long promotes a radical repolymerization pathway and/or mineralization. The central challenge of this endeavor is to produce the desirable monomers without promoting product degradation or further reaction. Eventually, the aim is to produce chemicals like vanillin, formaldehyde-free plywood resins, industrial solvents, and synthetic chemical precursors.



## Taylor Brown

*Faculty Advisor: Erica Hartmann*

### **Mobile Antibiotic Resistance Genes in the Indoor Microbiome**

In indoor environments, bacteria face selective pressure to carry antibiotic resistant genes (ARGs) from antimicrobial substances used in furniture, building materials, and personal care products. Humans rely on antibiotics to clear bacterial infections, so understanding the way in which these genes are transferred, i.e., on mobile genetic elements, is critical. To investigate this phenomenon, dust samples were collected from over 100 collection sites in over 40 different athletic facilities. DNA from these samples was sequenced to assemble a metagenomic database, which was analyzed to locate ARGs in mobile genetic elements. In parallel, bacteria were cultured from these samples and exposed to antibiotics to screen for resistance phenotypes, and plasmid DNA was extracted from resistant species. From the metagenomics data, the ARG *gidB* was found only on plasmids, a common method of horizontal gene transfer. This gene codes for resistance to streptomycin, an antibiotic used to treat tuberculosis. Seven strains of streptomycin-resistant bacteria were identified from the culture isolates. To confirm the presence of *gidB* on plasmids in resistant bacteria, PCR primers were developed by dividing known sequences of *gidB* genes into categories based on their phylogenetic tree. This gene evolves quickly, so creating more than one specific primer was necessary. Optimization is ongoing to uniquely amplify this gene. Once *gidB* is identified in plasmid DNA, future experimentation will determine if this gene can be passed to other species of bacteria through conjugation. These results will direct future recommendations for antibiotic development and indoor environment design.



**Michael Campbell**

*Faculty Advisor: Seth Stein*

**Earthquakes And Moneyball: Explaining Cascadia Earthquake Probabilities To Students  
And The Public Using Baseball Analogies**

Much media attention focuses on Cascadia's earthquake hazard. A widely cited article starts "An earthquake will destroy a sizable portion of the coastal Northwest. The question is when." This leads students and the public to ask what the quoted probabilities mean. Probability estimates involve two primary choices: what data are used to describe when past earthquakes happened and what models are used to forecast future earthquakes. Why different choices give different estimates can be illustrated with simple analogies, using people's familiarity with probabilities in sports. The data come from a 10,000-year record of large paleoearthquakes compiled from subsidence data on land and turbidites, offshore deposits recording submarine slope failure. The earthquakes seem to occur in clusters of several events, separated by gaps. Earthquakes within a cluster occur more regularly than they do in the full record. Hence the next earthquake is much more likely if we assume we are in the recent cluster. Baseball analogies illustrate these ideas. The cluster issue is like deciding whether a baseball hitter's performance in the next game is better described by his lifetime record, or by the past few games. The other choice is whether to assume that the probability of an earthquake is constant with time or is small after one occurs and grows with time. This is like whether to assume that a player's performance is the same from year to year, or changes over their career. Similarly, saying "the probability of an earthquake is N%" involves specifying the assumptions made.



**Keyla Carvalho & Augusta Saraiva**

*Faculty Advisor: Ana Williams*

**Intercultural exchange in Portuguese: the importance of linguistic background for meaning  
negotiation of language learners**

Language is an important part of people's identities and thus affects the way they relate to the world. When it comes to intercultural exchange and language acquisition, the learner's linguistic background actively impacts those processes. By analyzing a group of Northwestern students who took a Portuguese class that required video interactions with native speakers, we aimed to understand how those different identities affect their process of language learning in meaning negotiation. The Portuguese language learners engaged in ordinary conversations with five different native speakers throughout the quarter. Six Portuguese learners, all native English speakers, participated in the research. They were divided in two main groups: the ones with regular exposure to Spanish, either because they are learning it or grew up bilingual, and the ones with previous exposure to spoken Portuguese, either as heritage speakers or by having lived in Brazil. Given that Spanish and Portuguese are similar languages, we wanted to test two hypothesis regarding meaning negotiation: (1) students who already knew Spanish would use it to compensate for their lack of vocabulary in Portuguese and (2) students with more exposure to spoken Portuguese would engage less in meaning negotiation and more in grammar rules. The results show that fluent Spanish speakers would more often speak a mix of Portuguese and Spanish, instead of asking for clarification. The second group, contrary to our

expectations, would test more often their inferences in Portuguese, requesting more support for their assumptions. Our study demonstrates that linguistic backgrounds influence the acquisition of vocabulary.



**Zer Chia**

*Faculty Advisor: Thomas Meade*

### **Development of Near Zero Background MRI Contrast Agents**

Magnetic resonance imaging (MRI) is a powerful research and diagnostic imaging tool, providing excellent spatial and temporal resolution without the use of ionizing radiation. These attributes make MRI ideal for correlating biochemical events to physiological changes. The signal generated by an MRI contrast agent can be quantified by its relaxivity ( $r_1$ ) that is related to the following parameters: the number of bound water molecules ( $q$ ), the mean residence lifetime of the bound water molecules ( $\tau_m$ ), and the rotational correlation time of the contrast agent ( $\tau_r$ ). Attempts to increase the relaxivity of the contrast agent by modifying the parameters  $q$ ,  $\tau_m$ , and  $\tau_r$  have been extensively studied. However, in the “off” state, the contrast agent exhibits a strong background signal corresponding to  $\sim 40\%$  of the total signal due to a fourth parameter – the electronic relaxation time ( $T_{1e}$ ) of Gd(III). Consequently, MRI suffers from a lack of sensitivity in these molecular imaging applications. The aim of this research is to develop a new class of bio-activatable contrast agents with near zero background by modulating the  $T_{1e}$  of the Gd(III) center. Here, we demonstrate that a decrease in relaxivity (i.e. darker image) of 50% can be achieved by magnetically coupling Gd(III) to Co(II), a transition metal with a significantly faster  $T_{1e}$  than that of Gd(III). We believe that this is the first step in the development of more effective contrast agents well-suited for molecular imaging purposes. Consequently, we have begun to explore methods to improve solution stability and to incorporate bio-activation strategies



**Adina Cianciotto**

*Faculty Advisor: Steven Franconeri*

### **Does Retinal or Perceived Space Affect Eye Movements?**

This study aims to advance our basic understanding of how we perceive objects in our environment. It's unclear whether we understand object structure based on only how we perceive or on how it truly exists in the world. Examining eye-movements provides insight into how our visual system represents and understands objects. A perceived-space hypothesis predicts that we look at two different-looking objects in different ways, even if they are the same size from one's perspective. However, a retinal-space hypothesis predicts that we look at those objects in the same way, even if they are perceived to be different sizes. This study examined this question by collecting eye-tracking data when objects' perceived size was manipulated with the Configural Shape Illusion—the illusion of continuity/elongation through distortion of a target through the presence of an adjacent shape. Participants were shown a semi-circle adjacent to a rectangle, with either zero spacing or with a small



gap between them, and asked to indicate whether the semi-circle's color matched that of a fixation circle. If object perception is influenced by perceived-space, then eye-fixations should differ between these two conditions because the semi-circle appears larger in the zero-spacing condition. Results showed no significant difference between participants' first fixation on the semi-circle across the conditions, suggesting that an object's perceived size does not influence our initial representation of an object's structure. Further research is necessary to tell whether perceived-size influences object perception in subsequent processing, even if it may not be prioritized for initial percept guiding eye-movements.



**Gabriel Cohen**

*Faculty Advisor: Mesmin Destin*

### **First Year Fraternity Membership: Tracking Attitude Change**

Greek life as an institution has faced a variety of criticisms in recent years, both here at Northwestern and nationwide. In an effort to combat many of these problems, facilitate positive attitude change, and encourage healthy community behavior, Northwestern's Interfraternity Council (IFC) currently mandates a series of workshops in various domains such as sexual violence prevention and mental health to be attended by all first-year fraternity members. This study seeks to evaluate how attitudes in respect to social orientation, seeking mental health help, and intervening in sexual violence differ between male students who choose to go Greek and those who do not, how these attitudes change throughout the pledge process, and whether such change is mediated by organizational identification. To answer this question, 47 first-year male Northwestern students, both members and non-members of fraternities, were surveyed at two time points several weeks apart. Findings, suggestions for future research, and implications in the realm of fraternal education will be discussed.



**Camille Cooley**

*Faculty Advisor: Dan Lewis*

### **Illinois Intellectual and Developmental Disability State Policy: Helping or Hurting?**

Caregivers who look after adults with intellectual or developmental disabilities (IDD) are limited in their option of sufficient day services and longtime housing through state mandated policies, services, and support. Illinois is consistently ranked as one of the worst states in the US when it comes to providing these services for people with IDD, despite extensive policy shifts over the past several years to align with federal mandates. This study utilizes interviews with parents and caregivers of adults with IDD across the Greater Chicagoland in order to map out the reality of Illinois policy. Through these interviews, we find that recent efforts to standardize and simplify the obtainment of state funded services fails to support families over an extended period of time, relying to caregivers to fill in the gaps. By exploring the assumptions inherent in IDD policy and funding meant to support families, this project reveals how the expectations in state policies not only clash, but can also bring about more adversity in the day to day lives of adults with IDD.



**Avi Dravid**

*Faculty Advisor: Marco Gallio*

### **The Evolutionary Bases of Hygrosensation in the genus *Drosophila***

The common laboratory fruit fly, *Drosophila melanogaster*, belongs to a group of very diverse fly species. Members of the genus *Drosophila* live on all continents with the exception of Antarctica and have adapted to very different environments. The Gallio Lab studies how the sensory systems and brain of *Drosophila* flies process information about the environment such as temperature and humidity. The goal of my project is to understand the neurobiological changes that make it possible for different fly species to live in vastly different temperature and humidity conditions. My focus has been to study humidity preference in three species: *D. mojavensis*, *D. melanogaster* and *D. teissieri*. *D. mojavensis* can be found in the arid deserts of Mexico and southern California. *D. teissieri* is a jungle fly that inhabits western Africa. *D. melanogaster* has a cosmopolitan distribution. Each species shows distinct preference for humidity conditions related to its native environment (Enjin et al., 2016). Together with other undergrads and scientists in the Gallio Lab, I am establishing CRISPR/Cas9 technology to create mutants and transgenics in *D. mojavensis* and *D. teissieri*. By knocking out genes implicated in humidity sensing and creating transgenic species, I will gain more insight into how humidity preferences are perturbed by loss of gene function or the expression of isoforms from other species. The ultimate goal of this project is to study sensory adaptation to life in extreme environments.



**Rachel Dubner**

*Faculty Advisor: Michael Jewett*

### **In Vitro Production of Conjugate Vaccines Directed Against Diverse Pathogenic Bacteria**

Antibacterial resistance is a growing threat worldwide that necessitates new strategies for treatment. Conjugate vaccines, which involve the covalent linking of polysaccharide antigens to carrier proteins, are among the most effective vaccines against bacterial pathogens. However, current state-of-the-art techniques for their production are time consuming and complex. Additionally, vaccines developed using these methods require refrigeration and therefore cannot be distributed to remote or resource-limited locations. To address these limitations, the Jewett Lab has engineered a cell-free platform for the synthesis of glycoprotein vaccines, which can be lyophilized for ambient temperature storage and transportation. Cell-free glycoprotein synthesis involves three main components: oligosaccharyltransferases (OSTs), lipid-linked oligosaccharides (LLOs), which consist of a bacterial polysaccharide antigen linked to a lipid, and the target protein to be glycosylated which, in this case, is the vaccine carrier protein. In the process of glycosylation, the polysaccharide is cleaved from the lipid and covalently attached to the carrier protein by the OST enzyme. By mixing cell lysates enriched with either LLOs or OSTs, transcription, translation, and glycosylation can be co-activated in vitro, allowing for the synthesis of conjugate vaccines in under 24 hours. Using these processes, we have produced antibacterial vaccines containing FDA-approved carrier proteins directed against *Escherichia coli* Serogroup O78. Additionally, we have demonstrated the ability to conjugate surface

antigens from E. coli Serogroup O7 and Pseudomonas aeruginosa Serogroup O11 onto sfGFP. Future work will be directed towards attaching these glycans to FDA-approved carriers and improving reaction efficiency to produce higher glycoprotein yields.



**Maria Feiler**

*Faculty Advisor: Erin Waxenbaum*

### **Variation of Sexual Dimorphism Due to Climatic Stress**

Sexual dimorphism presents itself in humans primarily through the anatomical shape of the cranium and pelvis. However, some physical anthropologists maintain that climate traits could have an effect on human sexual dimorphism. Despite ongoing research pertaining to climatic effects on soft tissue or size dimorphism, little to no research has looked at how climate affects nonmetric skeletal indicators of sex. To further understand the plasticity of the human skeleton, standard sex indicators of the cranium and pelvis in two populations of differing climatic stress (a Native Alaskan sample and a portion of the Terry Black collection) were compared and the dimorphism of these populations will be assessed for statistical significance. Though only two traits (nuchal crest and mastoid process) show statistical significance, the results show that the Native Alaskans tended to have stronger masculine traits than the Terry Black collection. This study opens discussions of how climate, nutrition, stress, and disease could affect standard forensic and archaeological procedures and potentially produce more accurate skeletal assessment in the future.



**Emily Fraser**

*Faculty Advisor: Richard Zinbarg*

### **Individualized Cognitive Behavioral Therapy and Changes in Couple Functioning**

Beyond creating stress and impairment on daily functioning, generalized anxiety disorder (GAD) often is associated with a deleterious effect on intimate relationships. It can be associated with barriers in communication and intimacy, lower marital satisfaction, as well as increased risk of divorce for patients and their partners (Kessler, Walters & Forthofer, 1998). Moreover, relationship dissatisfaction has been correlated with worse outcomes following cognitive behavioral therapy (Durham, Allan, & Hackett, 1997). Given this information, relationship factors present an important focus for intervention to improve therapy for GAD. The present study aimed to test correlations between changes in partner hostility and criticism and symptom change after individual treatment for patients with GAD. Twenty-six patients with a principal diagnosis of GAD received eighteen sessions of an individual imagery-enhanced cognitive-behavioral treatment package. In addition, the patients and their partners were videotaped discussing the patients' worries at pre- and post-treatment. These videotapes were later coded for levels of partner hostile and non-hostile criticism directed at the patients. There was a statistically significant correlation between symptom change and hostile criticism in couples interactions at 12-month follow up. This data suggests that GAD treatment could be improved with a focus on decreasing hostile criticism between patients and their partners. Keywords:

Cognitive-behavioral therapy, Generalized anxiety disorder, Exposure therapy, couple functioning, Treatment outcomes, Outcome correlations



**Anam Furrukh**

*Faculty Advisor: Anam Furrukh*

### **Investigation of the influence of Heparin on Kinetic Parameters of DNA Endonuclease Cas9**

The bacterial CRISPR/Cas9 system shows promise as a genome-editing tool to treat human disease. Cas9 is a protein capable of targeting and binding double stranded DNA. Upon binding, Cas9 cleaves targeted DNA. If damaged, disease-causing DNA can be cut and healthy DNA can be provided to repair the cut sequence, scientists would have a cut and paste mechanism for the human genome. Given the biological implications of Cas9 as a genome-editing tool, it is of great importance to understand the binding mechanisms of Cas9 to double stranded DNA [Ran13]. It is integral to understand these binding kinetics of Cas9 to its target DNA to study specificity of the Cas9 protein. Standard practices involve the use of negatively charged polymer Heparin to reduce unspecific binding of Cas9 to non-target DNA. This study proposes a novel method for study of Cas9, while demonstrating the negative impact Heparin has on the Cas9-DNA interaction. By using short electrically switchable DNA layers tethered to a gold surface, the change in DNA movement through solution after binding of Cas9 is studied. We found that (1) Heparin changes on and off rates that characterize Cas9 (2) It is vital to see some level of unspecific binding of Cas9 to understand the risk of Cas9 cutting functional DNA in vivo, yet Heparin removes the ability to do this. We demonstrate the benefit of studying Cas9 without Heparin by using the switchSENSE method, which does not require Heparin to obtain accurate on and off rates for the Cas9-DNA interaction.



**Michelle Guo**

*Faculty Advisor: Xunrong Luo*

### **Vasculogenic collagen/elastin scaffold for islets enhanced engraftment and function in an extrahepatic site**

Intrahepatic islet transplantation is a promising therapeutic strategy for patients with Type I diabetes, but the liver is a hostile transplantation site where graft loss often causes inadequate graft function and survival. Another obstacle is that isolated cells lose their natural vascularized and specialized extracellular matrix. Thus, transplanted islets must receive nutritional and physical support through the formation of new blood vessels. To address these limitations, we developed a vasculogenic biomimetic scaffold engineered to deliver islet grafts to extrahepatic transplant sites. The scaffold consisted of type I collagen blended with elastin, which has been shown to promote angiogenesis. Its pore size was tailored to accommodate the islet cells and to support new vessel ingrowth. In vitro, the scaffold enabled prolonged culture of islets up to 1 week, preserving their integrity, viability and function. In vivo, after only 4 weeks postoperatively, the scaffold demonstrated enhanced

vascularization of a marginal pancreatic donor islet mass graft, in a mouse epididymal fat pad transplant site, with outcomes similar to the kidney capsule delivery technique and improved when compared to islets delivered through a control collagen scaffold. Such enhanced vascularization and engraftment was also assessed through histological evaluation and gene expression analysis of crucial angiogenesis-associated marker genes and de novo matrix deposition-associated marker genes, which were found significantly upregulated 4 and 12 weeks postoperatively. In conclusion, this biomaterial strategy has the potential to improve clinical outcomes in islet transplantation and reduce the burden on donor organ availability by maximizing graft survival in clinical islet transplantation.



**Yuxi Han**

*Faculty Advisor: Laura DeMarco*

### **Polygons, Companion Shapes, and the Construction of Polyhedra**

Given any polyhedron in  $R^3$ , we can cut it open along its edges, flatten it out, and obtain a polygon in the plane  $R^2$ . In this project, we explored the opposite process, an open question that was first posed about 70 years ago: given a polygon in  $R^2$ , what is the folding procedure to reconstruct the polyhedron in  $R^3$ ? We focused on a special case, where we are given a polygon with  $n$  vertices and we try to find its "companion shape" (another polygon with  $n$  vertices) so that, glued together and folded, we obtain a polyhedron where all  $n$  cone angles are equal. The case where  $n=4$  (i.e., the quadrilaterals) was explored in great detail by studying the shapes of all tetrahedra with equal cone angles and how parallelograms together with their companion shapes are folded into tetrahedra. We then applied this general theory to other  $R^2$  developments, in particular the case of a polygon with  $n$  vertices, as  $n$  goes to infinity, where the curvature distribution approximates harmonic measure on a shape in the plane. We explored an iterative process of constructing the "harmonic caps." It was our conjecture that in the  $R^2$  plane, the iteration will produce rounder shapes and ultimately limit on a perfect circle.



**Erin Hesch**

*Faculty Advisor: Daniel Molden*

### **Nevertheless, She Persisted: A Study of Perceived Progress and Motivated Self-Regulation**

Self-regulation refers to the process of monitoring and controlling one's own emotions, thoughts, and actions, and is vital to many different types of goal pursuit, including happiness, healthiness, and academic and job success (Moffitt et al., 2011; Tangney, Baumeister, & Boone, 2004). However, self-regulation is often difficult to sustain over time (Muraven & Baumeister, 2000). The Motivated Effort-Allocation (MEA) model asserts that failures in self-regulation stem from a change in a person's motivation to continue such self-regulation (Molden et al., 2016). Two important factors this model proposed that may contribute to changes in motivation are the effort required to sustain self-regulation and the perceived feeling of progress this effort produces. The primary hypothesis tested in this research was that high perceived effort of self-regulation would reduce motivation to continue regulation, but these effects could be moderated if the sense of progress made during regulation was

high. We tested this in two studies measuring the effects of perceived progress on students motivation to complete four blocks of anagrams. In the first study our perceived progress manipulation was not successful. A more straightforward progress manipulation was effective in the second study, and the anagrams also increased in difficulty as the blocks progressed. Our results did not show any significant interaction between effort and progress for anagrams attempted or solved, or for the time spent on block four. It is possible that students' motivations were generally too low, and future research might explore the effects of effort and progress in contexts where people are self-regulating toward an important goal.



**Claire Hilburger**

*Faculty Advisor: Neha Kamat*

### **Hybrid Membrane Interactions with Fatty Acids**

The design of synthetic vesicles is a promising step towards creating intelligent drug delivery vehicles to treat cancers and other pathologies. Specifically, the membrane properties of these carriers can be fine-tuned for triggered release of drugs. Liposomes, composed of a purely phospholipid bilayer, have been studied extensively for drug encapsulation due to their biocompatibility, but their membranes are leaky and lack flexibility. Conversely, polymersomes made of amphiphilic diblock co-polymers offer a more mechanically stable carrier with the prospect of triggered release of their contents, but can be too impermeable and lack biocompatibility. A hybrid vesicle of phospholipid and di-block copolymer would possess optimal stability, controlled release of cargo, and high biocompatibility. One benefit of achieving an optimal blend is increased uptake of biological molecules to trigger release, or absorb toxins. Particularly, I studied fatty acid (FA) uptake. An optimal phospholipid:polymer blend would have the largest relative uptake of FAs. To quantify uptake, I monitored membrane growth via Fluorescence Resonance Energy Transfer (FRET) assays after FA addition. FRET determines membrane surface area changes by monitoring energy transferred between neighboring fluorescent molecules. By controlling the relative amounts of phospholipid and polymer in membranes, I was able to determine that a 1:1 molar ratio between phospholipid and polymer results in optimal FA uptake. Therefore, hybrid vesicles have higher membrane incorporation efficiency than both pure liposomes and polymersomes. These 1:1 hybrids can be further explored for toxic lipid absorption in tumor sites, or FA insertion can be investigated for triggered release of vesicle contents.



**Jacob Hoeflich**

*Faculty Advisor: Kim Suiseeya*

### **The Impact of Shale-Based Energy Development on Local Politics**

What is the effect of natural gas development on local politics? I set out to study the impact of fracking on communities in rural Pennsylvania because fracking's local effects are often overlooked compared to its effect on global energy markets. My work attempts to solve this puzzling question by analyzing if natural gas development causes an increase or decrease in political corruption and political

participation. I carry out a case study on a city in central Pennsylvania called Williamsport through process tracing. I run a regression analysis to examine whether the amount of money state-legislators receive from the natural gas lobby influences state-legislatures' votes on environmental and natural gas legislation. To analyze the impact of natural gas development on political participation, I carry out a difference-in-difference analysis to compare voter turnout rates in districts with fracking to districts without fracking. I also conducted interviews with stakeholders personally affected by fracking throughout the community. I find that natural gas development causes an increase in political corruption. It causes legislatures devote political resources disproportionately to the natural gas industry, thereby violating the principle of equality of representation. This in-turn causes a decrease in voter turnout rates in districts with fracking due to a decrease in external political efficacy. However, it also causes an increase in informal and contentious forms of political participation due to increasing internal political efficacy. In conclusion, this means that fracking both disrupts and spurs the local democratic process.



**Anna Holubecki**

*Faculty Advisor: Molly Losh*

### **Defining the Neuropsychological Profile of Individuals with Autism Spectrum Disorder and Their Parents**

Autism spectrum disorder (ASD), characterized by social communication deficits and restricted, repetitive behaviors, has poorly understood polygenic roots. Subtle neuropsychological differences have been reported in some parents of individuals with ASD and may reflect genetic liability to the disorder, but the neuropsychological profile of this subgroup (e.g., executive function, visual perception) is not clearly defined. Studying this profile may reveal some of the disorder's endophenotypes, symptoms with traceable genetic roots. Rapid automatized naming (RAN; rapid naming of an item array) may be a candidate endophenotype of ASD; studies demonstrate that individuals with ASD and their parents display atypical RAN naming and gaze patterns. RAN is one tool that taps into many neuropsychological skills (e.g., reading/language automaticity, executive function, visual perception), saving time and money. However, it remains unclear which RAN indices (i.e., naming and gaze patterns) relate to specific neuropsychological skills. This study investigated performance in standardized tests of reading fluency, visual perception, and executive function, and how they relate to RAN indices. Group comparisons revealed that individuals with ASD (n=25), but not their parents (n=47), performed worse than matched controls (n=15 and n=23, respectively) in most standardized tests. Correlations with RAN indices revealed that in individuals with ASD and their parents, repetitive gaze movements related to detailed visual perception, and reduced naming time and regressive fixations related to poorer reading fluency. Features related to ASD influenced such relationships. Specific RAN indices may be more sensitive to neuropsychological differences in parents of individuals with ASD than multiple standardized tests combined.



## Joanna Hong

*Faculty Advisor: Robin Nusslock*

### **The effects of state and trait anxiety on implicit reactions to ambiguous emotional faces**

A characteristic feature of anxiety disorders is the propensity to view ambiguity as explicitly negative. However, research has yet to consider whether this interpretation of ambiguity is also implicitly negative. In other words, is this bias detectable prior to entering conscious awareness? This study examined the joint contribution of state and trait anxiety to negative interpretational biases of ambiguous stimuli. I predicted that highly anxious people placed in an anxiety-inducing situation would have a stronger negative implicit reaction to ambiguous stimuli. To test this hypothesis, participants completed a measure of trait anxiety prior to an autobiographical recall task where they were randomly assigned to either think and write about a time they felt especially anxious (anxiety condition) or a time they felt relatively neutral (control condition). Afterward, participants completed the affect misattribution procedure - a widely used measure of implicit affective reactions. On this task, participants were exposed to affective primes (happy, fearful, and ambiguous faces) prior to novel target stimuli (i.e., Chinese characters). Because the affective prime comes so quickly before the novel Chinese character, participants' affective reaction to any given Chinese character is driven by their implicit affective reaction to the preceding emotional prime. Thus, the dependent variables in the current study are the positivity rating of the ambiguous target stimuli (i.e., the Chinese character) in each of the affective prime type conditions (positive, negative, and ambiguous). Results supported these predictions. This study extends past research by showing that negative interpretational biases in anxiety operate implicitly.



## Alex Huffman

*Faculty Advisor: Jennifer Kearney*

### **Mapping of Neuronal Activity Following Seizures in a Mouse Model of Dravet Syndrome**

Dravet syndrome is an infant-onset epilepsy most often caused by heterozygous mutations in the SCN1A gene. SCN1A encodes the Nav1.1 voltage-gated sodium channel that is important for propagation of electrical signals in the nervous system. Individuals with Dravet syndrome have multiple seizure types, developmental delay and/or intellectual disability, and are at high risk of sudden unexpected death in epilepsy. Functional analyses of SCN1A variants suggest patients retain only a single functional copy. Mouse models with one functional copy of *Scn1a* show many features of Dravet syndrome, including spontaneous seizures and susceptibility to seizures elicited by elevated body temperature. Experiments in the mouse model suggest hyperexcitability in neurons of the hippocampus, an area thought to be critical in seizures, but little work has been done to map neuronal circuit activity. We examined the expression of c-fos, which transiently marks neurons with high activity levels. Our study focused on activity in the hippocampus of Dravet mice following spontaneous and heat-induced seizures. Brains were collected 1-4 hours after the seizure and processed for detection of c-fos. Expression of c-fos was scored by an observer blinded to the treatment. We observed strong c-fos labeling in hippocampal neurons following seizure activity. In the heat-induced seizure model, different regions of the hippocampus activate at different time points.



Patterns of expression were similar for both heat-induced and spontaneous seizures. In both models, c-fos expression returned to baseline by four hours post-seizure. This study demonstrates that the hippocampus is involved in both heat-induced and spontaneous seizures, in agreement with the hypothesis that the hippocampal circuit is engaged during seizures in the Dravet syndrome mouse model.



**Joshua Inwald**

*Faculty Advisor: Joshua Inwald*

### **The Effects of Meta-Cognitive Priming on Hiring Discrimination**

Previous research has demonstrated an “I think it, therefore it’s true” effect, in which people are more likely to discriminate based on identity-based stereotypes when they think of themselves as objective perceivers and thinkers (Uhlmann & Cohen, 2007). An experiment was conducted to replicate this effect and understand what happens when people are primed with the opposite of self-perceived objectivity, self-perceived subjectivity. We predicted discriminatory evaluations would be exacerbated by the self-perceived objectivity manipulation but mitigated by the self-perceived subjectivity manipulation. Using a  $3 \times 2$  between-subjects design, participants were primed with either a self-objectivity, a self-subjectivity or a control stimulus, then asked to evaluate one job applicant’s hireability for a technology job, with the age of the applicant being either younger-aged (30) or older-aged (56). Replicating prior research, age discrimination was exacerbated when perceivers had been primed to think of themselves as objective thinkers. However, contrary to expectations, subjectivity priming resulted in effects highly similar to objectivity priming, leading us to suspect that the very act of meta-cognitive priming, regardless of the prime’s content, encourages stereotyping and discrimination. Possible theoretical mechanisms explaining our results and implications for future research are discussed.



**In Jang**

*Faculty Advisor: Claudia Haase*

### **Associations between Physiological Linkage and Relationship Adjustment: Effects on Marital Satisfaction and Emotional Experience**

Physiological linkage (i.e., the covariation of moment-to-moment physiology between individuals) is thought to play an important role in relationship functioning. The present study examined physiological linkage across interbeat interval (IBI) and skin conductance levels (SCL) in a sample of married spouses (N=106) during both a pleasant and a conflict conversation and looked for associations with spouses’ marital satisfaction and subjective emotional experience. When physiological linkage was operationalized with anti-phase and in-phase linkage constituting opposite ends of a continuum (i.e., overall linkage), results indicated a significant negative association between overall linkage and subjective experience of disgust; and this finding generalized across conversations and physiological channels. When physiological linkage was operationalized with anti-phase and in-

phase linkage constituting one end of a continuum and no linkage constituting the other end of a continuum (i.e., total linkage), similar patterns were seen, except certain additional results that suggested a positive correlation between total linkage and marital satisfaction. Overall, these findings provide insight into the relationship between linkage, marital satisfaction and emotional experience and suggest the need for further research.



**Sophia Jenz**

*Faculty Advisor: Eva Redei*

### **Modeling Posttraumatic Stress Disorder and Transcription Factor Levels**

Posttraumatic stress disorder (PTSD) is an anxiety disorder characterized by flashbacks of the traumatic event and high comorbidity with major depressive disorder (MDD). Prior stress is known to increase the likelihood of developing PTSD after experiencing a traumatic event. Currently, PTSD is diagnosed clinically, its biological etiology is not known and there are few effective treatments. This study aimed to identify if a genetic animal model of depression shows PTSD-like behavior using the Stress-Enhanced Fear Learning (SEFL) paradigm, which has been used as a model for PTSD. Wistar Kyoto (WKY) rats were bi-directionally and selectively bred based on their extremes of depression-like behavior. The WKY More Immobile (WMI) strain mirror human MDD-specific traits, and the isogenic WKY Less Immobile (WLI) strain act as controls without depression-like behavior. To test their SEFL, one group of WMI and WLI males and females received acute restraint stress forty-eight hours before Contextual Fear Conditioning (CFC), and a second group did not. Prior stress resulted in increased fear memory in WMI males, but not females, a finding similar to those obtained using CFC in human subjects. Plasma corticosterone differences between stressed and not-stressed WLI and WMI male and female animals immediately prior to fear conditioning paralleled SEFL results. Hippocampal expression of the glucocorticoid receptor, the nuclear receptor for corticosterone and a transcriptional factor, followed the expected pattern for being negatively regulated by its ligand. These results suggest the WMI as a model for studying the underlying neurobiology and genetics of PTSD and depression-like behavioral characteristics.



**Theresa Juliano**

*Faculty Advisor: Richard Ashley*

### **Does race modify the relationship between mental health disorders and opioid prescription among patients with pain?**

Mental health disorders and race have both been independently associated with differential prescribing patterns of opioids. In addition, mental health disorders and race have also been associated. However, literature on opioids has failed to address the role mental health disorders and race, together, might have on opioid prescription outcomes. Our study addresses that gap and seeks to determine if the relationship between mental health disorders differs by white and black patients with pain. Analyses of cross-sectional data taken from the 2012-2014 National Ambulatory Medical Care Survey (NAMCS) was conducted using chi-square tests and binary logistic regression models. After adjusting

for demographic factors, clinical factors, and region, results show that visits of white patients with mental health disorders, but not black patients with mental health disorders, were significantly associated with prescribed opioids. Additionally, our preliminary results suggest that race may modify the relationship between mental health disorders and opioid prescribing. Future stratified analyses for effect modification by race suggest that the relationship between mental health status and opioid prescription is, indeed, different among white and black patients.



**Evan Kaspi**

*Faculty Advisor: Marco Gallio*

### **Thermosensory Effects on *Drosophila* Circadian Rhythms**

Circadian rhythms are the daily cycles in an organism's behavioral, physiological and biochemical processes which are driven by a molecular oscillator known as the circadian clock. Temperature has a profound effect on circadian behavior and day/night changes in ambient temperature serve as a cue to synchronize the clock to the environment, a phenomenon known as temperature entrainment. Additionally, when an animal is exposed to constant hot or cold temperature (such as in different seasons), the period of circadian rhythms remains reasonably close to 24 hrs despite the expected slowing/speeding up of biochemical processes, a phenomenon called temperature compensation. However, the exact mechanism by which the clock senses external temperature remains unknown, even though both entrainment and compensation are well described. Our goal is to study how the neural network that controls behavioral rhythms in activity in the *Drosophila* brain (the "clock neurons") receives and processes temperature information.



**Meghna Katta**

*Faculty Advisor: Lisa Wilsbacher*

### **Coronary Vasculature and Conduction System Development in Settings of Ventricular Noncompaction**

During heart development, the ventricular wall matures via the processes of ventricular trabeculation and compaction. Failure to complete the compaction process leads to a heart defect called ventricular noncompaction, a condition in humans that includes ventricular arrhythmias. The development of coronary vessels and the conduction system is not well understood in cases of ventricular noncompaction. Interestingly, the disruption of the compaction process can be compatible with life. Sphingosine 1-phosphate (S1P) is a bioactive lipid that has five receptors, S1P1-S1P5. The S1P1 receptor, which acts via a G-protein second messenger cascade, is the prominent subtype in cardiomyocytes. Previous studies have shown that cardiomyocyte-specific S1P1 deletion leads to ventricular noncompaction. Using mutant mice that lack cardiomyocyte S1P1 as the model, immunofluorescence techniques were utilized in order to visualize localization patterns and expression levels for the conduction system proteins Connexin 40, Connexin 43, and N-Cadherin. These proteins are found in areas known as gap junctions, and function to ensure synchronous contraction of

cardiomyocytes. Phenotypic differences between control hearts and mutant cardiomyocyte S1P1 knockout hearts were studied using confocal microscopy and analyzed using FIJI image software. The results indicate that in the settings of ventricular noncompaction, the conduction system fails to properly differentiate. In summary, this study establishes the essential role of gap junction proteins (Cx40, Cx43, N-Cad) in normal cardiac function. It also provides a promising direction for determining the mechanisms needed for survival and how development proceeds in mice exhibiting ventricular noncompaction due to the absence of the S1P1 receptor.



**Caylin Kaunas**

*Faculty Advisor: Fashina Alade*

### **All My Best Friends are Online: The Effects of MMO's on the Development of Social Skills in Adolescents**

With the increasing popularity of online gaming, many are quick to dismiss video game playing as addictive, aggressive, or simply another form of mindless entertainment. Although gaming is not exempt from critique, as with other media, it has largely remained a topic of minimal research in both academics and popular media in regards towards it's potential benefits. In order to narrow down the scope of gaming, massively multiplayer online games (MMOs) were focused on in order to understand if there was any potential positive correlation within the socialization provided through individuals who played MMOs. Research was conducted through the review of both empirical and popular press articles similar to the topic in order to discover if there were any overarching themes displaying positives or negatives. Through research there was a large amount of positive associations with playing MMOs, including: growth and development of social skills and socialization practices, safe identity experimentation, and the unique construction of an alternative social space for some users. Through the findings, rather than be dismissed as simply another form of entertainment, MMO's should be further investigated as a potential tool towards treating or helping those with certain mental health conditions (such as social anxieties) rather than simply be evaluated as a negative form of distraction or entertainment.



**Seongsik Kim**

*Faculty Advisor: Jason Wilson*

### **Hint Engine**

The purpose of this research project is to evaluate the performance of the Hint Engine. The Hint Engine is an Artificial Intelligence program that provides assistance to train its users to perform certain tasks. This technology stems from previous research in developing intelligent robots that assist users, such as in cases like medication sorting. The Hint Engine differentiates itself from other technologies with its ability to assess how much assistance the users need in particular situations and give appropriate degrees of assistance based on the assessment of the situation. It gives the users enough assistance to finish a task, but not too much that the users solely rely on the hints. My role is developing

a chat-based platform that can be used to evaluate how well the Hint Engine trains its users to perform certain tasks. On this platform, the users will be given tasks to complete, with half of the users being assisted by the Hint Engine and the other half having no assistance. When the evaluation is completed at the end of this quarter, we expect to find that users being assisted by the Hint Engine will complete the given tasks with more success than the users without the Hint Engine. In addition, those that were assisted by the Hint Engine will have better intuition on determining what to do for similar scenarios in the future. This technology can then be applied to a broad range of tasks including medication sorting, cyber-intrusion detection training, and education purposes.



**Elina Kim**

*Faculty Advisor: Jason Brickner*

### **Nuclear pore-dependent transcriptional memory and transcriptional activation in budding yeast**

The eukaryotic nucleus is highly compartmentalized such that genes localize non-randomly in it. Subnuclear localization is an important regulator of transcription, as gene expression is often determined based on their location. In *Saccharomyces cerevisiae*, INO1 and HIS4 are two of many genes that move from the nucleoplasm to the nuclear periphery upon transcriptional activation. Targeting to the nuclear periphery requires cis-acting DNA “zip codes”, transcription factors that recognize those zip codes, and physical interaction with the nuclear pore complex (NPC). This study explores the influence of subnuclear positioning on the transcriptional regulation of INO1 and HIS4. Interestingly, when INO1 is repressed, it remains at the nuclear periphery and is primed for faster re-activation in the future, a phenomenon known as epigenetic transcriptional memory. Memory requires the NPC protein Nup100 and the transcription factor Sfl1. I developed a chemical genetic method to measure the effects of INO1 transcriptional memory on the rate of induction, independent of any complicating physiological inputs. Using this system, I found that INO1 memory leads to faster re-activation and that Nup100 is required for this effect. Gcn4 is the transcription factor that regulates expression of HIS4 and is required for HIS4 targeting to the periphery. Previous experiments have identified the Gcn4 positioning domain (PD), a 27 amino acid sequence that is both necessary and sufficient to target HIS4 to the periphery. Mutating three amino acids of the Gcn4 PD blocks HIS4 targeting to the periphery. I found that these mutations in the PD led to defective HIS4 transcription. These findings suggest that peripheral localization promotes stronger transcription.



**Andrew Kittleson**

*Faculty Advisor: Robin Nusslock*

### **Uncovering Neural Correlates of Anxious-Apprehension in Anticipation of Rewards with Electroencephalogram**

Anxiety disorders are the most common group of mental illnesses in the United States and affect over 15% of the population (Anxiety and Depression Association of America, 2016). Prior work utilizing

electroencephalogram (EEG) to investigate event-related potentials (ERPs) from the scalp have shown recent success in isolating certain neural correlates related to increased risk for developing anxiety disorders. However, most of these studies investigated error- and threat-related processing. Far fewer have explored potential relationships between anxiety and abnormal reward-related ERPs. The relationship between anxiety and the stimulus-preceding negativity (SPN), an ERP directly preceding reward feedback, was investigated here. The SPN is a negative deflection that reflects increases in attentional and perceptual systems during the anticipation of an upcoming stimulus, such as reward feedback. Results reveal that anxious-apprehension was related to a blunted SPN reflecting inefficient feedback anticipation, likely due to intrusive and uncontrollable cognitive worry. The current findings of this study illuminate how decision-making and reward-anticipation are affected by a specific set of cognitive symptoms seen in anxiety disorders.



**Vasil Kukushliev**

*Faculty Advisor: William Miller*

### **Oxygen consumption of hematopoietic stem progenitor cells differentiating into megakaryocytes in culture**

As megakaryocytes (Mks) develop in the body, they experience an increased concentration of oxygen (pO<sub>2</sub>). A culture process to expand and differentiate hematopoietic stem progenitor cells (HSPCs) into Mks, mimicking the oxygen gradient, has been previously established. HSPCs are first cultured at 5% pO<sub>2</sub> and after 5 days shifted to 20% pO<sub>2</sub>. However, the oxygen level at the bottom of a well-plate, where cells are resting, and the oxygen consumption of HSPCs along their maturation and development are poorly understood. Using mass transfer theory and a SDR Sensory Dish, we investigated the oxygen levels and the oxygen consumption on a per cell and per volume basis. First, CHRF cells (Mk cell line) were used to validate the experimental set-up by studying control cells and cells treated with phorbol 12-myristate 13-acetate (PMA, known to induce Mk-like maturation). Results showed a 2.5-fold increase in oxygen consumption per cell for maturing CHRF cells (PMA treated) compared to actively-replicating control cells. After validating the system with the CHRF cells, recent and ongoing efforts include studies using HSPCs. Initial observations showed that oxygen concentration during the first phase (5% pO<sub>2</sub>) remained largely constant at 4.5% through 3 days and then decreased to 3% by day 5. During the second phase of the culture (20% pO<sub>2</sub>), oxygen concentration linearly decreased with time as the culture matured. Future steps include exploring Mk metabolic profiles of expansion and maturation in addition to oxygen consumption profiles, with the final goal of achieving optimal environmental conditions for maximized Mk production.



**Keishel Lee**

*Faculty Advisor: Richard Ashley*

### **The role of iconic gesture in facilitating memory and recall of lyrics**

Previous research has shown that gesture aids in learning words and is useful for musical expression. However, none have examined the use of gesture in learning words and music together. The original impetus for combining gesture and learning lyrics stems from observations of teaching students with cognitive disabilities musical songs and adding gestures to reinforce the words and melody. This study aims to investigate if iconic gestures can facilitate better recall of song (lyrics and melody) as opposed to no gesture. Iconic gestures are visual representations of referential meaning that depict aspects of spatial images, actions, people or objects. By testing undergraduates' memory for simple American folksongs in four conditions, it was hypothesized that if gestures facilitate recall of words, then they can also facilitate recall of words and melody together, since they are stored in an integrated fashion. The recall accuracy was scored in terms of number of correct words, pitch, and rhythm. Results suggest that iconic gestures help with learning and recalling lyrics to songs, but did not reach statistical significance. However, memorizing words and melody together was found to be significantly better than remembering just the melody. In conclusion, using gestures to accompany words can aid in learning and remembering songs, which can be utilized and reinforced in the context of music education, for students of all levels and abilities. Future studies may consider long-term retention of songs, different types of gesture (iconic vs. beat), or simultaneous vs. sequential learning of gesture and song.



**Frederick Levenson**

*Faculty Advisor: Henry Binford*

### **Creationist Rhetoric in 21st Century American Public Discourse**

My project deconstructs the methods and devices of present day creationist rhetoric in the United States. Despite the wide acceptance of Charles Darwin's theory of evolution, there is still a very vocal and very organized contingent of religious Americans who not only reject evolution, but see the theory as antithetical to all of their moral beliefs. In scholarly works and discussions, many academics simply dismiss these creationists as irrational. I make no such assumption. Instead, my study delves into the world of creationist logic, interrogating the façade these groups erect and examining the construction of each argument they make. I specifically focus on public creationist debates of the 21st century, zeroing in on two very different creationist organizations: the Discovery Institute and Answers in Genesis. In my project, I use close reading and rhetorical analysis to identify how creationists use two stock mischaracterizations, "straw men," to frame their discourse. I place these "straw men" in current court cases, creationist institutions, and public debates. Through these methods, I discovered just how pervasive these "straw men" are, and that their very presence is used to play into a larger narrative of persecution that looms large in the creationist vision of the world. Moreover, in our age of superficial disagreements, I hope to provide a case study of a long-standing, vitriolic debate and invite my audience to engage with an argument that is seemingly diametrically opposed to their sensibilities.



**Daniella Lewittes**

*Faculty Advisor: Frederick Northrup*

### **Hindered Rotation in Tertiary Aromatic Amines Due to Intramolecular Hydrogen Bonding**

The reactivity and chemical properties of a molecule are largely defined by its conformation, or shape and spatial orientation, in the solution. While solution molecular conformation can be influenced by the properties of the solvent and the temperature of the system, some of the 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-N-methylbenzylamine (2-HBMMB) and other derivatives of this molecule which exhibit amine N-hydroxyl hydrogen intramolecular hydrogen bonding. As the temperature of solutions of these molecules 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 of the molecules, at the lowest temperatures. We have varied the molecular composition to study the effects of mass, steric hindrance and pKa 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. Most 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.



**Suwei Liu**

*Faculty Advisor: Sinan Keten*

### **Engineering Bioinspired Underwater Adhesives based on Mussel Foot Protein-5**

Adhesives are important for biomedical applications such as wound care and medical devices bonding. However chemical based adhesives lead to issues such as poor durability, limited biocompatibility and small elasticity. Alternatives such as bioinspired adhesives are superior materials which have stronger adhesion, greater reliability and reversible attachment capability even under an aquatic environment. Inspired by mussels which secrete bio-glue to stick to a surface, researchers found that mussel foot protein-5 (Mfp-5) primarily leads to a strong underwater adhesion among all other proteins in mussel feet. Specially, the major components 3,4-dihydroxyphenylalanine (DOPA) and lysine (Lys) in Mfp-5 yield a synergistic effect, which has been verified through both experiments and simulations of simplified biostructures. However, the underlying mechanism on a molecular level is still poorly understood. In this study, we investigated the DOPA-Lys synergy based on a 10-residue peptide using molecular dynamics simulation. The results revealed the spatial relationship between the two amino acids in order for Lys to evict water for DOPA to adsorb on a surface. We also derived the optimal sequence of a 10-residue peptide containing DOPA, Lys and “spacers” (Glycine) to achieve the highest adhesion energy. This study serves as a good guidance for future DOPA-based adhesives



design, especially when being applied to complicated biological systems such as fibrous proteins, the bulk properties of which are suitable for engineering advanced tunable bioinspired materials.



**Xinyi Liu**

*Faculty Advisor: Charles Manski*

**College Major Choice under Financial Constraint:  
How do low income students choose majors compared to the representative student body  
at Northwestern?**

Socioeconomic status affects educational and occupational decisions, and in particular, choice of college majors—an important determinant of college experience and outcomes after graduation. This paper aims to understand how low-income students at Northwestern form expectations about factors that led to their major choice and the role of financial aid in their decision-making process. While studies on educational choices have had a long history, this study relaxes the untenable assumptions in traditional methods by using a novel choice model and collecting an innovative dataset on students' subjective expectations of major-related outcomes with a focus on the income gap. Two samples, one approximately random, the other exclusively low-income, were collected and separated into three subsamples for analysis: random, low-income, and high-income. While non pecuniary factors (enjoyment of work and coursework) are significant in the choice of primary majors for all three groups, expected future income is significant for the low income group, and parental approval is significant for the high income group. Expected income is also significant for all three groups in the preference ordering, or ranking, of majors. Due to the generous financial aid policies at Northwestern, student loans did not have major effects on major choice. The low income sample has a mean probability of 12.6% higher than the high income one to choose social sciences other than MMSS/Economics as the primary intended major.



**Ryan Loach**

*Faculty Advisor: Renee Engeln*

**Social Media, Social Comparison, and College Student Body Image**

This pair of studies investigated the impact of social media on student body image. A pilot study surveyed students on the content of their Instagram feeds and social comparison tendencies through a structured interview. It was found that the majority of images on Instagram contain people, with most images containing an individual the user knows. Independent sample t-tests indicated no significant difference in image comparison frequency between genders. However, women reported significantly more appearance-related comparisons than men. Not surprisingly, participants were also more likely to compare themselves to same-gender images than other gender images. Additionally, we also found that men who qualified for the study (by indicating regular Instagram use) showed greater physical appearance comparison tendencies as well as increased body surveillance compared to men who did not qualify. A second study sought to compare the impact of Facebook and Instagram usage

on body image. Participants were randomly assigned to use Facebook, use Instagram, or play Bejeweled. While Facebook use did not lead to increases in body dissatisfaction or guilt/shame, Instagram users showed a marginally significant increase in body dissatisfaction and a significant increase in guilt/shame after browsing Instagram. Those exposed to Instagram also thought about their appearance more and made significantly more appearance related comparisons than those assigned to Facebook. It is possible that this was due to the fact that those on Instagram spent more time looking at images of people than those using Facebook. Together, these studies suggest that Instagram negatively impacts college student body image.



**Maria Loi**

*Faculty Advisor: David Rapp*

### **Creating Leaders of Learning Organizations**

During the last decades, there have been many changes in the business world that have resulted in 52 percent of Fortune 500 companies either going bankrupt, being acquired, or ceasing to exist (Wang, 2014). One critical change is the transformation of the economy into a knowledge-based economy, where information and learning are key drivers of economic growth and productivity. In order to survive and thrive in this new business world order, organizations are having to shift their focus to their learning-related assets, eventually transforming into learning organizations. The 'learning organization' is a very complex term. Past scholars have focused on establishing the theoretical framework of the learning organization as a concept. The purpose of this study is to explore how the learning organization is operationalized in practical terms, in order to render its creation less complex. While specific systems and processes are essential for its creation, the core of an organization is its people. Thus, my proposed way of operationalization is through examining the personal qualities that leaders of learning organizations should possess, and the techniques through which these qualities can be developed. Developing leaders with the qualities associated with the principles and dimensions of learning organizations is the first and most important step towards creating a learning organization. Preliminary results suggest that curiosity, intellectual humility and collaboration are the most important qualities for leaders of learning organizations to possess.



**Wendy Luo**

*Faculty Advisor: Eva Redei*

### **Identification of behavioral and transcriptomic differences in an animal model of postpartum depression**

Major depressive disorder (MDD) is a complex and common disease with a sex-biased occurrence: the prevalence of MDD is twice as high in women as in men after the onset of puberty. Women are especially at risk during times of major hormonal changes, and are subject to postpartum depression (PPD). This study aims to identify an animal model of PPD-like behavior and its biological etiology that can lead to possible treatments. Wistar Kyoto (WKY) rats have been bi-directionally selectively

bred to generate a genetic model of MDD: WKY More Immobile (WMI) rats exhibit more depressive-like behaviors; WKY Less Immobile (WLI) rats act as the isogenic control. To determine if this established animal model parallels PPD in humans, WLI and WMI maternal behaviors were observed for 10 days postpartum (PP). Behavioral data revealed different patterns of neglect and passive nursing between the WLI and WMI dams, thus confirming differences in maternal behavior between strains. Hypothalamic brain tissue was collected from WLI and WMI dams that raised pups to weaning (at 24 days PP) and from WLI and WMI dams whose pups died prior to that. Hypothalamic expression of genes previously shown to regulate maternal behavior, including oxytocin and vasopressin receptor, was analyzed. Preliminary data suggest a significant difference in the expression of target genes both between strains as well as within strains between groups. These transcriptomic differences could ultimately lead to treatments for PPD, and could have major implications for the mother and the child.



**Colin Lynch**

*Faculty Advisor: Thomas Meade*

### **Synthesis of a Lanthanide-Cryptate Magnetic Resonance Spectroscopy Probe**

Magnetic resonance (MR) imaging has greatly impacted diagnostic medicine due to its high spatiotemporal resolution and unlimited penetration depth. However, traditional MR imaging, which derives signal from the relaxation of hydrogen nuclei found in water molecules, has limitations in molecular imaging applications, since it detects the effect of the probe on nearby water molecules as opposed to the probe itself. Magnetic resonance spectroscopy (MRS) has emerged as an alternative to traditional MR imaging by deriving signal from specific  $^1\text{H}$  NMR resonances in a region of interest. MRS presents a new opportunity to improve molecular imaging using MR by creating a probe that creates significant  $^1\text{H}$  NMR signal at a chemical shift outside the 0-12 ppm range, where biological background and water dominate the spectrum. We present the synthesis of a bipyridyl cryptate-based  $\text{Ln}(\text{III})$  complex suitable for development as an MRS probe. The cryptate is constructed from three 4,4',6,6'-tetramethyl-2,2'-bipyridine units, providing a highly symmetric chelating ligand with up to 6 equivalent methyl groups. The lanthanide ion coordinated within the cryptate will subsequently shift the  $^1\text{H}$  NMR signal of these methyl groups due to its lanthanide induced shift.<sup>1</sup> Furthermore, the complex can be synthesized with several different lanthanide ions, each inducing a unique shift according to its magnetic properties. These different complexes will produce signal at a different characteristic chemical shift depending on the identity of the chelated lanthanide ion. These initial results show promise for further development of lanthanide-cryptate complexes as MRS probes to be used concurrently with traditional MR imaging.



**Jacqueline Maloney**

*Faculty Advisor: Vijay Mittal*

### **Psychological Characteristics of Problematic Internet Use**

Problematic Internet Use (PIU) is defined as an inability to control the amount of time spent on the Internet, and this behavior can lead to clinically significant distress and impaired functioning. PIU is increasingly common in the general population, and research suggests that individuals with PIU tend to share common symptoms with other addictive behaviors. Currently, it is unclear whether individuals with PIU exhibit impairments in reward processing or inhibitory control (two possible mechanisms suggested from the broader literature on addictive behavior) and what the psychological characteristics are of this group (e.g., clinical symptoms and personality). Teasing apart these questions may provide critical intersections regarding the etiology of PIU and fill unknown gaps within the field regarding this topic. In the present study, 62 participants (32 PIU individuals and 30 controls) were asked to complete a series of self-report and computerized tasks intended to characterize PIU individuals in terms of reward sensitivity and inhibitory control, clinical symptoms, and personality. Findings revealed that compared to controls, the PIU group endorsed (1) greater preference for immediate rewards, (2) more negative psychotic-like experiences and, (3) higher neuroticism, lower agreeableness, and lower conscientiousness. Higher PIU was associated with greater sensitivity to punishment, increased negative psychotic-like symptoms, and higher neuroticism, decreased agreeableness, and lower conscientiousness. Taken together, this work provides a comprehensive understanding of the psychological characteristics of this group and the possible risk factors for developing PIU. As a result, these data may inform our conceptualization of the etiology of addictive behaviors and other relevant clinical experiences. Furthermore, findings provide insights into preventative strategies and intervention approaches for psychopathology. Keywords: internet use, inhibition, reward, addiction



**Stephanie Marin**

*Faculty Advisor: Nathalie Bouzaglo*

### **Between the Quechua and Spanish in Poetry Language of the Soul**

The “[Poetry, Language of the Soul]”, of Siwar Mamani, is a book that presents a bilingual aesthetic by mixing Quechua and Spanish. The text is developed in Capinota a province of Bolivia, where even today there is a significant indigenous presence that maintains Quechua as the main language. In the text, Quechua is intentionally used in specific sections; this, in my opinion, is done by the author to offer an experience more faithful to his indigenous reality. Mamani’s aesthetics provide the reader with a linguistic resource with which to peer into the indigenous culture of the region and learn from it in a more complex way than simply telling a story. What I want to propose in this research is that it is a text that openly wants to protect the indigenous culture of Capinota from abroad, but at the same time wants to offer a panorama of indigenous culture for those who do not know it. There are no formal academic papers on Mamani’s literature. I had the opportunity to travel to Capinota to collaborate with Mamani. The questions that I try to solve through this work are: Why the genre of poetry? How is “[the spirit]” of Capinota represented? While this book of poems conveys some

aspects of indigenous culture, to what extent does it give a voice to this group? How does Mamani, the author, work as a public figure for social activism? How do the poems work as a space that allows for cultural exchange?



**Aimee Moses**

*Faculty Advisor: Hillary Swanson*

### **The Impact of STEM Curriculum on Student Perceptions of Computational Thinking**

It is estimated that by 2020, half of STEM (Science, Technology, Engineering, and Math) jobs will involve computing. Unfortunately, students from groups underrepresented in STEM fields (e.g., women, racial minorities, and low socioeconomic status) have negative perceptions of computation and are less likely to enroll in computer science classes and therefore develop skills for computational science. The CT-STEM project is addressing this problem by embedding computational thinking (CT) practices into science classes that all students are required to take. This study is part of the CT-STEM project and investigates how high school students, both from overrepresented and underrepresented groups, perceive CT, and how their perceptions are changed by participation in computational science curriculum. To investigate student perceptions, this study used qualitative analysis to characterize student responses to questions on pre- and post- attitudinal surveys. Findings show that students conceptualized CT as thinking with a computer, thinking like a computer, thinking about computers, problem solving, and critical thinking. They conceptualized how scientists use CT in their work as data practices, modeling and simulation practices, or computational problem solving. In future analyses, this study will use quantitative analysis to explore correlations between student demographics and their perceptions of CT. The findings of this study contribute to literature concerned with equitable access to CT and have implications for the design of curriculum meant to increase access to computational science. Computational science curriculum that fosters positive perceptions of computation will ultimately broaden participation in STEM and other computational fields.



**Nirmal Mulaikal**

*Faculty Advisor: Jonathan Marshall*

### **Once They Were Heroes: Changing Coverage of Baseball Stars in the Steroids Era**

When Mark McGwire, Sammy Sosa, and other sluggers chased Major League Baseball's single season home-run record in 1998, sports writers showered them with praise. The journalists used language that reflected the heroic myths that have long been attached to baseball in its cultural role as America's "national game." Even after Steve Wilstein of the Associated Press revealed that McGwire was using androstenedione, a testosterone-producing pill, few sports writers wanted to disturb the home-run party, and the significance of Wilstein's discovery was dismissed. Within seven years, however, the content and tone of baseball coverage had shifted. News about performance-enhancing drugs dominated articles about baseball, McGwire, Sosa, new home-run king Barry Bonds, and other

powerful hitters were no longer being described as heroes, and the game itself was treated with skepticism and cynicism. This paper examines this dramatic change in baseball writing and explores the possible significance of this transformation for American culture as a whole.



**Elizabeth Odunsi**

*Faculty Advisor: Laura Nielsen*

### **Droppin' Knowledge: Hip Hop's Portrayal of the Criminal Justice System**

Since its inception, hip-hop music has served as a cultural outlet for critiquing various political, economic and social institutions. Historically, the criminal justice system has been an especially common target of condemnation from hip-hop artists and fans. Current scholarship about hip-hop music assumes this pattern has continued without evaluating the extent to which hip-hop artists reference the criminal justice system or analyzing the content of these references. In order to investigate the validity of existing narratives regarding how hip-hop artists depict the criminal justice system in their music, I conducted a lyrical analysis of over 700 popular hip-hop songs that were released between both 1990-1996 and 2010-2016, coding each for references to the criminal justice system. Additionally, I used data gathered from an online survey, as well as a follow-up group interview with select survey respondents, to explore how listeners respond to these lyrics. The findings of this project suggest that the frequency and content of hip-hop lyrics referencing the criminal justice system have changed over the past two decades. Additionally, my research indicates that listeners have internalized at least a portion of the messages about the criminal justice system that are conveyed through hip-hop music. This study adds to existing research on how popular culture impacts the public's thoughts, beliefs and opinions, and contributes to efforts to understand hip hop's influence amidst its growing popularity.



**Grace Park**

*Faculty Advisor: Erik Andersen*

### **Identifying Genetic Determinants of Avermectin Resistance in *Caenorhabditis elegans***

Parasitic nematodes cause neglected tropical diseases (NTDs) in a large fraction of the human population and can be treated with anti-parasitic drugs, or anthelmintics. However, with mass drug administration programs, 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. In order 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

ivermectin resistance in the related hookworm parasite *Haemonchus contortus*. By running abamectin drug assays with *C. elegans* strains that differ only within this one chromosome V region that overlaps with *H. contortus* abamectin resistance, we hope to identify the gene(s) that underlie abamectin resistance and relate the findings back to human health.



**David Park**

*Faculty Advisor: Erica Hartmann*

### **Quantification of Antibiotic Resistance Gene *mdtK* Expression in Dust-cultivated *Pseudomonas monteilii***

Humans are in continuous, direct contact with indoor microbes, which can be commonly found in dust. A critical characteristic of a fraction of the microbiome is resistance to antibiotics, a development which allows a select group of bacteria to withstand antibiotic treatment. This phenomenon is particularly worrisome in pathogens, which could cause antibiotic-resistant infections. I have isolated and identified a microbial species called *Pseudomonas monteilii* from indoor dust. *P. monteilii* is a potential pathogen that has been implicated in various infections, and this particular dust-borne isolate is resistant to several antibiotics. To investigate whether its resistance is due to multi-drug efflux pumps (MDEPs), which extrude multiple different kinds of drugs based on their structures, I developed an assay using quantitative reverse transcription PCR to measure the expression of *mdtK*, a chromosomal MDEP with activity towards several types of antibiotics (trimethoprim, benzalkonium, chloramphenicol, and etc.). To determine whether *mdtK* truly confers resistance, I will use this assay to measure the abundance of *mdtK* transcripts in cultures grown in media with and without antibiotic. Analysis of expression of *mdtK* will demonstrate whether this MDEP is a cause for concern in the context of antibiotic-resistant potential pathogens in indoor dust.



**Lucia Procopio**

*Faculty Advisor: Erin Waxenbaum*

### **Curating Racism: Understanding Field Museum Physical Anthropology from 1893 to 1967**

Early anthropological study has often been credited with advancing new and existing racist ideologies. As major research institutions, 19th and 20th century museums were often complicit in this process. This paper uses the Field Museum as a case study to explore how natural history museums during this period worked to develop and propagate scientific racism. While previous research has focused on the 1933 Races of Mankind exhibition, this work will present a broader understanding of the ways in which the Field Museum perpetuated these ideas. Additionally, it will take a unique focus on the impact these ideas had beyond academic circles. Through analysis of the Field Museum's collection, exhibition, and publication practices from the 1893 Chicago World's Columbian Exhibition through the deinstallation of the Races of Mankind Exhibition in 1969, this research demonstrates how the Field Museum developed and propagated concepts of racial hierarchy and race as biology, masquerading these theories as scientific fact. The Field's message of scientific racism was successful

in reaching large audiences and gave scientific credence to racist ideologies well beyond academia. To reach this conclusion, the study employs analysis of archival material from Field Museum, Chicago History Museum, and Getty Research Institute collections, in addition to newspaper archives and other primary and secondary sources. In an early 21st Century that continues to be plagued by racism, it is crucial to look back on the recent past and understand anthropology's complicity in developing hierarchies that still exist today and remain conscious of its legacies moving forward.



**Carson Rogge**

*Faculty Advisor: Hillary Swanson*

### **Defining Micro-Practices of Computational Thinking in the Context of STEM Classrooms**

It is widely agreed that Computational Thinking (CT) is important to science and science education; however, it is still a relatively new construct. The CT-STEM project has defined CT practices in STEM disciplines and researches science curriculum meant to help students develop both CT-STEM practices and scientific knowledge. This study aims to characterize students' CT-STEM practices in the context of CT-biology and CT-physics units. The data for the present study was collected from the work of 85 high-school students who completed two CT-biology units and 48 high-school students who completed one CT-physics unit. Student responses to questions embedded in each unit were analyzed using a grounded approach, and a coding scheme was created to characterize the CT-STEM practices indicated by responses. Responses were then coded in order to identify trends in students' patterns of engagement in CT-STEM practices. The coding scheme characterizes micro-practices related to previously documented CT-STEM practices such as exploring a model by changing parameters in the interface or code, explaining the phenomenon represented by the model, using a model as evidence to support an argument, understanding how models can be used to understand a concept or test a hypothesis, implementing a data collection protocol or process, and drawing reasonable conclusions from analyzed data. Findings make a theoretical contribution to literature concerned with characterizing CT by elaborating a previously developed taxonomy of CT-STEM practices. They make a practical contribution to science education by clarifying learning objectives for curriculum meant to develop CT-STEM practices.



**Hannah Savitz**

*Faculty Advisor: Wendi Gardner*

### **Obscuring the self by choosing a partner: The challenge of identity denial for bisexuals in romantic relationships**

Expanding on research done on the mental health and happiness benefits associated with romantic relationships, this study investigates whether identity denial, the experience of being socially denied one's chosen identity by having others refuse to acknowledge that identity, presents a challenge for bisexual people within committed romantic relationships. For straight, gay, and lesbian individuals, one's choice of partner makes one's own sexual identity more visible to others. For bisexuals,



committing to a partner may obscure their own identity, as others will assume they are straight if they choose an opposite sex partner, and gay or lesbian if they choose a same sex partner. The current study surveyed individuals in long-term relationships (one year or more), and oversampled data from individuals who identify as gay, lesbian, or bisexual. As hypothesized, bisexual individuals, unlike their straight and gay/lesbian counterparts, did not benefit from relationship commitment in terms of emotional well-being, in part because, as predicted, they did not benefit from relationship commitment in terms of self-concept clarity. For gay, lesbian, and straight individuals, the boost to self-concept clarity one received from romantic commitment mediated the association between commitment and well-being. For bisexual individuals, self-concept clarity was just as important for well-being, but was not boosted by romantic commitment. Finally, intriguing evidence suggests that differences in self-concept clarity may be explained by the extent to which the individual's sexual identity is "known" to others in one's own and one's partners social circles, as this was significantly lower in bisexual individuals compared to their straight, gay, and lesbian counterparts.



**Sarah Schecter**

*Faculty Advisor: Laura Nielsen*

### **Sexual Assaults on College Campuses: Practices that Can Fix the Problem of Underreporting**

This project identified certain trends that lead to higher rates of reporting sexual assaults on college campuses, using the timing of the 2011 Department of Education Dear Colleague Letter about Title IX as a springboard. Recent studies indicated that at least 20 percent of women and 5 percent of men are sexually assaulted during college. However, the number of students reporting these assaults to universities is drastically lower. Thus, the driving question behind this project investigated the relationship between formal Title IX policies, campus culture, and reported sexual assaults, and what factors explain the differences in reported sexual assaults across universities. Using a multi-methodological approach through statistical analysis and in-depth case studies, this paper identified three characteristics that have a significant relationship with the rate at which students report sexual assaults: elite status, Greek Life, and compliance with the Dear Colleague Letter mentioned above. Key findings indicate that campus climate surveys surrounding sexual assault, high levels of student activism about sexual assault awareness, and changes in sexual assault education pieces lead to high rates of reporting of sexual assaults on college campuses. Important policy recommendations urge schools across the country to do the following: allow for student activism, understand sexual assault on campus through surveys, and ensure students receive effective sexual assault education.



## Christine Schlaug

*Faculty Advisor: Tina Grieco-Calub*

### **The Impact of Attribute Knowledge on Children's Word Learning**

Children acquire new words at a rapid pace in early childhood. High quality, naturalistic social interactions with caregivers are instrumental in promoting early language by providing not only access to words, but also relations between words (e.g., drink from a cup). Therefore, it is not surprising that familiar information may influence children's acquisition of novel words. The extent to which children utilize familiar information may also vary across development. The purpose of the present study was to explore children's acquisition of novel label-object associations that have familiar or unfamiliar motion attributes. The study also tested this in two different age groups: 3.5-4.5 and 7.5-8.5 years ( $N = 15$  per age group, anticipated). Children were presented images of novel objects that had a novel label (ie. "dax"). These objects were animated with either a familiar verb (ie. "bounce") or a novel verb (ie. "vor"). Children were then tested on their learning of the presented nouns and verbs using a forced choice task and an expressive recall task. Preliminary results indicate that older children are overall more successful at learning the label-object associations than younger children and are able to more accurately learn them when paired with familiar motion attributes as compared to novel motion attributes. These results suggest that children's word learning may be aided by utilizing already-known sources of information and success at word learning may be improved with age.



## Zachary Schroeder

*Faculty Advisor: Wendi Gardner*

### **Lovingkindness Meditation and Racial Prejudice: Maybe love really IS all you need**

Research suggests loving-kindness meditation (LKM) may be an efficient and pleasant way to reduce implicit racial prejudice. A Buddhist practice, LKM meditators practice releasing oxytocin while visualizing an array of people from loved-ones to strangers to enemies, drawing members of the outgroup into the ingroup. In this experiment, participants sent loving thoughts to someone they loved (e.g. grandparent) until they felt an oxytocin release and repeated the process with an assigned subject. This experiment sought to verify that a short LKM could significantly reduce implicit racial prejudice and to understand how adjusting the presentation of the meditation subject could increase this reduction. Students at Northwestern University ( $n=71$ ) were shown one of three gender-matched meditation subjects. All three were presented as fellow Northwestern students who were feeling lonely. In one condition the student was white, in one s/he was black, and in the third condition the black profile added information about their own compassionate tendencies (volunteerism). Thus, the first two conditions presented a student in need of compassion who varied on race, and the third depicted the outgroup racial target in need of compassion as explicitly compassionate him or herself. After the meditation, each participant completed a racial prejudice IAT. The results of this study indicate that LKM is an efficient and effective strategy for reducing racial prejudice and significant linear trend found between the three conditions, opening venues for further research that may lead to specialized curriculum to reduce racial prejudice.



### Abigail Schroeter

*Faculty Advisor: Brian Hoffman*

#### **Kinetics Studies of Cu (II), Zn (II), and ethylenediamine tetraacetate (EDTA) and Cu (II), Ca (II), and EDTA for the development of a greener calibration technique for Rapid Freeze Quench for Electron Paramagnetic Resonance Spectroscopy**

Rapid Freeze Quench (RFQ) is a technique that mixes two samples, such as an enzyme and its substrate, then rapidly freezes them to stop reactions and capture crucial transient states that can be measured by EPR and other methods. Most of these reactions proceed within milliseconds or microseconds, making it crucial that the RFQ apparatus mix and freeze samples on the proper timescale. RFQ calibration is often done using the reaction of metmyoglobin (Fe(III)) and azide, which has well defined kinetics but often requires large excesses of (highly toxic) azide, making it both an inefficient and expensive endeavor to calibrate RFQ. This work examines two systems utilizing the chelate, ethylenediamine tetraacetate, (EDTA): one with Cu(II) and Zn(II) and the other with Cu(II) and Ca(II) as cheaper, greener, and more user-friendly alternatives to the traditional system. The rates of these reaction were established via UV-Visible and stopped-flow UV-Visible spectroscopy. The kinetics of the Zn(II)/Cu(II)/EDTA system were too slow (100-1000 seconds) for use in RFQ but serve to establish the practicality of the basic approach. The rates for the Ca/Cu/EDTA were found to be tunable across 100 ms-100 ms time scales, which is within the time scales of interest. The study has established a simple method of EPR quantitation of Cu(II) species that matches the results from optical spectroscopy. Moreover, this work has also created a viable technique to study the kinetics of common metals and chelators using copper (II) as a counterion and chromophore.



### Priya Shankarappa

*Faculty Advisor: D Watterson*

#### **Structural and Physicochemical Characteristics of CYP2D6 Substrates and a Case Study of Aminopyridazine Compounds**

Aminopyridazines are a class of drugs that inhibit protein kinases responsible for activating glial pro-inflammatory responses. They offer potential therapies for neurodegenerative disease, and they also show favorable bioavailability and blood-brain-barrier penetrance. CYP2D6 is a metabolic enzyme, notorious for its genetic polymorphisms, which vary the enzyme's activity in different individuals. It complicates dosing and creates potential adverse effects for drugs that are CYP2D6 substrates, and substrate drugs are now rarely approved. Minaprine is a well-known aminopyridazine drug that was withdrawn as a result of CYP2D6-related side effects. Many analogs of minaprine have been found to be CYP2D6 substrates as well, but some are non-substrates. Structural and physicochemical characteristics were compared in substrate analogs and non-substrate analogs. Most compounds used were previously synthesized, but some were synthesized particularly for these experiments. The order of the amine was an important structural characteristic, while the pKa's of basic nitrogens on the compound were an interesting physicochemical property. While this project focuses on the chemical

space of aminopyridazines in relation to CYP2D6 metabolism, it serves a broader role of studying structurally underrepresented classes of compounds, important for cheminformatics pursuits.



**Olivia Shay**

*Faculty Advisor: Claudia Haase*

### **Psychological Well-Being and Cognitive Functioning in Mid- to Late Life: Findings from a National Sample**

Psychological well-being has been lauded as a protective factor against declines in health in late life. Despite this evidence, past research has not fully explored its potential benefits for individuals' cognitive functioning. The present study examined the relationship between psychological well-being (i.e., autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, self-acceptance) and cognitive functioning (i.e., executive functioning, episodic memory) as well as potential moderators of this relationship (i.e., age, socioeconomic status) in a national, cross-sectional sample of mid- to late life adults ( $N = 1760$ ). Regression analyses revealed a positive association between global psychological well-being and global cognitive functioning. Findings remained stable when controlling for age, sex, and socioeconomic status and did not differ across age or socioeconomic status. Additionally, strong associations were found between specific dimensions of psychological well-being and cognitive functioning (i.e., executive functioning and positive relations with others); however, autonomy, environmental mastery, and self-acceptance were the only dimensions of psychological wellbeing to be positively associated with all three measures of cognitive functioning (i.e., global, executive functioning, episodic memory). Overall, these findings contribute to our understanding of the importance of the relationship between psychological well-being and cognitive functioning throughout the life span.



**Christina Shehata**

*Faculty Advisor: Norman Wickett*

### **Comparing Bioinformatic Methods for the Detection of Positive Selection**

The complexity of life is influenced by organisms' adaptation by selection, which works to either conserve advantageous genes or acts directionally to propagate favorable mutations and exclude harmful ones. Detecting genes under selection is a crucial facet of biology that can identify candidate genes for specific phenotypes of interest. Thus, inferring positive selection in the plant genomes can improve the understanding of the evolutionary history and current biological forces acting upon certain species or populations. Here, I use the two methods in tandem for evidence of selection in *Artocarpus* (Moraceae) and to determine if the genes under selection are artifacts of the method used to detect them. dN/dS is a statistical test that measures the ratio of non-synonymous to synonymous base changes in a coding region of the genome and can therefore provide information regarding mutations that have become fixed along independent lineages. LSD (Levels of Exclusively Shared Difference) is a method that can identify branches of a population tree targeted by positive selection,

so it is likely useful in population genetic studies. Examining the differences between multiple methods to detect selection can be useful in identifying the strengths and limitations of each method, while providing information about the types of data for which a method is valid. Furthermore, the identification of candidate genes under selection can inform the development of improved *Artocarpus* cultivars to make best use of underutilized food crops in the near future.



**Kelly Shi**

*Faculty Advisor: Fashina Alade*

### **The Modern Imaginary Friend: Parasocial Relationships Through Face-to-Face Screen Interactions**

If you have ever felt a deep connection with a personality on a screen, this presentation is for you. Whether they're a talk show host, a beauty vlogger, or a big personality on a reality show, some on-screen personalities are just so charming that viewers consider them to be a friend, even though they've never met or talked outside of a screen. This one-sided engagement is called a parasocial relationship, a phenomenon that has become more prevalent with the rise of screen media. Scholars, culture critics, and parents alike all wonder whether these relationships are beneficial for viewers; while some argue that parasocial relationships can reduce a sense of loneliness or isolation, others claim that the relationships can lead to dependence on media or a lack of judgment when making decisions. However, the nature of parasocial relationships has evolved along with the growth of screen media. As screen entertainment has shifted from television to include digital platforms such as YouTube, parasocial relationships have become more interactive, intimate, and meaningful. By reviewing both empirical research and popular culture articles, this presentation will show that parasocial relationships with television personalities impact adults negatively, while those with vloggers (YouTube personalities) have a positive effect on young people. Not only does this finding answer questions about the positive or negative impact of parasocial relationships, but it also demonstrates how digital media platforms have a marked positive effect on viewers, especially in comparison with older platforms such as television.



**Jamilah Silver**

*Faculty Advisor: Evan Goulding*

### **Thematic Analysis: Implications for a Behavioral Intervention Technology for Bipolar Disorder**

Bipolar disorder is a chronic mental illness with high levels of morbidity and mortality. Combining adjunctive psychosocial with pharmacological treatment improves clinical outcomes; however, many individuals do not receive psychosocial treatment. Psychosocial treatments may be improved by developing tools that assist in utilization of self-management techniques. Smartphone applications have the potential to improve access to effective psychosocial treatments and provide improved self-management tools while also collecting daily self-report and behavioral measurements to further

enhance treatment. Obtaining users' feedback provides an opportunity to improve application design and the embedded intervention. A small field trial of LiveWell, a smartphone self-management application for bipolar disorder, was carried out with the primary goal of obtaining user feedback to improve the application and intervention. Audiotapes of exit interviews were transcribed, coded based on a priori categories addressing aspects of the application and intervention, and combined and sorted by the a priori categories to identify recurring themes as well as empirically developed subthemes. This analysis revealed that participants found the Daily Check-Ins useful for increasing awareness and guiding action. Participants also liked being able to personalize their Wellness Plan and viewed this as an important feature of the application. Some participants viewed the Foundations as too simple but still found some content useful. Some participants utilized all aspects of the application but some participants used only parts of the application, with the Toolbox being less frequently utilized. User feedback obtained on LiveWell provides a starting point for making improvements to the application and intervention.



**Rebecca Sinard**

*Faculty Advisor: Edith Chen*

### **Effects of Chronic Family Relationship, Friendship, and Home Life Stress on Childhood Asthma**

Previous research has demonstrated the multifaceted genetic, environmental, and psychological factors influencing childhood asthma. In particular, prior research has revealed the significant effects of genetics, cockroach allergen and cigarette smoke exposure, and general psychological stress on childhood asthma severity. However, little research exists exploring different types of chronic stress and their relationships with childhood asthma control and lung functioning. In this study, 308 children ages 8-17 with diagnosed asthma and their parents completed a variety of questionnaires and tests, including ones to assess asthma control, lung functioning, environmental exposures, and degrees of family relationship, friendship, and home life chronic stressors. Analysis of this data revealed that as expected, higher stress levels in each chronic stress subcategory correlated significantly with lower scores on asthma control tests (ACT). Contrary to expectations, none of the chronic stress subcategories correlated significantly with peak expiratory flow (PEF) values, which indicate a participant's lung functioning. Exploratory multiple regression analysis revealed that when the three chronic stress subcategories were entered simultaneously, only home life significantly predicted child ACT. Exploratory analysis revealed that home life stress predicted child ACT above and beyond environmental factors. These results are limited in their reliance on self-report and effortful tasks, but they encourage future research to extend the findings of this study by assessing change in chronic psychological stressors over time and associated changes in childhood asthma control and lung functioning.



**Evan Sitar**

*Faculty Advisor: Joel Rosenfeld*

**Effects of practice on Lukacs' (2016) countermeasures (CMs) to the P300-based Complex Trial Protocol (CTP) for detection of concealed episodic information from a mock crime**

The Complex Trial Protocol (CTP) has proven a robust concealed information test (CIT) in forensic analogs (Rosenfeld et al., 2008), with good accuracy and resistance to the countermeasures typically applied in CITs, which involve subject-generated secret responses to irrelevant stimuli. Meixner & Rosenfeld (2011) also reported the utility of the CTP in anti-terrorist situations in which planned but undone crime specifics are unknown. In this situation, investigators compare the largest with the next largest P300 response, (the “blind I-max test”) assuming the former to represent response to the (crime-relevant) probe item, and the latter to represent the response to the most salient irrelevant, the “I-max.” Lukacs et al. (2016), while replicating the major findings of the CTP in forensic situations in which the probe is known, developed a countermeasure technique which foiled the I-max test in anti-terror scenarios. This technique appeared to our lab as challenging for the subject and requiring considerable practice, as reported by Lukacs et al. Thus in the present study we compared 2 groups, a practice (P) group in which we tried to approximate the practice countermeasure training as in Lukacs et al (2016) vs. a non-practice (NP) group. The concealed information was episodic: stolen items in a mock crime (watch, bracelet, randomly assigned). Using the bootstrap method (Rosenfeld et al., 2013) to determine stimulus knowledge, 2/15 P and 6/16 NP subjects were detected as recognizing the stolen item.



**Sophie Spears**

*Faculty Advisor: Lauren Stokes*

**Good Girls Go To Heaven, Bad Girls Go Everywhere: A History of the Sex Workers Rights Movement in Post-War America**

This project aims to fill the gaps in feminist and AIDS history by examining both movements from the perspective of prostitutes. While prostitution is often cited as the world's oldest profession, there are very few historical accounts from prostitutes' perspectives in America until 1973. That year, feminist and former prostitute Margo St. James founded the first sex workers' rights organization, “Call Off Your Old Tired Ethics” (COYOTE). Its mission was the decriminalization of prostitution, although COYOTE came to represent much more than that. For over two decades, COYOTE made prostitutes visible, challenging society's limits on women's sexuality. It questioned the double standard which punished prostitutes but not their customers, encouraged open dialogues about sex and sexual health, and asserted that women should feel empowered by the exchange of money for sexual services. The criminalization of prostitution prevented prostitutes from forming a community and a sense of empowerment, but COYOTE's community efforts and harm reduction strategies throughout the 1970s and 1980s made space for prostitutes to come together and feel pride in their identity. Finally, in reclaiming the term “whore,” COYOTE attempted to bridge the gap between “good girls” and “bad girls,” weakening the patriarchy's ability to use the threat of being labelled a sexual deviant to

control women. Its outspoken defense of prostitutes undermined the victim narrative and returned agency to an isolated and disenfranchised social group.



**Victoria Steigerwald**

*Faculty Advisor: Richard Zinbarg*

**Investigating Self-Compassion and Empathy in the Context of an Internet-Delivered Mindfulness-Based Exposure Intervention**

It has been hypothesized that mindfulness-based programs with a primary focus on teaching self-compassion or empathy will have greater effects on self-compassion and empathy than will mindfulness-based exposure programs, which focus primarily on enhancing present moment awareness and reducing distress. However, because research on mindfulness-based exposure programs has centered on their potential to reduce distress and facilitate exposures, their effects on self-compassion and empathy are unknown. The current study's goal was therefore to determine the effects of the Working with Difficulty Meditation, a mindfulness-based exposure program, on self-compassion and empathy through an Internet-based treatment study. Five participants were randomly assigned to the meditation group or the waitlist control group, which waited two weeks before beginning the meditation. Once given access to the meditation, participants were asked to complete at least 10 meditations over 14 days. Participants in both groups also completed the Self-Compassion Scale and the Interpersonal Reactivity Scale at three time points, providing measures of self-compassion and empathy, respectively. Results indicated no significant increases in self-compassion or empathy for either group, with no significant interaction between group and time. These results fail to provide support for the meditation enhancing self-compassion or empathy, but, with five participants, the findings should be interpreted with caution. Additionally, because participant adherence appeared to be low, it will be important for future studies of related interventions to find ways to better monitor and encourage adherence.



**Angelina Strohbach**

*Faculty Advisor: Caroline Bledsoe*

**Reproducing Inequality: Disparities in Mobile Technology and Pregnancy Care for Low-Income Women in Chicago**

Mobile internet and communication technology has rapidly become ubiquitous in the United States. "Mobile health" or "mHealth" has just as rapidly been incorporated into health care and behavior. However, research considering how mHealth impacts the patient role within the doctor-patient relationship, as well as how it alters questions of "access" within mainstream healthcare, is still developing. This has been particularly under-studied for low-income women of color, who face an array of social and health disparities, especially with regards to obstetric care. Obstetrics not only presents extreme social and health disparities, but is also one of the most popular and sought-after areas of mHealth available today. This study analyzes two perinatal mHealth intervention programs



piloted within a Medicaid-only clinic in Chicago. I conducted a series of focus groups regarding a pregnancy smartphone application, in addition to analyzing transcripts from 200 SMS text message threads between postpartum patients and a patient navigator. Finally, I conducted 8 in-depth interviews with publicly-insured women about their experiences with mHealth and pregnancy care. Major themes included using mHealth due to a desire for continuity of care, consolidation of knowledge into a single source, and the idea that mHealth should allow for more individualized, humanizing interactions. I argue that critical medical anthropology and emerging fields like digital anthropology should take a role in assessing novel practices surrounding mHealth, in order to better understand new permutations of inequality and structural discrimination within pregnancy care and the healthcare system at large.



**Akshar Thakkar & Katlyn McGrattan**

*Faculty Advisor: Bonnie Martin-Harris*

### **Optimal Nipples for Efficient Barium Expression During the Videofluoroscopic Swallow Exam**

The videofluoroscopic swallow study (VFSS) is a procedure used to identify deficits in swallow physiology and bolus flow among bottle-fed infants. During the procedure infants are fed thin and nectar barium from their home bottle nipple. While these nipples enable efficient expression of milk, their small orifice size limits the expression of the more viscous barium. Nipples with larger orifices capable of expressing more viscous liquids are clinically available. However, it is unknown which of these nipples enables infants to express barium with the same efficient rate of flow as they achieve when drinking milk in their typical feeding environment. Flow rates of four bottle nipples (Dr. Brown's L1, L2, L3, L4) were calculated during the expression of formula, thin barium, and nectar barium using a pulsated pressure pump. Differences in flow rates across conditions were tested using ANOVA with post-hoc Dunnett's testing to identify the nipple that enabled thin and nectar barium contrast to flow at the same rates as formula with L1. Average flow rate for formula on a L1 was  $10.57 \pm 0.12$  mL/minute. Although L1 nipples yielded similar flow rates when expressing thin barium ( $9.77 \pm 0.13$  mL/min,  $p=0.45$ ), a L3 nipple was required to achieve similar rates with nectar barium ( $9.87 \pm 0.09$  mL/min,  $p=0.59$ ). Nipples with larger orifice sizes appear to facilitate efficient expression of nectar barium during the VFSS. Future investigations that develop standardized methods of conducting the VFSS among bottle-fed children are necessary to improve reliability and validity of the exam.



**Anna Tolley**

*Faculty Advisor: Cynthia Robin*

### **A Salty Survival: An Exploration of Resilience and the Maya Marketplace**

What roles did seemingly ordinary materials play in the longevity of cities, especially during a period of "collapse"? In this study I identify the existence of a marketplace where salt was a key trade good

at the ancient Maya city of Aventura. I utilize multiple lines of archaeological evidence, ceramic density analysis, microartifact analysis, and phosphorus analysis, to identify salt trade from a test excavation in a small structure in Aventura's central plaza. Identifying a marketplace at this site is significant in understanding the economics underpinning Aventura's survival through the period of the "collapse" in the Terminal Classic through the Early Postclassic (CE 750 – 1100). The presence of salt trade and a marketplace at Aventura provides evidence that the everyday parts of life, like trade and the consumption of salt, were critical to a city's success. The research results identify how everyday parts of life, such as salt, play critical roles in the success of cities through the identification of the high density of a salt associated ceramic vessel type compared to ceramic finds of other Aventura excavations, the identification of marine-intertidal shell types, and the presence of soil phosphorus levels indicative of human activity. These results give evidence for the presence of a marketplace thriving in Aventura at a time of "collapse," thus undermining theories of a Maya civic collapse and social degradation at the end of the ninth century CE.



**Brandon Vilarello**

*Faculty Advisor: Nina Kraus*

### **Neurophysiology in HIV+ individuals suggests a central auditory processing deficit**

Despite anecdotal reports of hearing difficulty associated with HIV infection, recent research finds no consistent link between HIV infection and hearing loss. However, tests of central auditory processing suggest a link between HIV infection and central nervous system (CNS) function. HIV infection can wreak havoc on the CNS because although antiretroviral therapies reduce viral load in the body, they do not effectively cross the blood-brain barrier. We hypothesized that poor neural encoding of sound underlies the auditory processing deficit associated with HIV. This project is an international collaboration with a clinic in Tanzania where researchers conducted objective tests of auditory function. These EEG-based tests include ABR (auditory brainstem response) and FFR (frequency-following responses), which are stereotyped waveforms that evaluate the auditory periphery and auditory midbrain, respectively, and can be used to find differences between subject groups by analyzing response timing, amplitude, and pitch processing. ABRs were identical between the HIV+ group and HIV- age- and sex- matched controls, suggesting that the auditory periphery is healthy. However, FFR analyses show reduced responses in peak amplitude in the HIV+ group relative to the controls. In particular, the responses to key pitch cues responsible for speaker identification and consonant differentiation showed significantly reduced amplitudes, suggesting a disruption in neural encoding of speech. Additionally, immune system function, measured by t-cell count, correlated with FFR peak amplitude. Together, these data support the idea of a CNS origin for auditory processing deficits in HIV+ individuals and corroborate anecdotal accounts of difficulty hearing in everyday listening environments.



**Emily Vogt**

*Faculty Advisor: Eric Schulz*

**The Cognitive and Economic Implications of Non-Medical Adderall and Related Prescription Stimulant Usage on College Campuses**

Non-medical usage of Adderall and related prescription stimulants has seen a marked increase over the past decade due to the alleged cognitive-enhancing effects from using these drugs. Current estimates show that, every day, 415 college students try prescription stimulants for the first time for non-medical purposes. Yet, existing research reveals little to no significant effect of these drugs on increasing cognitive capacity or performance of non-medical users. Thus, there likely exists some alternative explanation for why non-medical prescription stimulant markets continue to flourish on college campuses beyond this impression of cognitive enhancement. This within-design study of 30 non-ADHD users of prescription stimulants aimed to investigate whether there were any measurable changes in factors related to economic behavior that may underlie continued participation in these non-medical stimulant markets. These economic behavioral domains included risk preferences, discounting factors, and demand for related goods. To execute this, participants completed a series of identical cognitive and economic tasks during two separate time periods, one that occurred when they were on a prescription stimulant and one that occurred when they were sober. An analysis of variance (ANOVA) will be used to determine whether being on prescription stimulants played any statistically significant effect in modulating economic behavior across these specific domains.



**Angela Walwema**

*Faculty Advisor: Amy Iler*

**Understanding the Role of Flowers in Climate-Vegetation Feedbacks: A Case Study with a Subalpine Sunflower**

In high-elevation and high-latitude ecosystems, climate change has led to earlier snowmelt, an event that triggers the start of the growing season and thus creates a shift in phenology. Early snowmelt leads to earlier development of sensitive flower buds that are exposed to nighttime freezing temperatures and subsequent frost damage in some plant species, including the aspen sunflower (*Helianthella quinquenervis*). In years where *H. quinquenervis* flowers regularly in mid-July, open meadows in the Rocky Mountains appear to be showered with yellow due to the abundant bloom of this species. In years where *H. quinquenervis* flowers early, the emerging buds are damaged by frost and the meadow appears mostly green. I hypothesized that the lack of *H. quinquenervis* flowers decreases the amount of sunlight that the meadow reflects (i.e., lower albedo); lower reflectance may lead to higher soil temperatures, reduced soil moisture and increased plant water stress compared to plots with flowers still intact. I conducted a plot-level flower removal experiment to test these hypotheses in a subalpine meadow in the Colorado Rocky Mountains in 2017. I found that *Helianthella* flower petals reflect significantly more light than leaves, and this effect persists at the scale of the plot or meadow. *Helianthella* removal did result in a trend supporting the initial hypothesis, with slightly increased water stress in the removals compared to unmanipulated control plots, although this effect was not significant. Soil temperatures, however, did not differ between treatments.

Helianthella was not blooming as densely as it has in the past years, and effects of reduced albedo on soils and plants may be stronger when floral density is higher. Nonetheless, I found that a change in floral albedo is one of the multifaceted consequences of early flowering that has not been considered previously. Studies of how changes in climate affect vegetation and how vegetation then feedbacks to affect climate focus on green-up and ignore flowers as noise. This study provides preliminary evidence that flowers could play an important role in climate-vegetation feedbacks by altering the amount of light reflected from the Earth's surface.



**Shiwei Wang**

*Faculty Advisor: William Dichtel*

### **Self-assembly of imine-linked macrocycles related to 2D Covalent Organic Frameworks**

The interlayer interactions of two-dimensional covalent organic frameworks (2D COFs) are important for their formation but are ultimately poorly understood. An advanced understanding will help inform better control of the growth process and fabricate materials with higher crystallinity. Adapting the monomer design criteria, we have synthesized hexagonal imine-linked macrocycles that self-assemble into nanotubes and act as soluble structural analogs of 2D COFs. By introducing chirality via pendant side chains, we study the thermodynamics of macrocycle aggregation by variable temperature circular dichroism and UV-vis spectroscopy. We show that electron-donating substituents in the macrocycle backbone lead to enhanced stacking enthalpies, offering experimental support for previously reported calculations. The study of macrocycle self-assembly sheds insight into some of the fundamental stacking interactions of the extended 2D COF layers and will be used to inform future monomer design.



**Elizabeth Wayne**

*Faculty Advisor: Elizabeth Hurd*

### **Misrepresentations of the Irish Republican Army: A Critical Examination of Labeling Extremist Groups**

This paper is a scholarly correction for the assumption that terrorist groups, like the Irish Republican Army (IRA), can only have religious or political motives for violence. This notion is a common feature of literature on extremist groups, even though it relies on the questionable idea that religion and politics are separate entities. This paper created a new model for the IRA that examined its motives and the forces that control the narrative of one of the conflicts it fought in, the Troubles (1968-1998). What was found is that the “political” and “religious” motives of the IRA cannot be separated for easy labeling of the group. Insisting on such labeling erases part of the IRA’s identity and ignores the context from which the group arose. This model was also applied to two other groups embroiled in religio-political conflict: Falun Gong in China and the Islamic State in Iraq and Syria (ISIS). These groups show that the problems associated with labeling extremist groups continue to this day. A more holistic view of these groups, no matter how egregious their crimes, is essential for understanding why

these groups emerged, their popularity, and what work needs to be done so they do not resurface in the future. Extremist groups tend to arise out of a history of oppression. Reform is needed to address the economic and social position of marginalized peoples so they do not have to resort to violence because all other avenues are ineffective.



**Kandace Webb**

*Faculty Advisor: Michael Brook*

### **The Relationship Between Cognition and Violent Offending in a Prison Population**

Violent crime is a pervasive public health issue, and there is a growing body of literature that supports the etiological role of neurocognitive deficits in violent offending. Additionally, psychopathy has demonstrated relationships with both cognition and the likelihood of violent offending. While there have been many studies examining the relationship between neurocognitive deficits and violence, few have investigated multiple cognitive domains or comprehensively examined the effects of psychopathy on the cognition-violence relationship. In the present study, 99 adult male inmates at Lake County Jail were administered a neuropsychological evaluation for the domains of intelligence, attention, executive function, and language as well as questionnaires aimed at assessing psychopathy and other historical variables. The results indicated that scores on cognitive tests were not significantly associated with measures of violent offending. However, exploratory analyses indicated that black inmates had positive relationships between measures of attention and primarily convictions for violent offenses, while inmates of other races showed expected negative relationships between attentional scores and alternate measures of violence. The former group also scored higher on measures of psychopathy total and factor scores. However, psychopathy total scores attenuated only one correlation between attention and violence, which was in the combined racial group. These results suggest that race and psychopathy are important factors to consider when examining the cognition-violence relationship, and these factors may influence convictions. This is consistent with previous studies on prejudice in the criminal justice system.



**Benjamin Weinberg**

*Faculty Advisor: Laurel Yong*

### **Ballot Challenge: Explaining Voting Rights Restrictions in 21st-Century America**

Over the past decade, the United States has seen a wave of restrictive voting laws unprecedented since the passage of the Voting Rights Act in 1965. These laws make voting more difficult for more people, raising barriers that may depress turnout and disproportionately affect racial minorities and other vulnerable populations. This project examines restrictive voting laws passed since 2001 to understand what factors triggered this wave and to determine which states successfully restrict the vote. I use a duration analysis technique with a range of political and demographic variables to model when and why states adopt, and supplement this analysis with case studies in Iowa, Michigan, Washington, and Wisconsin. The results offer evidence that Republican lawmakers adopt restrictions quickly and

consistently upon gaining power, with adoption most probable in the year immediately following a switch to Republican legislative control. Anxiety surrounding electoral integrity in the wake of the 2000 election enabled bipartisan support to spark the first modern restrictions. This preceded a conservative push toward stricter, more strategic laws. These findings affirm that contemporary voting rights restrictions are a highly strategic and almost exclusively Republican maneuver. Likelihood of adoption is increased by some measures of historical electoral competition and moderated by sensitivity to the political and legal risk of restrictions. In order to protect voting rights going forward, advocates can focus on creating pressure via public opinion and electoral consequences, while shifting the argument toward voting reforms that place the burden of democratic integrity upon government, rather than citizens.



**Mariani Weinstein**

*Faculty Advisor: Dedre Gentner*

### **Metaphors Across Languages: Conventional and Novel Metaphors among Monolingual and Bilingual Speakers of Spanish and English**

People use and comprehend novel and conventional metaphors in everyday life. The Career of Metaphor hypothesis proposes that novel metaphors are processed by horizontal alignment (comparison), through repeated use a metaphorical category is formed, and conventional metaphors are processed through horizontal alignment (categorization). One type of evidence for this hypothesis is that English speakers prefer conventional metaphors in direct metaphor form (X is Y), whereas they prefer novel metaphors in indirect simile form (X is like Y). This study replicated the Career of Metaphor effect in another language (Spanish) and explored preference patterns in bilinguals. Monolingual English, monolingual Spanish, and high-proficiency English-Spanish bilingual speakers participated in a short online study in which they indicated grammatical preference for metaphors of four types: conventional in English but novel in Spanish, conventional in Spanish but novel in English, conventional in both, or novel in both. In Study 1, we replicated the effect of conventionality on form preference in English speakers with the new set of items, and in Spanish speakers for the first time. In Study 2, we found some suggestions that transfer of metaphorical conventionality across a bilingual's languages might occur. This study explores the promise of using cross-linguistic and bilingualism research to study metaphor theories and works towards developing sound methodologies for this purpose.



**Fiona Worsfold**

*Faculty Advisor: Luisa Marcelino*

### **Expansion and Analysis of new coral bleaching data for the 2016 Bleaching Response Index**

Coral reefs are some of the most productive and diverse ecosystems on earth due to a symbiotic association between two partners: the coral and dinoflagellate algae. With climate change on the rise, thermal stress is prevalent in coral reefs leading to the breakdown of the partnership (bleaching), the

likely death of the coral and the collapse of the reef ecosystem. However, bleaching susceptibility is highly variable among corals, where more resistant species may be able to acclimate climate-change induced thermal stress. In order to compare bleaching susceptibility among coral species, our lab has developed a bleaching response index which standardized bleaching responses from hundreds of surveys with disparate severity criteria and protocols. The initial bleaching response index compiled 374 coral taxa that underwent bleaching episodes throughout the world from 1982 to 2006. My URAP project involves expanding on that dataset to include more recent bleaching episodes and additional reef sites. I have been mining and standardizing 135,000 bleaching and mortality records from the Florida Keys from surveys encompassing 11 years (2005 through 2016). I coded in Matlab the equations previously published by our lab so that the records could be standardized. Mining this large dataset with dozens of coral species and 100s of coral communities that have been exposed to a few thermal stress episodes will help with the understanding of the role of biological differences versus environmental differences that explain differential bleaching among coral species. This results will amplify the effectivity and approach of coral conservation.



**Kenneth Xu**

*Faculty Advisor: Allison Skinner*

### **The Role of Exposure to Biased Nonverbal Signals in Acquisition of Implicit Social Bias**

Previous studies have demonstrated that one's implicit attitudes can be expressed through nonverbal behaviors during intergroup interactions. For example, people with relatively high levels of racial bias tend to show lower levels of nonverbal friendliness (e.g. less eye contact, fewer smiles) in interracial interactions (relative to same-race interactions). Further research on the relationship between these nonverbal signals and implicit attitudes has shown that even brief exposure to biased nonverbal signals can exacerbate one's existing implicit racial prejudices. In this study we expand upon previous literature on the effect of nonverbal signals, examining whether short-term exposure to nonverbal bias is sufficient for creating prejudice against groups/classes of people. We tested if exposure to positive nonverbal signals toward a member of one novel class of people (e.g. people of the same fictitious nationality) and negative nonverbal signals toward a member of another class of people would produce novel biases toward their entire groups. Although participants did not show significant biases in favor of the target of positive nonverbal signals' group in this sample ( $N = 77$ ), it does show a trend in the predicted direction,  $F(1, 75) = 1.43$ ,  $p = .236$ . Findings suggest that exposure to biased nonverbal signals in the context of social interactions with members of novel groups may be able to create novel group prejudices. In our ongoing work we are following up on this data with a substantially larger sample.



**Yufan Yang**

*Faculty Advisor: Evan Scott*

### **Modifying Nanoparticle Morphology and Surface Charge to enhance APC Targeting**

Due to their ability to be tailored for enhanced cellular targeting, nanoparticles (NPs) have emerged as advantageous vessels for controlled drug delivery. However, recognition by the mononuclear phagocytic system (MPS) presents a major obstacle for nanotherapy. Comprised of various phagocytic cells, the MPS removes NPs from circulation shortly after recognition, preventing NPs from efficiently reaching their target cells and reducing the intended therapeutic effect. Although some MPS cells can serve beneficially during immunotherapy and vaccination as antigen-presenting cells (APCs) capable of priming antigen-specific immune responses, their swift clearance of NPs is a major obstacle for nanotherapy in general. The most frequently employed method of enhancing NP targeting is to incorporate targeting ligands like antibodies and peptides, but this method has so far demonstrated minimal impact on nonspecific MPS clearance. Thus, there is currently a need for more precise methods of cell-specific NP delivery. An alternative strategy focused on modifying physicochemical properties—size, shape, surface chemistry, etc.—has recently demonstrated that preferential uptake of NPs composed of poly (ethylene glycol)-block-poly(propylene sulfide) (PEG-bl-PPS) by specific APC subsets can be achieved solely by varying the NP morphology. The property of surface charge can be adjusted through chemical functionalization of NP surfaces and has been demonstrated to influence NP biodistribution and cellular uptake alone. As it has yet to be explored whether additional physicochemical properties of NPs can synergize with morphology-dependent targeting, I propose using PEG-bl-PPS to form NPs with various combinations of morphology and surface charge to further optimize the cell target specificity.



**Chelsea Ye & Manon Petit**

*Faculty Advisor: Manijeh Razeghi*

### **Growth and Characterization of Gallium Oxide and Fabrication of Transistors**

A semiconductor is in between an insulator and metal and is the core part of modern electronics. Recently, the study of Ga<sub>2</sub>O<sub>3</sub> as a semiconductor has become of interest because it can potentially make devices that are anticipated to yield a further 100x improvement over the currently commercially used SiC. Ga<sub>2</sub>O<sub>3</sub> has a wide application field due to its high breakdown energy which could allow for use in high power electronic devices for energy savings. However, the growth of a usable yet cheap sample of Ga<sub>2</sub>O<sub>3</sub> has yet to be achieved. Various methods are used to grow Ga<sub>2</sub>O<sub>3</sub> in which we will be focusing on Metalorganic Chemical Vapor Deposition (MOCVD). MOCVD works by layering thin films of material over the given substrate. Growth is difficult because there are not many accessible substrates with the same structure as Ga<sub>2</sub>O<sub>3</sub>. Currently, growth is being done on the more accessible Al<sub>2</sub>O<sub>3</sub> which has an atomic structure mismatch with Ga<sub>2</sub>O<sub>3</sub>. This can cause imperfections and dislocations within the crystal. To determine the quality of the samples, numerous characterization steps are taken. Structural characterization is performed using an X-Ray Diffraction and Scanning Electron Microscope. Optical characterization is performed using photoluminescence. Electrical characterization is performed using Hall effect measurements. Currently, we have succeeded in



growing both p-type and n-type Ga<sub>2</sub>O<sub>3</sub>. Both p-type and n-type materials are needed to create more effective and efficient devices. Using these samples, we managed to fabricate novel transistors that had not been created before.



**Alberta Yoo**

*Faculty Advisor: Megan Wood*

### **Development of Reclamation and Reuse System in Agricultural Areas through the Use of IoT Communication and Drones**

With a large sphere of activity and ability to transfer data through wireless communication system, drones have proven to be more and more useful in both research and manufacturing. Whether by allowing researchers to collect measurements or filmmakers to attain aerial shots, the use of drone has allowed collection of real time data with minimum human intervention. In the field of agriculture, steady water levels and optimal crop conditions have been hard to maintain due to extreme and fluctuating weather conditions caused by global warming. By employing technology to gather data on soil moisture level and trigger appropriate response from water supply system, this paper constructs a water management method that only releases water when needed and requires minimum human labor in the process. With system and program designed through Arduino, this paper designs and tests various aspects of the model, gathering measurements through drone sensors, accumulating data through wireless communication, and enabling remote control of reclaimed rainwater supply through Smartphone application. The method was shown to be not only environmentally friendly and economically sound, but also user-friendly, as it allowed easy access and analysis of data and wireless remote control of water pumps through keys on the Smartphone application. The implications of this research are that through use of sensors, drones, and IoT communication, data can be gathered and used to trigger automatic response from various management systems, especially those in remote or hazardous areas that favor minimal human interaction.



**Emma Zblewski**

*Faculty Advisor: Peter Locke*

### **Safe Enough? Constructing Accessible, Inclusive Spaces at the Intersection of Queer Identity and Trauma**

My research investigated how Chicago community-based organizations navigate the intersection of LGBTQ+ identity and trauma, and attempt to create “safe spaces” to provide care. LGBTQ+ individuals are at heightened risk for victimization both through interpersonal violence and lifelong structural violence. Queer folks are not inherently damaged or traumatized, but the healthcare targeting such populations must be conscious of the overarching effect of trauma. The concept of a “safe space” is controversial in today’s culture. Within the queer community, it is utilized differentially to negotiate rules and expectations of the younger members of the group that defy binaries. I focused on the Center on Halsted, a historically LGBTQ+ institution in Boystown, at which I conducted

ethnographic research over the course of seven months. Through analysis of communications and policy documents, participant-observation sessions and semi-structured interviews with staff and volunteers, I looked at how organizational models and care structures work to reach target populations and locations in the city. Themes found were analyzed and discussed in a humanistic, ethnographic approach. Comparative analysis was done relative to Centro de Salud Esperanza, through semi-structured interviews and analysis of public relations and policy documents. I explored how trauma is conceptually utilized to provide competent care and shape organizational structure, as well as how conceptions of trauma and violence are used to negotiate, replicate, and challenge norms around inclusion, access, and safety. My research is contextualized in Chicago's history of institutionalized trauma, queer healthcare, and intersectional activism, as well as the present and its changing demographics.



## **∞ Guide to Oral Presentations**

## Oral Presentation Session One

11:00-12:30

### **Pushing the Boundaries of Art**

Lake Room (203)

**Moderator: Ryan Dohoney**, Bienen School of Music

**Cody Boukather**, “Queercore and Expansions in Technology”

**Matthew Griffin**, “The Man of Many Phases: Modern Myth in Marvel’s Moon Knight”

**Anzish Mirza**, “Activism through Street Artists: A Look at Banksy”

**Grace Pechianu**, “Thomas Mann’s *Doktor Faustus* and the Post-War Concerto”

**Caroline Spikner and George Estey**, “Jazz and Dance Improvisation in the Nutcracker Suite”

### **Advancements in Science and Engineering I**

Arch Room (206)

**Moderator: Magdalena Osburn**, Earth and Planetary Science Department

**Sahil Akolawala**, “Making Polymer Nanostructures Permanent for the Technology Industry”

**Hannah Dion-Kirschner**, “Calibrating Proxies and Reconstructing Climate in a Small Arctic Watershed”

**Alyssa Larios**, “Dopamine-Dependent Reinforcement Learning in D1 and D2 Striatal MSN Populations during Virtual Navigation”

**Ally O'Donnell**, “Electromagnet Optimization for Innovative Space Telescope Technology”

**Hadley C. Pfalzgraf**, “Enhancing Memory with Oscillating Sounds”

**Yilan Wang**, “Exploration of Backup Mechanisms for Mitochondrial Inheritance in *S. cerevisiae*”

## **Oral Presentation Session One,** *continued* 11:00-12:30

### **Understanding the Legacies that Shape Us** Rock Room (207)

**Moderator:** Axel Mueller, Philosophy Department

**Adina Goldman**, “In the Courtyard of Death: Lively Encounters in the Talmudic Cemetery”

**Chelsea Hammersmith**, “Future Periods: Digitized Menstruation and the Politics of Risk, Liberation, and the Self”

**Emily Kuttner**, “The Negotiation of National Identity through Public Murals”

**Jiayi Lu**, “Island Effect on Both Argument and Adjunct Extraction Wh-Questions in Mandarin Chinese”

**Vinay Patel**, “The Ethics of Anti-Colonial Violence”

### **Processing Politics and Media Influence** Armadillo Room (208)

**Moderator:** David Rapp, Psychology Department and the School of Education and Social Policy

**Rebecca Adler**, “Misinformation Across the Aisle: The Effects of Political Affiliation on the Reproduction of Inaccurate Ideas”

**Jueun Choi**, “Support for Internet Content Regulation among Citizens of Five MENA Countries: Lebanon, Qatar, Saudi Arabia, Tunisia, and the UAE”

**Megan Imundo**, “Experiences with ‘Fair and Balanced’ Discourse Can Mischaracterize and Misinform”

**Sumaia Masoom**, “‘Poised for Power’: Anti-Muslim Rhetoric, Identity, and the 2016 U.S. Election Cycle”

**Logan S. Peretz**, “How Hillary May Have Lost the White House: The Electoral Effects of Presidential Campaign Visits in 2016”

## Oral Presentation Session Two

1:00-2:30

### **Identity/Activism**

Lake Room (203)

**Moderator: Anthony Chen**, Sociology Department

**Ibtesaam Moosa and Habibah Abass**, “Beyond the Crisis: Integration of Rohingya Refugees in Malaysian Society”

**Sylvia Regan**, “Young, Gay, and Proud: Gay and Lesbian Youth in San Francisco 1978-1981”

**Paul Salamanca**, “‘Yellow Fever’ and ‘Sticky Rice’: A Mixed Method Investigation of Queer Asian Heterophily in Chicago”

**Shira Zilberstein**, “Space Making as Artistic Practice: The Relationship between Grassroots Art Organizations and the Political Economy of Urban Development”

**Liz Quinn**, “The Blame Game: The Role of Disgust in Hate Crimes against Gay Men”

### **Advancements in Science and Engineering II**

Arch Room (206)

**Moderator: Karen Smilowitz**, Industrial Engineering and Management Sciences Department

**Dipayan Banerjee**, “Optimizing Public School Transportation Systems by Modifying School Start Times”

**Katherine Braun**, “Quantifying the Annual Carbon Budget from a Rapidly Eroding Coastal Freshwater Wetland using Field and Model Data”

**Teddy Broeren**, “Mathematical Model of the Formation of Saturn's Rings”

**Amy Lieberman**, “Voice-Pitch Perturbation in Non-Clinical Psychosis Population”

**Christine Junhui Liu**, “How Does Preschool Music Experience Influence the Developing Brain?”

## **Oral Presentation Session Two,** *continued* 1:00-2:30

### **Engaging Conflict** Rock Room (207)

**Moderator: Richard Joseph,** Political Science Department

**Brandon Ayersman,** “Freedom Gates: Building Peace and Democracy in Liberia, 1988-2018”

**Emma Danbury,** “Organizational Discourse and its Effects on Modern Slavery”

**Grant Everly,** “The Security Mindset and the Limits of Rehabilitation in Prison”

**Jordyn Ricard,** “Emotional Behavior during Conflict and Marital Satisfaction: A Laboratory-Based Study of Married Couples”

**Nina Sedeno,** “Women, Armed Conflict, and Peace in Nepal”

### **Developing Challenges/Challenges to Development** Armadillo Room (208)

**Moderator: Lilah Shapiro,** School of Education and Social Policy

**Emily Harriott,** “Examining How Parents Language Abilities Relate to Toddler Language Abilities and Growth after a Pilot App-Based Language Intervention”

**Imani Wilson,** “Black Teachers Matter: The Decline of Black Teachers in the Educator Workforce, Why it Matters, and What Can Be Done”

**Anne Zola,** “These Boots Weren’t Made for Walking: Clothing Choices as a Form of Self-Objectification”

**Victoria Wee,** “Trust in College Administration and Student Well-Being”

**Jamilah Silver,** “The Role of Home Environment, Temperament, Family Warmth & Attachment: Moderators and Predictors between Exposure to Violence and Depressive Symptoms in Low-Income Preschoolers”

## Oral Presentation Judges

**Jaime Dominguez**, Political Science

**Michelle Driscoll**, Physics and Astronomy

**Candy Lee**, Journalism

**Cynthia Nazarian**, French and Italian

**Miriam Sherin**, Learning Sciences

**Ceci Rogers**, Journalism

**Patricia Vitt**, Plant Science and Conservation





## Oral Presentation Abstracts

*Alphabetical by presenter's last name*

## Habibah Abass and Ibtesaam Moosa

*Faculty Advisor: Hasan Mahmud*

### Beyond the Crisis: Integration of Rohingya Refugees in Malaysian Society

Some scholars believe that refugees eventually integrate into their country of settlement. We aimed to investigate this theory by interviewing two groups of Rohingya refugees who have been living in Malaysia for different periods of time. We chose Malaysia because it has a growing refugee population despite not being a signatory of the 1951 UN Refugee Convention. Have Rohingya refugees in Malaysia integrated into society? If so, how did they do it? This question is important because of its academic significance and humanitarian urgency. Over half a million Rohingya refugees have fled Myanmar since the 2017 exodus alone. The sheer number of Rohingya refugees warrants much attention in order to fully understand such a humanitarian crisis and to explore ways to improve their experiences and possibly to enhance their integration into their destination countries. In addition to field observation, we conducted semi-structured interviews with 22 Rohingya refugees with the help of a Rohingya translator. Our findings led us to the conclusion that Rohingya refugees have not been integrating into Malaysian society, primarily due to being considered illegal migrants by the Malaysian government. We also found very little difference in terms of integration between Rohingya refugees who have lived in Malaysia for longer periods of time. Thus, we argue that the length of stay in the destination country does little, if any, in allowing refugees' integration. Existing legal frameworks must be revised so that governments and international organizations can take greater initiatives to support refugees' integration that shape the lives of millions.



## Rebecca Adler

*Faculty Advisor: David Rapp*

### Misinformation Across the Aisle: The Effects of Political Affiliation on the Reproduction of Inaccurate Ideas

People are influenced by inaccurate text content, suggesting that evaluative processing does not resolve successfully during comprehension. Evaluative processing, however, has been demonstrated to be heightened when a political argument is supplied by a dissimilar political source. It is unclear whether political affiliation has an analogous effect for apolitical information. In the current study, we examined whether matches or mismatches between participants' and characters' political beliefs affect the use of apolitical, inaccurate statements. To do this, participants indicated their political affiliation, read a story (with either Republican or Democratic characters) that contained a mixture of inaccurate, accurate, and neutral facts, and then completed a questionnaire that asked about the facts mentioned in the story. Replicating previous work, participants often utilized inaccurate information they've read to subsequently answer general knowledge questions. We examined whether this pattern varied based on the similarity between participants and story characters in terms of political affiliation. Participants, regardless of similarity/dissimilarity to the characters' political affiliations, revealed analogous use of inaccurate information. Democrats were, however, perhaps more skeptical of the information, as they left more questions blank than Republicans. There were also differences in reading times, as a function of the reader's and narrator's political affiliation; specifically, Republicans read more slowly, and

reading times were longer with a Democratic narrator. These findings speak to the overall problematic consequences of exposure to inaccurate information. And while similarity/dissimilarity to the narrator did not have the expected effects, there do seem to be differences in processing which may warrant further examination.



**Sahil Akolawala**

*Faculty Advisor: Muzhou Wang*

### **Making Polymer Nanostructures Permanent for the Technology Industry**

To increase the capabilities of the computers we rely on, engineers are striving for methods to fit more wires and components on a single microchip. One possible way to achieve this is by leveraging the patterning of nanoscale block copolymer molecules (BCP), which hinges on their size, shape, and structural complexity on a single substrate. Once a desired morphology is obtained, Sequential Infiltration Synthesis (SIS) can secure polymers for templating or thin film layering. SIS use metallic compounds in the vapor phase to attach to multiple BCPs on the substrate, creating the permanent

nanostructure. Unfortunately, a commonly utilized BCP called poly(styrene-*b*-isoprene-*b*-styrene) (PS-PI-PS) is unable to undergo SIS, as it lacks a process-dependent functional group. Thus, this industry-standard BCP cannot be used for the above application. Therefore, my goal was to modify PS-PI-PS to work for SIS. I modified PS-PI-PS using thioglycolic acid and UV light, altering the carbon-carbon double bonds in polyisoprene with a sulfur atom and the functional group. PS-PI-PS lacks sulfur, so the atom was used to determine the extent of reaction ( $\text{C}\text{E}\text{a}$ ). Atomic composition was determined by X-ray Photoelectron Spectroscopy. Three parameters were tested: Acid concentration, photo-initiator mass, and UV time. I concluded that PS-PI-PS can be best modified using 3M thioglycolic acid and 75 mg of photo-initiator, achieving 20% modification of isoprene. This  $\text{C}\text{E}\text{a}$  is potentially sufficient enough for the implementation of SIS, which will be tested in upcoming experimentation. Thus, this BCP, and others that are structurally similar, could be used in nano-templating for industry.



**Brandon Ayersman**

*Faculty Advisor: Richard Joseph*

### **Freedom Gates: Building Peace and Democracy in Liberia, 1988-2018**

The building of peace and democracy in Liberia after a devastating civil war is a significant achievement in Africa. We have had the opportunity to study this process under the guidance of Professor Richard Joseph, who created the Carter Center's African Governance Program. Our research will contribute to the writing of a book on Liberia. This research has elucidated how the Carter Center intervention in Liberia evolved, and how it influenced the shaping of contemporary Liberia. We used a variety of materials to construct an untold narrative on the critical but understudied role the Carter Center played in ending the Liberian civil war and in the conduct of democratic elections. Our report tracks the Carter Center's involvement from the very beginning of the conflict in 1989, through various peacekeeping agreements and efforts, through the presidencies of Charles Taylor and Ellen Johnson Sirleaf, all the way up until today. We have had access to primary correspondences and interviews with many people in the country at the time, including Professor Joseph, U.S. President Jimmy Carter, and the warlord Charles Taylor. Our presentation will give an overview of the untold story of the Carter Center and how similar international and civic organizations shaped the struggle for peace and democracy.



**Dipayan Banerjee**

*Faculty Advisor: Karen Smilowitz and Jill Wilson*

### **Optimizing Public School Transportation Systems by Modifying School Start Times**

Every year in the United States, over \$20 billion is spent on transportation for public school systems. The Evanston/Skokie School District 65 alone budgeted nearly \$4 million for transportation for the 2017-2018 school year. As reusing a school bus to serve multiple routes is less expensive than assigning a unique bus to each route, transportation costs can be reduced significantly by staggering school start

times to facilitate reusing buses. Recent work models the simplified problem of minimizing the number of buses required to complete a set of morning school bus routes by shifting the start times of the associated schools. We extended these existing integer programming models by introducing features which reflect realistic facets of public school transportation systems. Our model considers the type of each school (e.g., elementary, middle, or K-8 school) and requires that all schools of the same type start within a certain time window. We also incorporate afternoon bus routes into our model, noting that optimizing a school transportation system requires us to concurrently minimize the number of buses required in the morning and the number of buses required in the afternoon. Using our model and data provided by District 65, we were able to assess potential transportation savings associated with various levels of modification to school start times in Evanston and Skokie. Ongoing work focuses on collaborating with District 65 to optimize other components of school transportation systems, and on developing improved solution methods for our existing model.



**Cody Boukather**

*Faculty Advisor: Ryan Doboney*

### **Queercore and Expansions in Technology**

Sadie “Switchblade” Smith, singer of the queercore band G.L.O.S.S. (“Girls Living Outside of Society’s Shit”) writes, “sellouts always argue that you need a bigger platform to get your message out, but the bigger your platform, the more watered down and compromised your message becomes, and then you are actually making things worse for queer people.” Martin Sorrondeguy, singer of the queercore band Limp Wrist writes, “It is tragic and pathetic, witnessing individuals and organizations act so desperately to ‘prove’ our ‘normalcy’ to the homogenous mall-goers of the world.” G.L.O.S.S. and Limp Wrist argue that mass-media has “watered down” their message; I further argue that mass-media and social media have fostered misrepresentations and misunderstandings of these groups within the hardcore-punk milieu. Queercore in the 1980’s was communicated through shows, fanzines, and flyers, so misinterpretations were not as prevalent as they are now; but, with the accessibility of the internet, the hardcore-punk and queercore scenes are now represented through social media platforms like Myspace, Facebook, YouTube, Instagram, Twitter, and Tumblr. These social media platforms heightened queercore’s popularity and gave way for users to skew a band’s message. Through attending four Limp Wrist shows, conducting numerous interviews, and examining older and newer forms of material evidence, I investigated how social media platforms have affected the reception of queercore ideas within the current American hardcore-punk scene.



**Katherine Braun**

*Faculty Advisor: Dan Horton*

### **Quantifying the Annual Carbon Budget from a Rapidly Eroding Coastal Freshwater Wetland using Field and Model Data**

Coastal freshwater wetlands are important components of the global carbon (C) cycle and are generally presumed to store C. Along Great Lakes shorelines, however, coastal erosion is transitioning these landscapes from C sinks to sources through the loss of wetland area and rapid export of stored C. No previous work has explored the impact of coastal processes on freshwater wetland C. Here, I modify a saltmarsh C budget model for use in freshwater coastal wetlands. I validate the model with data collected from a Lake Michigan wetland at Illinois Beach State Park (IBSP). The model generates the C budget by subtracting C export from C storage across three types of coastal environments: sand plains, wetland, and covered wetland. The inputs for C storage include the C inventory, which was quantified through elemental analysis on samples from nine sediment cores (average inventory: 126 kgC m<sup>-2</sup>), and wetland age (540-2,105 BP), which was determined through C-14 dating of basal wetland material. Inputs for C export include erosion rates and overwash extent, which were measured through ArcGIS analysis of aerial photographs and RTK-GPS topographic survey data collected in 2017-2018. The IBSP wetland at Transect A functions as a source of C during periods of high lake level and geomorphic change; the wetland exported over 10% of its C reservoir over seven months in 2017. This model shows that geomorphic change is a key component of freshwater wetland C budgets. Model output provides a means of prioritizing different wetlands for land management and conservation.



**Teddy Broeren**

*Faculty Advisor: Daniel Abrams*

### **Mathematical Model of the Formation of Saturn's Rings**

A definitive explanation for the existence of rings around Saturn has eluded astronomers and physicists for hundreds of years. Popular prevailing theories involve either an ancient moon getting destroyed and spewing its mass around the planet's atmosphere, or the formation of rings from the planetary nebula that created the planet itself. A major obstacle to confirming these theories is identifying the exact age of the ring system. It has been proposed that ring systems are a transient phenomenon, and that eventually all the gas giants will cease to have rings. Could a synchronization model adequately explain why some matter aggregated around Saturn to form moons, why some redistributed into rings, and whether this observation is only temporary? The Kuramoto Model for synchronization has been used to model many systems which have included fireflies, lasers, neurons, and heart cells. I have investigated whether the Kuramoto model can also be used to model the situation where numerous massive particles are gravitationally bound to Saturn and interact with each other through a series of collisions.



**Jueun Choi**

*Faculty Advisor: Jocelyn Sage Mitchell*

**Support for Internet Content Regulation among Citizens of Five MENA Countries:  
Lebanon, Qatar, Saudi Arabia, Tunisia, and the UAE**

Citizens in five Middle East and North African countries (Lebanon, Qatar, Saudi Arabia, Tunisia, and the UAE) generally support “content regulation” (similar to the Western view of “censorship”) on the Internet for political and culturally sensitive content: an average of 55%, according to the 2017 Media Use in the Middle East survey. However, Qataris have the lowest level of support among these countries: 31%. My research question is: Why do Qatari nationals have the lowest support for content regulation on the Internet? What makes them different? After carrying out my research, I argue that Qataris have a different perspective on content regulation from the other countries because of two reasons: Qatar’s relative political stability and the presence of the Al Jazeera Media Network. Besides analyzing the nationally representative survey data (n=6,169), I have also conducted my own survey with Qatari nationals (n=21), completed four face-to-face interviews, and used scholarly journal articles (e.g. Anzawa 2011; Davidson 2012; MacFarquihar 2009; Vogt 2002, etc.) to support my thesis. Besides a better understanding of the domestic politics and society of Qatar, my research is also useful because it investigates the overall trend in the MENA region that shows support for content regulation. Many in the West see content regulation as equal to censorship and interpret it negatively, but MENA citizens have a different, non-Western perspective towards government intervention in media. “Content regulation” is a relatively new research topic in the region despite its prevalence. Therefore, my research informs future academic research on how the locals interpret this term.



**Emma Danbury**

*Faculty Advisor: Sureshi Jayawardene*

**Organizational Discourse and its Effects on Modern Slavery**

Language, as an essential element of society, can be studied to understand its influence in the development of social issues. Through a critical analysis of discourse, we can see how language can both bolster or dismantle social hierarchies. Given its global scope and the ambiguity with which it is understood, the issue of modern slavery presents a worthwhile context in which to study the power of discourse. By applying methods of discourse analysis to the websites of two anti-slavery NGOs, this research seeks to better understand how the discourse used by organizations reflects the way they understand and respond to situations of enslavement in the modern day. A review of existing scholarship reveals that discourse from individuals and organizations often embodies one of two approaches to combatting slavery, a neo-abolitionist approach or a pro-rights approach, and that discourse promoting a neo-abolitionist view can have detrimental effects on enslaved and exploited individuals. The analysis examines the organizations’ nomination of enslavement situations, as well as how different actors are discursively constructed within website texts. It concludes that both organizations communicate a neo-abolitionist perspective in their rhetoric through the construction of victims and survivors as strictly passive actors, which could contribute to further exploitation of vulnerable groups in the long run. By further understanding the impact of discourse, those working

within the public interest sector may be able to craft their language in ways that produce greater positive results for the people they seek to help.



**Hannah Dion-Kirschner**

*Faculty Advisors: Magdalena Osburn and Yarrow Axford*

### **Calibrating Proxies and Reconstructing Climate in a Small Arctic Watershed**

Climate change is one of the most significant scientific problems humanity now faces, and Arctic amplification renders high-latitude environments unusually sensitive to climatic change. To understand how modern changes may impact the Arctic, we can examine Arctic paleoclimate through the lens of climate proxies. Plant lipid biomarkers and their hydrogen and carbon isotopic compositions yield valuable paleoclimatic information; however, many variables affect the production and preservation of lipid isotope signals, including precipitation amount and source, biosynthesis mechanisms, and sediment depositional processes. These variables are not well-constrained, particularly for high-latitude environments, where plants experience continuous light and cool temperatures during their short growing season. Here we present a study of lipid biomarkers in a single watershed in southwest Greenland. Our analytes from in and around Little Sugarloaf Lake (LSL) include terrestrial and aquatic plants, lake water, surface sediments, and a sediment core. This diverse sample set allows us to fulfill two goals: 1) We examine the production of lipids in the LSL watershed and determine what information can and cannot reliably be obtained from LSL lipid biomarkers. Our data challenge some common assumptions about plant lipid biomarkers. 2) We apply our modern calibration to the analysis of a 3500-year sediment core record. This geochemical record reflects a 3000-year period of relative stability followed by distinct contemporary change. Our work contributes to a better understanding of common paleoclimate proxies for research in southwest Greenland, and enables a well-constrained watershed-level reconstruction of late Holocene climate.



**George Estey and Caroline Spikner**

*Faculty Advisor: Susan Lee*

### **Jazz and Dance Improvisation in the Nutcracker Suite**

An academic year URG (2017) allowed the presenters to explore the intersection of jazz dance and jazz music improvisation through a production of Duke Ellington and Billy Strayhorn's arrangement of *The Nutcracker Suite*. The Nutcracker was used to test questions of improvisation in live performance. Through the process we held a series of improv jams with the musicians and dancers aiming to establish a space where the dancers and musicians are fully supporting each other in a spontaneous creative process. The musicians and dancers were asked to learn each other's methods of creating spontaneous performance. Inspired by the improvisation within existing structures that occurs when jazz musicians perform, three choreographers sought to develop ways in which improvisation could be genuinely integrated into choreographed dances. The choreography celebrated the wide variety of jazz dance styles, exploring whether some eras of jazz dance were more adept to



improvise with the musicians. While dancers grappled with moving between choreography and improvisations, the musicians were asked to expand the improvisational sections of the Ellington score to follow qualities and themes observed in the dance performance. Co-producers of “A Jazz Nutcracker,” Caroline Spikner and George Estey, will describe findings in terms of collaborative performance, the benefits and consequences of a multi-disciplinary collaborative rehearsal process, and the many questions which unfolded throughout the performance. They will then reveal how these findings will influence the next step of their research.



### **Grant Everly**

*Faculty Advisor: Heather Schoenfeld*

### **The Security Mindset and the Limits of Rehabilitation in Prison**

Current conversations on criminal justice reform have pushed for prisoner rehabilitation as a means to reduce recidivism; however, this rehabilitative emphasis often fails to account for how the security demands of a prison inherently conflict with rehabilitative goals. Drawing on 46 qualitative interviews (20 with prisoners, 15 with security staff, and 11 with other non-security or therapeutic staff) and 23 hours of program observation at a rehabilitative-oriented prison in a Midwestern state, I argue that the structure of the prison (i.e. its spatial arrangement and constant demand for security and safety) and the presence of a “security mindset” in security staff undermines rehabilitative efforts. The security mindset, including the pervasive distrust of prisoners, creates an endemic rift between security staff and therapeutic staff and a lack of respect between prisoners and security staff. Together, these relational dynamics create a negative environment that does not provide the positive support needed for effective rehabilitation programming. My findings suggest that the current call for rehabilitation in prison may be misguided, as prisons do not foster positive environments conducive to rehabilitative programming. Conversely, in order for rehabilitative programming to be feasible in a prison setting, the role of security must be re-conceptualized to account for both the security demands of a prison, and the long-term success of prisoners.



### **Adina Goldman**

*Faculty Advisor: Mira Balberg*

### **In the Courtyard of Death: Lively Encounters in the Talmudic Cemetery**

In late ancient Jewish writings, the dead can feel physical pain and experience the emotional sting of insult. They have ongoing relationships with the living, sharing money, gossip, and even tubes of makeup. My project explores these hazy boundaries between life and death in the Babylonian Talmud and related rabbinic literatures. Through close readings of Talmudic stories and statements, I outline a rabbinic conception of death as an extended leave-taking from living society that takes place over a year-long transitional period following burial. Talmudic “ghost stories” about encounters between the living and the dead shed light on the ways in which the living continue to rely on the dead and build shared community with them. This work helps fill a gap in scholarship on how late ancient people

imagined the experience of death. It offers a counterpoint to modern Western conceptions of life and death as completely opposed states, and pushes us to consider the ways the dead may still have roles to play in our lives.



**Matthew Griffin**

*Faculty Advisor: Sarah Taylor*

### **The Man of Many Phases: Modern Myth in Marvel's Moon Knight**

In the Marvel Comics series Moon Knight, a mercenary believes an ancient Egyptian deity has brought him back from the dead so he can become the eponymous superhero. However, the mercenary's symptoms of schizophrenia suggest he is instead simply suffering from a psychological break. From 1975-1999, Moon Knight stories used this psychological-religious tension to explore the significance of mythology and religion in modern society. For my research, I examined the way Moon Knight stories represent these religious themes relative to the work of religious scholars such as Mircea Eliade, who claimed that we live in a completely rational, post-mythic society. I also interviewed character co-creator and series writer Doug Moench, whose personal experiences with the supernatural influenced his writing of the character. Through my research, I found that Moench's Moon Knight stories argue that mythology and religion are alive and well in today's society, though they may appear in less traditional forms. This project ultimately supports contemporary research that claims seemingly secular popular culture in fact serves as a modern form of religious expression.



**Chelsea Hammersmith**

*Faculty Advisor: Amy Partridge*

### **Future Periods: Digitized Menstruation and the Politics of Risk, Liberation, and the Self**

In the last fifteen years, menstruation has become a new frontier of the tech world. The market has become saturated with period-tracking apps and—in the not-too-distant future—consumers will be able to purchase “smart” tampons and menstrual cups with embedded sensors that collect data about users’ cycles and relay that data to an app. In my project, I explore how and why these new modes of menstrual management have come to market. To what extent are these products markers of the cooptation of health and wellness into tech and commercial start-up culture? How does the speculative nature of start-up culture impact our conceptualization of health and wellness? How does this relate to the promotion of “self-tracking” as “self-care”? I selected three specific products for analysis: 1) Clue, a period-tracking app for iPhone and Android, 2) Thinx, a line of reusable, “period-proof” underwear, and finally, 3) the LoonCup, “the world’s first SMART menstrual cup.” I used the products themselves as well as their websites, social media, ads, and pamphlets for primary source analysis. I suggest that menstruation has been opened up to digitization and to the personal technology market because it has been newly understood both as a problem and as a site of possibility. However, I conclude while these products are signals of an increasingly neoliberal wellness culture based in self-optimization, above all, they are an experiment with living and

liberation: tools for the fundamental reimagination and restructuring of embodied relationships to the self and to life itself.



**Emily Harriott**

*Faculty Advisor: Elizabeth Norton*

### **Examining How Parents Language Abilities Relate to Toddler Language Abilities and Growth after a Pilot App-Based Language Intervention**

Children develop language at a remarkably rapid pace; there are a multitude of factors that can influence this pace, such as socioeconomic status, hearing loss, maternal responsiveness, and medical diagnoses. The purpose of this particular study was to investigate the effects of parental language abilities on child language development and growth, since little is known about how parent language may affect their child's development. Furthermore, even less is known about how parent language may affect their child's response to intervention, particularly a parent-directed mobile application-based intervention. English-speaking parents with toddlers aged 18-32 months utilized a mobile application designed to improve the quantity and quality of their language input to their child for 6 weeks. Families were representative of SES in the Chicago area. Parent language abilities and child language abilities were assessed pre-intervention, and children were assessed again 6 weeks later (MacArthur-Bates Communicative Development Inventories, Words & Sentences form). Partial correlations controlling for child age and family socioeconomic status revealed that parent nonword repetition was related to the child's total words pre-intervention ( $r=.287$ ) and that parent oral comprehension was related to the child's change in total words after intervention ( $r=.316$ ). Parent nonword repetition, oral comprehension, and picture vocabulary scores were also related to the child's initial sentence complexity score ( $r=0.373$ ,  $r=0.320$ ,  $r=0.467$ , respectively). Data has been collected from 15/20 planned dyads in this pilot study. These pilot results reveal that some parental language ability measures are correlated with child language development, even when controlling for child age and family SES. Funded by the Northwestern University Delaney Fund for Research in Communication.



**Megan N. Imundo**

*Faculty Advisor: David Rapp*

### **Experiences with 'Fair and Balanced' Discourse Can Mischaracterize and Misinform**

News presentations that offer both sides of a controversial issue, sometimes described as providing a "fair and balanced view," are often considered a key component of good journalism. But providing both sides of an issue can mislead readers into thinking that available empirical evidence equally supports the two sides when that need not be the case, resulting in a phenomenon known as false balance. If experts are inaccurately portrayed as being equitably divided on an issue, then the average reader may come to incorrectly believe that both sides of the issue are equally valid. To examine the impact of false balance on beliefs about the global warming debate, participants were presented with

texts containing either an interview with an expert holding a view consistent with scientific consensus, a source holding a contrarian view, both interviews, or control texts. As media outlets incorporate various types of sources in discussions on global warming, the contrarian source was either a credible climate expert, an expert in another field (known as a “fake expert”), or a non-expert. Results revealed that exposure to falsely balanced texts significantly lower readers’ perceived scientific consensus as compared to control texts when both experts are highly credible. Ratings of scientific consensus were also significantly lower when participants were exposed to the contrarian fake expert text compared to the control texts. These findings suggest that participants are somewhat attuned to source credibility when evaluating a source’s argument but may lack the ability to consistently discern when certain science backgrounds lend credibility to a source or topic and when they do not. Furthermore, the inclusion of contrarian messages can influence participants’ decisions, even when paired with information from more valid sources. Presenting two sides of an argument as equivalent, implicitly or not, can have problematic consequences for beliefs about the validity of those arguments. This is a challenge given journalistic traditions and procedures, indicating that “fair and balanced” views need to be considered with more nuance and supporting information.



**Emily Kuttner**

*Faculty Advisor: Jean Clipperton*

### **The Negotiation of National Identity through Public Murals**

Art is a reflection of our lives, and since our lives are inherently political, so, too, is our art. This paper analyzes the content of two community-initiated mural projects in Santiago, Chile and the government-initiated murals in Santiago’s metro stations to show how dominant and counter narratives of national identity are constructed and contested. Murals offer a visual rhetoric that both the state and the community use to shape the conception of “we.” Using the symbols in each mural to identify core themes, I find that “history” and “values” are the most frequent core themes of the community projects in La Pincoya and San Miguel, respectively, while “aesthetic” is the metro art’s most common core theme. I look at the history, creation process, and government engagement to explain the differences in the narratives. Since the government functions as a patron of the arts one would expect that at low levels of government engagement, a mural project shows a high level of counter narrative content, and vice versa, but not all the case studies in this paper fit this assumption. Using veto player theory and median voter theory, this paper shows that when the principle decision-makers’ interests are broad, a compromise process pulls the content towards a moderate middle, presented in universally-relatable social themes. Yet, when the principle decision-maker’s interests are cohesive, the content depicts an extreme high or low level of counter narrative content depending on the key decision maker’s interests.



**Alyssa Larios**

*Faculty Advisor: Daniel Dombeck*

### **Dopamine-Dependent Reinforcement Learning in D1 and D2 Striatal MSN Populations during Virtual Navigation**

When navigating through space, the brain must integrate sensory information with past experiences to choose behaviors that are most likely to produce a positive outcome. Striatal medium spiny neurons (MSNs) expressing dopamine receptor 1 (D1) and dopamine receptor 2 (D2) receive sensory and motor information from cortical and midbrain regions to modulate locomotion; how these cells are differentially activated in changing environments can contribute to sensory-dependent behavior selection. Dopamine release is evoked during unpredicted reward events, and training with a conditioned stimulus shifts the dopamine response from the reward to the reward-predictive stimulus [1]. Models of dopamine dependent reinforcement learning postulate that dopamine can serve as a “teaching” signal which can enable sensory stimuli to become associated with reward by strengthening and weakening synaptic connections onto MSNs. Modulation of dopamine release during reinforcement learning has differential long-term effects on D1 and D2 MSN activity patterns in the striatum which could be the basis for Go and No-go decision making in various environments [2]. Sensory stimuli that have consistently led to a positive outcome in the past would lead to strong long-term potentiation in D1 or long-term depression in D2 MSNs receiving repeated coincident glutamate and dopamine input, leading over time to repetition of movements leading to reward. Using fiber photometry, the activity pattern of D2 MSNs during virtual navigation was found to be different in familiar versus novel environment, while the D1 population maintained consistent firing patterns across sensory contexts.



**Amy Lieberman**

*Faculty Advisor: Vijay Mittal*

### **Voice-Pitch Perturbation in Non-Clinical Psychosis Population**

Patients with psychosis experience deficits in multisensory integration (MSI), or the communication between different sensory modalities, such as sound and sight. One way to assess multisensory integrations is by utilizing voice-pitch tasks in which participants hear the pitch of their own voice artificially altered by a computer. When healthy individuals hear this computerized pitch-shift, they respond behaviorally by changing their own pitch. This is a reflexive attempt to “correct” a perceived error, demonstrating communication between the sensory system and the motor system. While voice-pitch tasks have been used to assess MSI in patients with Parkinson’s disease (another population with emergent MSI abnormalities), it is unclear what responses on voice-pitch tasks look like in psychosis populations. One way to address this unknown question is to assess voice-pitch task performance in individuals with nonclinical psychosis (NCP) who are otherwise healthy but experience occasional psychotic-like experiences (PLEs). In the present study, a total of 36 participants (11 NCP and 25 controls) were asked to complete a voice-pitch task in which they held a constant and steady “ahh” sound. While vocalizing, they heard the pitch of their voice artificially shifted by a computer, and the task determined if they consequently shifted pitch in response to the stimuli. I then compared the

groups on magnitude and latency of the participant vocal responses, and predicted that the NCP group would exhibit abnormalities in their performance, demonstrated by greater magnitudes and longer latencies. Although results from the study were not statistically significant, the effect size and pattern of trends both suggest that with increased power, the NCP group may show deficits in sensorimotor integration, reflected by abnormal performance on the voice-pitch task when compared to controls. Studying integration patterns among at-risk samples and psychosis populations may identify a potential vulnerability marker relevant for understanding the pathogenesis of psychosis.



**Christine Junhui Liu**

*Faculty Advisor: Nina Kraus*

### **How Does Preschool Music Experience Influence the Developing Brain?**

The sounds of our lives shape our brains. Music experience, as a system of complex sound inputs, provides a theoretical and practical framework to study experience-dependent plasticity of auditory neurophysiology. Current research shows enhanced subcortical speech-sound processing and cognitive abilities in lifelong adult musicians compared to non-musicians; however, it is unknown whether these enhancements are evident in preschool-aged musicians. Given that our brain is most sensitive to experiences early in life, we hypothesize that even though preschool musicians have not had the extensive training of lifelong musicians, early musical training engenders similar enhancements in auditory processing and cognition. We examined neural responses to sound in 45 preschoolers (ages 3-5) by recording their frequency following response (FFR) to speech stimuli. Measured through EEG electrodes on the scalp, FFR is a response that originates largely from the auditory midbrain and provides a snapshot of one's auditory processing. In adults, musicians process speech sounds more quickly and have better representation of speech pitch, timing, and harmonics relative to non-musicians. We found that preschool musicians (n=23) with at least one formal active music activity (e.g., violin lessons) in the past year have enhanced encoding of speech harmonics, suggesting that their brains are better at encoding the fine details of speech sounds than non-musicians (n=22). Furthermore, this enhancement in speech harmonics processing correlates with their amount of musical training. We did not observe any musician enhancement in neural processing of speech pitch and timing, or cognitive measures. Accurate subcortical auditory encoding provides the cornerstone for language development and classroom learning. Thus, these physiological enhancements from early music training may boost language and cognitive abilities in preschool children.



**Jiayi Lu**

*Faculty Advisor: Masaya Yoshida*

### **Island Effect on Both Argument and Adjunct Extraction Wh-Questions in Mandarin Chinese**

Movements of wh-elements (e.g. “what”) to beginning of sentences are necessary for forming wh-questions in English. In contrast, Chinese is a language without overt wh-movement. This study supports existence of covert wh-movements in Chinese by showing that relative clause (RC)-island effect exists for both adjunct and argument wh-elements. In English, when wh-movements involve extracting wh-elements from relative clauses, the corresponding wh-question would be ill-formed (e.g. “What did I see the girl who ate?”). This relative clause (RC)-island effect is triggered only when movement exists. Based on informal judgments, it is previously claimed that RC-island prohibits argument but not adjunct extraction in Chinese, and thus putting the covert wh-movement analysis into question. In this study, we use an acceptability judgement task (n=56) and show that both types of extraction are affected by RC-island. We employ a 2×2×2 factorial design where Dependency-Length × Island × Wh-category are manipulated as independent factors. A linear mixed effects model reveals significant interactions of Dependency-Length × Island in both adjunct and argument conditions. There is no significant interaction of Island × Wh-category in long dependency conditions. There are two important findings. First, arguments show island effect. Second, the lack of interaction of Structure × Wh-category in long dependency conditions suggests that adjuncts are not more sensitive to islands than arguments. Our results support that all wh-elements in Chinese show sensitivity to RC-island. This supports the covert movement analysis of wh-elements in Chinese, and thus provide a new approach to understand Chinese wh-movement in theoretical linguistics.



**Sumaia Masoom**

*Faculty Advisor: Lilah Shapiro*

### **‘Poised for Power’: Anti-Muslim Rhetoric, Identity, and the 2016 U.S. Election Cycle**

In the years since 9/11, several studies have been conducted on the biophysical effects of discrimination on Muslim Americans, and the statistically demonstrated correlation between anti-Muslim rhetoric and acute mental health crises. However, this research leaves a gap in knowledge of how anti-Muslim rhetoric affects young Muslim Americans reaching adulthood almost two decades into the post-9/11 era, specifically with respect to their conceptions of identity, community and American political culture. This study aims to fill the gap through 15 interviews with Muslim American college students. Using grounded theory and critical discourse analysis, this study found that today’s Muslim youth view Islamophobia as a racializing ideology beyond just “fear of Islam” that deepens their sense of otherization. Further, though members of the Muslim Students Association may drift from the community over time, they continue to identify these groups as a significant foundation for the exploration of their Muslim identity, and often defer back to these groups in times of political strife for sanctuary. Politically, although they tend to be disheartened by both political parties’ current rhetoric about Islam, they identify the recent rise in anti-Muslim rhetoric merely an amplification of existing political rhetoric rather than a new development. Finally, in order to combat this rhetoric, the

students interviewed tend to agree that there must be an increase in political mobilization in the broader Muslim community; should they accomplish this shift in community dynamics, this study implies that they may truly be, in their own words, “poised for power.”



**Anzish Mirza**

*Faculty Advisor: Hariclea Zengos*

### **Activism through Street Artists: A Look at Banksy**

This project looks at street graffiti that calls for political change in government policies regarding the refugee crisis. It focuses on Banksy, and the politically charged messages conveyed through his artwork. Banksy's work spans from Britain to the Palestinian territories, encompassing and questioning social stigmas through a silent but visual means of protest. It looks at how he serves as an influential voice and representation for the refugee crisis, going against the single narrative that exists. This research looks at the tactics he employs in order to convey his message and the reaction he receives from the public. The research highlights specific pieces by Banksy, such as his mural of Steve Jobs and the iconic image of the girl from the musical *Les Miserables*. It examines the importance of the location of the artwork, his use of color, the messages behind the images that he uses, as well as his incorporation of technology and social media. It also emphasizes the importance of the artwork for the community it is painted in. Banksy's artwork has become a signature which is recognized worldwide. It is interesting to observe how he promotes conversations about the refugee crisis and tries to diminish the umbrella of the single narrative by trying to diversify and humanize the victims portrayed by mainstream media and regenerating interest through the silent protest of street art. In conclusion, the research determines how the effect and impact of art differs from the written word.



**Ally O'Donnell**

*Faculty Advisor: Melville Ulmer*

### **Electromagnet Optimization for Innovative Space Telescope Technology**

In our technological age, we use objects that contain electromagnets every day, yet there is little documentation on how to optimize them. Commercial electromagnets are widely available and typically more powerful than handmade ones. Using extensions made of a highly permeable metal, an electromagnet's field can be focused and magnified. The first step of the project was to determine which configuration of electromagnets was advantageous: two concentric pole electromagnets, two dual-pole electromagnets or two dual-pole electromagnets with a yoke. The second step was to determine the ideal geometry of extensions for the electromagnetic poles. The final step was to machine the optimal pole extensions from a highly permeable metal. Computer animated designs were developed using Siemens NX and simulations were run with these designs using COMSOL Multiphysics 4.4. The best electromagnet configuration was determined to be the two dual-pole electromagnets with a yoke. After testing around fifty geometries, the best one was determined to be a rhombic, trapezoidal prism. The new design was theoretically and experimentally proven to increase



the magnetic field strength. This work is clear evidence that existing commercial electromagnets can be optimized to produce a higher magnitude and more focused magnetic field. With further research, this work could be generalized to a wider variety of electromagnet configurations.



**Vinay Patel**

*Faculty Advisor: Axel Mueller*

### **The Ethics of Anti-Colonial Violence**

Colonialism was a primordial sin in the structuring of oppressive societies globally. Not only do the colonized endure the worst forms of exploitation, slavery, and genocide, the socially ingrained narrative of the colonizer's superiority makes oppression seem natural and informs an inferiority complex in the colonized mind. Mahatma Gandhi proposes disciplined, nonviolent resistance (satyagraha) as a solution, keeping the colonized on the morally righteous path and inspiring the colonizer to recognize their errors with universal love. Frantz Fanon defends violence as integral to restoring the dignity of the colonized and totally eschewing the colonizer's political and ideological grip on society. The brutality and perniciousness of colonial violence demands a special ethical consideration of violence in resistance. This discussion evaluates the insights offered by Gandhi and Fanon into the ethical status of violence, highlighting the psychological harms of colonialism, the ethics of self-defense, and pragmatic considerations of violent and nonviolent anti-colonial resistance. I argue that for the specific purpose of decolonization, violence should not be a forbidden tool because it is more likely to address the problems that allow colonial violence to sustain itself. This presents a challenge to the popular representations of various social movements working to challenge problems which stem from colonialism.



**Grace Pechianu**

*Faculty Advisor: Jesse Rosenberg*

### **Thomas Mann's *Doktor Faustus* and the Post-War Concerto**

The medieval Faust legend inspired the composition of numerous literary, artistic, and musical works. Within the last twenty years, large-scale concertos for solo instrument and orchestra were written by Hans Werner Henze and Geoffrey Gordon, for violin and violoncello respectively, with Thomas Mann's novel *Doktor Faustus* specifically in mind. In *Doktor Faustus* (1947), the traditional character of Faust — the man who sells his soul to the devil for supernatural powers — is transformed by Mann into the fictional composer Adrian Leverkühn, who sells his soul to the devil for 24 years of inspired creativity. Most musical adaptations of Faust-material feature vocalists. The appeal of *Doktor Faustus* for creators of concertos, a genre never before associated with the Faust legend, thus invites deeper exploration. My examination of both works revealed that each captures the mockery of Faust figure Adrian Leverkühn by parodying traditional musical styles, form, and development. In this manner, the voice of the solo instruments assumes the identity of multiple characters, communicating multiple

narratives, as suggested by composer Geoffrey Gordon. Moreover, harmonic and formal structures discerned through original analysis indicated that both concertos referenced Leverkühn's fictional musical compositions and may function as partial realizations of these compositions, thus presenting diegetic implications. Musical adaptations of Mann's *Faustus* pose a unique opportunity for composers and performers, as Leverkühn invites the display of technical mastery in performance, while the concept of *Faust* as a composer challenges artists to transcend musical and earthly boundaries of form within their works.



**Logan S. Peretz**

*Faculty Advisor: Mary C. McGrath*

### **How Hillary May Have Lost the White House: The Electoral Effects of Presidential Campaign Visits in 2016**

Following her loss in the 2016 election, Hillary Clinton came under fire from political pundits who attributed her defeat to a failure to visit key swing states like Wisconsin and Michigan. Did Secretary Clinton's strategy on the ground cost her the election? This thesis investigates the electoral effects of campaign visits by Donald Trump, Hillary Clinton, and Gary Johnson and identifies if visits to a county during the 2016 Presidential Election increased a candidate's share of the vote in that county. The analysis is based on an original dataset of all visits by the major candidates between September 1st and Election Day 2016, disaggregated by the county level. A series of Ordinary Least Squares (OLS) regression models provide a foundation for analysis, while a Nearest Neighbor matching model provides a robustness check. The results imply that Secretary Clinton's visits in the later part of the campaign had a positive effect on her vote share in places she visited, while no significant effect was observed for Trump or Johnson. To this extent, the pundits' criticism appears to have been well founded. Given the incredibly large amount of limited resources that presidential candidates dedicate to holding such campaign stops, this work shows that campaign visits can be well worth the investment, depending on the candidate.



**Hadley C. Pfalzgraf**

*Faculty Advisor: Ken A. Paller*

### **Enhancing Memory with Oscillating Sounds**

Memory functions are associated with various oscillations of electrical activity in the brain, and disruptions of those rhythms can be observed in many neurological syndromes. Oscillations at the theta (3-7Hz) frequency, in particular, are thought to play a particularly important role in memory, but the precise connection of this rhythm to neural function is still unclear. In previous studies, theta oscillations have been induced in the brain through transcranial Direct Current Stimulation (tDCS) and repetitive Transcranial Magnetic Stimulation (rTMS). We hypothesized oscillatory auditory stimulation could also entrain theta rhythms and help shed light on the connection between theta and memory. In the current study, the intensity of pink noise was modulated at specific frequencies while

pictures of objects were presented on a grid background. Each object was consistently paired with one of three types of pink noise. The 60 objects were distributed evenly into the three sound conditions – control constant noise, 4Hz-modulated noise (theta), and 15Hz-modulated noise (beta). Overall, stimulation influenced both oscillations and memory. EEG recordings indicated higher theta while 4Hz noise was playing and higher beta while 15Hz noise was playing. Further, the locations of objects in the 4Hz condition were remembered better than those in the control and beta conditions. We also found a positive relationship between the magnitude of theta entrainment and memory accuracy. Oscillatory auditory stimulation thus holds promise for counteracting some of the memory impairment that is found in neurological disorders such as Alzheimer’s disease.



**Liz Quinn**

*Faculty Advisor: Sylvia Perry*

### **The Blame Game: The Role of Disgust in Hate Crimes against Gay Men**

In hate crimes committed against gay men, victims are often blamed for provoking the violence. This argument is the cornerstone of the infamous “gay panic defense,” which legally legitimizes this behavior in 48 U.S. states. Until now, the role of disgust has yet to be explored in blame attribution in hate crimes. The purpose of the current research was to examine the relationship between disgust and blame attribution in hate crimes against gay men. The result of a correlational study ( $N = 252$ ) indicated that increased implicit gay-disgust associations predicted increased blame attributed to the gay male victim of a hate crime. Although implicit gay-disgust associations were unrelated to defendant blame, implicit gay-disgust associations were associated with judgments about whether the hate crime statute should be applied. Consistent with my preregistered hypotheses, as implicit gay-disgust associations increased, perceptions that the homicide constituted as a hate crime decreased. In Study 2 ( $N = 611$ ), disgust was experimentally manipulated. As predicted, we found that inducing disgust resulted in a decreased perception that the homicide constituted a hate crime. We also found that the disgust induction moderately increased victim blame. The current findings support the notion that implicit gay-disgust associations are associated with victim blame in hate crimes against gay men. Moreover, our experimental findings provide causal evidence that heightened disgust reduces willingness to apply the hate crime statute when the victim is a gay man.



**Sylvia Regan**

*Faculty Advisor: Amy Partridge*

### **Young, Gay, and Proud: Gay and Lesbian Youth in San Francisco 1978-1981**

In 1979, twenty young men and women from across the San Francisco Bay Area came together to form the Gay Youth Community Coalition (GYCC) with the goal of fostering a vibrant gay youth community. This project uses archival analysis of newsletters, flyers, and organizational notes from the GYCC to theorize how these young people articulated a unique Gay Youth identity in the face of homophobic and ageist oppression. Focusing on the GYCC’s participation in San Francisco’s Gay

Freedom Day Parades and the 1979 March on Washington for Lesbian and Gay Rights, this research unveils how gay youth both participated in and resisted the politics of the larger, implicitly adult, gay movement. This project explores the radical implications of these young people proudly asserting a gay identity and even advocating for the abolition of age of consent laws during a period of anti-gay backlash and moral panic over youth sexuality. This backlash, exemplified by Anita Bryant's "Save Our Children" campaign and the Briggs Initiative in California, incited hysteria over the threat of gay men corrupting boys into the homosexual lifestyle. Consideration of gay youth activism broadens our historical understanding of gay organizing in San Francisco and on a national scale in this critical time period. As this research shows, the GYCC's identity-specific premise, paired with its radical, liberationist demands for social change, complicates historical theorizations of the demise of Gay Liberation and New Left politics and the rise of gay identity politics by the mid-seventies.



**Jordyn Ricard**

*Faculty Advisor: Claudia Haase*

### **Emotional Behavior during Conflict and Marital Satisfaction: A Laboratory-Based Study of Married Couples**

Negative emotional behaviors, such as criticism, defensiveness, contempt, and stonewalling, that spouses may show during conflict, are key predictors of marital dissatisfaction. Existing research has focused on middle-class couples, but little is known about how these negative emotional behaviors predict marital satisfaction among couples from socioeconomically diverse backgrounds. The present laboratory-based study sought to address this gap in the literature. Thirty-seven married couples (74 spouses) from socioeconomically diverse backgrounds (age:  $M = 41.98$ ,  $SD = 10.42$ ; household income:  $M = \$50,001$ – $\$75,000$ , range: Less than  $\$20,000$  to Greater than  $\$150,000$ ; 44% African American) engaged in an unrehearsed 10-minute conversation about an area of disagreement in their marriage while they were being videotaped. Negative emotional behaviors (i.e., criticism; stonewalling; contempt; defensiveness) during the last 30 seconds of the conflict conversation were objectively coded on a second-by-second basis by trained raters using the Specific Affect Coding System based on a gestalt of facial expressions, body language, voice, and content (average interrater reliability: .75). Marital satisfaction was measured using a well-established questionnaire (15 items;  $\alpha = .83$ ). Correlation analyses showed that criticism (but not defensiveness) behavior was associated with lower marital satisfaction. Stonewalling and contempt behavior occurred very rarely during the 30-second coding period and thus were not included in the present analyses. Findings provide initial evidence that, across SES levels, objectively coded "thin slices" of criticism behavior during 30 seconds of a conflict conversation can be used to understand how happy spouses are with their marriage overall. Directions for future research are discussed.



**Paul Salamanca**

*Faculty Advisor: Anthony Chen*

**‘Yellow Fever’ and ‘Sticky Rice:’ A Mixed Method Investigation of Queer Asian Heterophily in Chicago**

While there has been some large-scale quantitative research on patterns of romantic and sexual partnering within the field of Sociology, this research has not focused extensively on queer populations. On the other hand, quantitative network investigations outside of Sociology have looked at queer romantic and sexual networks, but have not extensively studied queer Asians. This undergraduate thesis explores quantitative differences in the partnering practices of Asian and non-Asian queer men in Chicago using a large, novel dataset of romantic and sexual networks. Quantitative findings indicate, among other findings, that queer Asian men are significantly less likely to have homophilous partnerships, where their partners share their racial identity. While this quantitative analysis is able to show broad trends among queer Asians in Chicago, it is unable to add insight into what these trends look like on the ground and the meanings queer Asians attach to their partnerships. Thus, I also conducted 17 qualitative semi-structured interviews, and qualitative analysis was put into conversation with quantitative findings. I analyzed the interviews from the perspective of a Sexual Fields Theory. Participants saw themselves embedded within queer Chicago communities that valued traits associated with white masculinity, and were aware of that social structure when they were looking for partners.



**Nina Seden**

*Faculty Advisor: Lisa Buchter*

**Women, Armed Conflict, and Peace in Nepal**

The goal of this research paper is to analyze concepts of armed conflict and peacebuilding from a gender perspective using a feminist epistemology approach. I examine the impact of armed conflict on women, and the implications of women's roles in armed conflict and in peacebuilding processes post-conflict. In doing so, I raise the question of how situations of armed conflict and peacebuilding influence women's empowerment and contribute to the social transformation of predominantly patriarchal societies post-conflict. Combining both a media and textual analysis of secondary sources, I explore this question in the case of Nepal, a country that experienced armed conflict from 1996-2006 and is undergoing reconstruction. Using these methods, my main findings are that while armed conflict afforded women greater roles and opportunities for empowerment, these enhancements were not sustained in the post-conflict period. Furthermore, while peacebuilding was perceived as a unique opportunity for women's empowerment, gender inequalities persisted. These findings highlight the need for a better understanding of the implications of women's contributions, agency, and empowerment for the prevention of future conflict and societal transformation that warrants future research.



**Jamilah Silver**

*Faculty Advisor: Mark Reinecke*

**The Role of Home Environment, Temperament, Family Warmth & Attachment:  
Moderators and Predictors between Exposure to Violence and Depressive Symptoms in  
Low Income Preschoolers**

Several factors are associated with vulnerability for depression in adolescence including exposure to violence, temperament, secure attachment, and family warmth. Relationships between these variables and depression in preschool youth has received little study. Studies are needed in preschool aged children to investigate whether correlates of depression are contributors to early onset depression. This study examined the relationship between depressive symptoms, exposure to violence, personality, and home environments among a cohort of low income preschool children. Primary caregivers of preschoolers in Head Start programs in Chicago participated in a comprehensive online questionnaire. Caregivers were questioned about their children using structured measures to derive levels of home chaos, family warmth, temperament, exposure to violence, attachment, and depressive symptoms. Findings confirmed that low income preschoolers exhibit symptoms of depression. Analyses examining the influence of exposure to violence on preschoolers' number of depressive symptoms demonstrated that exposure to violence predicted depressive symptoms. Further, analyses revealed that home chaos and negative affect are statistically significant for predicting the number of depressive symptoms. Findings outline the key role of exposure to violence, personality, and home environments in preschool onset depression. This finding in a preschool sample provides support for the hypothesis that similar factors contribute to both adolescent and preschool depression. Findings indicate that these factors may have increased importance as moderators and predictors of risk in younger age groups. Findings also suggest that these factors should be considered key targets for early intervention in early depression.



**Yilan Wang**

*Faculty Advisor: Laura L. Lackner*

**Exploration of Backup Mechanisms for Mitochondrial Inheritance in *S. cerevisiae***

Mitochondria play significant roles in many cellular processes and cannot be generated de novo, therefore defects in mitochondrial inheritance during cell division can cause mitochondrial deficiency, which leads to severe cellular dysfunction. In yeast, two organelle-specific adaptor proteins Mmr1 and Ypt11 work in parallel to facilitate mitochondrial transport into daughter cells via the motor Myo2. Deletion of both genes causes a severe growth defect rather than lethality, implying the existence of backup mitochondrial inheritance mechanisms. To gain insight into alternative mitochondrial inheritance mechanisms, I created a conditional *mmr1-AID ypt11Δ* strain, in which Mmr1 can be depleted in the presence of auxin, to conduct a high-copy suppressor screen. I identified the following genes which, when overexpressed, can suppress the slow growth phenotype by rescuing mitochondrial inheritance: three peroxisomal genes (PEX34, INP2, PEX3) and genes of unknown function (YJL118W). Quantifications of live-cell fluorescence microscopy images indicate that the inheritance of mitochondria is significantly increased when PEX34 and INP2 are genomically overexpressed. The

morphological phenotypes of mitochondria and peroxisomes suggest two mechanisms for the suppression: 1) Pex34 is involved in the mitochondrion-peroxisome tethering complex and overexpression of PEX34 dramatically upregulates the tethering for mitochondria to “hitchhike” via inter-organelle contact; 2) overexpression of INP2 may mis-target this peroxisomal Myo2-adaptor protein to mitochondria and leads to nonspecific organelle trafficking mediated by Myo2. Given the importance of mitochondrial positioning to cellular function, insight gained from my project may be translated to develop cures for the numerous diseases in which defects in mitochondrial positioning have been associated.



**Victoria Wee**

*Faculty Advisor: Wendi Gardner*

### **Trust in College Administration and Student Well-Being**

First-generation college students (FGC) and college students from low socioeconomic backgrounds (SES) overcome great hurdles to get into college and continue to face challenges throughout their postsecondary education. Northwestern University as an institution often celebrates its commitment to socioeconomic diversity, but what’s more important is how students perceive this support – if it’s sufficient, if the university is active in creating this support, and if the university is equal in how it supports all students. The present study tracked 57 Northwestern students across the socioeconomic spectrum. Students completed questionnaires about their trust in the campus administration and services, likelihood of utilizing campus services, and measures of well-being. Analyses include the relationship between trust and student well-being, whether SES impacts this relationship, and determining the pathways in which the relationship may exist. Although low-SES and high-SES students do not significantly differ in their levels of trust in the university, low-SES students report significantly lower well-being, which is correlated with trust. Low-SES students also perceive less institutional commitment to socioeconomic diversity, which is a predictor of trust. However, low-SES students’ trust and well-being benefit greatly from various levels of advising. The study’s findings have implications on what schools can do to make the transition into college and overall college experience psychologically easier and academically more successful for students, particularly those who are FGC or low-SES.



**Imani Wilson**

*Faculty Advisor: Lilah Shapiro*

### **Black Teachers Matter: The Decline of Black Teachers in the Educator Workforce, Why it Matters, and What Can Be Done**

The term “diversity” floods rhetoric regarding education reform. Unfortunately, when it comes to the teaching force, attention to diversity has not extended far beyond assuring that non-white teachers exist. Such “checkbox diversity” ideologies produce policies disconnected from the unique challenges and experiences minority teachers face. This disconnect has been linked to lower retention rates for

Black teachers. Yet little research has sought to understand the experiences of Black teachers, which could provide insight into the Black teacher shortage. My project focuses on Black teachers' experiences, as informed by eleven 90-minute interviews and eight, hour long class observations with self-identifying Black teachers at a large, suburban high school. These data help identify the roles they fill and contributions they make to their students, schools, and communities, with findings that can contribute to broadening local and national conversations about the value of Black teachers beyond their mere existence. By examining the links between race and school environment, I aim to highlight the environments and conditions under which Black teachers thrive and struggle. My analysis indicates that Black teachers take on a number of roles positioning them to better connect with and care for their students, and to push for equity within their schools. I also find that Black teachers thrive in environments where they feel whole and supported, and struggle when their voices or abilities are discounted, or when they feel insecure about their jobs. These findings can inform the development of strategies designed to prepare and support Black teachers.



**Shira Zilberstein**

*Faculty Advisor: Anthony Chen*

### **Space Making as Artistic Practice: The Relationship between Grassroots Art Organizations and the Political Economy of Urban Development**

Standard narratives on the relationship between art and urban development detail art networks as complicit agents in processes of upscaling and gentrification connected to the political and economic elite. My research challenges the conventional narrative by investigating the relationship between grassroots art spaces, tied to local, community based interests, and the urban political economy of development in the Chicago neighborhood of Pilsen. Using archival, ethnographic and interview methods, I investigate three art networks – mainstream, do-it-yourself and Latinx – to contrast the construction and role of grassroots and mainstream art networks within the context of gentrification. While mainstream art networks create prime areas for top-down processes of urban change, grassroots art networks strive to represent marginal group identities, interests and reframe dynamics of power. By allying with longtime residents, community organizations and other art spaces, grassroots art organizations form an urban social movement that is aimed towards redefining the goals and function of urban space. My findings indicate that heterogeneous art networks interact with the urban political economy differently and grassroots art networks serve as legitimate forces influencing urbanism in opposition to top-down development.



**Anne Zola**

*Faculty Advisor: Renee Engeln*

### **These Boots Weren't Made for Walking: Clothing Choices as a Form of Self-Objectification**

According to Objectification Theory, women's ability to attract others often functions as a type of social currency, and through self-objectification, women come to view their bodies as an object to be



looked at and evaluated by others. Under this view, one's clothing choices are likely driven, to some extent, by self-objectification. The adverse effects of fashion choices has been documented in popular media, but no empirical study to date has investigated the frequency of wearing appearance-driven over function-driven clothing. The goal of this study was to establish empirical evidence of college women and men's clothing choices and how these choices relate to body appreciation and body surveillance. In an online survey, we asked college men ( $n = 284$ ) and women ( $n = 261$ ) to report how frequently they wore clothing that restricted movement, was distracting, or caused pain or discomfort. We predicted wearing such clothing more frequently would be associated with lower body appreciation and higher body surveillance for both men and women. Overall, more women than men reported wearing clothing that was restricting, distracting, or painful. In general, those who reported wearing such clothing showed significantly higher body surveillance and significantly lower body appreciation than those who did not. Our results suggest that appearance-driven clothing choices can be conceptualized as a form of self-objectification.



# ∞ Guide to Creative Arts Festival

*In scheduled order of appearance*

# Creative Arts Festival

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



## Visual Art Showcase



Elizabeth Cameron

### **Invisible Men: A visual response to Ralph Ellison's *Invisible Man***

#### **Description**

I have created a visual response to the novel *Invisible Man*, by Ralph Ellison, using charcoal and oil pastel on packing paper. The composition and scale of the piece are inspired by renaissance narrative paintings which illustrate multiple points of a story in the same massive painting. My use of the same narrative and compositional technique is poignant because the stories told in the *Invisible Man* are as familiar to African Americans and White America alike as mythology and histories might have been to people of the renaissance. To exhibit the hyper-characterization of the people in the story, I have drawn both Mary, and the old lady who is seen getting evicted, in the same dress. The overlapping timeframes represent the interchangeability of the characters and the namelessness this implies. Stylistically, I am inspired by African and African Americans artists of the 20th century, and I use a pallet of bold colors which are brilliant, eye-catching, and carry a sense of vitality which is also felt in the novel. Despite Ellison's criticism of trying too hard to blend white and black in the book (explicitly in the paint factory), I am emphasizing the use of these European and African influences in my piece to reference the many descriptions of jazz throughout the novel. Jazz originated as a blending of the two musical traditions, an artistic form which is a result of African diaspora and which takes harmonic forms from western music and rhythm from African music.

#### **Artist Statement**

As an avid painter and reader, I strive to blend the visual and literary arts and draw inspiration for my work in one from my studies in the other. I am particularly interested in the representations of Epic literature in visual art. For example, *The Odyssey*, *The Iliad*, and *The Aeneid* all served to inspire generations upon generations of visual artists. By broadening the definition of Epic Literature, I find that the through line of literature and art is that both strive to represent the human condition and define what it means to be human often through the use of allegory. In my visual art, I take up allegorical figures and represent them in ways which I hope promote both the original text and to make their concepts accessible.



**Kimani Isaac**

***Seeing Red: A Synesthetic Experience***

**Description**

*Seeing Red* is a series of paintings that aim to raise awareness about synesthesia and help the layperson get a better sense of the experience for themselves. Synesthesia is a neurological condition in which the senses are cross-wired in the brain, causing whoever has the condition to experience more than one sensation at a time. For example, tasting raspberries may also feel like holding something heavy and rough, or black and white text may appear in a myriad dazzle of colors. For hundreds of years, those with this condition were disbelieved, and the invention of the MRI was the catalyst in helping to prove that those claiming to have this type of experience were telling the truth. However, research still has trouble quantifying synesthesia's many forms, and it has often been deemed "ineffable," impossible to describe to others. Furthermore, those who live with this condition are often not believed in their personal lives and can experience emotional injury and personal shame. They might live life scared they are unraveling at the seams, unable to confide in the people closest to them. This project aimed to address concerns about legitimacy within the synesthetic experience, using art as a means to convey the seemingly "ineffable" with a visual representation of what the subjects experience. There are five paintings of different words that are faithful representations of the subjects' synesthetic responses.

**Artist Statement**

A year ago and half ago, I never imagined this project was actually going to get funded. Synesthesia was about as foreign to me as anyone else at that point. I met someone who lived in my dorm who had it, and after he made it his "fun fact" during floor introductions, I was intrigued. He told me the color of my name, and before I knew it, we had borrowed markers from the RA and were sitting down for the next two hours drawing my name and precisely what he saw. It was just about the coolest pet project I'd ever done. Imagine my joy when I found out that it could become a funded research project! After getting funded, I spent the summer painting my friend's reactions to different words, and suddenly people left and right came out of the woodwork, thanking me, excited that I was doing something related to an experience they'd always had but never opened up about. I have always approached my art with the intent to aid in the struggle of liberating others. I find myself humbled and grateful to be able to give this art to those who need it most. It is my hope that those who see it will remember that we all move through the world with different experiences. A condition like synesthesia, and the way it has been historically ignored, can remind us all that sometimes the most important thing is to simply be supported and believed. In the social atmosphere we find ourselves in, it can be easy to forget this. I hope this work inspires you to see your world, and most importantly the people around you, a little differently, and a little more kindly.



**Valerie Gruet**

**The Cute One and "Peaceful Reflections"**

**Description**

My motivation for these pieces was to showcase how art can make you smile, engage with the peace transmitted through the image, and make you reflect on how the work relates to your own experience.

The approach with both pieces was to create detailed works with graphite. I can conclude that the use of shading and tone highlight the focal points in the pieces, drawing the viewer into a different world. Both of these pieces represent important moments in my life and how art has been my freedom and liberation from hardship.

### **Artist Statement**

My name is Valerie Gruest, and I was born in Guatemala. I am a Chicago based artist majoring in both Communication Studies and Art Theory & Practice at Northwestern University. 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 path as an artist took a detour as I was a swimmer and competed at the Rio 2016 Olympic Games. Now, I am able to fulfill my one true dream, being an artist in all of its forms. Life doesn't come around every time we need it, but we can have pieces of art that bring everything back together.



## **Performances in scheduled order of appearance**



**Caroline Spikner and Jacquelyn Tepper**

### **Choreographing the Camera in the National Parks (Dance/Film)**

#### **Description and Artists' Statement**

Caroline Spikner received an Undergraduate Research Grant (winter 2018) to create a dance film assessing the possibilities of cinematography and specifically camera choreography in natural spaces. Through an independent study, Jacquelyn Tepper conducted aligned research, considering the dancer in relation to the space in which they create and move. The research began with a trip to Big Bend National park in Texas, where the collaborators spent a week exploring choreographic strategies to design movement inspired by landscapes and ways in which the camera can play an active role in how the dance and park is observed. After Big Bend the pair travelled to Shenandoah National Park continuing to explore the relationship between the dancer and the camera. While the dancers were drawn to Utah due to the parks recent politics in relation to redesignation of land by the current administration, Shenandoah and Big Bend were selected based on the project's musical score (the *National Park Suite*) which includes five distinct parks (Shenandoah, Big Bend, Yosemite, Rainier, Acadia). This score, to which the full length dance film is set, was composed by NU Alum Landon Hegedus. In the performance, the dancer (Tepper) will perform selections of choreography from the project. She will be accompanied by live musicians as well as a screendance constructed from selections of video footage from the parks visited throughout winter quarter. Though the final URG culminates in a thirty five minute dance film, this alternative performance is meant to highlight Tepper's work in site specific choreography as well as Spikner's research in camera movement. Musician: Joseph Miller- saxophone



**Dominique Teoh, Amanda Hermans, Caroline Olsen**

**Out of Shadows (Short Documentary)**

**Description**

*Out of the Shadows* is a documentary that follows *Quinto Imperio*, a cumbia band from Chicago's Back of the Yards neighborhood. It is a story of immigrants who are undocumented, unapologetic, and unafraid to fight for their future and for the future of youth from a community that is often misunderstood. The film follows the band as they prepare to perform at a scholarship fundraiser. In telling this story, the film recounts the history of the band and addresses the difficulties faced by undocumented students in pursuing a college education.

**Artist Statement**

*Out of the Shadows* seeks to amplify the voice of the undocumented community generally, and of Back of the Yards specifically. This documentary gives voice to the work that *Quinto Imperio* does. They are a group of family and friends who use music to advocate for immigrant rights, working closely with other community members to support undocumented students. Whereas mainstream media coverage depicts Back of the Yards as a neighborhood riddled with violence, we hope to give attention to some of the positive movements taking place in the community. Back of the Yards community members have gained increasing attention recently for their positive efforts in business and activism, with some notable examples being the establishment of a local coffee shop, clothing brand, as well as student activism surrounding issues of immigration. *Out of the Shadows* seeks to contribute to this positive representation of the community by telling the story of *Quinto Imperio*. The film was created for the Medill Documentary class, under the guidance of Brent Huffman.



**Alana Rosenbloom**

**At Last (Dance)**

**Description**

This project began as an exploration of duets inspired by Etta James' incomparable musical talent with her song "At Last." The duets explore the idea of having multiple soulmates, partners, or true loves. The whole piece is a series of five duets, each under one minute. The dance attempts to demonstrate how even though people walk in and out of your life, each unique relationship adds value. Relationships do not have to last forever in order to be meaningful, thus, the piece is defined by short encounters that represent different relationships.

**Artistic Statement**

The movement is inspired by the music and by the dancers' personal movement vocabularies. I wanted the piece to feel as light and lovely as James' voice, while at the same time highlighting the incredible strength each dancer has. In addition, in order for the piece to come full circle, each dancer enters and exits the space and dances with two different partners. The partner work was derived in the studio. Ultimately, the piece is meant to be both aesthetically pleasing and thought provoking, attempting to complicate the idea of one true love.

Dancers: Jacquelyn Tepper, Caroline Spikner, Katie Ippolito, Calvin Ticknor-Swanson, and Noah LaPook



**Zaki Hussain and Nouf Al-Sulaiti**

***Terima Kasih* (Film)**

**Description**

Set in present time, Singapore, *Terima Kasih* follows a single mother and her schizophrenic daughter for a day.

**Artist Statement:**

Funded by Studio 20Q, an NU-Q film-granting student-run organization, *Terima Kasih* is a short drama that brings light to financially-challenged family households that have a member with mental illness. Inspired by my own family, I hope to get the audience to intimately spend a day with the mother and daughter. As much as the film's topic is about mental illness, it is also about the thick and thin in family dynamics especially during tough times.



**Yadid Licht and Dasha Gorin**

***YUP: Episode 1 "The Binge"* (Web Series)**

**Description**

*YUP* is an animated web series that I created and have been working on for over a year and a half. In Fall 2016, I received a grant from the Northwestern student film production board, NU Channel 1, to produce a pilot episode for the show. *YUP* takes the premise of the "young adults in the city" sitcom and animates it using goofy, cute, characters. Working with my producers, Dasha Gorin and Jenna Levin, we assembled a crew of animators, inbetweeners, background artists, sound-recordists, composers, and editors. Additionally, we cast a hilarious group of voice actors, who brought great energy and life to the characters. After hundreds of hours of work over the span of over a year, the pilot episode of *YUP* premiered on campus to a crowd of over 50 students and community members. It has also amassed close to 2,000 views online. We are in the midst of production on the second episode, which we hope to complete this summer.

**Artist Statement**

In the past, producing animated content at Northwestern was especially difficult. Few students have experience in the field, as Northwestern's only animation classes are small and difficult to enroll in. Additionally, the film community at Northwestern is heavily focused on live-action projects. Yet in the production of *YUP*, Dasha and I were able to tap into the incredibly talented creative community at Northwestern, and create the groundwork for a sustained animation presence on campus. In recruiting for this project, Dasha and I were exceptionally surprised by the amount of students interested in animation, as we recruited students from a variety of disciplines, including computer science, art theory & practice, film, and theater. Collaborating with background artists, student animators, and using a myriad of spreadsheets to track our progress, this project was



completed in a little bit over a year following its conception. Around the time that *YUP* premiered, Dasha and I also decided it was time to create a more permanent animation presence on campus. Accordingly, we co-founded CatToonz, Northwestern's first animation production group. We assembled an executive board of nine students, and a general membership of close to twenty. Now, we are using the knowledge and expertise that we have developed while working on *YUP* to help support other students' animated projects on campus.



Shara Feit

***Ties* (Staged Reading)**

**Description**

Despite her husband's departure, the trials of her third trimester, and the weight of a family curse, Clara leaves home to visit her favorite place: the ocean. When a stranger arrives, Clara finds herself on an adventure that just might change fate. In Shara Feit's lyrical play *Ties*, men dance on the ocean floor, women wander for eternity, and mothers and daughters decide how much to sacrifice for those they love.

**Artist Statement**

*Ties* was written over the course of Northwestern University's 2016-2017 Advanced Playwriting Sequence, developed in the 2017 Agnes Nixon Masterclass, and given a staged reading in Northwestern's 2017 Agnes Nixon Playwriting Festival. *Ties* is a magical, feminist adventure and contemporary myth. It is a love letter to mothers and daughters and to those who love boldly despite love's inevitable consequences. *Ties* is an attempt to honor the epic significance and earthshaking magic of mothers, daughters, and adventures.



Max Kliman and Jake Daniels

***Seventy-One* (Virtual Reality 360-Degree Short Film)**

**Description and Artists' Statement**

While many students have used their time at Northwestern to make short films, we decided to take filmmaking in a different direction and tell a story in virtual reality. As RTVF majors, we love movies, storytelling, and creating, and we have always had a passion for working together to make entertaining content. However, we wanted to be ambitious and try something new — something we weren't sure if we could accomplish originally. So we set out to tackle virtual reality. We had both previously been intrigued by the medium, but we had never had the chance to experiment with its capabilities. We decided this project would be the perfect chance for us to combine two of our interests - filmmaking and virtual reality - and answer a question we had both been considering: Is it possible to create a live-action narrative film in 360-video virtual reality? We had almost no experience with virtual reality going into the summer, but we were determined and motivated. By researching equipment, workshopping script ideas, experimenting with technology, and often using trial and error, we were able to discover that, while difficult, it is possible to create film in this

medium. We are now excited by the future of virtual reality filmmaking. Even though this project took us the entire summer, we created it by learning on the fly. We believe that in the future this technology can be used to create beautiful work and can change the way we think about entertainment.



**Katherine Ippolito and Calvin Ticknor-Swanson**

***Station (Dance)***

**Description and Artists' Statement**

A contemporary dance duet choreographed and performed by Katherine Ippolito and Calvin Ticknor-Swanson, originally created for Graffiti Dancers' *A Formal Affair* in April 2018. This piece aims to depict two lovers split up by some fateful circumstances. Years later, they cross paths on a city street and relive the heartbreaking memory of their separation. The composition was based on the rhythm of the music, gesture work, prop study, partnering, improvisation, and original contemporary choreography. The choreographers challenged themselves to find intention behind each movement in order to shape the narrative, drawing from personal experience. The work attempts to highlight the struggle between love and circumstance and how unresolved love leaves a lasting imprint on those involved.



**Neha Hashid and Ammar Younas**

***Kiln (Short Documentary)***

**Description and Artists' Statement**

*Kiln* is a documentary that explores the issue of bonded labor in Pakistan from the perspectives of key people involved in the issue: the bonded labor and the bonder. It is one of few, if not only, works that explores the issue from the bonder's perspective in its aim of shedding light on the situation in its entirety. The documentary follows Bashir who takes a loan of \$600 from a brick-kiln owner and, to pay it back, begins working at the brick kiln. After a year of suffering through physical, verbal and mental abuse, though, he decides to leave. To his disbelief, he finds out that his debt has been added to. He now owes the owner \$5,500 and cannot leave unless he pays it all back. The brick-kiln owner, knowing that Bashir cannot settle the debt on his minimal wages, makes him an offer: If Bashir wants his freedom, he can either pay back the money or divorce his wife and hand his children over to the brick-kiln owner. Ultimately, the documentary aims to shed light on an issue that many know about but do not entirely understand, and so, fail to take action against. It aims to humanize the suffering and rights violations that minority groups face.



# Creative Arts Festival

## Jury

**Tara Mallen**, Rivendell Theatre

**Mickie Pascal**, Pascal-Rudnicke Casting

**Jennifer Rudnicke**, Pascal-Rudnicke Casting



## Stage Manager

**Liza Alrutz**



## Master of Ceremonies

**Maria Valencia**





**∞ Guide to High School Showcase ∞**  
**Presentations 2018**

# **NU High School Project Showcase Poster Presentations**

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

## **Amundsen High School**

1. **Natalia Awisha**, “The Effect of Light on the Rate of a Chemical Reaction.” Advisor: Eman Sarhan.

## **Eric Solorio Academy High School**

2. **Carol Teran**, “The Effects of Fuel Type on Potato Cannon Muzzle Velocity.” Advisor: Elliot Michel.

## **Glenbrook South High School**

3. **Amil Dravid**, “Machine Learning as a Means to Analyze Cancer Chromatin Signatures.” Advisor: Karl Hujsak.
4. **Mykyta Solonko & Michael Polinski**, “Search and Rescue Quadcopter.” Advisor: Michael Stancik.
5. **Mykyta Solonko**, “Wireless Weather Station.”

## **Harry D. Jacobs High School**

6. **Kris Shah**, “Genotoxic Effects of Synthetic Food Preservatives Using Escherichia coli.” Advisor: Conrad Rogers.

## **Lincoln Park High School**

7. **Gbadebo Adeniyi**, “Making Marketable Products Through 3D Printing.”
8. **Andres Aguero**, “Opioids and Receptors.”
9. **Elijah Ben & Adam Ross**, “Designing a Maker Space.” Advisor: John Cabey.
10. **Samiliar Birch, Beatriz Mejia & Abheek Mondal**, “3D Printing Robotics That Draw.”
11. **Michael Cardiff**, “Build-A-Isomer.”
12. **Moses Carrisoza**, “Adderall.” Advisor: John Cabey.
13. **Nathaniel Mohill**, “Building and Designing an Electric Guitar.”
14. **Farzan Mukhtar & Maksym Melnyk**, “Designer Insulins.” Advisor: John Cabey.
15. **Cheyenne Reggans-Jones**, “The Science of Baking—Mirror Glaze Cakes and More!”
16. **Maria Rue**, “The Wonderful World of Lipids.” Advisor: John Cabey.
17. **Katelyn Shelton**, “Structure and Function of Hallucinogens.” Advisor: John Cabey.
18. **Tryphosa Thatheu, Prativa Khatiwada, Oluranti Ajani & Giselle Perez**, “Stimulants and Their Functions.” Advisor: John Cabey.

## **NU High School Project Showcase Poster Presentations** *Continued*

### **Niles North High School**

19. **Rushi Bhatt**, “Grain Boundary Characterization of Cadmium Telluride.”
20. **Nelson Fernandes**, “Doped Ceria as a Thermochemical Reaction Medium for Generating Syngas and Oxygen.” Advisor: Kanchan Mondal
21. **Zain Jamal**, “The Effect of Common NSAIDs on Inflammatory Cytokines Found in Cases of Rheumatoid Arthritis.”
22. **Divy Kumar**, “The Effects of the Geomagnetic Field on Tardigrade Survivability.” Advisor: Richard Thielsen.

### **Niles West High School**

23. **Azam Ahmed**, “Effect of Surface Polarity on Thirdhand Components of E-cigarette Vapor.” Advisor: Kurinji Krishnamoorthy.
24. **Kate Karaman**, “The Effect of 4-MCHM on Daphnia magna Population Change.”
25. **Maha Syed**, “Engineering a Microbial Fuel Cell.” Advisor: Parin Patel

### **Phoenix Military Academy**

26. **Abigail Pio**, “Strong as Concrete?”

### **RISE Online STEM Research Institute**

27. **Sahithi Ankireddy**, “Correlation Between GPS Errors and Geomagnetic Activity in the Ionosphere.” Advisor: Jacklyn Naughton.
28. **Shouri Bochetty**, “Developing a Probabilistic Program to Analyze Combinations of Risk Factors.” Advisor: Jacklyn Naughton.
29. **Om Gandhi**, “The Effect of Antioxidants on the Survival Rate of *S. cerevisiae* Exposed to Ultraviolet Radiation.” Advisor: Jacklyn Naughton.
30. **Prarthana Prashanth**, “The Effects of Antioxidants on Fruit Flies.” Advisor: Jacklyn Naughton.
31. **Nikhith Rao**, “Design of Inhibitors for Lung Cancer by Targeting VEGFR-2.” Advisor: Jacklyn Naughton.
32. **Eva Tuecke**, “The Effect of Common Household Paints on *Drosophila melanogaster*.” Advisor: Jacklyn Naughton.

## **NU High School Project Showcase Poster Presentations** *Continued*

### **Von Steuben Metropolitan Science Center**

33. **Abigail Arnashus**, “The Light Move for Reptiles.” Advisor: Manny Aldana.
34. **Raymond Diaz**, “Invasive Species: Do Relatives Help or Hinder?” Advisor: Manny Aldana.
35. **Hazel Rose Galvan**, “Polyaniline/Graphene-Oxide Supercapacitor Electrodes.” Advisor: Manny Aldana.
36. **Ivery Marquez**, “Whey to the Future.”
37. **Sofia Rogel**, “The Big Sick.”



## ⌘ Judges for the NU High School Project Showcase ⌘ Poster Presentations

**Albert Xue**, Chemical and Biological Engineering, Northwestern University Graduate School

**Eric Schwenker**, Materials Science & Engineering, Northwestern University Graduate School

**Jimmy Kim**, Physics and Astronomy, Northwestern University Graduate School

**Laura Ruhge**, Microbiology-Immunology, Northwestern University Graduate School

**Lawrence Crosby**, Materials Science & Engineering, Northwestern University Graduate School

**Melissa Barona**, Chemical & Biological Engineering, Northwestern University Graduate School

**Michael Katz**, Physics and Astronomy, Northwestern University Graduate School

**Michael Zevin**, Physics and Astronomy, Northwestern University Graduate School

**Nell Maltman**, Communication Sciences & Disorders, Northwestern University Graduate School

**Paul Williams**, Physics and Astronomy, Northwestern University Graduate School

**Puikei Cheng**, Mechanical Engineering, Northwestern University Graduate School

**Raeed Chowdhury**, Biomedical Engineering, Northwestern University Graduate School

**Rey Maktoufi**, Media, Technology & Society, Northwestern University Graduate School

**Roman Grigorii**, Mechanical Engineering, Northwestern University Graduate School

**Shi Ye**, Physics, Northwestern University Graduate School

**Thomas Wytock**, Applied Mathematics, Northwestern University Graduate School

**Zachary Hafen**, Physics and Astronomy, Northwestern University Graduate School



## **⌘ NU High School Project Showcase ⌘** **Planning & Organization**

Office of STEM Education Partnerships

Amy Pratt, Michelle Paulsen, Phong Luu



## **⌘ NU High School Mentors ⌘**

Ebony Calloway, Jonathan Cohen, Victoria Larsen, Nick Medrano,

Will Oestreich, Grace Phelps, Carrie Willis



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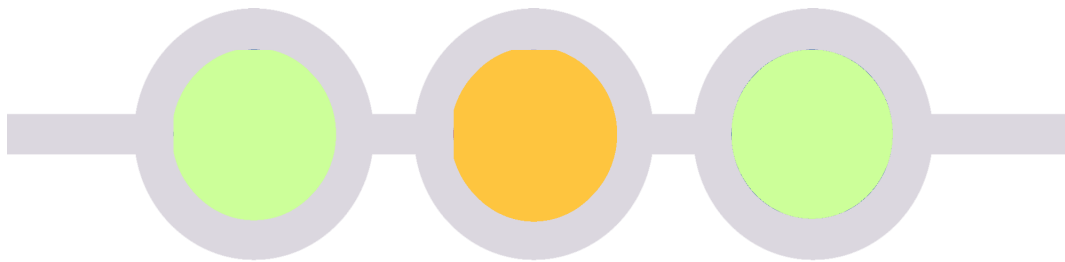
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