

# **TAKE THE LEAD IN YOUR EDUCATION!**

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



UNIVERSITY

UndergradResearch.Northwestern.edu/OUR 633 Clark Street, West Tower NORTHWESTERN



Phone 847-491-7040 Fax 847-491-4434



Dear Members of the Northwestern Community:

Undergraduate research experiences at Northwestern continue to expand. Our Office of Undergraduate Research saw increased applications to every single program we offer this year, and many programs saw record highs. The Summer Undergraduate Research Grant program alone awarded over \$500,000 to support independent student research and creative projects. Students will be working in labs, making documentaries, exploring archives, and visiting over two dozen different countries around the world. We strongly believe that undergraduate research plays a formative role in the Northwestern education, marking the transition to more engaged learners. It is our goal to have as many students as possible participate in these experiences.

Our focus is to help students learn how research is done by connecting them to faculty through programs like nuViBE (Ventures in Biology Education), the Science Research Workshops, and the Undergraduate Research Assistant Program. We then work to transition students to more independent projects through department, school, and University-wide grant programs. We also developed webbased resources on formulating research projects, including a new comic web series designed to show the steps in the process, and we have greatly expanded the availability of one-on-one advising for students to write research grant proposals. The Office of Undergraduate Research staff worked with over 500 students in almost 1,000 separate meetings this year. Finally, we look to help students showcase their discoveries through events like the Undergraduate Research and Arts Exposition, realizing that having good research is not enough in our society. Students must also learn the skills of successful communication, and as part of the preparation for the Expo, students attend presentation workshops. Together, we hope these experiences help launch students successfully into their post-undergraduate lives, whether that be in graduate school, on fellowships, or starting their career path. Experiential learning is a key part of the Northwestern experience.

Our future looks even more promising. We are about to debut a new Global and Research Opportunities web site, allowing students to discover the rich array of opportunities available on campus and abroad. It showcases everything from openings in various labs on the Evanston and Chicago campuses to grant, fellowship, and experiential learning opportunities. The new site uses responsive design for mobile and tablet devices, allowing easier access for students on the go. We envision this resource opening up a new world of possibilities.

None of these opportunities would be possible without the dedicated mentoring, encouragement, and support provided by Northwestern's outstanding faculty and staff. Their work enables students to have incredible experiences, and it prepares them for the world beyond our campus. We remain immensely proud of the students presenting and performing at this year's Undergraduate Research and Arts Exposition and Creative Arts Festival; their talents make us optimistic for our future.

Sincerely, we Sense Daniel L Linzer

Provost

2014 Program Front Cover Design by Vasiliki Valkanas School of Communication, Class of 2015 Communication Studies; IMC

Exposition Logo Design by Taylor Barrett Weinberg College of Arts and Sciences, Class of 2012 Sociology; Creative Writing: Non-Fiction

# The 2014 Undergraduate Research and Arts Exposition

Northwestern University's twelfth 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

# Monday, June 2, 2014

Norris University Center

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# **So Program of Events**

10:00-11:30	<b>Northwestern University Poster Session One</b> Louis Room (205)
11:00-12:30	Lunch N' Learn Oral Presentation Session One Lake Room (203), Arch Room (206), Rock Room (207), Armadillo Room (208)
1:00-2:30	Lunch N' Learn Oral Presentation Session Two Lake Room (203), Arch Room (206), Rock Room (207), Armadillo Room (208)
1:45-2:40	<b>NU High School Project Showcase Poster Session</b> Wildcat (101), Chicago (103), Big Ten (104)
2:30-4:00	<b>Northwestern University Poster Session Two</b> Louis Room (205)
3:00-4:30	<b>Evanston Township High School Oral Presentation Session</b> Arch Room (206)
8:00-9:30	<b>Creative Arts Festival</b> : Theatre and Interpretation Center Struble Theatre
9:30-10:30	<b>Post-Show Reception</b> : Theatre and Interpretation Center Struble Theatre; Open to all presenters and attendees

# **So** Exposition Steering Committee

Ronald Braeutigam, Associate Provost for Undergraduate Education Stephen Carr, Associate Dean, McCormick School of Engineering Sally Ewing, Associate Dean, School of Communication Mary Finn, Associate Dean, Weinberg College of Arts and Sciences Linda Garton, Assistant Dean, Henry and Leigh Bienen School of Music Desiree Hanford, Medill School of Journalism, Media, Integrated Marketing Communications, Lecturer, Journalism Riko Ohashi, Undergraduate Student Susan Olson, Assistant Dean, School of Education & Social Policy Kristen Perkins, NU/ETHS Partnership Coordinator, Office of STEM Education Partnerships Amy Pratt, Associate Director, Office of STEM Education Partnerships Jane Rankin, Associate Dean, School of Communication Sofia Sami, Undergraduate Student

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# **50** Exposition Planning & Organization

Office of Undergraduate Research

Peter Civetta Director

Jana Measells Advisor

Gretchen Oehlschlager Administration

> **Emily Hittner** Student Outreach

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# **50** Creative Arts Festival

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# **Steering Committee**

Undergraduate Students: Anne Berkowitz, Colleen Cassingham, Kathryn Del Beccaro, Gaby FeBland, Riko Ohashi, Bryce O'Tierney, Maris O'Tierney, Sofia Sami, and Kalina Silverman

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# Jury

Gus Friedlander, Musician Mickie Paskal, Paskal Rudnicke Casting Agency Jennifer Rudnicke, Paskal Rudnicke Casting Agency

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# Stage Manager

Alex Goodman

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## Master of Ceremonies

Nat Kier

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## **50** Faculty Judges of Undergraduate Posters

Erik Andersen, Molecular Biosciences Ana Arjona, Political Science Cornelius Audo, Chemistry Elisa Baena, Spanish and Portuguese Josef Barton, History Christine Bell, Art History Steve Carr, Engineering Megen Culpepper, Molecular Biosciences Bernard Dobroski, Music Studies Jillana Enteen, Gender and Sexuality Studies Mary Finn, English Rick Gaber, Molecular Biosciences Wendi Gardner, Psychology Adam Goodman, Center for Leadership Benjamin Gorvine, Psychology Mark Hauser, Anthropology Philip Hockberger, Physiology Robert Holmgren, Molecular Biosciences Matthew Johnson, Anthropology Peter Kaye, School of Continuing Studies Jinah Kim, Asian American Studies Michael Kluppel, Pediatrics Robert Lamb, Molecular Biosciences Hilarie Lieb, Economics Joan Linsenmeier, Psychology Eugene Lowe, Religious Studies Sherzod T. Madrahimov, Chemistry William Murphy, Anthropology Laura Panko, Program in Biological Sciences **Owen Priest,** Chemistry Ishwar Radhakrishnan, Molecular Biosciences Andrew Rivers, Physics and Astronomy Cynthia Robin, Anthropology

## So Faculty Poster Judges, continued

Sarah Rodriguez, Medical Humanities and Bioethics Program Karl Rosengren, Psychology Fay Rosner, Weinberg College of Arts and Sciences Helen Schwartzman, Anthropology Mark Sheldon, Philosophy H. David Smith, Psychology Karrie Snyder, Sociology Vivasvan Soni, English Noelle Sullivan, Global Health Studies Program Francesca Tataranni, Classics Liz Fekete Trubey, English Akbar Virmani, African Studies Cindy Voisine, Molecular Biosciences Eric Weiss, Molecular Biosciences Mark Witte, Economics Brad Zakarin, History Nyree Zerega, Program in Biological Sciences Rachel Zuckert, Philosophy

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## **So** Oral Presentation Judges

Yarrow Axford, Earth and Planetary Sciences Michael Deas, Journalism Jaime Dominguez, Political Science Deborah Douglas, Journalism Laura Beth Nielsen, Legal Studies Ceci Rodgers, Journalism Clarence Waldron, Journalism Michele Weldon, Journalism

## **50** Judges for the NU High School Project Showcase

Bernard Beckerman, The Graduate School Larry Cheng, The Graduate School Justin Finkle, The Graduate School Madison Fitzpatrick, The Graduate School Sarah Gomez, The Graduate School Jiangtao Gou, The Graduate School Sam Hadden, The Graduate School Henry Heitzer, The Graduate School Yi Hua, The Graduate School Aaron Oppenheimer, The Graduate School Andrew Scarpelli, The Graduate School Jennifer Schoborg, The Graduate School Jovanca Smith, The Graduate School Adam Weingarten, The Graduate School Jia Wu, The Graduate School Sara Yacob, The Graduate School

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# NU High School Project Showcase Planning & Organization

Office of STEM Education Partnerships Phong Luu, Michelle Paulsen, Kristen Perkins, Amy Pratt, Ashley Walter

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## **SO** NU High School Mentors

Sami Hashmi, Laila Hayani, Joseph Hurley, Catherine Ives-Louter, Olive Jung, Acadia Kocher, Brenna Ledvora, Jessica Marone, Nick Medrano, Erik Park, William Reynolds-Ejzak, Ariana Steele

			TIME	BOOM	PROGRAM
LAST NAIVIE	FIRST INAIVIE	PRESENTATION TYPE	TIME	ROOIVI	PAGE #
Amer	Lindsay	PM Poster #1	2:30 PM	Louis 205	8, 24
Arasteh	Omid M.	PM Poster #23	2:30 PM	Louis 205	9, 24
Awwad	Adam	PM Poster #24	2:30 PM	Louis 205	9, 25
Baker	Molly	AM Poster #27	10:00 AM	Louis 205	3, 25
Bandurovych	Yuliya	PM Poster #25	2:30 PM	Louis 205	9, 25
Beal	Rachel	PM Poster #26	2:30 PM	Louis 205	9, 26
Berkowitz	Anne	Creative Arts Festival	8:00 PM	Struble Theatre	19
Bridgewaters	Sarah	PM Poster #3	2:30 PM	Louis 205	8, 27
Brockman	Aozora	PM Poster #4	2:30 PM	Louis 205	8, 27
Burklow	Emily	AM Poster #5	10:00 AM	Louis 205	2, 28
		Oral Presentation	1:00 PM	Armadillo 208	7, 28
Cano	Victoria	Creative Arts Festival	8:00 PM	Struble Theatre	16
Cavanaugh	Jack	Oral Presentation	11:00 AM	Lake 203	4, 29
Chang	Diana	Creative Arts Festival	8:00 PM	Struble Theatre	21
Chavez	Raul	AM Poster #28	10:00 AM	Louis 205	3, 29
Chen	Lillian	AM Poster #29	10:00 AM	Louis 205	3, 30
Chen	Sharon	AM Poster #30	10:00 AM	Louis 205	3, 30
Chen	Xiaowen	AM Poster #31	10:00 AM	Louis 205	3, 31
Cherney	Elyssa	Oral Presentation	11:00 AM	Arch 206	4, 31
Cherukupalli	Varshini	AM Poster #6	10:00 AM	Louis 205	2, 32
Cheung	Sandy	PM Poster #27	2:30 PM	Louis 205	9, 32
Choo	Sungsub Billy	AM Poster #7	10:00 AM	Louis 205	2, 33
Chriswell	Kaitlyn	Oral Presentation	11:00 AM	Armadillo 208	5, 34
Coccoli	Caroline	AM Poster #32	10:00 AM	Louis 205	3, 34
Cohen	Rhaina	Oral Presentation	11:00 AM	Armadillo 208	5, 35
Daly	Christine	Oral Presentation	1:00 PM	Rock 207	7, 35
Davies	Molly	Oral Presentation	1:00 PM	Rock 207	7,36
Dennis	Lauren	PM Poster #5	2:30 PM	Louis 205	8, 36
Desai	Nirmal	Oral Presentation	11:00 AM	Lake 203	4, 37
Diesing	Rebecca	PM Poster #24	2:30 PM	Louis 205	9, 25
Dillon	Claire	Oral Presentation	11:00 AM	Arch 206	4, 37
Ding	Yujia	PM Poster #28	2:30 PM	Louis 205	9, 38
Dunlap	Jamese	Oral Presentation	11:00 AM	Armadillo 208	5, 38
Entz	Alex	Oral Presentation	11:00 AM	Rock 207	5, 39
Faber	Holden M.	PM Poster #29	2:30 PM	Louis 205	9, 39
Falzoni	Sofia	PM Poster #6	2:30 PM	Louis 205	8, 40
Ferguson	Michael	AM Poster #8	10:00 AM	Louis 205	2, 40
Fong	Samson	Oral Presentation	11:00 AM	Lake 203	4, 37
Foster	Jack	AM Poster #1	10:00 AM	Louis 205	2, 41
Foster-Gimbel	Olivia	AM Poster #9	10:00 AM	Louis 205	2, 41
Friedrich	Leanne	Oral Presentation	1:00 PM	Lake 203	6, 42
Galvin	Rachel	AM Poster #10	10:00 AM	Louis 205	2, 42
Gore	Alexandra	AM Poster #26	10:00 AM	Louis 205	3, 43
Gorsky	David	PM Poster #7	2:30 PM	Louis 205	8, 43
Grodinsky	Leah	PM Poster #8	2:30 PM	Louis 205	8, 44
Guthmann	Ries	Oral Presentation	1:00 PM	Armadillo 208	7, 44
Haeck	Carly	AM Poster #11	10:00 AM	Louis 205	2, 45
Hallaman	Georgia	PM Poster #30	2:30 PM	Louis 205	9, 46

LAST NAME	FIRST NAME	PRESENTATION TYPE	TIME	ROOM	PROGRAM
					PAGE #
Han	Jeehee	PM Poster #9	2:30 PM	Louis 205	8, 46
Harwood	Nick	AM Poster #2	10:00 AM	Louis 205	2, 47
Heidinger	Storm	Creative Arts Festival	8:00 PM	Struble Theatre	19
Heller	Alex	Oral Presentation	11:00 AM	Rock 207	5, 47
Hernandez	Iseli	AM Poster #12	10:00 AM	Louis 205	2, 48
Hersey	Sarah	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	16
Heydari	David	AM Poster #33	10:00 AM	Louis 205	3, 48
Houchins	Natalie	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	19
Houskeeper	Sam	AM Poster #3	10:00 AM	Louis 205	3, 49
Huynh	Kimberly	Oral Presentation	11:00 AM	Lake 203	4, 49
Jain	Sandeep	AM Poster #13	10:00 AM	Louis 205	2, 50
James	Keisha	AM Poster #14	10:00 AM	Louis 205	2, 50
Jan	Emily	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	21
Jeong	Tae Heon	AM Poster #34	10:00 AM	Louis 205	3, 51
Jones	Halimah	AM Poster #15	10:00 AM	Louis 205	2, 51
Jorgensen	Kelsey	AM Poster #35	10:00 AM	Louis 205	3, 52
Jung	Olive	AM Poster #36	10:00 AM	Louis 205	3, 52
Као	Sharon	Oral Presentation	1:00 PM	Arch 206	6, 53
Kazvini-Gore	Nicholas	Oral Presentation	11:00 AM	Arch 206	4, 53
Keeve	Christian	PM Poster #2	2:30 PM	Louis 205	8, 54
Kelly	Katherine A.	Oral Presentation	11:00 AM	Lake 203	4, 54
, Kendall	Allyson	Oral Presentation	1:00 PM	Arch 206	6, 55
Ki	Michelle	AM Poster #4	10:00 AM	Louis 205	3, 56
Kim	Jin Hak	AM Poster #37	10:00 AM	Louis 205	3, 56
Kim	Stephanie	AM Poster #26	10:00 AM	Louis 205	3, 43
Kincaid	Alvssa	PM Poster #10	2:30 PM	Louis 205	8, 57
Kirkham	Xavier	AM Poster #16	10:00 AM	Louis 205	2, 57
Kisfalusi	Zachary	AM Poster #38	10:00 AM	Louis 205	3, 58
Kumar	Vatsala	Creative Arts Festival	8:00 PM	Struble Theatre	16
Kurgan	Kate	PM Poster #31	2:30 PM	Louis 205	9, 58
Lassman	William	AM Poster #39	10:00 AM	Louis 205	3, 59
Lee	Han Gyeol	Creative Arts Festival	8:00 PM	Struble Theatre	17
Lenz	Cosima	AM Poster #17	10:00 AM	Louis 205	2.59
Liquin	Emily	AM Poster #18	10:00 AM	Louis 205	2,60
Liss	Daniel	Oral Presentation	11:00 AM	Armadillo 208	5,60
Loncto	Mary Iris	Creative Arts Festival	8:00 PM	Struble Theatre	3, 88 16
Maize	lacqueline	Creative Arts Festival	8:00 PM	Struble Theatre	16
Malick	Rida	PM Poster #14	2.30 PM		8 72
Mana	Soad	Oral Presentation	11:00 AM	Rock 207	5,61
Manchanda	Shivon	PM Poster #32	2:30 PM		9,61
Martin	Anne	Creative Arts Festival	8.00 PM	Struble Theatre	3, 01 19
Mathison	Mesum	PM Poster #11	2:30 PM		8 62
McBride	Ionathon	AM Poster #40	10:00 AM	Louis 205	3 63
McMonigal	Kayleen	Oral Presentation	1:00 PM	Lake 203	5, 05 6, 63
McSweeney	Melissa	PM Poster #33	2.30 DM		9.64
Medrano	Fortunato	AM Poster #19	10.00 ΔΜ		2 64
Melinger-Cohen	Ariol	AM Doctor #11			2,04
Milad	Hannah	Oral Presentation	11.00 AM	Bock 207	5,05
ivillau	mannan	UTAL FIESCILLALIUN	11.00 AN	NOCK 207	5,05

			TIME	ROOM	PROGRAM
LAST NAIVIE	FIRST MAIVIE	PRESENTATION TYPE	TIVIE	ROOM	PAGE #
Montgomery	Simone	PM Poster #20	2:30 PM	Louis 205	8, 85
Morley	Claire	PM Poster #34	2:30 PM	Louis 205	9, 66
Muneeruddin	Hinasahar	PM Poster #12	2:30 PM	Louis 205	8, 66
Murray	Alison	Oral Presentation	11:00 AM	Rock 207	5, 67
Myers	Pernell	Creative Arts Festival	8:00 PM	Struble Theatre	19
Nagasawa	Katherine	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	18
Nakonechny	Svyat	Oral Presentation	11:00 AM	Armadillo 208	5, 67
Nam	DongHee	PM Poster #35	2:30 PM	Louis 205	9, 68
O'Brien	David	PM Poster #36	2:30 PM	Louis 205	9, 68
Olalde	Mark	Oral Presentation	1:00 PM	Armadillo 208	7, 69
O'Tierney	Bryce	Creative Arts Festival	8:00 PM	Struble Theatre	16, 17
		Oral Presentation	11:00 AM	Arch 206	4, 70
O'Tierney	Maris	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	19
Palmer	Zoe	AM Poster #20	10:00 AM	Louis 205	2, 70
Pang	Kerri	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	18
Parish	Joshua	AM Poster #21	10:00 AM	Louis 205	2, 71
Park	Jaesuk (Eugene)	PM Poster #13	2:30 PM	Louis 205	8, 71
Parsons	Gabrielle	Creative Arts Festival	8:00 PM	Struble Theatre	21
Patel	Viral	Oral Presentation	11:00 AM	Lake 203	4, 37
Patel	Zabin	PM Poster #14	2:30 PM	Louis 205	8, 72
Pirpiris	Juliette	PM Poster #15	2:30 PM	Louis 205	8, 72
Poladian	Ani	AM Poster #22	10:00 AM	Louis 205	2, 73
Porter-Castro	Sofia	Oral Presentation	1:00 PM	Arch 206	6, 73
Quadri	Zaynab	Oral Presentation	1:00 PM	Rock 207	7, 74
Reddy	Neha	<b>Oral Presentation</b>	1:00 PM	Arch 206	6, 74
Reznik	Samantha	Oral Presentation	1:00 PM	Rock 207	7, 75
Rodriguez	Alexandra	AM Poster #42	10:00 AM	Louis 205	3, 76
Romaniak	Holly	PM Poster #16	2:30 PM	Louis 205	8, 76
Rowberg	Andrew	<b>Oral Presentation</b>	1:00 PM	Lake 203	6, 77
Santos	Peter	<b>Oral Presentation</b>	1:00 PM	Lake 203	6, 77
Sarraf	Рауа	PM Poster #37	2:30 PM	Louis 205	9, 78
Schrier	Elizabeth	Oral Presentation	1:00 PM	Arch 206	6, 78
Scotti	Kristen	<b>Oral Presentation</b>	1:00 PM	Armadillo 208	7, 44
Shapiro	Ari	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	19
Shavlik	Margaret	<b>Oral Presentation</b>	1:00 PM	Rock 207	7, 79
Sherbini	Danya	Creative Arts Festival	8:00 PM	Struble Theatre	17
Shi	Norah	PM Poster #17	2:30 PM	Louis 205	8, 79
Shimano	Marisa	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	16
Siedjak	Jennifer	AM Poster #23	10:00 AM	Louis 205	3, 80
Silberg	Mark	Oral Presentation	1:00 PM	Armadillo 208	7, 80
Smith	Maggie	PM Poster #19	2:30 PM	Louis 205	8, 81
Smith	Riley	PM Poster #18	2:30 PM	Louis 205	8, 81
Stephens	Jasmine	AM Poster #24	10:00 AM	Louis 205	3, 82
Stoehr	Jenna	PM Poster #38	2:30 PM	Louis 205	9, 82
Subramani	Nishant	Oral Presentation	1:00 PM	Lake 203	6, 83
Suh	Ji Young	AM Poster #25	10:00 AM	Louis 205	3, 83
Suh	Sarah	AM Poster #43	10:00 AM	Louis 205	3, 84
ter Haar	Charlotte M.	PM Poster #39	2:30 PM	Louis 205	9, 84

LAST NAME	FIRST NAME	PRESENTATION TYPE	TIME	ROOM	PROGRAM PAGE #
Thai	Michelle	PM Poster #20	2:30 PM	Louis 205	8, 85
Thiel	Daniel	PM Poster #10	2:30 PM	Louis 205	8, 57
Thomas	Kathryn	AM Poster #44	10:00 AM	Louis 205	3, 85
Tindal	Lauren	PM Poster #21	2:30 PM	Louis 205	8, 86
Tran	Brendan	Oral Presentation	11:00 AM	Lake 203	4, 37
Trewn	Amrit	Oral Presentation	11:00 AM	Arch 206	4, 87
Unno	Sei	PM Poster #20	2:30 PM	Louis 205	8, 85
Wang	Jane	AM Poster #45	10:00 AM	Louis 205	3, 87
Webb	Hallye	<b>Creative Arts Festival</b>	8:00 PM	Struble Theatre	19
Weinfeld	Michael	PM Poster #40	2:30 PM	Louis 205	9, 88
Wright	Zara	PM Poster #22	2:30 PM	Louis 205	9, 88
Yang	Antonia	Creative Arts Festival	8:00 PM	Struble Theatre	18
Yang	Chuyue	Oral Presentation	11:00 AM	Lake 203	4, 89
Yang	Jeong Yun (John)	PM Poster #41	2:30 PM	Louis 205	9, 89
Yang	Simon	Oral Presentation	11:00 AM	Lake 203	4, 37
Yu	Jessica	AM Poster #46	10:00 AM	Louis 205	3, 90
Zaonegina	Elina	<b>Oral Presentation</b>	1:00 PM	Armadillo 208	7, 91
Zingman	Michael	Oral Presentation	11:00 AM	Lake 203	4, 91
Zou	Fengwei	PM Poster #42	2:30 PM	Louis 205	9, 92
Zuckerman	Valerie	PM Poster #10	2:30 PM	Louis 205	8, 57

# **50** Guide to Poster & Oral Presentations

# **80** Poster Session One

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

#### Humanities & Arts

- 1. **Jack Foster**, "Making the Italian Criminal: From Italian Positivism to the National Origins Act"
- 2. Nick Harwood, "Battle Train Tokyo: Footwork Gone Global"
- 3. Sam Houskeeper, "The Communist Party of Ireland during the Revolutionary Period"
- 4. **Michelle Ki**, "Manifestations of Patriarchy in Popular Music: A Content Analysis of American and Korean Popular Songs from 2010-2013"

#### Social Sciences & Journalism

- 5. **Emily Burklow**, "Descriptive Study of Variance in Psychological and Financial Wellbeing by Partnership Behavior among Low-Income Mothers"
- 6. **Varshini Cherukupalli**, "Iron-Deficiency Anemia in Charnia, Haryana, India: Analysis of Prevalence and Effective Strategies for Intervention"
- 7. **Sungsub Billy Choo**, "The Role of Transnational Relationships and Bilingualism among Korean University Students in Their Information and Communication Technology (ICT) Use and Future Plans"
- 8. **Michael Ferguson**, "Banksy Effect vs. Broken Windows Hypothesis: A Cognitive Science Approach to the Study of Graffiti, Street Art, and Vandalism"
- 9. Olivia Foster-Gimbel, "Ethnicity, Objectification Theory, and Body Image Disturbance"
- 10. **Rachel Galvin**, "Interdependent Emotional Regulation as Signal Value in Romantic Relationships"
- 11. **Carly Haeck**, "Increasing Body Image Satisfaction with a Web-Based Positive Psychological Intervention"
- 12. **Iseli Hernandez**, "Cultural Influence on Endorsement of Causal and Recovery Explanations for Illness"
- 13. **Sandeep Jain**, "Investigating the Mechanism behind Glucose's Role in Sustaining Self-Control"
- 14. **Keisha James**, "Marriage Rights as Human Rights: How Ethiopian Women Access the Legal System"
- 15. Halimah Jones, "Health Promotion and Illness Prevention: Two Orientations of Health"
- 16. **Xavier Kirkham**, "Spatial Thinking and Sketching among Middle School Students Engaged in Hands-On Engineering Design Activities"
- 17. **Cosima Lenz**, "Changes in the Public Health and Surveillance System in Hamburg, Germany after the 2011 E-coli Outbreak"
- 18. **Emily Liquin**, "The Learning Effect: The Role of Task Exposure in Children's Symbolic Understanding"
- 19. Fortunato Medrano, "Hypothesis Testing and Problem Solving at a Children's Museum"
- 20. Zoe Palmer, "Backwards On Wheels: Tests of Objectification Theory in Roller Derby"
- 21. **Joshua Parish**, "Medical Tourism and Malpractice Litigation: Addressing Physician and Attorney Perceptions of Issues Following Cross-Jurisdictional Care"
- 22. Ani Poladian, "A Motivational Approach to Cross-Gender Interactions: The Moderating Role of Goal Orientations on Prosocial Behavior in Males"

# 80 Poster Session One, continued

- 23. **Jennifer Siedjak**, "High Point, Low Point, No Point: The Relationship between Depression and Emotional Autobiographical Memories"
- 24. **Jasmine Stephens**, "The Perils of Positive Thinking: Effects of Body Affirming Statement on College Women"
- 25. **Ji Young Suh**, "What They Think vs. What They Do: Online Privacy Management via Different Devices in Different Locations"
- 26. Alexandra Gore and Stephanie Kim, "Student Approaches to Problem Solving in Biology"

#### Natural Sciences & Engineering

- 27. Molly Baker, "Metabolic Heterogeneity in P. aeruginosa Biofilms"
- 28. Raul Chavez, "A Systematic Variation of Barium-Containing Pottery Glazes"
- 29. Lillian Chen, "Characterizing the Role of the Dentate Gyrus during Recent and Remote Trace Eyeblink Conditioning"
- 30. Sharon Chen, "Genistein's Effect on Lipid Droplets in Colon Cancer Cells"
- 31. Xiaowen Chen, "Single-Ion Excitation Simulation in Three-State Systems"
- 32. **Caroline Coccoli**, "Long-Term Patterns in Organic Matter Burial off the Oregon Coast over the Holocene"
- 33. **David Heydari**, "Design of Broadband Anti-Reflection Coatings for Quantum Cascade Lasers"
- 34. **Tae Heon Jeong**, "Predictive Analytics For Depression Patients"
- 35. **Kelsey Jorgensen**, "Binary Join of the Transparent Conducting Oxides T-Phase GITO and Bixbyite ZITO"
- 36. **Olive Jung**, "Synthesis of Transition State Analogue Inhibitors of Diphosphomevalonate of Cholesterol Biosynthesis in *Streptococcus pneumoniae*"
- 37. **Jin Hak Kim**, "A New Technique for the Use of Virally Transfected Receptors in Fear Memory Retrieval in Mice"
- 38. **Zachary Kisfalusi**, "Correlation and Analysis of Surface Hydrology of Northern Cook County as a Product of Surface Runoff"
- 39. **William Lassman**, "Effect of Localized Enhanced Binding Sites on Methane Adsorption in Metal Organic Frameworks"
- 40. **Jonathon McBride**, "Generation of Brain Specific NALCN Knockouts to Study the Role of the Sodium Leak in Mammalian Circadian Physiology"
- 41. **Ariel Melinger-Cohen**, "Paragenesis and P-T-X Relationships in the Low-Grade Hydrothermal Metamorphism of the Copper-Bearing Ores of the Portage Lake Volcanic Series, Northern Michigan"
- 42. **Jeong Yun (John) Yang**, "Novel Strategy for Anticancer Drug Synergy with Multidrug Resistance Protein Inhibitors"
- 43. **Sarah Suh**, "Impact of the Human Growth Hormone Receptor Exon 3 (hGHRd3) Polymorphism on Newborn Size"
- 44. **Kathryn Thomas**, "Augmented Carotid Body Chemosensitivity during Hyperthermia Is Blunted with Low-Dose Dopamine"
- 45. Jane Wang, "Testing the NU4MNS Probe for Early Detection of Alzheimer's Disease"
- 46. Jessica Yu, "Agent-Based Models of Heterogeneous Tumor Cell Populations"

# **So Lunch N' Learn: Oral Presentation Session One** 11:00-12:30

#### Advancements in Science and Engineering I

Lake Room (203) Moderator: Aaron Packman, Civil and Environmental Engineering

- Jack Cavanaugh, "Investigating Nanoscale Precursors to Skeletal Growth through a Biomimetic System"
- Nirmal Desai, Samson Fong, Viral Patel, Brendan Tran and Simon Yang, "Novel pH Sensitive Dual-State Promoter System for Oral Applications"
- Kimberly Huynh, "Visualizing Dissolved Oxygen Concentration in Groundwater Flow Using Pressure Sensitive Paint"
- Katherine A. Kelly, "Patient Characteristics and Clinical Decision Making in the Pediatric Traumatic Brain Injury Patient Population"
- **Chuyue Yang**, "Usage Pattern and Significance of Internal Shine-Dalgarno-Like Sequences in *E. coli* Genome"
- Michael Zingman, "Flagellar Calcium Signaling in *Trypanosoma cruzi*, the Parasite that Causes Chagas Disease"

#### World Views: Immigration, Identity, and Culture Arch Room (206) Moderator: Mary Weismantel, Anthropology

- Elyssa Cherney, "Kumari Worship in a Global World: Transnational Feminism and Nepal's Living Goddess"
- **Claire Dillon**, "Empty Space and Identity Politics in the Work of Felix Gonzalez-Torres: Negation, Visual Rhyme, and Creative Reinterpretation"
- Nicholas Kazvini-Gore, "Differences between Refugees and Voluntary Newcomers in Acculturation: The Case of Iranian Immigrants in Hamburg, Germany"
- Maris O'Tierney, "Intersections of Architecture, Music, and Catalan Culture in Barcelona: Historical Roots and Contemporary Soundscape of el Palau de la Música Catalana"

#### Amrit Trewn, "Meditations on Violence, Suffering, and Humanity in the Algerian Diaspora"

# **So** Lunch N' Learn: Oral Presentation Session One,

#### Challenges and Choices in Education and Development Rock Room (207) Moderator: Karl Rosengren, Psychology

- Alex Entz, "Does Expanding Preschool Access Improve Test Scores?"
- Alex Heller, "The Treatment of Bullying in Primary Schools of Oslo, Norway"
- Soad Mana, "Foodies with Fists: Using a Social Justice Framework to Address a Chicago Food Desert"
- Hannah Milad, "Perceptions of Adderall: How Understandings of Prescription Stimulants Affect Drug Abuse on College Campuses"
- Alison Murray, "Is Grasping at Objects in Photographs Related to Inhibitory Control?"

#### Reasoning, Rhetoric, and Practices in Networks and Groups Armadillo Room (208) Moderator: Axel Mueller, Philosophy

- Kaitlyn Chriswell, "Cross-Cutting Cleavages: Euskadi Ta Askatasuna, Terra Lliure, and the Centrality of Social Networks"
- Rhaina Cohen, "Camouflaged Child Care: Rhetoric of U.S. Military Child Care"
- Jamese Dunlap, "Savings Accounts among Low-Income African American Households"
- Daniel Liss, "Rule-Governed Evidentialism: An Account of Group Justification"
- Svyat Nakonechny, "Who Knows Who Knows What in Economic Development: Understanding the World Bank through Its Contractor Networks"

## **So Lunch N' Learn Oral Presentation Session Two** 1:00-2:30

#### Advancements in Science and Engineering II Lake Room (203) Moderator: SonBinh Nguyen, Chemistry

Leanne Friedrich, "Grain Alignment in Chiton Ocelli Lenses"

- Kayleen McMonigal, "Developing a New Paleo Sea Level Proxy: The Calcite Rafts of the Yucatan Peninsula, Mexico"
- Andrew Rowberg, "Zinc Oxide Nanowires as an Electron Transport Layer in Carbon Nanotube-Based Organic Photovoltaic Devices"

Peter Santos, "Self Assembly of a DPP Tripod Chromophore Donor for Organic Photovoltaics"

Nishant Subramani, "How Evil Are Turnovers?"

#### Assessing Health: Systems, Practices, and Perspectives Arch Room (206) Moderator: Helen Schwartzman, Anthropology

Sharon Kao, "Reducing Mental Illness Stigma through Perspective-Taking in the Asian Population"

Allyson Kendall, "The Data Transparency Revolution and Improvement of Health Outcomes"

- **Sofia Porter-Castro**, "Flavors of Childhood: How Nostalgic Longing and Life Constraints Come Together to Inform the Foodways of Mexican Immigrants"
- Neha Reddy, "Examining the Cultural Perceptions of Female Circumcision as a Human Rights Issue in Harare, Ethiopia"
- Elizabeth Schrier, "Immigrants in the Danish Healthcare System: Isolation Experiences Contributing to Poorer Quality of Care"

# So Lunch N' Learn Oral Presentation Session Two,

#### Understanding Ourselves: Experience, Culture, and Expectations Rock Room (207) Moderator: Renee Engeln, Psychology

- **Christine Daly**, "Do People Know What They Want in a Romantic Partner? The Negligible Predictive Power of Ideal Partner Preferences"
- Molly Davies, "Agreeableness, Conscientiousness, and the Religious Experience"

Zaynab Quadri, "The Great White Hope: James Bond and the Crisis of White Masculinity"

Samantha Reznik, "The Effect of Helplessness Induction on Posterior versus Anterior Theta Activity"

Margaret Shavlik, "Waistful Thinking: College Women's Fear of the Freshman Fifteen"

#### Sustainability in Theory and Practice Armadillo Room (208) Moderator: Donald Gordon, School of Continuing Studies

Victoria Cano, "Women and Theatre as a Means for Solving the Bangladeshi Sanitation Crisis"

- Ries Guthmann and Kristen Scotti, "Financing Urban Renewal in Chicago: Tax Increment Financing"
- Mark Olalde, "We Are Not Tree Huggers: The Rise of Economically Sustainable Environmentalism across the Caribbean"
- **Mark Silberg**, "Technology as Moral Force: A Philosophical Defense of Ethical Extensionism, Creative Innovation, and Sustainability"
- Elina Zaonegina, "Moral Licensing and Cleansing Effects on Recycling Behavior"

# **Son** Poster Session Two

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

#### Humanities & Arts

- 1. **Lindsay Amer**, "Queer Methodology in Theatre for Young Audiences in Theory and Practice"
- 2. **Christian Keeve**, "Shock To Your System: An Afrofuturistic Examination of Electromagnetism and Android Embodiment in the Black Superheroic"

#### Social Sciences & Journalism

- 3. Sarah Bridgewaters, "Categorization and Analysis of Educational Reform in Chicago"
- 4. **Aozora Brockman**, "Falling in Love' with Korean Idols: Non-Asian Female Fans and East Asian Masculinity"
- 5. **Lauren Dennis**, "Do Your Baby's Hair': Adoptive Parents on Transracial Adoption, Their Conceptions of Race, and Navigating African-American Spaces"
- 6. **Sofia Falzoni**, "The Effects of Income on Transnationalism and Integration among Hispanic Immigrants in Miami, FL"
- 7. **David Gorsky**, "The Effects of Prekindergarten on Academic and Behavioral Development through 8th Grade"
- 8. **Leah Grodinsky**, "Imaginary Companions & Identity: How Childhood Imaginary Companions Shape Our Adult Lives"
- 9. **Jeehee Han**, "Income Inequality in the United States and Public Opposition to Health Care Provisions"
- 10. **Alyssa Kincaid, Daniel Thiel** and **Valerie Zuckerman**, "A Revolution for All? An Examination of the Effects of the Arab Spring on Women's Rights"
- 11. **Mesum Mathison**, "How Do We Develop Notions of 'Race'? An Exploration of Infants' Sensitivity to Social Categories of Race"
- 12. **Hinasahar Muneeruddin**, "Walking the Walk: Discrimination of Muslim-Americans and Racial Ethnic Minorities and Its Impact on Coping and Collective Action"
- 13. Jaesuk (Eugene) Park, "Analysis of Asthma Hospitalization Trend in Chicago Area"
- 14. **Zabin Patel** and **Rida Malick**, "Obesity and Weight Perceptions in Turkish College Students"
- 15. **Juliette Pirpiris**, "The Role of English in International Business: An Anthropological Study of Language in Business Culture"
- 16. **Holly Romaniak**, "Individual Differences in Cognitive Reappraisal Ability in Highly Anxious Individuals"
- 17. Norah Shi, "The Changing Migration Pattern of Female Migrant Workers in Urban China"
- 18. **Maggie Smith**, "Dimensions of Male Asexuality: Investigation of the Sexual Interests, Behaviors and Arousal Patterns of Asexual Males"
- 19. **Riley Smith**, "Healthcare Experiences of Lesbian and Bisexual Women in Cape Town, South Africa"
- 20. **Michelle Thai, Sei Unno,** and **Simone Montgomery**, "The Development and Validation of a Scale of Career Anxiety"
- 21. **Lauren Tindal**, "Creating People-Driven Personality Feedback: The Holistic Narrative Approach"

# 80 Poster Session Two, continued

22. **Zara Wright**, "Creating a Self-Report Measure of Psychopathy Using Items from the Personality Inventory for the DSM-5"

#### Natural Sciences & Engineering

- 23. **Omid M. Arasteh**, "Implementation of a FM Transceiver Using Universal Software Radio Peripheral (USRP)"
- 24. Adam Awwad and Rebecca Diesing, "Alteration of Actin's Critical Concentration in Microgravity"
- 25. **Yuliya Bandurovych**, "Self-Report Treatment Profile: Healthcare Utilization among Knee Osteoarthritis and Low Back Pain Subjects"
- 26. **Rachel Beal**, "Phase Stability and Electrical Properties of Ruddlesden Popper Series lanthanum Nickelates for IT-SOFC Applications"
- 27. **Sandy Cheung**, "The Link to Zinc: What Studying Egg Development in the Soil Worm *Caenorhabditis elegans* Can Tell Us about Human Egg Viability"
- 28. **Yujia Ding**, "Structure-Function Analysis of Sds3, *Suppressor of Defective Silencing 3*, a Key Component of the Histone Deacetylase-Containing Mammalian Sin3L/Rpd3L Corepressor Complex"
- 29. Holden M. Faber, "Spontaneous Fluctuations of PO2 in the Rabbit Somatosensory Cortex"
- 30. **Georgia Hallaman**, "Ant Diversity and Abundance in Six Western Minnesota Tallgrass Prairie Remnants: The Connection between Ants and *Echinacea angustifolia*"
- 31. **Kate Kurgan**, "Engineering Protein Fusions to Mimic Particulate Methane Monooxygenase"
- 32. Shivon Manchanda, "Rescuing Age–Related Memory Decline in Caenorhabditis elegans"
- 33. **Melissa McSweeney**, "Long-Term Associative Olfactory Memory in *Caenorhabditis elegans* Is Regulated by Wnt Signaling"
- 34. **Claire Morley**, "Enriched Environment Attenuates Depressed Behavior of Genetic Animal Model of Depression"
- 35. **DongHee Nam**, "Stilbene-Conjugated MRI Contrast Agents as Amyloid Imaging Probes"
- 36. **David O'Brien**, "Separation of CO2 from Flue Gas Using Functionalized Porous Graphene as a Molecular Sieve"
- 37. **Paya Sarraf**, "Unraveling the Evolutionary History of a Cosmopolitan Plant Genus: Phylogeny and Biogeography of *Maclura* (Moraceae)"
- 38. **Jenna Stoehr**, "Investigating the Impact of Therapeutic Drug Combinations on Triple-Negative Breast Cancer Cells"
- 39. **Charlotte ter Haar**, "Establishing a Cell-Free Biology Platform for the Production of Therapeutic Proteins"
- 40. Michael Weinfeld, "Interaction between CEACAM16 and Alpha-Tectorin"
- 42. Fengwei Zou, "Preparation of Patchy Particles by Hierarchical Electrostatic Self-Assembly"
- 43. Alexandra Rodriguez, "Intermetallic Compounds Grown in In Flux: EuIr2In8, EuIr4In2Ge4, Sm2Ir2InGe3"

# NU High School Project Showcase Poster Presentations, 1:45-2:40

Wildcat Room (101), Chicago Room (103), Big Ten Room (104)

#### Adlai E. Stevenson High School

Christina Palffy

Russell Ang and Jessie Wang, "The Effect of Sympatry on Avian Plumage Color Divergence" Rahul Arun and Akshay Chaubal, "The Effect of Stellar Mass on Orbital Eccentricity"

Revanth Bellam, "Effect of Rainwater vs. Tap Water on Growth of Brassica Rapa"

Shivani Dhebar, "The Effect of Natural Products on E.coli and S.epidermidis"

**Justin Horowitz** and **Erica Smolinski**, "The Effect of Beverage Temperature on Perception of Agreeableness"

Han Song Huang, "Effect of Tennis Racquet Frame Composition on Thermal Expansion and Hardness"

Anvesh Jalasutram, "The Effect of Stress Factors on the Effectiveness of Neurofeedback" Diane Jiang, "The Effect of Negamycin on Escherichia Coli In Order to Find the Binding Site of Negamycin on Bacterial Ribosomes"

Jaymo Kang, "The Effects of Surface Quality in High-Z Semiconductors on the Spectral Resolution of x-ray and gamma-ray Detectors"

**Caroline Kelmis** and **Samuel Oh**, "The Effect of the Number of DSS1 Alleles in Mice on the Masses and Presence of Abnormal Cells in Various Organs"

Jeremy Lan, "Effect of Silica Substrate Type on Platinum Nanoparticle Catalyst Efficiency" Sophia Liu, "The Effects of C. Elegans Strain on Temportal and Spatial Egg-Laying Behavior" Monica Muthaiya, "The Effect of Ovarian Cancer Tumor Development on % Change in SELENBP1 Optical Density Concentration"

**Bhabna Pati**, "Comparison of Chemical and Physical Properties of Generic versus Visine-A Eye Drops Formulated With Reverse Engineering"

**Sneha Poondru**, "Behind the Scenes: The Effect of Makeup on the Inhibition of Staphylococcus Epidermidis"

Pranjali Rathi, "Effect of UV Laser Pulse on Movement of Micron-Spheres"

Alexandra Shafran, "Effect of X-Ray Radiation on E. Coli Bacteria"

Ajay Varadhan, "The Effect of the Addition of a Metal Shield on the Electrical Pulse Conducted in the Tissue during the Application of Electrostatic Charges"

#### Crystal Lake Central High School

Jacklyn Naughton

Simon Su, "The Effects of Algae on the Remediation of Oil Spills in Aquatic Environments"

#### **Evanston Township High School**

#### Daryl Haggard

Taylor Sims and Talia Weiss, "Environment and Variability of High Redshift X-Ray Bright Optically Normal Galaxies"

#### Adilson Motter

Adam Frim, "Spontaneous Synchronization in Systems of Mechanical Metronomes"

# NU High School Project Showcase Poster Presentations, continued

#### Friedrich Von Steuben Metropolitan Science Center

Jennifer Roden Angelica Rose Galvan, "Dymaxion"

#### **Geneva High School**

Jacklyn Naughton Ben Maher, "The Effect of Vitamin D Supplementation on High Glucose in *C.elegans*"

#### Harry D. Jacobs High School

Jacklyn Naughton Theresa Do, "The Use of Artificial Intelligence to Improve Insulin Therapy"

#### Hinsdale Central High School

Jacklyn Naughton Bernard Wong, "People of the Same Race and Their Ideas on Criminal Activity" Mark Wollschlaeger Sunil Dommaraju, "Using Flow Cytometry to Measure the Anti-Cancer Effects of a Plant Extract on Prostate Cancer"

#### **Illinois Mathematics and Science Academy**

H. Thomas Diehl
Janani Sivakumar, "A Search for Strong Gravitational Lenses in the Dark Energy Survey Supernova Fields"
James Hirschauer
Vikram Anjur and Alex Moreno, "Performance Validation of the QIE10.P5 ASIC for the Phase I Upgrade of the CMS Detector at CERN LHC"
Judith Scheppler
Rashmi Thimmapuram, "Novel Method to Localize the Language Region using Electrocorticography (ECoG) during Natural Conversation"
Jin-Yuan Wu
Adit Suvarna, "A Multiplexed Readout Scheme for a Large Array of Photomultiplier Tubes"

#### Keith Country Day School

Jacklyn Naughton Rebecca Lisk, "The Effect of Methylene Blue on Neurodegeneration of *Drosophila melanogaster*"

#### Niles West High School

Joseph Serpico Anthony Vikhter, "The Movement of a Puck in a Slapshot"

# NU High School Project Showcase Poster Presentations, continued

# Princeton International School of Mathematics and Science (PRISMS) Dr. Dana Liebmann Laura Tanase, "Subliminal Effects: Detecting Priming Influences on Memory" Dr. Lesley Skousen Solomon Kim, "Efficacy of Laws and Bans on the Smoking Population and Cigarette Consumption Rates" Ruoqian (Amy) Xiong, "Characteristics of Facebook Acquisitions and Future Trends of the Social Networking Technology Industry" Hongze (Eric) Yu, "Stock Trading Tax: How The Stock Market Reflects and Influences a Country's Economy"

#### Robert Lindblom Math & Science Academy High School

Elizabeth Copper Anthony Bartley, "Proliferation vs. Differentiation" Marquise Walker, "Myoblast Encapsulation for Novelty Muscular Dystrophy Gene Therapy" Daniel Kang Isabel Raymundo, "The Changing Computer Mind"

#### Walter Payton College Prep

Jacqueline Barge Sydney Ford, Emily Ng, and David Zegeye, "An Infrared Examination of Young Stars in Upper Centaurus Lupus"

#### Whitney M. Young Magnet High School

Edward Kang Adam Adachi and Malik Williams, "BITS" Ruiheng Liu, "Synthesis of Arabinose by Ruff-Fenton Degradation" Claire-Wen Walsh, "Design of an Affordable, Practical, Electric-Pedal-Assist Kit for Bicyclists Living with Mobility Impairment" Carmen Marquez Katia Villevald, "Optimizing Traffic Lights" Katherine Rehak Weipeng Zhang, "Colorectal Cancer: Vitamin D Receptor Deficiency Upregulates Expression of Claudin 5"

# Evanston Township High SchoolOral Presentation Session

3:00-4:30, Arch Room (206)

#### Moderator: Peter Civetta, American Studies Program

- Aaron Clarke, "Negotiation Thru Poetry aka The Turn Up" Teacher: Steve Newman; Respondent from NU: Alex Heller
- Nina Doeff, "Word to the WiSE: Research Exploring Women in Science and Engineering" Teacher: Makoto Ogura; Respondent from NU: Kayleen McMonigal
- Jackie Kretchmer, "Hope Behind Bars: An Exploration of Granting Freedom to the Innocent" Teacher: Steve Newman; Respondent from NU: Amrit Trewn
- **Ruby Macsai-Goren**, "Conflict Mediation and Youth Community Outreach" Teacher: Steve Newman; Respondent from NU: Soad Mana
- Asia Sageman, "Of Women and Men, Boys and Girls: The Global Dilemmas of Gender Inequity" Teacher: David Allen; Respondent from NU: Margaret Shavlik

# **50** Guide to Creative Arts Festival

# **80** Creative Arts Festival

8:00-9:30pm, Struble Theatre

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#### Sarah Hersey, Vatsala Kumar, Mary Iris Loncto, Marisa Shimano, Jacqueline Maize, Bryce O'Tierney

Faculty/Choreography: Amanda Exley Lower

#### The Women Inside

Marge Piercy wrote, "I have a sense of these buried lives striving to come out through me to express themselves." Amanda Exley Lower: I am filled with characters who have inspired and haunted me, whose lives ripple across history into my existence, helping to inform the way I understand my experiences. I have wondered, how did these heroines embody such resonant womanhood? How do their stories transcend time and space and enter into my life? Perhaps the answers lie in how they move. They live inside me, and this piece explores how those ancient spirits move my woman's body. *The Women Inside* premiered at Berger Park by Duende Dance Theater in 2013. Dancers Amanda Exley Lower, Savannah Couch, Sarah Hersey, Vatsala Kumar, Mary Iris Loncto, Jacqueline Maize, and Marisa Shimano re-envisioned the piece for Northwestern Dance Department's *Danceworks 2014*: "Hot Buttons," in collaboration with violinist Bryce O'Tierney.

#### Victoria Cano

Faculty: Sarah Rodriguez

#### Converting to Bangladesh

As a woman, I have never been afraid to simply go to the bathroom. I remember the first time I read about a Bangladeshi woman suffering from an acid attack because she went into the jungle into the middle of the night to use a bathroom. I couldn't stop thinking about the fact that a woman had been mutilated because she did not have a safe, easy, or socially acceptable place to use the toilet. How can we attempt to address any of the numerous and complex problems the world faces when a fourteen year old girl, in any part of the world, has to put her life on the line to pee? I first began to study and explore the relationship between gender and sanitation in Bangladesh eight years ago. This theatrical performance is the culmination of all my years of study. I believe women are the key to improving sanitation on a global scale. I believe theater is the primary means through which to accomplish that. I believe that theater should act as the hybridization between the principles of entertainment and education. I believe that theater should provoke and evoke and that story telling can be used as an effective tool to break through the barriers of stigma. I believe that theater is the most accessible form of communication that exists, serving as the penultimate vessel for creating empathy. I believe everyone has a story to tell. That's what being an actor, a global citizen, a human being is all about. Our stories. This is play about a group of women's stories. My journey to write this play changed me for the better. I only hope that this play will help return the favor.

#### Danya Sherbini

Faculty: Robert Gundlach

#### Bloodlines: A Recent History

This creative project explores how collective hardship shapes family interactions and relationships, and transforms the meaning of family ties. It consists of a series of three poems; each poem retains the perspective of the speaker but focuses on that speaker's relationship with and observations regarding a different family member. All poems are oriented around the specific issue of addiction, and aim to convey how the experience of addiction causes family to become both a burden and an anchor.

#### Bryce Quinn O'Tierney

Faculty: Eula Biss

#### Into the Burren

The process of writing Into the Burren, my Senior Honors Thesis/Manuscript, was one of working toward a balance between intuition and intention. As a Creative Writing (Poetry) and Violin Studies double major, mine is a creative practice borne of a dialogue between the disciplines of writing and music. When I left for the West of Ireland last summer on a URG to pursue the music of a fiddler ancestor-Austin Tierney-I anticipated that my writing out of that socio-musical/cultural experience would bridge poetry and prose. What I did not anticipate was how the dialogue between these lineated and un-lineated thinking spaces would allow me to bring to bear my quest for (the artistic) self, distinct and emergent from a longing for the other. The prose/poetry form of Into the Burren found its reason(ing) in my negotiation of the relationships between artist and beloved (romantic other) & artist and Beloved (the art, specifically music), with the physical relationship between player and fiddle resonating with the primary human relationships; and always with Austin as a private guide and presence on the page throughout the journey. I had to go out to look in, toward a renewal of the music at the root of me, and I have been challenged, surprised, supported, and enlivened by the attunement of the lineated and un-lineated spaces to each other and to this project-how their distinctive weightings toward each other across the body of the manuscript create its process of conversation, the melody, the tune. I will read selected pieces from Into the Burren as well as play traditional fiddle tunes included within its narrative.

#### Han Gyeol Lee

Faculty: Kyle Henry

#### Island

"Island" is a film project set out with a belief that the visions the audience of stories have in their minds when processing a story are as important as the visions that the authors of those stories had in mind when creating the stories. The project collaborates with the audience in the visualizing process of a short story into a film, rather than the director and cinematographer dictating what the film should look like. Two project participants, one with a background in acting and another in film directing, were asked to envision the following story: "A girl, in the middle of a bad day, encounters her town's famous hermit. She one day witnesses his suicide. While the townspeople are abuzz

about his disappearance, the girl decides to keep it a secret." Both participants were to act as "Girl," the protagonist in the story. Since with limited budget and schedule, the project could not accommodate all imaginations of the participants, the project circumscribed what locations and cast the participants must imagine within; as a director, I presented the pictures and videos of the location and cast the project participants must include in their imagination process before I let them read the story. The participants, then, communicated with me what images they had in mind when processing the short story with drawings, descriptions, and other references. Two student musicians performed the melody that came to their minds reading the story as well--one of the ending scores of the film. In the production process, the project participants and I worked closely together to recreate the images the participants had in mind as accurately as possible on the screen. The final product is the interweaving of the two participants' interpretations. Visualizing a written story in collaboration with the audience far enriches the content and possibilities, but it is an extremely difficult process since it is hard to engage another person to be passionate about a story because unless with vast resources, mind images are properties of the mind.

#### Kerri Pang and Katherine Nagasawa

#### Leo Chiang, New Day Films

#### The Great Khmer American Rapper

Busboy by night and community organizer by day, Cambodian American Johnny Yoeun is laying the groundwork for a hiphop activism movement in his Uptown, Chicago neighborhood. The film explores Johnny's nuanced identity, and each day is a balance -- as a young activist, a former gangbanger, a son of refugee parents and a key voice in Chicago's Asian American community. Ultimately, his story is one of transformation, from a life of violence on the streets to one that empowers his fragmented community through the art of hip hop.

#### Antonia Yang

Faculty: Kyle Henry

#### David in Bloom

Many students, especially those who get caught up in trying to establish a socially acceptable "stable" career path, end up losing themselves in the process. A lot of young people in my generation can relate to this. In fact, society and our educational system fuel the competition, drive, and determination to carve stereotypical paths that force young people to be something they are not. As a result, young people who may not know what they want don't even get a chance to explore. David in Bloom tells the tale of a troubled artist and graphic designer, who after being dumped by his girlfriend, decides to use love potions to seek new romance. The love potions give him attention from the opposite sex, which is what he wants, but not necessarily what he needs to be happy. He does learn through this experience to accept himself, and his creativity, which allows him to revisit his life with new hope. This film, which I wrote last spring and filmed/directed this past winter, is my interpretation of a young professional's journey through the whirlwinds of life, heartbreak, and self-re-discovery. Crazy as his journey may be, sometimes you need to go through all the ridiculous paths first before you encounter the right one. Sometimes you may not get what you wanted or what you thought was meant for you, and that may be the best for now.
## Anne Berkowitz, Natalie C. Houchins, Anne Martin, Pernell Myers, Ari Shapiro, Hallye Webb

Faculty: Laura Schellhardt

## The Way

You ain't gonna bring back the dead, no matter how hard you try. *The Way* is a love letter to the West Texas sky told by a mother, a sister, two friends, and a stranger, each making their way to the Chihuahuan Desert to resurrect what they believe will make them whole again. I wrote *The Way* during the 2012-2013 Playwriting Sequence, under the instruction of Laura Schellhardt. It is my first full-length play. This ten minute portion includes scenes four through six of Act I.

## Storm Heidinger

Faculty: John Bresland, Eula Biss

## Circadas, the Sound of Summer

Since Montaigne, essays have attempted to answer the question of "How to Live" and finding meaning in life, but the activity of meaning making is not only reserved for philosophers and writers, but essential for each individual's personal growth and sense of purpose. My essay reflects on the search for meaning in my life, amidst a fear of death, feelings of fading youth, alone and missing home, all set in the sounds of the summer, supplied by the symphony of cicadas in the hot air. Combining personal anecdote and meditation, I work through the emotions and fears in my mind in order to come to conclusions about meaning making and purpose in my life. I come to the conclusion, tentatively, that meaning making in our lives is not something found solely through study, or by listening to the advice of others, but through a recognition of learning and experience, by diving into your past and looking forward to the future to find meaning specific to your personal life. We share similarities in our fears, of failure and death, or being alone, but at the end of the day, this is a journey that we must personally undertake. Finding the meaning of life or answering the question of how to live do not take place within the abstract, but in each individual's experience, made up in the specific details and single moments that pile together to create a sense of self, from birth to death.

## Maris Maeve O'Tierney (maris maeve) and Bryce Quinn O'Tierney (bryce quinn)

## Faculty: Nancy Gustafson

## maeve & quinn: musical fusion/fission

maeve & quinn is a musical collaboration between identical twin sisters Maris Maeve O'Tierney (piano, guitar, vocals) and Bryce Quinn O'Tierney (violin, vocal harmonies). Born and raised in Anchorage, Alaska, Maris and Bryce, now Northwestern seniors, have developed an interdisciplinary academic and artistic perspective through their varied fields of study; Maris is a triple major in vocal performance, art history, and political science, and Bryce is a double major in violin performance and creative writing (poetry concentration). Both Maris and Bryce have a strong background and training as classical musicians but their classical technique also serves as a stepping-stone to other genres. They use their classical skill-set as a basis for innovation, improvisation, and the fusion of various genres, drawing from the musical rhythms of their Irish heritage and the styles of contemporary singer-songwriters and ensembles to compose original music of folk/pop style. Maris recently released her third album of original music, titled "inflection point," and she and Bryce collaborate on her songwriting in performance on campus and in the greater Chicago area. Beyond her instrumental compositions and live violin improvisations, Bryce has also been developing her song-writing project over this past year, fusing her poetic/creative writing work with musical motifs. maeve & quinn was selected as Niteskool Productions' Music Video Artist of 2014 for the original song "fusion"; Laurel Cohen, a Northwestern RTVF cinematographer, will direct the video, which launches in June. Maris and Bryce look forward to composing music together and hope to begin cowriting and co-producing their first collaborative album after they graduate in June. maeve & quinn's Creative Arts Festival performance will include live collaborations on songs from Maris' previous three albums and exploration of new original works co-composed with Bryce.

## **So Visual Arts** Daytime, Louis Room (205)

## Mesmerizingly Cerebral by Diana Chang

"Mesmerizingly Cerebral" is inspired by optical art made popular in 1960s England. Optical art has a unique ability to extend beyond the surface of the canvas to finish their simultaneously mesmerizing and perplexing visual effect within the mind of the viewer. This piece dabbles in the interface of the visual effects complementary colors and varied line densities make. The experience of the piece is unique not only to each individual but to each viewing. The four different quadrants contend for the focus of the eye, and consequently, the mind. Each viewing yields a different victor. The simple repeating square pattern removes meaning from the piece, reinforcing a cerebral experience. Fluorescent base was made with acrylic paint and roller. Each individual quad was done with spray paint and stencil or the stencil itself. Square canvas measures exactly 3 feet by 3 feet. The large size and blindingly vibrant color scheme renders the piece one to be experienced.

## **Untitled** by Gabrielle Parsons

I was motivated to complete Untitled after weeks of stress and debilitation related to school, work, and other commitments. My mind felt cluttered, I was frustrated, and I felt that I needed to illustrate all of the emotion and feelings that I was having in order to alleviate myself of them. It was a Tuesday night, and I set my Pandora radio station to Sade, dimmed the lights in my apartment, and laid on the floor with my drawing pad and kit of acrylic paints. I approached Untitled with the intent of clearing my mind; unknowing about what would be produced on the paper. It took me several sketches and disliked paintings before I settled on completing Untitled. The painting serves as a constant reminder to myself about how deep I can get emotionally and mentally, but not in a frightful way. Others who observe Untitled immediately refer to it as dark, but I see it as darkness expelled. It has only served to help me realize that emotions and feelings can be transient; that in darkness there can be light.

## Life in Lathrop by Emily Jan

## Faculty: Zach Wise

Lathrop Homes is a public housing community built on 35 acres on the near- Northwest side of Chicago, one of the first developments commissioned by President Franklin Roosevelt's Public Works Administration. In recent years, Lathrop has been in a long limbo with the Chicago Housing Administration about demolition and re-developments to make room for mixed-income housing. Many residents are concerned about how redevelopment will pan out and worry they may lose their homes to gentrification. This photo essay is a look at what life is like in a place so steeped in history that could so easily be erased. There is nostalgia for a more interesting and dangerous past and also insecurity about what's to comebut ultimately, it's a place of family and friends who call Lathrop their home. My approach to this project was simple: get to know residents and document their daily life. I spent several days of the week at the housing complex, attended community meetings to get to

## **So Visual Arts**, continued

know residents and visited Lathrop residents in their homes. I hope the stories of the individuals and families that I have documented facilitate conversation surrounding gentrification in urban areas and that this photo essay gives voice to those currently undergoing large-scale economic and social shifts in their neighborhood. It's a specific look at a far larger issue that occurs in other urban areas around the world. My hope for this story is that it continues to fuel discussion on the multi-faceted phenomenon that is gentrification.

## **So** Poster & Oral Presentation Abstracts

alphabetical by presenter's last name

#### ନ୍ଧର୍ୟ

#### Lindsay Amer

#### Faculty Advisor: Rives Collins

## Queer Methodology in Theatre for Young Audiences in Theory and Practice

Scholarship dealing with LGBTQ issues in theatre for young audiences (TYA) is few and far between. My thesis attempts to rectify this oversight by assessing the small but evolving body of work on this subject. Using methodology provided by queer theorists such as Michel Foucault, Eve Sedgwick, and Alexander Doty, I outline the criteria necessary for a TYA play which productively engages in queer discourses. With the support of neurological advances in the study of mirrorneurons and the psychological field looking at self-development, TYA becomes the foremost art form which allows young people to exercise empathy, emphasizing the importance of the existence of these narratives. I deconstruct "troubled youth" plays such as Laurie Brooks' The Wrestling Season where coming out leads to negative consequences, and move into an analysis of three new plays for young audiences with progressive LGBTQ characters and narratives. These are Catherine Wheels' White a play for under-5's where color invades a completely white world in a metaphor for diversity, Emily Freeman's And Then Came Tango for elementary school audiences about a controversial samesex penguin couple at The Central Park Zoo, and Gabriel Jason Dean's The Transition of Doodle Pequeno for middle-schoolers about a boy and his imaginary goat who meet Reno, a boy who likes to wear dresses. In the subsequent practical component of my argument, I examine the process behind an on campus production and tour of Dean's play which I directed, outlining the ways in which these theoretical claims apply to theatrical practice.

#### ୬୦୧୪

#### Omid M. Arasteh

#### Faculty Advisor: Alan Sahakian

#### Implementation of a FM Transceiver Using Universal Software Radio Peripheral (USRP)

The Universal Software Radio Peripheral (USRP) is a piece of hardware used to enhance the current state-of-art applications of software defined radio both in academic world and industry. The purpose of this project is to further understand the wide range of possibilities within wireless communication and in specific, designing a FM transceiver based on the USRP technology and the GNU Radio platform. The basic idea of software defined radio is to use software instead of physical components such as filters, modulators/demodulators, etc in radio communication. In this project, a FM transceiver is implemented using the GNU radio platform which is an open-source software toolkit that provides signal processing blocks to implement software radios. The software is then integrated with the USRP to make the FM receiver and the transmitter.

## Adam Awwad and Rebecca Diesing

Faculty Advisor: John Mordacq

## Alteration of Actin's Critical Concentration in Microgravity

The protein actin is critical for communication and structure for human cells; specifically, bone tissue relies heavily on signal transduction through actin pathways. This transmittance of signals can be inhibited by breaks in the physical pathway, leading to an alteration in cell gene expression. Such breaks have been shown to occur in just 20 seconds of exposure to microgravity, demonstrating a major health concern for astronauts aboard the International Space Station and other long-duration missions. Despite the importance of actin, few studies, if any, have addressed an essential dynamic of its function: the concentration in which actin subunits polymerize, known as the "critical concentration." A difference in this value due to irregular diffusion in microgravity may explain actin's deficit in function previously observed. Our research investigates this hypothesis through the measurement of actin's critical concentration in microgravity, simulated through a reduced gravity aircraft, and the comparison of this value to that in normal Earth gravity. Although our results are still pending analysis, we believe that this research will provide great insight into a possible cause of the hastened musculoskeletal degeneration experienced by astronauts, and lead to its eventual treatment.

## ഗ്രര

## Molly Baker

## Faculty Advisor: Aaron Packman

## Metabolic Heterogeneity in P. aeruginosa Biofilms

Pseudomonas biofilms typically exhibit an oxygen gradient – with oxygen concentration decreasing from the edges of the biofilm colony to the center. It is the intent of this research to image and quantify this gradient using fluorescence microscopy and oxygen optode technology. Oxygen optodes fluoresce with a lack of oxygen and in the presence of ultraviolet light. This technology was used to image biofilms growing on a glass surface. The oxygen distribution was calibrated using sodium metabisulfite to quench the dissolved oxygen in water in known quantities. This oxygen concentration quantification method can be used in any number of future experiments to determine the effects of various factors on oxygen distribution.

## ହ୍ୟ

## Yuliya Bandurovych

Faculty Advisor: Robert Norman Harden

## Self-Report Treatment Profile: Healthcare Utilization among Knee Osteoarthritis and Low Back Pain Subjects

A variety of methods are available for the treatment of chronic pain, but the extent of utilization and effectiveness of these treatments differs greatly. Data were collected from subjects with chronic low

back pain (LBP, n=43) and knee osteoarthritis pain (KOA, n=47) enrolled in two separate double blind placebo controlled pharmaceutical trials. Self-care treatments (hot packs, bedrest, and ice) were most commonly used by both LBP (74%, 72%, and 60%, respectively) and KOA subjects (53%, 49%, and 40%, respectively) and were reported to be effective by the largest number of subjects (56%, 56%, 35% and 43%, 38%, 32% respectively). Many KOA subjects reported positive effect from using knee braces (40%), while chiropractic treatment was more popular among LBP subjects (39%). Physical therapy was utilized more in the LBP population (54%) than in the KOA population (22%); however, more LBP subjects than KOA subjects (21% v. 4%, respectively) reported physical therapy to have had "no effect" in addressing their pain. A third (32%) of the KOA population and approximately a quarter (23%) of the LBP population received injections, averaging 1.4 and 1.6 injections per person, respectively. Ninety-four percent of the LBP subjects versus 65% of the KOA subjects who had received injections found the injections to be helpful, with post-injection pain relief lasting between weeks and few months. Comparing treatments between two different sites of pain will not only help to identify commonalities, but also the differences that should be considered by health care professionals when prescribing treatments for these complex chronic conditions. Supported by Mallinckrodt Pharmaceuticals and Forest Pharmaceuticals, Inc.

#### ഇരു

## **Rachel Beal**

## Faculty Advisor: Thomas O. Mason

## Phase Stability and Electrical Properties of Ruddlesden Popper Series lanthanum Nickelates for IT-SOFC Applications

LSGM has been identified as a promising electrolyte material for intermediate-temperature solid oxide fuel cells (IT-SOFCs) owing to its high ionic conductivity and low electronic conductivity in the intermediate temperature range (500-800°C), but in order to capitalize on its favorable properties, appropriate electrode materials must be selected. The work presented here examines the phase stability and electrical properties of Ruddlesden Popper series lanthanum nickelate cathode materials—with the formula  $La_{n+1}Ni_nO_{3n+1}$ —used in conjunction with an LSGM electrolyte. The n=1, 2, and 3 members of the series were doped with gallium, fired at fuel cell processing temperatures (1400°C), and then characterized via X-ray diffraction to determine the bounds of Ga solid-solubility for each each phase. Electrical conductivity was also measured and was found to decrease with increasing dopant level for n=3 Ruddlesden Popper lanthanum nickelate phase, indicating that Ga-interdiffusion would lead to the formation of a resistive solid solution at the cathode-electrolyte interface.

ഗ്രര

#### Sarah Bridgewaters

#### Faculty Advisor: Karrie Snyder

## Categorization and Analysis of Educational Reform in Chicago

There has always been an effort made for educational improvement in Chicago, from the dawn of the civil rights movement (1930's). People come from very different places of motivation and push for sometimes very different types of reform. There have not been any generalizable attempts to identify which specific types of reform (proactive vs. reactive, short term vs. long term) are the most effective in guaranteeing student success. In my efforts to categorize and analyze reform in Chicago, it became evident that CPS facilitates racial and socio-economic segregation within schools and exacerbates these issues through the 'reform' enacted. They do not show evidence of understanding these current levels of segregation and subsequent disparity of resources received by schools of primarily Black or Latino student populations. With my results, I also wish to complicate what is considered reform. The type of reform were ignored or not properly documented. In addition to categorizing different types of reform, my research highlights and recognizes the two-tier educational system in Chicago and lack of substantiated information available on anything but charter schools.

#### ନ୍ଧର୍ୟ

#### Aozora Brockman

#### Faculty Advisor: Ji-Yeon Yuh

## "Falling in Love" with Korean Idols: Non-Asian Female Fans and East Asian Masculinity

Despite being raised in a media environment where "macho" men are epitomized as most masculine and East Asian men are characterized as being asexual, non-Asian, American female fans of South Korean popular culture become obsessed with Korean male idols who perform "manufactured versatile" masculinities. These are masculinities in which Korean men often act cute and wear makeup, but also change their masculine image from music video to music video. My project-based upon 14 in-depth interviews with college-aged females-focuses on the question of how these women understand these new forms of masculinities and media portravals of East Asian men. I analyze how most fans are able to broaden their conception of masculinity to include Korean idol masculinities, thereby allowing them to understand masculinity as a socially constructed trait, rather than a natural one. This process aids most non-Asian fans in being able to reverse their negative stereotypes of East Asian men and thus find Asian American men to be viable, attractive candidates for dating and marriage. Through interview excerpts I also suggest that the ability to broaden conceptions of masculinity and/or reverse stereotypical thinking is tied to identity; in this case, fans who were socialized to idealize white hegemonic masculinity were more likely to stay repulsed by the "soft," Asian masculinity presented in K-Pop. Exposure to K-Pop, I therefore conclude, can change perceptions of masculinity and attractiveness in some fans, but can only do so much to fully reverse the historically raced, negative stereotypes of Asian American men.

#### ହ୍ୟ

## **Emily Burklow**

Faculty Advisor: P. Lindsay Chase-Lansdale

## Descriptive Study of Variance in Psychological and Financial Wellbeing by Partnership Behavior among Low-Income Mothers

Existing literature on partnership trends has shown that socioeconomic circumstances and psychological wellbeing are linked to different partnership structures. Researchers have also detected recent trends including the rise in both cohabitation and divorce in Western Europe and the United States, but most studies have been conducted among middle- and high-income samples. This study examines the differences in psychological and financial wellbeing across six partnership categories among low-income mothers. The sample consists of 233 mothers with children enrolled in highquality early childhood education in Tulsa, Oklahoma. Quantitative data from parent surveys are used in analyses of variance on seven psychological measures, two measures of economic hardship, and three measures of relationship quality, by partnership type. Qualitative data are used to supplement these findings with illustrative examples of each category of partnership. These comparisons indicate that individuals with steady cohabiting relationships are not statistically significantly different than mothers living with a current husband. On-and-off relationships vary significantly from marriages on every measure of relationship quality. There are other significant differences along some demographic measures, including income, by partnership type. These findings are important in the development of social support systems for low-income families in that they show the important impacts of relationship type on other aspects of quality of life for mothers who may be balancing work, education, and family.

#### ନ୍ଧର

## Victoria Cano

## Faculty Advisor: Sarah Rodriguez

## Women and Theatre as a Means for Solving the Bangladeshi Sanitation Crisis

Last summer I received a Northwestern URG to go to Dhaka, Bangladesh and study the relationship between women and sanitation. One of my major goals was to create a playscript based on my observations. This script will serve as an artistic and educational tool to encourage an international discourse on combating gender based sanitation stigmas through a combination of theatre and women's self authorization. My research indicated that Bangladesh is on a precipice: it may continue the rapid advancement it has fought to achieve during the past forty years or it may grind to a standstill. Several factors are at play: the feminist movement in Bangladesh is fracturing and old methodologies, long held by established NGOs, are no longer working. Another ideological shift must come to Bangladesh. From my work, I have come to believe that it is through the empowerment of women that Bangladesh will continue its steady improvements in the sectors of sanitation, water, and hygiene. This continuation will be difficult and models of knowing will have to be torn down and rebuilt. Yet, there are already those pioneering a new way to reach women and improve the conditions of all Bangladeshis. Whether it be the through the puppets of Sisimpur (Bangladesh's branch of Sesame Street) or the small educational community theaters now dotting the rural countryside, there still remains a dedicated contingent, comprised of both domestic and international persons, utilizing theatre as a means for creating sustainable sanitation infrastructure, thereby creating positive change for Bangladesh the Bangladeshi way.

#### ହ୍ୟ

## Jack Cavanaugh

#### Faculty Advisor: Derk Joester

## Investigating Nanoscale Precursors to Skeletal Growth through a Biomimetic System

Growing evidence suggests that many organisms generate skeletal structures through the crystallization of an amorphous precursor phase. Organisms are thought to control both the stabilization and crystallization of the amorphous phase using impurity ions, proteins, and other macromolecules in order to produce a strong and tough crystalline composite. Using an in vitro model system established by our lab group consisting of synthetic lipid vesicles 25-100 µm in diameter, we identified conditions that trigger crystallization in biomimetic nanoparticles of amorphous calcium carbonate (ACC). Upon adding a carbonate source to a solution of vesicleencapsulated aqueous calcium, metastable ACC nanoparticles nucleate and remain stable at larger sizes (>500 nm) and for longer (>1 week) than previously reported. However, when barium ions, indistinguishable from calcium for many organisms, are substituted in the intervesicular solution, the amorphous nanoparticles crystallize. Time-lapse videos captured using polarized light microscopy identified the formation of crystalline nanoparticles by their strong birefringence. Analysis with confocal Raman spectroscopy indicated that the initial barium concentration affected the final nanoparticle crystal structure. The induction time before crystallization increased from 1-12 hours with decreasing barium concentration. Despite this dramatic behavior, we did not observe an influence on crystallization at the low barium concentrations that occur in calcifying organisms. Therefore, current experiments expand our scope to more abundant impurity ions like strontium and magnesium, and biologically relevant peptides, proteins, and macromolecules.

#### ନ୍ଧର

## **Raul Chavez**

## Faculty Advisor: Frederick Northrup

## A Systematic Variation of Barium-Containing Pottery Glazes

Pottery glazes involve complex chemistry between an aluminosilicate matrix and a variety of metal oxides used to create desired characteristics such as surface texture and color when fired at high temperatures (1200-1300 °C). Metals that are not securely bound into the glaze matrix of functional pottery can leach into food or drink. This project focuses on the leaching of barium—a highly toxic metal not regulated by the FDA— and other heavy metals into a 4% acetic acid solution representative of acidic food conditions. A wide variety of pottery glazes have been tested. Preliminary results suggest: leaching of barium is lowest at an optimal silica-alumina ratio of 6:1; the amount of leached barium decreases with increasing the firing temperature; glazes fired in an oxygen

rich atmosphere can leach up to 4000 times more barium than the same glaze fired in an oxygen poor atmosphere; the visible glaze damage after soaking in the acetic acid solution generally correlated with a greater amount of leached metal ions leached. We are investigating the effect of zinc, which has shown significant destabilization of the glaze matrix, as well as copper and other metals. Results of this experiment are further explained in the poster.

## ହ୍ୟ

## Lillian Chen

Faculty Advisor: John Disterboft

## Characterizing the Role of the Dentate Gyrus during Recent and Remote Trace Eyeblink Conditioning

In order to develop effective treatments for amnesia associated with Alzheimer's disease, the neural mechanisms underlying memory storage, particularly in the hippocampus, need to be better understood. Currently, the role of the hippocampus during the consolidation of declarative memories is highly contested. One view asserts that the hippocampus plays a time-limited role in memory consolidation; it is primarily active during memory acquisition, but as these memories are transferred to the neocortex for long-term storage, they become independent of the hippocampus. In contrast, other theories contend that the hippocampus plays an active role in both memory acquisition and remote recall. However, lesions studies, which do not show the normal physiological activity of an intact brain, have been used as the basis for these theories. Further, these theories view the functional role of the hippocampus as one homogenous structure, while in reality, multiple subregions and independent signaling pathways exist within the hippocampus. Thus, changes in neural activity within distinct subregions of the hippocampus across successive stages of memory remain unclear. This study uses a trace eye blink conditioning associative learning paradigm to characterize single neuron and local field potential activity of neurons within the dentate gyrus subregion of the hippocampus during both acquisition and remote recall of a consolidated memory. Results suggest that dentate gyrus activation is most prominent during periods of memory acquisition as opposed to remote memory recall. These findings are compared with current literature to construct a more holistic view of the hippocampus during memory acquisition and retrieval.

#### ନ୍ଧର

## Sharon Chen

Faculty Advisor: Suzana Savkovic, Northshore Research Institute

## Genistein's Effect on Lipid Droplets in Colon Cancer Cells

As numerous studies have shown, obesity is linked to heart diseases and various kinds of cancer, including colorectal cancer, the second leading cause of death among cancer-related deaths. In recent years the role that lipid droplets play in cancer cells as fat and energy storage has come to researcher's attention. In fact, an increase in lipid droplets seems to result in the degradation of the tumor suppressor FOXO3. Studies have also found that China and other Asian countries have lower occurrences of colon cancer, possibly due to a soy-rich diet. I hypothesized that genistein, a

component of soy, can decrease the number of lipid droplets in cells, which would also lead to the reactivation FOXO3. I investigated my question by two methods: immunoflurescent staining and protein assays. I cultured HT-29 (colon cancer) cells and incubated +/- genistein +/-known inducers of lipid droplets such as EGF and oleic acid. Secondly, proteins were extracted from treated cells and were blotted for presence of PLIN2, a surface protein on lipid droplets. Results are presented as images from the immunoflurescent staining and bar graphs that correlate to the relative density of the exposed blots. I conclude that genistein does indeed have the ability to lower the number of lipid droplets. This is a significant finding as genistein has potential as a preventive drug for obesity-linked colon cancer.

## ഗ്രര

## **Xiaowen Chen**

## Faculty Advisor: Brian Odom

## Single-Ion Excitation Simulation in Three-State Systems

Single ions can be excited using blue-detuned lasers in a way similar to Doppler cooling. Such effect creates a mechanical analogue to an optical laser and gives possibility to nondestructive internal quantum state readout. While experiments and theories involving two-state systems are relatively well-developed, excitation of ions in three-state systems has not been studied in details. In this paper, we investigate the effect of Coherent Population Trapping on three-state systems using the computer simulation of Ba+ excitation. We also optimize the experimental parameters for the specific goal of amplification of state-dependent motional seeding in spectroscopy experiments.

## ഇരു

## Elyssa Cherney

## Faculty Advisor: Mary Weismantel

## Kumari Worship in a Global World: Transnational Feminism and Nepal's Living Goddess

Across Nepal's Kathmandu Valley, six prepubescent girls are venerated as living Hindu and Buddhist goddesses until they begin menstruation. While some of these girls serve as goddesses, they cannot attend school or live with their families. Though most scholarship on *Kumari* worship provides theological accounts of the custom, my project examines whether *Kumari* worship is perceived as a *feminist* issue in Nepal. Using a feminist theory of critical judgment, I spent two weeks in Nepal and conducted 15 semi-formal interviews. I also relied on primary documents, including a 2005 Nepal Supreme Court case that challenged the tradition's constitutionality. By interviewing Nepalese people who worship *Kumari* and who work in gender-related fields, three major themes emerged in my data: *Kumari* worship as identity, *Kumari* worship as a gender issue, but not a feminist issue and *Kumari* worship as a religious and indigenous right. My study sheds light on the possibilities and limitations of a transnational feminist movement based on a monolithic definition of human rights. How we see *Kumari* worship – as oppressive, as celebratory or as somewhere in between – holds lessons for how western feminists can distinguish between human rights violations and

traditions that are just different from our own. In this study, I advocate for a more fluid definition of human rights that is determined by its local context.

#### ନ୍ଧର୍ୟ

## Varshini Cherukupalli

## Faculty Advisors: Mamta Swaroop and Noelle Sullivan

## Iron-Deficiency Anemia in Charnia, Haryana, India: Analysis of Prevalence and Effective Strategies for Intervention

Anemia is one of the most widespread public health concerns globally, especially in developing countries. Iron-Deficiency Anemia (IDA) is the most prevalent type; it impacts cognitive development and increases the risk of maternal/infant mortality. Iron/Folic-Acid (IFA) supplementation is utilized to improve hemoglobin levels, but adherence is a major issue with these programs. Thus, the primary focus of this research was to analyze the methods of sustainably mitigating anemia rates in rural Charnia, Haryana, India through a community health worker (or health promoter) program. Baseline hemoglobin testing was performed, and IFA and Albendazole (for deworming, which exacerbates anemia) were distributed to women and children in August 2013. The mean hemoglobin level of the 113 individuals tested was 10.08 g/dL; the prevalence of anemia was 78.8%. Accordingly, health promoters were trained for the experimental group. These individuals were expected to encourage anemia awareness and IFA compliance in their communities. Program modifications were implemented in December 2013, and final hemoglobin results will be collected in August 2014. Thus far, lessons from the implementation process include: the government's delivery system must be improved; increased community participation and oversight of the health promoters is necessary; and an IFA intervention must be combined with food-based approaches for sustainability. To target these issues, a partnership with a Rotary chapter was formed to increase local presence in Charnia. With the support of The George Institute for Global Health, existing smartphone technology will be modified to train healthcare workers to improve IFA delivery and provide health education as well.

## ନ୍ଧର

## Sandy Cheung

Faculty Advisors: Thomas O'Halloran and Sadie Wignall

## The Link to Zinc: What Studying Egg Development in the Soil Worm *Caenorhabditis elegans* Can Tell Us about Human Egg Viability

Zinc is an essential metal that is involved in proper cellular function including cell division. Studies on the developing mouse egg revealed massive zinc fluctuations and binding to a cell cycle regulator. These findings were key to understanding how viable mammalian eggs are created. While zinc studies demonstrated its crucial role in cell division mice, it is unknown how zinc regulation occurs in other animals. My project explores zinc effects in the microscopic soil worm, *Caenorhabditis elegans*, with the goal of understanding how healthy eggs are created. *C. elegans* hermaphrodites (possessing sperm and eggs) are an ideal model because they have a short reproductive life cycle, are transparent and produce large broods. Most importantly, the processes that govern egg development are shared between worms and humans. Preliminary work with *C. elegans* revealed that sequestering zinc reduced the brood size. This result caused us to examine the reproductive structures and processes required to produce a viable egg. Under normal conditions, *C. elegans* hermaphrodites make sperm, and then eggs to be fertilized. Sequestering zinc somehow perturbs this process. We hypothesize that zinc is important for viable egg production in *C. elegans* since zinc is important for governing egg development. To test zinc effects on unfertilized eggs and sperm, we sequestered zinc (made it unavailable for cellular activity) and quantified sperm and unfertilized eggs by widefield fluorescence microscopy. Our results showed that in zinc insufficient worms, sperm and unfertilized egg numbers decreased, and that the eggs there were abnormally shaped. From these results, we conclude that disruption of zinc homeostasis affects *C. elegans* egg development. This study is co-authored with Adelita Mendoza and Emily Que.

#### ହ୍ୟ

## Sungsub Billy Choo

## Faculty Advisors: Wan Shun Eva Lam and Jinah Kim

## The Role of Transnational Relationships and Bilingualism among Korean University Students in Their Information and Communication Technology (ICT) Use and Future Plans

Over the course of a life span many people become part of more than one community, institution, or region. Such diversification of one's membership is often times facilitated from moving to one place to another, be that to a different street, a different city, or a completely different country. In the recent years, through rapid development of transportation technology, moving around the globe has become a much more affordable option for people. And advancement in communication technology opened up many routes to stay connected and invested in the society they left over through the ever-expanding reach of the cyber network. Social scientists named such migrant behavior of maintaining and sometimes creating social ties that extend over the borders of nationstates "transnationalism." This study examines transnationalism seen on Northwestern University campus through semi-structured interview with current students who were born in Korea. The study compares the experiences of 1.5 generation Korean Americans with that of Korean third culture kids in order to take in to consideration of the diversity of people who partake in transnationalism. Data on their information and communication technology use and future plans are collected to assess how they view their bilingual ability and cultural fluency between Korean cultures and non-Korean cultures, which include their experiences in the United States. Implications of the study include possible improvements to how higher education system can help transnational students realize the potential of their unique social capital that comes with cultural fluency and bilingual ability.

## Kaitlyn Chriswell

#### Faculty Advisor: Ana Arjona

## Cross-Cutting Cleavages: Euskadi Ta Askatasuna, Terra Lliure, and the Centrality of Social Networks

Across the globe, armed groups are often present in very visible ways. However, not all armed groups reach this status. In fact, many armed groups fail in their formative stages and cease to exist. Why do some armed groups succeed where others do not? Both the Basque and Catalan regions of Spain have been home to nationalist, separatist armed groups, yet Euskadi Ta Askatasuna (ETA) has persisted for much longer in the Basque region than Terra Lliure did in Catalonia. This paper seeks to explain how social networks affect armed group viability -- whether a group "succeeds" and continues to exist or "fails" and dies out. It will specifically focus on how pre-existing social networks that are both tight-knit and heterogeneous in nature benefit armed groups and contribute to the longevity of an armed group. Two hypotheses are proposed in order to link pre-existing social networks to an armed group's success or failure. Primary source survey and interview evidence I collected from the Basque and Catalan regions of Spain serves as a basis for examining these hypotheses. I argue that differences observed in the social networks of the two regions help explain the failure of Terra Lliure, despite the success of ETA in otherwise very similar environments.

## ନ୍ଧର୍ୟ

#### Caroline Coccoli

## Faculty Advisor: Miguel Goni, Oregon State University

## Long-Term Patterns in Organic Matter Burial off the Oregon Coast over the Holocene

A high-resolution study of organic matter burial over the past ~13,000 years was completed in a site located at the land-ocean boundary offshore the Umpqua River along Oregon's margin. Terrestrial sediment along this margin is exported by small mountainous river systems via seasonal, episodic flood events. Tectonic uplift and topographic relief as well as climate variables (e.g., precipitation intensity/frequency) directly impact erosion rates. To explore how tectonic and climatic factors may have controlled land-ocean transfers in this region over the Holocene, we determined the organic carbon content, carbon-nitrogen ratio, stable isotopic compositions of organic carbon, yields of lignin-derived constituents, and mineral surface area of sediments collected using a combination of box, kasten and piston cores. Among the trends observed, marked decreases in several organic constituents indicated preferential, in-situ degradation of marine organic matter. Oscillations in the compositions of lignin phenols indicate fluctuations in the provenance of terrigenous materials deposited at this core site during this interval. In this presentation, we discuss how tectonic and climatic variability over the Holocene may have contributed to these trends.

ഗ്രര

## Rhaina Cohen

## Faculty Advisor: Ann Shola Orloff

## Camouflaged Child Care: Rhetoric of U.S. Military Child Care

In the United States, child care is expensive, poor-quality and fragmented, harming gender equality, children's development and economic growth. American history is filled with failed attempts to establish universal child care, aided by a century-old stigma attached to daycare. However, one group of Americans has access to affordable, high-quality government-run child care: military families. This project examines the arguments military leaders and lawmakers have employed to advocate for the military's child care program and offers civilian advocates of universal child care lessons from the military's rhetoric. I draw on interviews I conducted with the architect of the military's child care policy, the current director of the Department of Defense's Office of Family Policy and staff at the military's largest child development center as well as government documents. In contrast to arguments used among civilians that have framed child care as a service that can either enable mothers' employment or benefit children's development, military leaders have framed child care as an issue that impacts the military mission. They have argued that from promoting recruitment, retention and readiness to preparing the next generation of soldiers, child care is an investment in a stronger military force-both the present and future. Whereas nationally, work-life conflict is discussed as an individual concern, the military presents these competing responsibilities as a problem for the employer to reconcile. In its provision of child care, the military has made it possible for its employees to be both dedicated workers and devoted parents.

#### ମ୍ଚେର

## **Christine Daly**

#### Faculty Advisor: Eli Finkel

## Do People Know What They Want in a Romantic Partner? The Negligible Predictive Power of Ideal Partner Preferences

While it has long been assumed that the qualities that people desire in a romantic partner, known as their ideal partner preferences, play a role in determining who they are attracted to, recent findings have revealed a lack of predictive validity of people's idiographic preferences when evaluating potential romantic partners in face-to-face interactions. The present research re-tested the predictive validity in a blind date paradigm using the most stringent measurement of ideal partner preferences to date. Rather than choosing their ideal partner preferences from a pre-determined list of attributes, participants were asked to generate their own list of ideal attributes in a romantic partner and rate their blind date partner on the extent to which the ideal attributes they listed and the ideal attributes listed by another randomly selected participants' blind date partner fulfilled their idiographic ideal partner preferences strongly predicted their romantic interest in him or her, but that this effect was no stronger than when predicting romantic interest from a randomly selected participant's ideal partner preferences. Replicating prior results, we suggest that the present research provides further evidence that people may not be aware of the qualities that they most desire in a romantic partner.

#### ୬୦୧୪

#### Molly Davies

#### Faculty Advisor: Dan P. McAdams

## Agreeableness, Conscientiousness, and the Religious Experience

Past research has shown that the Big Five personality traits Agreeableness (A) and Conscientiousness (C) are positively correlated with measures of religiosity. Yet how do individual differences in A and C influence the experience of highly religious people? This study provides insight into how measures of A and C are expressed within actual human experience by looking at correlations between these two traits and how individuals describe their religion. We coded life story interviews of Christian adults to test the hypothesis that individuals high in Agreeableness would emphasize themes relating to Human Connection (God's Love, Relationships, Community, Equality, Empathy) whereas individuals high in Conscientiousness would speak more about the Life Structuring (Knowledge, Guidance, and Pursuing Valued Goals) function of religion. Included in the results, it was found that Empathy and the sum total of Human Connection codes were positively correlated to measures of Agreeableness, and several of the codes were correlated with specific facets of the two traits. These findings demonstrate how individuals' personalities influence how they experience their religion and the function it plays in their lives.

#### ହ୍ୟ

#### Lauren Dennis

#### Faculty Advisor: Lilah Shapiro

## "Do Your Baby's Hair": Adoptive Parents on Transracial Adoption, Their Conceptions of Race, and Navigating African-American Spaces

The number of families adopting children from races other than their own is rapidly growing in the United States. Historically, adoptive parents usually wished to adopt a child that looks like them, but with so many African-American children placed for adoption, more and more adoptive parents are willing to parent children outside of their own race. The growing popularity of transracial adoptions may indicate that American society is becoming more progressive, but the experiences of adoptive parents of transracially adopted children present a whole new set of challenges. In a country with as volatile a racial history as the United States, the study of transracial adoption sheds insight into the experiences of racially blended families and examines current attitudes about race in our society. Little literature exists on transracial adoption, as it is a recently developed phenomenon within the U.S., and this study offers insight to contribute to the filling of that gap in research. Findings are based on a qualitative study of ten white, non-Hispanic parents who have adopted an African-American or biracial daughter who is currently between the ages of three and six. These findings shed insight into how white adoptive parents of African-American daughters interact with and navigate African-American spaces and how racially blended families are received within their communities.

#### Nirmal Desai, Samson Fong, Viral Patel, Brendan Tran, and Simon Yang

Faculty Advisors: Michael Jewett, Josh Leonard, John Mordacq, and Keith Tyo

## Novel pH Sensitive Dual-State Promoter System for Oral Applications

Mouth bacteria are a primary culprit in tooth decay, as lactic acid secreted by natural bacteria in the human mouth decreases pH, leading to cavity formation. The enamel demineralization threshold is known to be around pH 5.5. The overall vision of our project is to prevent mouth pH from falling below 5.5 by engineering bacteria to sense pH and respond by increasing the alkalinity. To do this, we aimed to create genetic pH sensing elements that would work in the mouth. Our project laid the foundation for a dual-state promoter consisting of two promoters in series: a constitutive promoter active at a (tunable) basal level and an upstream, pH-inducible promoter. Previous research has found that the E. coli genes Asr and GadA are highly expressed when pH drops below 5.5. This research drove us to choose the promoter elements for GadA and Asr as our pH-inducible promoters. We have characterized a new pH-responsive promoter (Asr) as well as an iGEMcharacterized promoter (GadA) and a constitutive promoter (Lpp). Here we used E. coli for the ease at which it is genetically manipulated to provide proof of principle. Additionally, we tested these promoters with GFP for an easy visual output. Ultimately the aim is to engineer bacteria native to the oral microbiome to sense and respond to drops in pH. We envision that these bacteria will induce enzymes that catalyze reactions to counteract the decrease in pH, preventing the demineralization of the tooth.

#### ହ୍ୟ

## **Claire Dillon**

#### Faculty Advisor: Hannah Feldman

## Empty Space and Identity Politics in the Work of Felix Gonzalez-Torres: Negation, Visual Rhyme, and Creative Reinterpretation

The work of contemporary artist Felix Gonzalez-Torres (1957-1996) is widely renowned for its compelling engagement with issues involving aesthetics, politics, and the artist's personal concerns often inspired by his lived experience as a gay and HIV-positive Cuban-American. Much of the scholarship that analyzes his art is accordingly driven by limited narratives that focus on the personal and artistic significance of the minority communities to which Gonzalez-Torres belonged. However, the personal nature of Gonzalez-Torres's work takes on new meaning when it is interpreted and internalized by his audience. When viewers engage with Gonzalez-Torres's art, they are able to create their own subjective analyses that are not necessarily motivated by the artist's identity. The impact and implications of these individual interpretations are manifested in recent appropriations of Gonzalez-Torres's art. This project focuses on three examples of appropriation from the exhibitions Untitled (12<sup>th</sup> Istanbul Biennial) (2011) and Contarlo todo sin saber como in Madrid (2012). These appropriations use everyday objects and printed matter to visually rhyme, or emulate, Gonzalez-Torres's work while situating it new contexts. The interpretive potential of these appropriations functions within the artwork's remainder, which negates essentializing interpretations of Gonzalez-Torres's art by instead concentrating on its enigmatic qualities. Through the study of appropriation, this project explores the ability of Gonzalez-Torres's work to forge communities

through diverse yet intersecting interpretations that often traverse the boundaries of conventional identity categories. As a result, these artistic responses envision a model of identity politics in which all participants must seek compromise between their disparate identifications.

#### ନ୍ଧର୍ୟ

## Yujia Ding

#### Faculty Advisor: Ishwar Radhakrishnan

# Structure-Function Analysis of Sds3, *Suppressor of Defective Silencing 3*, a Key Component of the Histone Deacetylase-Containing Mammalian Sin3L/Rpd3L Corepressor Complex

At the most fundamental level, organisms must have a method to translate information stored in the genetic code into proteins that keep organisms alive. Gene transcription thus plays an important role in the survival of an organism and is predictably tightly regulated. Regulatory machinery exists at the molecular level and is of particular interest to researchers as there is a lack of understanding in how the structure of these complexes contributes to their function. One of these complexes, the Sin3L/Rpd3L HDAC corepressor complex, has been implicated to play a major role in but not limited to cancers and cardiac diseases. Though the role the complex plays in transcription is well studied, the structure and molecular mechanisms through which the Sin3L/Rpd3L complex acts is not well understood. My studies focused on Sds3, one of the key binding partners and the supposed oligomerization domain that recruits histone deacetylase activity to the site of transcriptional repression. Understanding the molecular mechanism of how Sds3 functions at the molecular level opens up an avenue for the discovery of small molecule therapeutics aimed at blocking the normal functions of histone deacetylase complexes as a treatment for various diseases. The work presented here characterizes the minimal dimerization domain of Sds3 and its behavior in solution, contributing to future work of reconstituting the Sin3L/Rpd3L corepressor complex from its core subunits.

#### ഇരു

## Jamese Dunlap

## Faculty Advisor: Monica Prasad

## Savings Accounts among Low-Income African American Households

Savings account ownership has implications for African Americans' preservation of cash, access to credit, and protection from unfair, discriminatory, or predatory lending practices. In light of the benefits that stem from mainstream financial participation, this study seeks to determine the reasons why some low-income African Americans own a savings account while others do not. The goal of this research is to determine what differences exist between two groups of African Americans that both have an annual income level of \$30,000 or less; however, one group of respondents own a savings account, while the other group does not. In-person interviews were conducted with thirty low-income African Americans, and data was collected on their economic backgrounds, banking experiences, and financial habits. Through a comparative qualitative analysis, a difference in banking experiences was found between the two groups. Additionally, the findings suggest that family

played a significant role in teaching respondents who owned a savings account, about the importance of saving. The results also suggest differences between the prior banking experiences of low-income African Americans who own a savings account and those who do not.

## ହ୍ୟ

#### Alex Entz

#### Faculty Advisor: Mark Witte

## **Does Expanding Preschool Access Improve Test Scores?**

Making preschool attendance universal has recently become a major policy issue across the country. There is literature to suggest that investments in early education provide extensive long-term social benefits, though recent analyses of the Head Start program have conflicted with such studies, finding evidence of total or near-total fadeout to cognitive gains by the third grade. To shed light onto this contradiction, my thesis develops two theoretical models. The first is one of policymaker choice, to better understand how decisions to expand preschool get made. The second is a model of a child's human capital development, which shows how children build and develop their skills. One implication is that investments in a young child's learning could yield extensive later benefits. I then develop an empirical model to test the hypothesis that expanding access to preschool leads to higher test scores on the National Assessment of Educational Progress (NAEP) exam five years later, using exogenous policy shocks as an instrument for preschool going. Regression results indicate that increasing preschool attendance rates does not impact fourth-grade NAEP test scores. I use an event study regression to check for endogenous trends that may bias the instrument, and find that there should be some concern about endogeneity, especially for math scores. There may be several reasons why preschool program expansions do not lead to increased test scores, including heterogeneity in program quality, cognitive fade-out, and public choice effects. These and other hypotheses are discussed and evaluated.

#### ഇരു

## Holden M. Faber

Faculty Advisor: Robert A. Linsenmeier

## Spontaneous Fluctuations of PO<sub>2</sub> in the Rabbit Somatosensory Cortex

In the non-stimulated brain, PO<sub>2</sub> fluctuates spontaneously with amplitudes of a few mmHg. We further characterized these spontaneous oscillations to understand the underlying mechanisms. Recordings were made from the whisker barrel cortex of 6 rabbits with acutely or chronically placed, 25  $\mu$ m diameter, insulated, gold-plated Au/Ag alloy wires. Measurements were made while rabbits were awake and while anesthetized with 0.5% or 1.5% isoflurane, during air inspiration and 100% oxygen inspiration. Data segments at least 60 seconds in duration were Fourier analyzed. In awake rabbits,  $\geq 70\%$  of the power was between 0 and 20 cycles per minute (cpm), with a non-uniform distribution and a peak usually near 10 cpm. During hyperoxia, total power was higher than during air-breathing, and the dominant frequencies tended to shift towards below 10 cpm. These observations suggest that lower frequency fluctuations represent efforts by the circulation to regulate

local PO<sub>2</sub>. We expected that anesthesia would disturb vascular regulation and depress the fluctuations. At 1.5% isoflurane the total power was usually lower than in the awake animal, but at 0.5% isoflurane, power was sometimes higher and sometimes lower than in the awake animal. There were no consistent changes in the frequency content of the fluctuations during anesthesia while the animal was breathing air. The hyperoxic changes in frequency content persisted during anesthesia. The PO<sub>2</sub> increased more during hyperoxia when the animal was anesthetized. Thus some elements of the regulation of cerebral oxygenation (oxygen levels; total power) were different during anesthesia, while others (frequency content) were unchanged.

#### ഇരു

## Sofia Falzoni

Faculty Advisor: Monica Prasad

## The Effects of Income on Transnationalism and Integration among Hispanic Immigrants in Miami, FL

This study investigates the effect of income level on transnationalism and integration among 1.5 and second-generation Hispanic immigrants in Miami, Florida. Through analysis of data from surveys and in-depth interviews, I explore how income affects Hispanics' transnationalism and integration, as well as the underlying mechanisms that account for the effects of transnationalism on integration. I find that income is not a significant factor in immigrants' transnationalism and integration. Specifically, I find that immigrants' level of transnationalism is more closely related to other factors, such as their country of origin, their relationships with relatives living abroad, and the length of time they have lived in the U.S. On the other hand, immigrants' degree of integration is more strongly related to factors such as their experience with the American schooling system, their level of comfort with English, the length of time living in the U.S., and the context-specific characteristics of a city with a majority Hispanic population. This paper helps to disentangle the complex relationship between transnationalism and integration.

#### ହ୍ୟ

## Michael Ferguson

## Faculty Advisor: Douglas Medin

## Banksy Effect vs. Broken Windows Hypothesis: A Cognitive Science Approach to the Study of Graffiti, Street Art, and Vandalism

The 'Broken Windows Theory' (Wilson & Kelling 1984) is a highly influential theory of human behavior that proposes that untended signs of social disorder such as litter, broken windows, and graffiti are cues that "nobody cares" about an area. However, behavioral responses to some types of unauthorized public paintings such as those by street artist Banksy call into question the boundaries of the Wilson & Kelling's signs of social disorder. We hypothesize that the causal legitimacy of public wall paintings do not play as strong of a role as the image's aesthetic qualities and message content, and that high-quality images with strong messages will not be perceived as signs of social disorder. To test this hypothesis, we ran a simple online experiment with 300 participants who were presented with stories explaining the causal history of "strange markings" that had appeared in a fictional community. Subjects were shown sets of images of street art and graffiti that were pretested to be at the extremes of high-low aesthetic quality and high-low message content. After viewing a set of these pictures, participants gave their opinions of the fictitious community to measure the effect of viewing the images. Our findings will hopefully not only help us make sense of how people construct their understanding of our modern urban environment, but also shed some light on how we comprehend visual images in general.

#### ନ୍ଧର୍ୟ

## Jack Foster

## Faculty Advisor: Ed Muir

## Making the Italian Criminal: From Italian Positivism to the National Origins Act

In the 1880s, concurrent with the beginnings of a four-decade long period of Southern Italian emigration, a Northern Italian physician named Cesare Lombroso published research which founded Italian Positivism. This anthropological study of crime emphasized the individual criminal instead of the crime - more specifically the criminal's body.1 The work of Italian Positivists profoundly influenced how American eugenicists and racial scientists understood criminal behavior. Their pseudo-scientific evidence claimed that the racial identity of Southern Italian immigrants was inextricably linked with criminal activity. National clamor against immigrants in the early 1900s brought political appeal for ever-more restrictive immigration policies, culminating in the Johnson-Reed Act of 1924. High among those immigrant groups targeted by the law were Southern Italians, who had immigrated in the largest numbers for decades. American immigration policies were grounded in the racist preconception, one among many, that the Southern Italian race was evolutionarily predisposed to a life of crime. This project studies the specific references to a Southern Italian race and its biologically-inherent criminality, as they occurred in both Italy and the United States. My study of Italian Positivist historic archives in Rome and Turin couples with crossreferencing immigration legislation materials, American restrictionist scholarly materials, and media portrayals of Southern Italians.

## ନ୍ଧର୍ୟ

## **Olivia Foster-Gimbel**

## Faculty Advisor: Renee Engeln

## Ethnicity, Objectification Theory, and Body Image Disturbance

We examined racial/ethnic differences in variables of objectification and body image disturbance in first year college women. Previous studies have indicated that there may be ethnic differences in body image disturbance, but results have been mixed. The goals of this study included attempting to find an impact of ethnicity on body image and examining the extent to which differences in self-reported objectification by others and self-objectification might explain these differences. Two-hundred seventy-four first year college women (ages 17 to 20) completed an online survey. 52% of participants identified as White, 7% as Black, 12% as Latina, 19% as East Asian, and 9% as other.

Only data from the four largest groups were analyzed. Participants completed measures on objectification by others, self-objectification, and body image disturbance. Results showed that there were variances in objectification variables and body disturbance variables among different races. For example, though East Asian women reported the lowest levels of objectification by others, they report the highest levels of drive for thinness and body dissatisfaction. In contrast, though Black women report the highest levels of objectification by others and of BMI, they report the lowest body dissatisfaction. This study suggests that objectification theory predictions may not hold for groups outside of White women. Future researchers should examine other potential cultural effects of objectification theory.

#### ഗ്രര

## Leanne Friedrich

## Faculty Advisor: Derk Joester

## Grain Alignment in Chiton Ocelli Lenses

Biomineralization is a complicated process wherein organisms form mineralized tissues. Chitons, a mollusk class found in tidal zones, feature a number of biominerals, particularly a form of calcium carbonate called aragonite. Chiton eyes, called ocelli, contain aragonite lenses. A previous study proposed that because aragonite is birefringent, the chiton can see in both air in water. However, the proposal assumed that the lens is a single crystal. In reality, it is composed of smaller crystals called grains. The orientation of these grains impacts how light scatters as it passes through the lens. This study uses electron backscatter diffraction (EBSD) to analyze the orientation of grains in the lenses. EBSD of lens cross-sections showed that the lens is polycrystalline, although the cross-section of each lens is dominated by two to four grains. The grains within the lens show strong alignment of the c axis, as well as frequent twinning. Because the optic axis of aragonite is close to the c axis, alignment of grains along the c axis is not controlled. Simulations show that this orientation impacts the lens birefringence. A 7-micron thick layer of aragonite lies at the surface of the lens. This layer is polycrystalline and exhibits minimal twinning. Twins in chiton ocelli exhibit a unique curved shape. These incoherent twins may explain how the lens develops.

## ନ୍ଧର

## **Rachel Galvin**

## Faculty Advisor: Wendi Gardner

## Interdependent Emotional Regulation as Signal Value in Romantic Relationships

Individuals consistently engage in interdependent emotion regulation and one's romantic partner serves as the most important sharing partner. Unfortunately, seeking concentrated emotion regulation support from one's partner can elicit negative consequences for both the seeker and provider of support, such as exhaustion, negative affect, or negative self-evaluations. In two studies, we explored why individuals seek out romantic partners for emotional regulation needs and how the patterns of emotion regulation seeking within a relationship may be perceived as a signal indicating relational value (Studies 1 and 2). In Study 1, participants responded to scenarios about different emotional regulation patterns within hypothetical relationships and indicated their perceptions of the quality of those partnerships. In Study 2, participants currently in romantic partnerships experienced a relationship threat and predicted emotion regulation seeking behaviors, individual outcomes, and relational consequences for various emotion-related scenarios. Both studies revealed individuals are aware of the potentially negative consequences of constantly seeking out one's partner, however partners also understand the relation-deepening benefits of the act, as well. Overall, the present research demonstrates why individuals rationally engage in behaviors that superficially appear detrimental to both ones partner and him or herself.

#### ഗ്രരു

## Alexandra Gore and Stephanie Kim

Faculty Advisor: Stanley Lo

## Student Approaches to Problem Solving in Biology

This study was created to analyze the ways students approach problem solving in biology. It follows the completion of a related research project exploring how students understand the concept of chromosome segregation. Building upon similar studies completed in STEM education, specifically in physics and engineering, this study looks at student approaches in biology. This novel investigation is significant due to the unique methods in which students approach problems across academic disciplines. The complex nature of genetics concepts taught in biology makes bioeducation research even more valuable. This study was conducted using the methodology of phenomenography, a methodology proposing that there are a limited number of approaches people use to understand the same issues, e.g. test problems. Students were asked to solve three to five biology test problems and were then prompted to explain their approaches. The data was recorded as transcripts from semi-prompted interviews. After analyzing the data, three main strategies of student approaches to these questions were identified: conceptual, algorithmic, and test taking. The interviews were coded to mark episodes where distinct conceptions of understanding within each of these main categories were identified. These distinct conceptions were used to construct subcategories of understanding that capture slight variations in students' learning approaches. Data analysis will be continued in order to better comprehend these distinct modes of student understanding. The implications of this research include the possibility to better understand learning in biology, an important aim in the growing field of STEM education research.

## ନ୍ଧର୍ୟ

## David Gorsky

Faculty Advisor: Diane Schanzenbach

## The Effects of Prekindergarten on Academic and Behavioral Development through 8<sup>th</sup> Grade

There is a national focus on expanding prekindergarten programs but evidence on the effects of these programs past first grade is quite limited. Using the Early Childhood Longitudinal Study-

Kindergarten Cohort (ECLS-K), I estimate the effects of attending prekindergarten on academic and behavioral outcomes through 8<sup>th</sup> grade. The analysis finds that attending prekindergarten is related to increased math and reading skills but decreased self-control and increases in externalizing behavioral problems at kindergarten entry. In terms of longer-run outcomes, academic gains are no longer present by the spring of first grade. However prekindergarten programs are associated with increased behavioral problems through eighth grade. These findings suggest that attending prekindergarten may not lead to lasting positive academic gains, and may even relate to higher rates of problem behaviors in the long term.

## ନ୍ଧର୍ୟ

## Leah Grodinsky

## Faculty Advisor: Wendi Gardner

## Imaginary Companions & Identity: How Childhood Imaginary Companions Shape Our Adult Lives

As many as 65 percent of children report having an imaginary companion (IC), and these relationships can shape how a child navigates his or her social world. Imaginary companions are conceived as a personified object (e.g. teddy bear) or an invisible character, and are commonly associated with loneliness, social deficiency, or maladaptive coping behaviors. Nonetheless, the catalysts for and functions of ICs are frequently debated, and some researchers posit social advantages that may result from imaginary companionships. Indeed, ICs may provide additional practice for children, yielding more effective accommodation skills or increased social adaptability. The long-term outcomes of imaginary companionships, however, are still ambiguous. The present research aims to deepen our understanding of the differences between adults who had imaginary companions (IC adults) and those who did not (NIC adults). In two studies, we expand on the existing research and investigate to what extent ICs influence socioemotional tendencies, responses to rejection, and creativity. We predicted that IC adults would 1) exhibit better coping skills after being rejected and 2) be more creative than NIC adults. Our social coping hypothesis was partially supported; IC adults did not display reduced self-esteem after rejection, whereas NIC adults did show such declines. Our creativity hypothesis was also supported, such that IC adults scored higher on two measures of creativity. Taken together, these studies can elucidate potential benefits of ICs beyond childhood. Rather than being symptoms of social incompetence, we argue that ICs are the product of a creative imagination and a healthy social appetite.

## ഗ്രര

## Ries Guthmann and Kristen Scotti

## Faculty Adviser: Donald Gordon

## Financing Urban Renewal in Chicago: Tax Increment Financing

Financing urban renewal projects is critical to the economic welfare of cities. Tax Increment Financing (TIF) is an economic development tool which captures future value of improvement areas to finance associated expenditures. A significant body of research investigates the effectiveness of

TIF, though due to diverse local policies governing use, performance is assessed broadly and results vary. Despite evidence suggesting adoption in Chicago is ineffective, TIF remains the primary route for public financing. Indeed, one-third of the city is currently located within TIF boundaries. Initiation is evaluated by municipal planning committees, enabling circumvention of political opposition. Consequently, projects are often politically driven and assessed in terms of financial viability rather than economic efficiency. Resolving current budget shortfalls has eclipsed economic growth as administrative focus has shifted in the wake of the recent economic crisis. Although touted as self-financing, taxpayers with at least one taxing authority in common with TIF properties share the cost for subsidizing affected taxing entities. This research examines the rise of TIF implementation in Chicago and evaluates its effectiveness in the aggregate. Impact of TIF adoption on property growth is modeled through multivariate analysis and the optimization point is identified. Results indicate Chicago's extensive use of TIF has reached a point of diminished marginal returns and continued overuse jeopardizes economic health and public welfare. It is imperative that academic research be considered with regard to agency practices; previous research fails to provide linking mechanisms. Accordingly, this research offers recommendations for reducing TIF use below saturation.

#### ନ୍ଧର

## Carly Haeck

#### Faculty Advisor: Stephen Schueller

## Increasing Body Image Satisfaction with a Web-Based Positive Psychological Intervention

While literature suggests that positive psychology interventions (PPIs) could be effective treatments for eating disorders, research examining the effects of general PPIs on body image is lacking. This study examined the efficacy of a web-based PPI, Happify, in the reduction of body image dissatisfaction. Participants were recruited online and randomly assigned to use Happify or a psychoeducational control program. Both programs lasted for six weeks, with measures of body image satisfaction and well-being collected at baseline and follow-up. Happify contains interactive activities designed to teach happiness strategies, whereas the control program consisted of weekly lessons on positive psychology but no instruction in application. Results showed no significant differences in outcomes between conditions, but statistically significant increases in well-being within both conditions and an increase in body image within the control group. The magnitude of increases in the control condition were larger than the Happify condition, suggesting that web-based PPIs can be beneficial for body image but that more research is needed to determine whether educating users about happiness is more effective than prescribing happiness activities.

#### ୬୦୧୪

## Georgia Hallaman

## Faculty Advisor: Stuart Wagenius

## Ant Diversity and Abundance in Six Western Minnesota Tallgrass Prairie Remnants: The Connection between Ants and *Echinacea angustifolia*

In spite of the significance that ants have in ecosystem structure and function, for the tallgrass prairie very little is known about ant community richness and abundance. I compared the ant abundance and richness in 6 tall grass prairie fragments in Douglas County, Western Minnesota to test whether these communities can be used effectively as indicators of the "health" of their surroundings, represented by the presence of the native prairie forb *Echinacea angustifolia*. A total of 3,626 ants from 25 different species were collected and identified. I found no evidence that ant alpha richness differed significantly across the 6 sites (p=0.34) based on the presence of Echinacea but I found relatively more evidence that ant abundances differ in conjunction with Echinacea's presence (p=0.074). Nonmetric Multidimensional Scaling was used to map the specific presence and abundances of ant species in these 6 communities and to interpret the effects of Echinacea's presence as well as the diversity of the sites in a different manner. My study provides critical baseline information about the composition of ant communities in Western tallgrass prairie as well as some evidence for the use of ants as bioindicators at both the community and species level.

## ନ୍ଧର୍ୟ

## Jeehee Han

#### Faculty Advisor: Monica Prasad

## Income Inequality in the U.S. and Public Opposition to Governmental Health Care Provisions

Many scholars have studied the relationship between public opinion on redistributive policies and the level of income inequality in the United States. A debate between two contrasting views appears in previous literature on how the public reacts to rising income inequality. This study empirically tests where health care policies-a timely and politically important issue in the U.S.-reside in this debate. Using the General Social Survey, I examine how the actual level of income inequality and perceptions of income inequality both impact respondents' opinions about governmental health care provisions. I include other factors as control variables, which previous literature has found to be relevant predictors of public opinion. Running ordered logistic regressions, I find a positive relationship between the actual level of income inequality and public opposition to health care policies. In contrast, there exists a negative relationship between the perception of income inequality and respondents' opposition to health care policies. Based on previous literature and a positive correlation between the two independent variables, I gather from these outcomes that a rise in income inequality occurs along with growing concern about inequality, yet they have mixed outcomes. This interpretation suggests that the social fragmentation theory is only partially supported with my regression outcomes, not fully taking any side on the debate. I further discuss how future studies using qualitative methods can provide more comprehensive findings to the debate.

#### ହ୍ୟ

## Nick Harwood

## Faculty Advisor: Mark. Butler

## Battle Train Tokyo: Footwork Gone Global

Footwork is a style of quick-paced electronic music and dance that originated in Chicago. Like juke and ghetto house, its progenitors, footwork has mostly remained a local phenomenon. But thanks to the internet, footwork music and dance have spread across the globe, and microscenes have sprouted in places far removed from electronic music's traditional nexuses. In this project, I explore one such microscene in Tokyo. Japanese footwork is far-reaching and diverse. In some cities, it is social glue; in others, an avenue of political protest. In Tokyo, the country's capital and its largest city, the scene is a diverse amalgam of producers, DJs, and dancers who come together in the name of footwork culture. By interviewing participants, attending performances, and observing the city's second ever footwork battle, I provide a survey of Tokyo's footwork scene as it convenes and diverges from Chicago's. I also examine how the internet produces Chicago in Tokyo and vice versa; appropriation is a two-way street, and footwork culture blossoms in its global incarnations.

#### ହ୍ୟ

## Alex Heller

Faculty Advisor: Mette Baran, Cardinal Stritch University

## The Treatment of Bullying in Primary Schools of Oslo, Norway

This past summer, I aimed to investigate if schools in Oslo, Norway, in accordance with their academic innovation, exhibited innovation in bullying prevention. I wondered if Scandinavia could offer new solutions to a problem so prevalent in our own society. To conduct my research, I interviewed faculty members, including administrators, teachers, and counselors, as well as students at four different primary schools in different sections of the Oslo area, asking them questions about their understanding of bullying and their thoughts on treating it. I learned that treatment of bullying in Norway is heavily focused on prevention as opposed to punishment. Schools have preemptive initiatives such as parent-teacher meetings to raise awareness on cyber-bullying, as well as antibullying squads, students elected by their peers, that meet weekly to discuss the social dynamics of their student body with school faculty. I also found that students tend to define bullying in terms of prolonged, physical violence-rather than acknowledging verbal acts. Initially, I was inclined to disagree with these students, as their testimony was at odds with what my own upbringing had lead me to believe about the much wider spectrum of bullying. I then realized, after examining alternative treatment methods and alternative definitions, that the concept of "bullying" is one that varies from culture to culture, and that our societal definition is merely one interpretation. Opening communication between schools of different cultures can expose societies new innovation with understanding and treating this issue.

#### Iseli G. Hernandez

#### Faculty Advisor: Karl Rosengren

## Cultural Influence on Endorsement of Causal and Recovery Explanations for Illness

Twenty-nine Mexican (M = 5.31 years, SD = 1.01) and twenty-four European-American (M = 5.31years, SD = 0.96) children ages three and a half to six and their parents participated. We administered ten short story vignettes to examine beliefs about illness. The first two vignettes were open-ended. The eight remaining vignettes were close-ended and provided possible reasons why the character got sick and possible ways he or she could get better. For both illness causality and illness recovery, participants were presented with possible causes that were biological and religious. The format of vignettes enabled children and their parents to endorse solely biological, solely religious explanations, or a combination of both. Thus, this project examines 1) whether individuals use multiple explanations for illness and 2) the impact of culture on health and illness reasoning. The majority of participants endorsed both types of reasoning patterns. The results also showed a significant interaction of culture and reasoning patterns for children and parents. Mexican children endorsed religious explanations equal to biological explanations, while US children endorsed religious less than biological ones. The Mexican parents endorsed religious explanations less than biological ones, as did US parents. Thus, for Mexican adults, culture and religion may play a smaller role in illness reasoning. In sum, our results suggest that children in Mexico reason differently than children in the US about illness.

#### ହ୍ୟ

## David Heydari

#### Faculty Advisor: Manijeh Razeghi

#### Design of Broadband Anti-Reflection Coatings for Quantum Cascade Lasers

The quantum cascade laser (QCL), a novel device that is based on quantum well technology, can provide broadband wavelength coverage for commercial spectroscopy systems in one compact and efficient architecture. These systems can be used to ultimately detect molecules in extreme trace quantities based on the fact that almost every molecule has characteristic absorption patterns in the mid-infrared spectral region. It can also provide outstanding wavelength tunability in one small package. Among other issues, the characteristic reflective mirrors in a QCL (required for controlling the wavelength of the emitted light) interfere with the feedback mechanism of the system, resulting in undesirable performances. The objective of this project was to develop anti-reflection (AR) coatings that would maximize broadband laser tunability and signal reliability by reducing this interference. From theoretical models, programmed in Python and MATLAB, a simple two-layer AR coating (with calculated indices of refraction and layer thicknesses) afforded nominal reflectivity percentages of 0.06 percent, an outstanding achievement over the original laser facet's reflectivity of 27 percent. Another program was devised in order to test infrared materials and determine which ones best fit the index of refraction requirements. These measurements would then be used to fabricate the coatings, and the materials deemed fit for such fabrication were barium fluoride  $(BaF_2)$ and zinc selenide (ZnSe). The coatings were deposited using a sputtering-based ion beam deposition system (IBSD), which also had controls for desired film thicknesses. An SEM and FT-IR

spectrometer will later be used to verify material properties and, ultimately, verify correlation between theoretical laser reflectivity values and experimental ones. Certainly, the immediate importance of this project is in its applications to laser modules that, through high tunability and efficiency, could scan an entire range of chemical composition frequencies beyond the current limited spectral range. This could provide very important and accurate information about the composition of a molecule, since a broader, fuller molecular spectrum makes it easier to identify more characteristics of a molecule. Such devices can even be used to protect people from exposure to a variety of hazardous chemicals.

#### ഇരു

## Sam Houskeeper

## Faculty Advisor: John Bushnell

## The Communist Party of Ireland during the Irish Revolutionary Period

A central theme to the history thesis that I will begin next year is the relationship between nationalism and socialism. In the early 20<sup>th</sup> century, Marxist movements transitioned from internationalist struggles primarily waged in Europe to nationalist struggles based in the colonized or formerly colonized world. Through archival research done on a summer URG grant in Dublin, Ireland, my investigation of this topic showed that Ireland was a microcosm of these cases, being both a European nation and a colony. Marxism was not powerful in Ireland during the revolutionary period because of the predominance of the national question. It was, however, a significant undercurrent at the time, and Irish Marxists like James Connolly attempted to link the national and social questions in a similar to Lenin's diagnosis of imperialism as the highest stage of capitalism. My research showed me an Ireland caught between two distinct iterations of global radical thought: industrial Marxism versus agrarian Marxism, Eurocentric Marxism versus anticolonial Marxism. Connolly thought that socialism would naturally follow the end of English rule, calling capitalism "the most foreign thing in Ireland."

## ନ୍ଧର୍ୟ

## Kimberly Huynh

## Faculty Advisor: Aaron Packman

## Visualizing Dissolved Oxygen Concentration in Groundwater Flow Using Pressure Sensitive Paint

Pressure sensitive paints (PSPs) were first designed for aerodynamic testing of aircraft in wind tunnels. Depending on how much oxygen is applied to a surface, PSPs fluoresce at different intensities. However, a novel application of the paint is the visualization of dissolved oxygen concentration in an aquatic system. This research revolves around developing the experimental methodology to prove this first with a flat plate before scaling up to applying this to a laboratory flume to model groundwater flow. At first, a flat plate coated with the paint will be submerged in water at varying oxygen concentrations. The varying concentrations, shown through the paint's fluorescence, can then be imaged with a scientific grade camera and analyzed with MATLAB to

create a calibration curve demonstrating the relationship between fluorescence and dissolved oxygen at every point in terms of both space and time. This methodology will then be scaled up to having the paint applied to columns of PVC spheres submerged in a flume with bacterial colonies adhering to the spheres' surface. This will illustrate local oxygen concentration, demonstrating the areas of low oxygen that bacteria create through respiration. This will improve temporal and spatial modeling of complex behavior such as eutrophication along with transport and fate of contaminants in watersheds.

## ନ୍ଧର୍ୟ

## Sandeep Jain

## Faculty Advisor: Daniel Molden

## Investigating the Mechanism behind Glucose's Role in Sustaining Self-Control

Self-control, the effortful regulation of one's actions, is key for success. Previous research shows that there are interesting physiological and psychological interactions that influence willingness to sustain self-control. In this study, we looked at how physiological processes associated with tasting sugar vs. artificial sweetener can affect perceptions and willingness to engage in continued effort in a difficult self-control task. This study examined more closely the motivational mechanisms that explain this effect. We had participants complete a Stroop Task with manipulated levels of difficult to deplete self-control resources, taste a drink of flavored water with either glucose or artificial sweeteners, and then engage in a difficult self-control task called the Cold Pressor Task where they had to place their hand in ice water for up to five minutes. We also manipulated the incentives to complete the difficult Cold Pressor Task and asked questions regarding the participants' experiences and motivations throughout the study. We found that regardless of incentive, merely tasting glucose had a main effect on increasing motivation, reported motivation to sustain self-regulation as well as self-regulation performance. Further analyses were inconsistent with previous research, but revealed additional interactions between prior self-control depletion, incentives and carbohydrate tasting that will be discussed.

## ହ୍ୟ

## Keisha James

## Faculty Advisor: Jeffrey Rice

## Marriage Rights as Human Rights: How Ethiopian Women Access the Legal System

Under the Ethiopian constitution, women are equal in terms of marriage, employment, and land rights, and entitled to affirmative measures and protection from harmful customs. This project explores how women's marriage rights are constructed within the constitution and federal family codes, as well as examine the extent to which they are being realized and how women are gaining legal assistance. Previous literature citing poverty as the main barrier to legal assistance lacks a gendered approach, while studies discussing violence against women fail to examine how the legal system is navigated. The marriage rights of women regarding divorce, paternity, custody, division of property, and child maintenance were considered, and the accessibility of legal aid programs and the barriers to accessing these services were examined in this project. The findings are based on interviews with legal aid lawyers and law professionals, and the family cases brought to Access to Justice, a legal aid clinic, by women. The results indicate that despite protection of women's rights being in the constitution and family codes, there are issues with knowledge of rights, implementation of new laws, and enforcement of laws that contradict customary law in practice. While legal aid has expanded in the past decade, programs are not sufficient to support the demand for legal advice and representation, the majority of which is being made by women. Economic, social, and religious barriers to accessing the legal system need to be identified and addressed in order to ensure the legal rights of women are being upheld.

#### ନ୍ଧର

## **Tae Heon Jeong**

## Faculty Advisor: Diego Klabjan

## **Predictive Analytics for Depression Patients**

Depression patients' behaviors are usually difficult to predict because they demonstrate the depression symptoms at unexpected times. The goal of this research is to detect those unusual moments so that the doctors can first reach out for help instead of waiting for the patients to ask for it. The Smartphones nowadays are so prevalent that they became very good sources of data for examining the life patterns of people. This research explores several different data sets from Android Smartphones to build algorithms for locating users' home location, mining users' sleep patterns and communication patterns, to eventually detect abnormal behaviors. All of the algorithms require two to three weeks of "pilot" data to set the standards and then, investigate any anomalies in "examination" data based on the built standards.

#### ହ୍ୟ

## Halimah Jones

## Faculty Advisor: Karl Rosengren

## Health Promotion and Illness Prevention: Two Orientations of Health

In this research we examined how the concepts of health promotion and illness prevention are construed in relation to one's physical health. Past research proposes that these are two distinct concepts that may be difficult to separate in practice. To empirically examine the relationship between health promotion and illness prevention, we created pairs of vignettes that presented two different lifestyles. The vignettes described fictitious characters questioned which was perceived as healthier. We recruited parents (N = 81) to complete the online questionnaire. The parents compared a health promotion focused lifestyle to an illness prevention focused lifestyle. We found that the age of the character influenced parents' choice of a health promotion or illness prevention lifestyle, F(1, 80) = 7.257, p = .009. Age of the character also interacted with whether the question asked about health or illness, F(1,80) = 22.05, p < .0001. Parents rated more child characters to be more likely to become ill with a health promotion focused lifestyle relative to a lifestyle focusing on illness prevention. However, parents rated more adult characters as more likely to become ill if their

lifestyle was prevention focused, rather than focused on promoting health. This suggests that the importance of health promotion and illness prevention is partially dependent on character's age. These findings indicate that parents may not emphasize health promotion to children and only introduced around adolescence. This carries implications for a potential need to evaluate health education, and further assess how this influences health outcomes.

#### ഗ്രരു

## Kelsey Jorgensen

Faculty Advisor: Thomas Mason

## Binary Join of the Transparent Conducting Oxides T-Phase GITO and Bixbyite ZITO

The solubility of ZnO in T-phase GITO  $(Ga_{3,x}In_{5+x}Sn_2O_{16})$  and  $Ga_2O_3$  in bixbyite ZITO  $(Zn_xIn_{2+2x}Sn_xO_{15})$  was investigated as well as the electrical properties of the doped materials. T-phase GITO can accomodate between 3% and 5% of its gallium replaced by zinc and bixbyite ZITO can accomodate between 3% and 4% of its zinc replaced by gallium. Bixbyite ZITO conductivity increased as  $Ga_2O_3$  was added. It was found that  $Zn^{2+}$  cations do not act as acceptors when replacing  $Ga^{3+}$  in T-phase and in fact result in higher conductivity with increasing dopant concentration.

#### ହ୍ୟ

## **Olive Jung**

#### Faculty Advisor: Richard Silverman

# Synthesis of Transition State Analogue Inhibitors of Diphosphomevalonate of Cholesterol Biosynthesis in *Streptococcus pneumoniae*

Streptococcus pneumoniae is a human pathogenic bacterium that causes a wide range of maladies, such as meningitis, sepsis, and pneumonia. Since the discovery of the bacteria as the cause of many harmful bacterial diseases, various antibiotics and vaccines have been widely used to treat these bacterial infections. However, there have been increasingly alarming trends of multidrug resistance against currently available methods of treatment. Consequently, present research on the bacterium has been dedicated to finding alternative antibiotics that are cost-efficient, yet still potent, against these bacterial mutations. My project takes a new approach from previous research by mimicking the actual transition state scaffold of 5-diphosphomevalonate in the mevalonate pathway of S. pneumoniae. I am examining whether close structural similarity of the target compound is important in the inhibition of diphosphomevalonate decarboxylase (DPM-DC) by covalently locking the enzyme in the analogue-substrate complex. While undertaking this project for the past three years, I have changed several reactions and rearranged synthetic steps in order to optimize the yield and stability of intermediates. Synthesis for the target molecule is still an ongoing process, as the desired intermediates have not been previously synthesized nor discussed in the existing literature. Once the final molecule is obtained I will be performing various biological assays to further assess whether the target compound is a potent inhibitor of DPM-DC.

## ନ୍ଧର

## Sharon Kao

Faculty Advisors: Galen Bodenhausen, Joan Chiao, and Alissa Chung

## Reducing Mental Illness Stigma through Perspective-Taking in the Asian Population

Mental illness is extremely prevalent in America; however, the general population's bias towards mental illness is great and has negative consequences for the individual and the society. In particular, Asians are more biased because of the conformist and collectivistic culture that shuns deviation from "normality," and it places blame on the entire family when one family member is mentally ill. Yet, few studies have examined ways to reduce bias towards mental illness. Perspective-taking is one potential method that may reduce such bias; it is the active contemplation of others' psychological experiences through empathy. It is effective in reducing racial bias but has yet to be tested in bias towards mental illness. Thus, this study examines the role of perspective-taking in reducing bias towards mental illness and compares its effectiveness in the East-Asian and Caucasian population. Fifty-six participants performed perspective-taking through reading vignettes about two mental or physical illnesses and writing about the person's typical day with the illness. Prior to and after perspective-taking, participants' level of explicit and implicit bias towards mental illness, contact with mental illness, and level of empathy were measured. Preliminary results showed that perspective-taking did not have an impact on explicit prejudice. However, their general level of empathy is predictive of their explicit bias, implying that a different dimension of empathy or a different kind of interaction with mental illness may be needed to change attitudes towards mental illness. Results also showed that Asians reported greater prejudice towards mental illness.

#### ହ୍ୟ

## Nicholas Kazvini-Gore

## Faculty Advisor: Gayla Ruffer

## Differences between Refugees and Voluntary Newcomers in Acculturation: The Case of Iranian Immigrants in Hamburg, Germany

The Iranian immigrant community in Hamburg, Germany is the second largest group of Iranian immigrants in Europe. This group is a unique case because there are multiple waves of immigrants that populate the diaspora who came to Hamburg for a variety of reasons. Iranians that came before the Iranian Revolution came as businessmen who managed international trade between Iran and Europe. Iranians that came after the Revolution were mainly refugees due to political unrest. This research seeks to understand the relationship between reason of immigration and success of acculturation into the German host society. Twenty-five in-depth interviews were conducted in Hamburg, Germany with members of the Iranian community over the course of Summer 2013 with the support of an undergraduate URG. The research found that the Iranians that came before the Islamic Revolution as free-will immigrants were more successful in acculturation due to high social capital, international awareness, and therefore higher respect in German society. Iranians that came after the Revolution faced a greater culture shock, had fewer resources,

and were not as prepared for contact with another culture. This research is important because it sheds light on an under-researched immigrant population in Germany, one of biggest host-countries in Europe. In addition, this research shows diversity in a diasporic population such that immigration policy can more intuitively be tuned to specific sub-sections in immigrant groups with differing reasons for immigration.

## ନ୍ଧର

## **Christian Keeve**

## Faculty Advisor: Michelle Wright

## Shock To Your System: An Afrofuturistic Examination of Electromagnetism and Android Embodiment in the Black Superheroic

The burgeoning field of Afrofuturism seeks to reimagine constructions of Blackness through Black cultural lenses and place it in future space-times in which it is usually underrepresented or outright excluded. In order to fully understand the Afrofuturistic depictions of black bodies, one must put it into dialogue with the Android and the Superhero, both of which have complicated and sometimes controversial histories in terms of Black cultural products. Black androids, like Black superheroes are often regarded as inherently self-contradictory, cultural and biological impossibilities, and even inevitable self-destructions. However, they become a necessity for black bodies to enter culturally realized future-scapes. In this project I utilize an Afrofuturistic examination of Black Superheroic bodies that are bestowed with electromagnetic power and technological enhancement, two forces that are often deployed as complementary, if not mutually inextricable. The Electric and the Technological are then put into dialogue with black cultural and mythological constructions. After reading analytical literature on Black superheroics and Afrofuturistic thought, I carry out case studies of specific Black superheroes, covering a variety of publishers, creators, and abilities, focusing on how electricity and technology affect and intersect agency and cultural boundedness. Due to the sheer amount of material published, I focus on origins and major story arcs. This is supplemented by examinations of independent interjections into Superheroic thought by black artists and creators that critique and complicate the Superhero figure in popular culture. Analysis concludes with thoughts on dichotomies among black creators and the place of Black Superheroism in Black popular culture.

## ନ୍ଧର୍ୟ

## Katherine Kelly

Faculty Advisor: Chevis Nicole Shannon, Vanderbilt University

## Patient Characteristics and Clinical Decision Making in the Pediatric Traumatic Brain Injury Patient Population

The purpose of our study was to retrospectively evaluate patient characteristics and factors influencing clinical decision making in an effort to inform an ongoing discussion centered on standardization of treatment and management for traumatic brain injury (TBI) patients. A retrospective study of 1836 children undergoing treatment and management for TBI between
January 2006 and April 2013 at the Vanderbilt University Children's Hospital was conducted. Descriptive statistics, multivariate and logistic regression were conducted using SAS 9.3. We found that 63% of our cohort was male, 77% were Caucasian, and over 75% presented alert and were discharged home. The mean age was 7.6 years (stdev 5.83). Approximately 50% of our cohort required ICU days of 3 or less while 40% required greater than 14 days in the ICU. Bleed characteristics including epidurals, subdurals, subarachnoid hemorrhage, and radiographic characteristics including bilaterality of bleeding, retinal hemorrhage and midline shift were evaluated. Of these factors, subdurals, epidurals, age, and low GCS were associated with ICU stays of 7 days or greater (p<.0001) Additionally, prolonged seizure activity, high glucose levels and subdural hematomas were found to be associated with hospital disposition other than home (p< .0001). The purpose of this study was to retrospectively review our institution's trauma patient population as a step towards standardization of clinical care. This descriptive study will inform a TBI protocol and multidisciplinary clinical pathway that will be used among the pediatric neurosurgery, emergency department and critical care teams at VCH.

#### ୬୦୧୪

## Allyson Kendall

#### Faculty Advisor: Donald Gordon

#### The Data Transparency Revolution and Improvement of Health Outcomes

The field of healthcare reform has experienced a recent shift toward advocating health data transparency. More than simply providing patients access to more information, this transparency revolution focuses on publishing health data in a way that is useful to third-party developers, encouraging the creation of data driven programs and services that allow patients to make faster, easier and better informed health decisions. The Department of Health & Human Services has led the federal effort to improve transparency in this way, and has taken major steps toward online publication of their research. They have primarily accomplished this through the creation of HealthData.gov, a website ultimately intended to become a central access point for all American health related data. The website makes this large-scale data available in an easily accessible and downloadable manner, intended to readily allow tech developers to utilize it in creating health related programs or services. For example, programs like Aidin, which helps families of Alzheimer's patients plan post-discharge care, use data from HealthData.gov to coordinate information like quality measures of hospital, doctor and nursing home performance. Through innovations like this, health data transparency initiatives are helping to create an active and competitive healthcare marketplace, in which third-party delivered services can empower patients to make better healthcare decisions with the help of a vast collection of health data. This research discusses the recent transparency efforts of the Department of Health and Human Services, and explores resulting technological developments and the potential health implications of data transparency for patients.

୬୦୧୪

#### Michelle Ki

Faculty Advisors: Jinah Kim and Lilah Shapiro

# Manifestations of Patriarchy in Popular Music: A Content Analysis of American and Korean Popular Songs from 2010-2013

This research project focuses on the ways that romantic and sexual relationships between women and men are portrayed in the lyrics of popular American and Korean songs. The qualitative analysis of the top 25 songs, ranked on the Billboard and Gaon Charts from America and Korea respectively over the years 2010-2012, reveals the ways that patriarchy is differently expressed in different cultures and societies. Despite cultural differences, both sets of songs reinforce and perpetuate the idea that men should be in control over romantic and sexual relations. By adding to the discussion of manifestations of patriarchy in mainstream popular culture, I aim to contribute to the deconstruction of institutions and structures that preserve destructive gender hierarchies.

#### ନ୍ଧର୍ୟ

# Jin Hak Kim

## Faculty Advisor: Jelena Radulovic

## A New Technique for the Use of Virally Transfected Receptors in Fear Memory Retrieval in Mice

Post-traumatic stress disorder (PTSD) is an anxiety disorder characterized by intrusive and vivid recall of a traumatic memory. PTSD treatments require systematic understanding of how traumatic memories are stored and remembered. The retrosplenial cortex (RSC) is necessary for the retrieval of both recently (days ago) and remotely (months to years ago) formed memories. In contrast, the hippocampus and anterior cingulate cortex, which provide inputs to the RSC, are specifically involved in recent and remote memory retrieval, respectively. It is unknown, however, whether RSC-mediated memory retrieval depends on activity of these inputs. Selective inhibition of the individual input from different brain regions is a necessary step to understand the role of these inputs on RSC function. Using Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) is a novel approach that can selectively modulate behavioral responses by altering neurotransmission. This study examined the efficacy of DREADDs by examining the changes in the memory retrieval upon DREADD activation. Viruses are injected to express inhibitory DREADDs that silence neurons when activated by the synthetic ligand Clozapine N-oxide (CNO). Mice were fear-conditioned and tested for memory retrieval in the same context after an injection of CNO. The activation of DREADD receptors expressed by the synapsin promoter in RSC and hippocampus successfully decreased the level of fear memory retrieval. This suggests that, the synapsin promoter is more effective in expressing DREADD receptors. Further investigation on input-specificity via DREADD technology will expand our understanding of neural networks, which is relevant to pharmacological treatment of anxiety disorders.

## Alyssa Kincaid, Daniel Thiel, and Valerie Zuckerman

Faculty Advisor: Hendrik Spruyt

## A Revolution for All? An Examination of the Effects of the Arab Spring on Women's Rights

The Arab Spring, which is accredited to have begun in Tunisia in December 2010, has spread to many countries in the Middle East and Africa, upending deeply rooted political and social institutions. It is not always evident how the effects of these changes, in countries such as Egypt, Tunisia, Libya, Yemen, and Bahrain, impacted the women's population. However, as a result of women's participation in the Arab Spring Revolts, governments have a heightened awareness of women's rights; but cultural norms play an important role in the implementation of those rights.

#### ହ୍ୟ

## Xavier Keith Price Kirkham

Faculty Advisor: David H. Uttal

# Spatial Thinking and Sketching among Middle School Students Engaged in Hands-On Engineering Design Activities

Spatial thinking is critical in STEM fields, particularly engineering. Sketching is vital in determining success in engineering. Research suggests that spatial visualization skills develop during adolescence, however little is known about the interplay of spatial skills and sketching. Studying adolescents is ideal to develop methods of bolstering these skills and increasing retention in STEM fields. This study looks at 40 middle school students' (ages 11-14) participation in two hands-on engineering activities. First, students' spatial and verbal abilities were assessed using the Vandenberg & Kuse Mental Rotation Test, Santa Barbara Solids Test, and Peabody Picture Vocabulary Test - Third Edition. Then, in one activity, students were asked to reconstruct a bridge using K'nex pieces and top, side, and cross section views of the bridge. They were also asked to sketch top, side, and a cross-section views of a different bridge built from K'nex. In our second activity, we asked them to design a bridge that would be tested in a model hurricane (i.e. wind, rain, flooding, weight). In the sketching-to-building activity, SBST score predicted bridge construction and sketch accuracy. In the design activity, SBST score and gender significantly predicted spontaneous design sketching. Spontaneous sketching predicted design complexity. These results suggest that spatial visualization skill is predictive of spontaneous sketching and sketching accuracy as well as design complexity and that girls are more likely to spontaneously sketch than boys.

ഗ്രര

## Zachary Kisfalusi

#### Faculty Advisor: Patricia Beddows

# Correlation and Analysis of Surface Hydrology of Northern Cook County as a Product of Surface Runoff

The surface hydrology of the northern part of Cook County has changed over time from c.1950 to the present. The aim of this research is to better understand the relationships between surface runoff, percent impervious surfaces, and precipitation changes over time. The working model is that urbanization particularly through the 1970 filled in the landscape while adding more impervious surfaces to the area. The N. Branch of the Chicago River and the Des Plaines River channels were analyzed for changed in discharge along with the Skokie River, W. Fork of the N. Branch, and McDonald Creek, all tributaries in the area. Through analyzing river discharge, groundwater levels, impervious surfaces, and climate precipitation, the changes over the last ~70 years have been evaluated. The discharge in almost all sites has increased, with a step function broadly in the 1970 decade, followed by a level value in the last three decades. This pattern coincides with intensification of urbanization, increasing usage, and increasing precipitation. This research quantifies the shift in urban surface hydrology associated with urbanization that overall transfers flow to engineers streams. The conceptual model used indicates that hydrological flux will thus be decoupled from the groundwater system and also return to atmosphere by evapotranspiration, and shunted more directly to extra regional discharge into the greater Mississippi basin and Lake Michigan. Due to limited well data, the direct impact on groundwater levels was not directly evaluated.

#### ହ୍ୟ

## Kate Kurgan

### Faculty Advisor: Amy Rosenzweig

## Engineering Protein Fusions to Mimic Particulate Methane Monooxygenase

Particulate methane monooxygenase (pMMO) catalyzes the oxidation of methane to methanol in methanotrophic bacteria. Methanotrophs are gram-negative eubacteria whose single source of carbon and energy is methane. Methane is the second most abundant greenhouse gas after carbon dioxide. Therefore, understanding the mechanism by which pMMO catalyzes this reaction has potential applications in alternative energy development, bioremediation processes, and the development of "green" synthetic catalysts. The Rosenzweig lab proposes that the active site of pMMO is a putative dicopper site housed in the periplasmic pmoB domain. A recombinant mimic housing the two soluble domains of the pmoB subunit, termed spmoB, has been instrumental in pinpointing the active site. However, its instability and low activity makes spmoB a poor candidate for the studies required to unravel the mechanism of pMMO. This research is aimed at achieving a stable, homogeneous spmoB system that is highly active in order to study the mechanism and structure as it relates to pMMO. We have identified five fusion proteins (T4 lysozyme, flavodoxin, cytochrome  $b_{562}$ RIL, rubredoxin, and xylanase) to insert at the site of the transmembrane helices of pmoB in hopes of stabilizing the protein. Of these five proteins, the spmoB\_flavodoxin fusion is both stable and homogeneous and further biochemical characterization has begun. Additionally, we are in the early stages making proliferating cell nuclear antigen (PCNA) fusions to spmoB. PCNA

natively trimerizes and will allow us to investigate the role secondary structure has on pmoB stability and activity.

#### ୬୦୧୪

#### Wiliam Lassman

## Faculty Advisor: Diego Gomez

# Effect of Localized Enhanced Binding Sites on Methane Adsorption in Metal Organic Frameworks

U.S. Energy dependence on foreign oil has a number of economic and environmental drawbacks. A potential solution to this issue is to use natural gas in lieu of oil-based fuels such as gasoline; there are abundant natural gas reserves in the U.S., and natural gas also burns more cleanly than gasoline. However, effectively using gas fuels in applications such as powering automobiles requires storing the fuel in vehicular tanks at densities comparable to those of liquid fuels. Gas densification is done by compressing to high pressures such as 250 bar, which is costly and energetically intensive. Thus, searching for adsorbent materials that densify natural gas at lower pressures is an active area of research. Metal-Organic Frameworks (MOFs) are nanoporous structures that possess many desirable qualities for adsorbing gases, such as high void fractions and high specific surface areas. A key factor determining adsorption performance is the interaction strength between the adsorbent material and the adsorbate. In this work, the effect of incorporating localized enhanced binding sites in the structure of metal-organic frameworks on the methane deliverable capacity was investigated. The approach consisted on the introduction of "faux" low-coordination metal sites on several hypothetical and synthesized MOFs, and artificially modifying the interaction strength of methane with these sites. Then, methane deliverable capacities between 65 and 5.8 bar were calculated using grand canonical Monte Carlo simulations. Preliminary results show that while the deliverable capacities were not significantly affected by the presence of localized enhanced binding sites, the methane adsorbed at the storage pressure did increase, so increasing the temperature at the delivery pressure produced a noticeable improvement in the performance of the original materials.

#### ହ୍ୟ

#### Cosima Lenz

#### Faculty Advisor: Franziska Lys

# Changes in the Public Health and Surveillance System in Hamburg, Germany after the 2011 E-coli Outbreak

From May until June of 2011, the country of Germany experienced the largest E-coli outbreak in its history, as well as being the largest having occurred in the First World. Approximately 3,500 cases were reported, the majority occurring in the northern part of the country in the city of Hamburg. During the outbreak various perceived flaws in the Public Health and Surveillance System came to light, which quickly became the target of international critique. Areas of critique included ineffective control laws concerning dangerous diseases, insufficient methods and lack of communication between city, state, and federal agencies, and lack of sufficient resources. In this study several experts

from various fields were interviewed regarding the changed that have occurred to address the flaws that came to light during the 2011 outbreak. Sufficient changes have occurred, especially in regard to communication, and knowledge has been gained in medical arenas concerning E-coli. Although other alterations to the system have proven to be more difficult to address, progress has been made.

#### ହ୍ୟ

## **Emily Liquin**

Faculty Advisor: David Uttal

# The Learning Effect: The Role of Task Exposure in Children's Symbolic Understanding

Existing research on early symbol use suggests that toddlers' understanding of a scale-model as a symbol for a room depends on a high degree of overall similarity between the symbol and referent. In this study, we investigated whether children completing a symbolic task with a high-similarity model would gain symbolic insight, leading to better performance on the same symbolic task with a low-similarity model and room on the next day. In Experiment 1, 27 3-year-olds completed a symbolic task on two consecutive days. The control group performed a hard task both days (model contained hiding locations, room contained hiding and non-hiding locations). The experimental group performed an easy task on Day 1 (both model and room contained hiding and non-hiding locations) and the hard task on Day 2. On Day 1 the experimental group performed significantly better than the control group, but on Day 2 both groups were highly successful. These results indicate a learning effect rather than the expected transfer effect. We hypothesized that repeating the instructions allowed children that had initially failed at the hard task to succeed on Day 2. In Experiment 2, 3-year-olds performed the hard task on two consecutive days, but without instructions on Day 2. Preliminary results indicate that children still learned across days, indicating that some other mechanism is at play. In general, these experiments suggest that children can rapidly learn to appreciate a symbol even after failure and without re-teaching. Future research is needed to determine the mechanism of this spontaneous learning.

#### ନ୍ଧର୍ୟ

#### **Daniel Liss**

## Faculty Advisor: Jennifer Lackey

## Rule-Governed Evidentialism: An Account of Group Justification

According to research in the social sciences, groups and social systems have a profound impact on the human experience. Further, we often talk of organizations as having knowledge, from claims such as "the non-profit knows it needs a grant," to a consulting company recommending a "knowledge management solution." Under a standard epistemological understanding of knowledge, knowledge involves justified true belief. If we are to say groups have knowledge, therefore, it is important to understand when they justifiedly believe something. To do this, the paper rejects three seminal accounts of group justification, and suggests what I call *Rule-Governed Evidentialism* in their place. This research project was conducted as an Honors Thesis in Philosophy at Northwestern University under the guidance of Professor Jennifer Lackey. As such, it followed the traditional methodology of examining the work of published philosophers, and crafting an argument in response to those previously forwarded accounts. *Rule-Governed Evidentialism* addresses the need for a connection between groups and its members, as well as acknowledges the power of social systems to affect group reasoning. There are two primary virtues of my view: (i) first, that it accommodates the intimate link between group justified belief and rationalizing action, (ii) and second, that it has the resources for holding groups responsible for illegitimately limiting the available evidence by way of the group structure. This paper only proposes necessary conditions for group justification, however, I believe these represent the core of what it means for a group to justifiedly believe something.

#### ନ୍ଧର

#### Soad Mana

#### Faculty Advisor: Caroline Bledsoe

## Foodies with Fists: Using a Social Justice Framework to Address a Chicago Food Desert

Thousands in inner city neighborhoods do not have access to healthy food, thus relying on the processed and packaged foods available at the corner stores. Community organizations are stepping up to help combat these issues with projects such as farmers' markets, urban-based CSAs, garden projects, and environmental and nutritional education programs. The objective of this study was to analyze the efficacy of a community program aimed at young volunteers by teaching them to recognize the structural barriers that underlie food access and diet related illnesses. Using participant observation and semi-structured interviews, I conducted the project at a community organization utilizes the social determinants of health as a guiding framework, regularly holding discussions on national food policy, the lack of grocery stores and affordable produce in the neighborhood, and the connection between high rates of youth obesity and diabetes to institutional racism. They would then coordinate trips to corner stores where teenagers would survey community members on the availability of affordable produce and discuss their results in community forums. These findings inform efforts to shift dietary health intervention from an emphasis on individual eating choices and nutritional content of food to more coordinated mobilization for health equity in the city.

#### ନ୍ଧର୍ୟ

## Shivon Manchanda

#### Faculty Advisor: Aryeh Routtenberg

## Rescuing Age-Related Memory Decline in Caenorhabditis elegans

One advantage of *Caenorhabditis elegans* aging is the relatively brief (14-20 days) lifespan of these microscopic soil-dwelling nematodes. Additionally, by taking advantage of gene targeting libraries in *C. elegans*, one can readily study the effects of selected mutants on aging. These advantages are especially useful in studying the effect of age on learning and memory processes. In our study, we compared the negative olfactory associative conditioning of adult (3 day) and aged (10 day) wildtype (N2) nematodes. We found that the younger nematodes retained conditioning both immediately and

12 h after learning. In contrast, 10-day old nematodes, though they show unimpaired learning and immediate retention at 0 h, show significant forgetting at 12 h. Thus, an age-related deficit is seen in long-term but not short-term memory. In daf-2 mutants, which have a mutated insulin/IGF-1 receptor, the 10-day-old nematodes retained conditioning at 12 h, suggesting rescue of the memory in animals lacking a functional IGF-1 receptor. Mutated animals showed similar acquisition to controls immediately after conditioning. We conclude that the demonstrated age-related memory decline in wildtype C. *elegans* is rescued by the daf-2 mutation. This suggests the provocative hypothesis that insulin-like growth factor participates in memory storage processes. Because it does not facilitate memory in 3-day-old adult worms, this effect is not derived from a developmental process but may directly regulate the signal transduction pathways involved in memory that deteriorate during aging. Linking the present results with the known role of the IGF-1 receptor in mammalian memory, the conclusion that this is an evolutionarily conserved mechanism appears warranted.

#### ହ୍ୟ

### **Mesum Mathison**

Faculty Advisor: Sandra Waxman

# How Do We Develop Notions of 'Race'? An Exploration of Infants' Sensitivity to Social Categories of Race

Previous research has investigated category formation in infancy. However, few studies have been done on infants' categorization of social stimuli, especially with regard to faces. In particular, it is unclear how infants' group individuals of races other than their own. The goal of the current research was to investigate how infants represent and structure this "other-race" category. This study begins to explore whether this "other-race" category is "differentiated" into multiple racial groups or whether infants consider this group a single "undifferentiated" group of individuals. The design of the present study utilized both an anticipatory looking paradigm and a violation of expectation paradigm, adapted for social stimuli for the first time. Thirteen- to 15-month-old infants watched video clips of own-race (White) and other-race (Black) faces appearing one at a time in the center door of a house and then moving to a door on either the left or the right, depending on the race of the face. Their eye movements were recorded with an eye tracker. Infants anticipatory looking patterns revealed that, regardless of the race of the face, infants preferred to look to the White face location over the Black face location 71% of the time, p = .03. This line of research will contribute to our understanding of early cognitive biases that are foundational to the "other-race effect" and of the patterns of stereotyping and prejudice that appear as early as the preschool years and persist throughout adulthood.

#### Jonathon McBride

## Faculty Advisors: Matthieu Flourakis and Ravi Allada

# Generation of Brain Specific NALCN Knockouts to Study the Role of the Sodium Leak in Mammalian Circadian Physiology

In mammals, circadian rhythms are controlled by a subset of neurons located in the hypothalamus called the suprachiasmatic nucleus (SCN). SCN neurons are regulated by ionic currents mediating changes in membrane properties with a focus on rhythmic potassium  $(K^{+})$  channel conductances. Nonetheless, the underlying mechanistic basis of high amplitude rhythms in neural activity remains unclear. In Drosophila, a sodium leak channel (NARROW ABDOMEN: NA) has been characterized to drive neuronal rhythms in circadian pacemaker neurons and to regulate circadian behavior. The degree of conservation of this channel in mammalian circadian physiology is unknown. The goal of this project is to generate a brain specific knock-out of NA homologue (NALCN) to study its role on circadian behavior. The LoxP-Cre recombinase system with a brain specific promoter (CamKIIa) was used to knock-out NALCN specifically in the brain. Unfortunately, this brain specific NALCN knock-out caused death around day 23 of development. To continue the investigation of NALCN, animals with a more specific brain knock-out will be generated using the vasoactive intestinal peptide promoter (VIP). VIP is the main signaling molecule in the SCN and its expression is restricted to the SCN. The animals generated in this project will be used to study how the NALCN affects the circadian behavior of the animals. Doing so will provide insight into the role of sodium conductances in circadian behavior and pace making neurons.

#### ନ୍ଧର

## Kayleen McMonigal

#### Faculty Advisor: Patricia Beddows

## Developing a New Paleo Sea Level Proxy: The Calcite Rafts of the Yucatan Peninsula, Mexico

Paleo sea level records for low latitude sites commonly utilize coral and mangrove deposits. However, coral grows over a wide range of water depth, and mangrove decays and becomes compacted over time. This leads to uncertainties of 1-10 m for both materials. Floating mineral calcite rafts precipitate on cave water surfaces and are a global feature of low latitude caves. The extensive coastal caves of the Yucatan Peninsula contain calcite rafts that accumulate in shallow water pools and the extreme permeability of this aquifer allows for the water table to closely match sea level. The raft deposits are also well preserved due to their mineral form and the protection of the caves, and therefore represent a new, potentially higher accuracy and resolution record of sea level. Field experiments spanning almost a year in three cave sites in the Yucatan Peninsula focused on the mineralogy and physical nature of calcite rafts, sedimentation processes, and formation and sedimentation rates. Rafts were found to form rapidly within days under some conditions, rafts were transported by water flows particularly at higher water levels, and raft sedimentation rates determined with traps and <sup>14</sup>C dating were on the order of 1 cm/100 years, providing for extensive record over relatively short geological time scales. These results support the potential of calcite rafts as a valuable new proxy for expanded records of past sea level from low latitude coastal caves.

#### ନ୍ଧର୍ୟ

#### Melissa R. McSweeney

Faculty Advisor: Aryeh Routtenberg

# Long-Term Associative Olfactory Memory in *Caenorhabditis elegans* Is Regulated by Wnt Signaling

What protein signaling molecules are critical participants in developmental processes throughout the animal kingdom, and now appear to be important in several memory-related processes. Recently, it has been shown that Wnt signaling is involved in the regulation of long-term fear memory in mice, long-term spatial memory in rats, synaptic plasticity in *Drosophila*, and the regulation of NMDA receptors in long term potentiation. Most importantly, it has been experimentally suggested that the sustained loss of Wnt signaling functioning is correlated with Alzheimer's disease in humans. To better understand this important signaling mechanism we have studied its role in memory using the earth dwelling nematode *Caenorhabditis elegans* that, though ancient, has similar synaptic and memory machinery as in mammals. For the first time to our knowledge we show here Wnt signaling's role in both short and long-term associative olfactory memory in C. elegans by using both a pharmacological and gene targeting approach. In pharmacological experiments, wild-type C. elegans were exposed to secreted Frizzled-related protein (sFRP-1), an endogenous protein that inhibits Wnt proteins from binding to the Frizzled receptor. We found time-dependent blockade of long-lasting memory in these experiments. To pinpoint the receptors that the sFRP1 might be targeting, we mutated two Frizzled receptor homologues (mom-5 and lin-17) which are essential in Wnt signaling pathways. The associative olfactory memory of the Frizzled mutants when compared to that of wild-type C. elegans using the chemotaxis assay were also impaired in their retrieval of the olfactory conditioning. Given the results of this series of experiments, we proposed that Wnt signaling in C. elegans, conserved throughout the evolutionary scale, is important for both short and long-term memory.

#### ഗ്രര

#### Fortunato Medrano

#### Faculty Advisor: David H. Uttal

## Hypothesis Testing and Problem Solving at a Children's Museum

We explored how parent-child engagement during hands-on activities enhances children's learning and understanding of engineering concepts. In this project we focus on conditions that promote hypothesis testing and problem solving as parents and children work together to fix/make sturdy two wobbly structures that we provided (a bridge or a skyscraper) and as children worked independently on a second wobbly structure. Hypothesis testing is regarded as an important element in problem solving, and individuals who engage in it are able to perform better than their aptitude would suggest (Swanson, 1990). Thus we coded for actions in which parents and children were checking the stability of their structure, i.e. when a participant shakes the structure to test its sturdiness. These Stability Check behaviors were split into two categories: Hypothesis Testing and Non-Hypothesis Testing. Ninety families (54 Mothers, 27 Fathers, 94 Children-Mage= 5.6) participated in the research at a Chicago Children's Museum's building exhibit. Results indicate that families who engaged in Stability Checks constructed sturdier structures. Moreover, performance was further improved when families utilized hypothesis testing during their interactions. This implies that hypothesis testing is occurring during parent-child interactions in a museum and families were able to apply this problem solving skill effectively.

#### ନ୍ଧର

## Ariel Melinger-Cohen

Faculty Advisors: Craig Bina and Steven Jacobsen

# Paragenesis and P-T-X Relationships in the Low-Grade Hydrothermal Metamorphism of the Copper-Bearing Ores of the Portage Lake Volcanic Series, Northern Michigan

Low-grade metamorphism of the Portage Lake Volcanics produced the region's mineral alterations, including its famous native copper, around one billion years ago when they were buried due to subsidence in the basin and later up-thrusted due to compression. The primary evidence of metamorphic events lies in the textures and mineral assemblages of rock samples. This study examines six samples from the Calumet and Hecla mines and one sample from Minnesota. Using optical microscopy to interpret crystalline texture, and for the first time introducing micro-Raman spectroscopy for mineral identification in the Portage Lake Volcanics, the microstructure and architecture of the samples are described. The results are modeled by grain size distributions to depict a general three-stage paragenetic sequence, which places shifts to the system within a timeline of the alteration history. Equilibrium assemblages are described and it is suggested that a temperature decline, as well as compositional changes in ion abundances and partial pressures within the fluid, were the driving forces for the evolution of mineral depositions throughout the alteration period. Correlations are drawn between changes during the alteration period, the placement of native copper, and theories for the metamorphic history of the Portage Lake Volcanics, suggesting that copper precipitation may be linked to the deposition of epidote crystals. Further research is targeted to determine the precise depth and timing of metamorphism.

#### ନ୍ଧର

## Hannah Milad

Faculty Advisor: Monica Prasad

# Perceptions of Adderall: How Understandings of Prescription Stimulants Affect Drug Abuse on College Campuses

In 1996, Adderall was introduced and approved by the Food & Drug Administration to treat children with Attention Deficit Hyperactivity Disorder. Shortly after, illegal use of the stimulant became popular on college campuses in the United States. Scholars disagree on how college students perceive its use and how attitudes towards Adderall affect its prevalence. Through analyzing students' understandings of the perceptions, motivations, and justifications for Adderall use, I asked why students are using Adderall and how they are using it. I conducted interviews with thirty Northwestern undergraduate seniors within the communications, engineering, and journalism concentrations to better understand the social construction of Adderall use. I found that students are not using Adderall for the rational reason – academic success – that most researchers believe. I emphasize social influences as the primary motivation for students' illicit use and address further patterns in perceptions of its use. Overall, this research allows for a better understanding of what motivates nonmedical stimulant use and suggests changes to existing methods of approaching drug abuse on college campuses.

## ହ୍ୟ

# **Claire Morley**

## Faculty Advisor: Eva Redei

# Enriched Environment Attenuates Depressed Behavior of Genetic Animal Model of Depression

As Major Depressive Disorder (MDD) continues to claim lives across the world, treatments for this debilitating disease are still not optimally effective. The enriched environment model, albeit simple, was hypothesized by the authors to mimic aspects of therapy in humans, and therefore, could attenuate depressive behavior even in a genetic rat model of depression. This model was previously developed by the Redei lab by bidirectional selective breeding of the Wistar Kyoto rats. Based on their performance in the forced swim test (FST), a WMI, 'more immobile', strain showing exaggerated despair-like behavior, and the WLI, 'less immobile', control strain were generated. Adult males of both strains were tested on the FST and Open Field Test (OFT) of depression- and anxiety-like behaviors before and after a 30 day exposure to an enriched environment. Enriched environment significantly attenuated despair-like behavior of WMIs suggesting that the molecular mechanisms by which it occurs can interfere with the molecular mechanisms is being carried out to prove or disprove this hypothesis.

#### ഗ്രര

# Hinasahar Muneeruddin

## Faculty Advisor: Jennifer Richeson

# Walking the Walk: Discrimination of Muslim-Americans and Racial Ethnic Minorities and Its Impact on Coping and Collective Action

Research suggests that the ways in which individuals cope with stressful events, such as discrimination, may shape the degree to which they yield negative health outcomes. Specifically, research finds that recalling a stressful event from a self-distanced perspective results in more positive physiological arousal and emotional outcomes compared with recalling the event from a self-immersed perspective. However, the way in which individuals cope with discrimination may also influence group relevant outcomes such as collective action. Building on this work, the current research explores the effects of recalling an experience with racial discrimination (Study 1) and with religious discrimination (Study 2) from either a self-immersed or self-distanced perspective. Furthermore, the present research investigates the impact of self-distanced reflection and self-

immersed reflection on collective action tendencies. We predict that participants who cope with discrimination through self-distancing experience more positive affect compared to participants who cope through self-immersion. Furthermore, participants who are in the self-distanced condition will be less likely to perceive injustice and feel less sympathy after being exposed to discriminatory events, thus will be less likely to engage in collective action.

#### ହ୍ୟ

#### Alison Murray

## Faculty Advisor: Karl Rosengren

## Is Grasping at Objects in Photographs Related to Inhibitory Control?

Children have been found to manually explore photographs as though they were real objects. This study investigated whether these manual explorations are related to inhibitory control. Sixty-six children (3.5 - 6 years) completed a grasping error task in which they were presented with objects that could be pulled off a page or photographs of those same objects. Participants were told to grasp the object off the page as fast as they could but to leave their hands on the table if a picture was presented. Participants also completed four additional validated inhibitory control tasks (knock-tap task, head-to-toe task, day/night task, and Flanker task). Parents completed the Child Behavior Questionnaire (CBQ) and the Behavior Rating Inventory of Executive Functioning—Preschool Edition (BRIEF-P). The four inhibitory control tasks were found to correlate with the number of grasps. A standardized inhibitory score, along with age and the BRIEF-P inhibit score also predicted the total number of grasps on the grasping errors task. These results suggest that inhibitory control plays a role in the grasping errors. This research, and future research, may allow for an earlier detection of inhibitory control problems with a task such as this.

#### ନ୍ଧର

# Svyat Nakonechny

Faculty Advisors: Carol Heimer and Ian Hurd

# Who Knows Who Knows What in Economic Development: Understanding the World Bank through Its Contractor Networks

The last several decades of both popular and academic discourses have produced countless analyses, critiques, and appraisals of the World Bank and its work. Few authors, however, have studied this organization beyond its four walls: indeed, the World Bank employs a vast network of contractors and consultants to perform the development work, and the changes in this cohort of partners can point to substantive shifts in the institution as a whole. This project attempts to empirically assess the evolution of these networks after the so-called Wolfensohn reforms, a set of initiatives introduced by President James Wolfensohn in mid-1990s to address the public outrage over its questionable and often harmful practices in Latin America. Did the patterns of partnerships change? Did the Bank become more open to active collaboration between various contractors? To answer these questions, I analyze the project data and Bank-to-contractors cash flows between 2001 and

2011 using the methodologies of social networks analysis. I find that the structure of contractor networks did not evolve over time, but some curious patterns of repeated collaborations and greater influence of certain contractors over others do emerge. While drawing on the discourses in both sociology and political science, these findings contribute to the broad discussion on the openness of the World Bank and the potential impact of this openness on the outcomes of its economic development work.

## ହ୍ୟ

# **DongHee Nam**

## Faculty Advisor: Thomas Meade

## Stilbene-Conjugated MRI Contrast Agents as Amyloid Imaging Probes

Amyloid protein assemblies are the characteristic pathogenic agents in Alzheimer's disease (AD) and other amyloidopathies. Currently, definitive diagnosis of AD requires identification of amyloid-β (AB) plaques and neurofibrillary tangles post-mortem. A non-invasive imaging technique that can detect the plaques would make the disease easier to diagnose and study. In this research, I evaluated two membrane-permeable Magnetic Resonance Imaging (MRI) contrast agents that bind to amyloid protein oligomers. These molecular imaging probes consist of a paramagnetic gadolinium (III) complex conjugated to a modified stilbene as a membrane translocation and Aß peptide-labeling moiety. Stilbene-Gd(III) contrast agents show low toxicity and remarkable cellular uptake by three different cell lines (HT-22 hippocampal neuronal cells, NIT/3T3 mouse fibroblast cells, and HeLa ovarian cancer cells), proving their efficient cell-penetrating capability. Cells labeled with the agents were also scanned on a 7.0 Tesla MRI, and stilbene-Gd(III) dependent image contrast was clearly visible. Furthermore, confocal laser-scanning microscopy revealed fluorescent properties of stilbene which allowed visualization of stilbene-Gd(III) contrast agents within the cells. These results demonstrate that these agents are bimodal that work both optically and magnetically. For the future studies, stilbene-Gd(III) agents will be tested in a mouse model to assess the feasibility of utilizing it for in vivo brain imaging. These contrast agents hold great potential as an effective and safe method to label cells in vitro and selectively deliver targeted molecular imaging probes into the brain in vivo. Ultimately, these agents may present an opportunity for targeting Aß plaques in the brain for the purpose of early diagnosis of AD via MRI.

#### ഇന്ദ

## David O'Brien

Faculty Advisor: Randall Snurr, Department of Chemical and Biological Engineering

# Separation of CO<sub>2</sub> from Flue Gas Using Functionalized Porous Graphene as a Molecular Sieve

Reducing carbon dioxide emissions by capturing  $CO_2$  from flue gas is not cost-effective with current technologies such as traditional polymeric and nanoporous membranes. An alternative is using graphene as a molecular sieve, which is a selective barrier that allows only certain molecules through. Graphene, which is impermeable to even Helium, can be made porous through selectively

drilling holes and then functionalized with various atoms such a nitrogen and fluorine groups to increase its selectivity towards  $CO_2$ . Graphene is also only one atom thick which would enhance the flux of molecules through its pores. Although various forms and derivatives of graphene have been studied, little is known regarding the optimal pore structure for carbon dioxide separation from the mixture. This study proposes to examine the binding energies of two types of graphene pore structures: nitrogen- and hydrogen-passivated of various sizes. The binding energies with  $CO_2$  and  $H_2$  separately and at various distances away from the pore structure using first principles density functional theory calculations. Two different orientations of the two molecules were also examined. The hydrogen-passivated pore with only 10 carbons removed exhibited a formidable barrier of 73 kJ/mol for  $CO_2$  but only 16 kJ/mol for  $H_2$ . The binding energy exhibited an inverse relationship with pore size for both molecules, as the pore size increased from 10 to 16 carbons removed. This trend was consistent for both hydrogen- and nitrogen-passivated pore structures. The nitrogen atom and the carbon of the  $CO_2$ . These results suggest that a larger pore structure with a nitrogen-passivated pore structure would be superior to traditional membranes.

#### ହ୍ୟ

#### Mark Olalde

#### Faculty Advisor: Stephan Garnett

# We Are Not Tree Huggers: The Rise of Economically Sustainable Environmentalism across the Caribbean

Permaculture or *permanent agriculture* seems too good to be true. The name refers to a style of agriculture that is self-sufficient, organic, and leaves behind a net zero footprint on the land. To top it off, permaculturalists turn a profit. This trend has been around for four decades but is just now taking off across the Caribbean. This region often goes unreported in international media, so I island-hopped among Trinidad, Curaçao, and Dominica to tell the story of permaculture. My research consisted of interviews, photography, and working on the farms. The multimedia story I am producing is meant to educate the U.S. about environmental issues that affect us all. Permaculturalists themselves are keying in on education, teaching the next generation principles of sustainability through the use of these farms. I am telling this story from the eyes of the people transplanting the trend and its philosophy across the Caribbean. In so doing, I focus on how this is a perfect compromise between economics and environmentalism. This story is so vitally important to tell because the general perception of environmentalists and sustainability movements is negative and marginalized. However, the rise of permaculture comes from average people making a living while leaving the Earth healthier than they found it.

ନ୍ଧର

## Maris Maeve O'Tierney

## Faculty Advisor: David Van Zanten

# Intersections of Architecture, Music, and Catalan Culture in Barcelona: Historical Roots and Contemporary Soundscape of el Palau de la Música Catalana

My thesis explores the collaborative experience of Catalan Modernisme architecture and music through the case study of el Palau de la Música Catalana: a Barcelona concert hall completed in 1908 that was designed by architect Lluís Domènech i Montaner for l'Orfeó Català, a Catalan choral society directed and conducted by musician/composer Lluís Millet. Accompanied by Domènech, who served as president of the Unió Catalanista, l'Orfeó Català gave voice to Catalanismo (Catalan nationalism) in Barcelona during La Renaixenca (Catalan Renaissance, early nineteenth-early twentieth century), building from the political activism of the Catalan choral society lineage. I trace the origins of el Palau-specifically, how Domènech and Millet's perspectives intersected in the creation of the concert hall-to help my reader understand how Modernisme architecture and music came together in the search for a new space of artistic and political expression that would distinguish Catalan identity vis-à-vis Castilian Spain. In light of the current Catalan independence movement, I built from my historical research through on-site experiences at el Palau in December 2013 to explore the idea of a contemporary soundscape of el Palau: how do visual (architectural and decorative) elements interact with the aural (musical) element in the hall to create an experience that is distinctly Catalan in iconography and that might also be in sound? I develop a perspective on this question through interviews conducted in Spanish with Catalan audience members about their visual/aural experiences in the space and my own experiences, to which I applied my trained ear as a classical musician and vocalist. A body of scholarship exists for the respective developments in Modernisme architecture and music, but an interdisciplinary perspective is absent. Through my thesis-to which I bring my background in art history, political science, and music (vocal) performance, my three academic majors-I cultivate an interdisciplinary exploration of the multisensory aural/visual experience within el Palau and its potential implications for Catalan culture.

#### ഗ്രര

## Zoe Palmer

## Faculty Advisor: Renee Engeln

# Backwards On Wheels: Tests of Objectification Theory in Roller Derby

This study examined how playing roller derby might change body-image related self-perception. Women reported decreased fat talk, body shame, body satisfaction, and body surveillance when engaged in roller derby compared to the context of their everyday lives. In Western cultures, women suffer considerable body image disturbance and self-objectification, which increases in certain contexts (e.g., trying on swimsuits.) Roller derby is a predominantly female nation-wide professional contact sport. In derby, body type diversity is both encouraged and useful. Players also skate under a "derby name," a persona many report experiencing as distinct from their everyday selves. We hypothesized that derby might be a context in which women can escape from omnipresent objectification. In the current study, we investigated whether the derby persona and emphasis on

strength over appearance has beneficial effects on women's body images. 296 skaters completed an online survey including measures of how much of a split they felt between their derby and everyday personas, body shame, body dissatisfaction, body surveillance, and fat talk. Participants completed these last four measures twice, once while imagining themselves immersed in derby activities and once imagining themselves during everyday life. Paired samples t-tests were performed on the four measures of body image disturbance. All four were significantly higher in everyday life and lower while in derby. These results suggest that women's roller derby personas may have healthier body images than their everyday personas. Playing roller derby provides a context in which women evaluate their bodies differently, in a less objectified fashion.

#### ഗ്രര

## Joshua Parish

## Faculty Advisor: Laura Pedraza-Farina

# Medical Tourism and Malpractice Litigation: Addressing Physician and Attorney Perceptions of Issues Following Cross-Jurisdictional Care

My research seeks to determine the ways American physicians and attorneys view the likelihood for malpractice litigation in the course of negligent care inflicted upon medical tourism returnees. Medical tourism refers to the act of seeking out healthcare in a foreign jurisdiction. Currently there exist no viable or realistic options to pursue compensation for malpractice overseas. My research features scenario-based surveys posing situations in which a patient returning from crossjurisdictional care suffers from a negligent act in the course of follow up care. The only variables that changed amongst the surveys were jurisdiction (foreign vs. domestic) and type of care (untraditional versus standard). Scenarios were followed by statements that both physicians and attorneys ranked the extent to which they agreed or disagreed. Generally, it appears that duty to provide care for a following up physician is linked to the type of care, not the jurisdiction. From the legal side, strong incentives for a patient to pursue malpractice domestically did not always result in the actual likelihood for malpractice litigation. The survey data has also indicated that in terms of a physician being held liable for malpractice, error amongst "guesswork" is far worse than error amongst operational fault. The greater empathy on the part of physicians for traditional care coupled with attorneys' view of a more likely malpractice suit implies that, for medical tourism returnee scenarios, standardized protocols should be put in place to determine the capability with which a physician can properly provide follow up care.

#### ନ୍ଧର

## JaeSuk (Eugene) Park

## Faculty Advisor: Sandy Zabell

## Analysis of Asthma Hospitalization Trend in Chicago Area

Although asthma generally disrupts people's lives in one way or another, not all asthma patients are hospitalized for various reasons. This study examines the significance and trend of variability in the proportion of asthma patients who are hospitalized among the Chicago ZIP code areas. It was hypothesized that the ZIP code areas with a proportion significantly different from other areas will be clustered according to some commonalities. To test this hypothesis, both the estimated number of people in each ZIP code who suffered from asthma between 2006 and 2010 and the average number of counts of hospitalizations due to asthma per year were calculated from the data sources. From these calculated values, a contingency table was created, displaying the estimated numbers of asthma patients who were hospitalized/not hospitalized for each ZIP code. Performing a chisquared test of independence on this contingency table demonstrated that there is sufficient statistical evidence to suggest that at least one ZIP code area differs from others in the proportion of asthma patients who are hospitalized. Also, displaying the seventeen ZIP code areas with substantially lower/higher observed values from the expected values showed six clusters, each with similar socioeconomic factor (per capita income). The data, therefore, suggested a considerable correlation between socioeconomic status and asthma hospitalization likelihood.

#### ନ୍ଧର

# Zabin Patel and Rida Malick

## Faculty Advisor: Mercedes Carnethon

## **Obesity and Weight Perceptions in Turkish College Students**

Global forces are linked to changing food patterns and the rise of global obesity. In Turkey, the national obesity and overweight rates are 17.2% and 34.8% among Turks over the age of 15 according to a 2012 report by the Turkish Statistics Institute. The adoption of a Western-type lifestyle in Turkey's urban centers has resulted in populations changing to a diet high in saturated fat and sugar, with a reduction in physical activity levels. In 2010 The Ministry of Health of Turkey launched "The Obesity Prevention and Control Program of Turkey" (2010-2014) to combat Turkey's rising obesity rates. The purpose of this study was to investigate obesity and weight perceptions in a sample of Turkish college students. Participants (N = 276) completed a questionnaire to assess their current weight status, ideal body type, weight satisfaction, and attitudes regarding the government's obesity prevention campaign. Statistical analyses showed significant differences in body weight perceptions between young men and women. Findings may help inform behavioral health interventions targeted toward this age group.

#### ନ୍ଧର

## Juliette S. Pirpiris

Faculty Advisor: William P. Murphy

# The Role of English in International Business: An Anthropological Study of Language in Business Culture

With international commerce becoming a mainstay in the business world, English has become a prerequisite in order to compete on the world stage. As a result, many countries in which English is not the native tongue or an official language emphasize teaching school children the language in hopes of enriching their future. Despite the widespread use of the language, there are many variants and dialectical registers, particularly American English and British English, as well as registers of

social class differences. Though extremely similar, syntactical and lexical differences make understanding either variant often difficult to comprehend if it is unfamiliar. Furthermore, from an anthropological perspective, language distinctions indicate cultural differences or a set of norms (as well as differences in social norms of behavior). Because of the role of language in shaping cultural and social assumptions, it is important to understand how language usage is affected by cultural differences on an international level. This study shows international business is itself a culture with a set of common norms and customs and operates with a clear and concise form of English as its shared language necessary for business transactions.

#### ഇരു

## Ani Poladian

#### Faculty Advisor: Daniel Molden

# A Motivational Approach to Cross-Gender Interactions: The Moderating Role of Goal Orientations on Prosocial Behavior in Males

This study investigated the role of motivational orientations on men's propensity to engage in prosocial behaviors towards women. Previous research has established two categories of motivational orientations: learning goals and performance goals. Learning goals encourage gaining knowledge about others' characteristics, while performance goals encourage ensuring that one's own characteristics are judged positively. Learning goals foster more positive interracial interactions and more instances of helping behavior. This study aimed to extend the literature on motivational orientations by investigating the role of learning/performance goals on cross-gender interactions. This research took the form of two similar between-subjects studies. As the independent variable of interest, male participants were randomly assigned a motivational orientation prime before interacting with a female confederate. The dependent variable was prosociality as measured by the Zurich Prosocial Game. In Study 1, gender difference and threat of appearing sexist were made salient, and, in Study 2, they were not. Results revealed a main effect of goal orientation on helping in both studies. However, in a surprising reversal, learning goals resulted in more helping behavior in Study 1, and performance goals resulted in more helping behavior in Study 2. These results likely demonstrate that learning goals increase men's propensity to help women when women are coded as outgroup members, while performance goals lead to more helping behavior when women are not coded as outgroup members. These results raise a number of interesting questions for further research on motivational approaches to cross-gender interactions.

#### ନ୍ଧର

#### Sofia Porter-Castro

Faculty Advisors: Robert Launay and Helen Schwartzman

# Flavors of Childhood: How Nostalgic Longing and Life Constraints Come Together to Inform the Foodways of Mexican Immigrants

Mexican-Americans are one of the largest immigrant groups in the United States, and they also suffer from some of the highest rates of diet-related chronic diseases (particularly diabetes and hypertension). Theories that have attempted to explain this negative health trend often blame lack of education about nutrition, an abandonment of traditional cuisine, and the increased incorporation of American style foods as the root cause of these health problems. This paper will analyze these theories while also looking at larger issues of food assistance programs and the immigration experience to develop a more complete image of the health needs of this community. This analysis is supplemented with ethnographic data exploring the relationship between foodways and health from the perspective of Mexican immigrants in Ann Arbor, MI. My goal is to demonstrate that there are three major forces affecting food choices among Mexican immigrants: nostalgic longing for culturally meaningful foods; financial limitations and time constraints; and the desire to incorporate newly learned nutrition information from American physicians. By looking at foodways, one can better understand how personal choice, culture, and larger food systems interact to affect the health of Mexican immigrants in the United States. This is an essential step if one hopes to create meaningful policy that improves the health and life conditions of this population.

## ഗ്രരു

## Zaynab Quadri

Faculty Advisor: Jacob Smith

## The Great White Hope: James Bond and the Crisis of White Masculinity

The enormous popularity of the James Bond films in the U.S. during the 1960s and the early 1970s gives valuable insight into the national mood at a tumultuous historical moment. Where other scholarship has situated Bond in film history or British history, this project seeks to place Bond in the context of American history and politics: more specifically, the politics of gender and race between 1963 and 1975. Through an analysis of the first seven films in the Bond franchise, as well as a theoretical framework derived from secondary literature on race, gender and film, it becomes evident that a key construct and appeal of Bond is white supremacy across partisan lines. Building on film historian Robert Ray's concepts of liberal and conservative film heroes, I argue that Bond's particular masculinity appealed to both sides of the political spectrum by carefully blending the free love elements of liberal heroes with the nationalistic elements of conservative heroes. Simultaneously, the white male protagonist was clearly shown to dominate minority and female characters, in a contested but nonetheless nostalgic celebration of white supremacy that seemed to be slipping away in the contemporary world.

#### ନ୍ଧର

## Neha Reddy

### Faculty Advisor: Jeff Rice

# Examining the Cultural Perceptions of Female Circumcision as a Human Rights Issue in Harare, Ethiopia

The commonly held opinion of female circumcision in much of the world is apparent through the procedure's more common name, female genital *mutilation*. The practice has been around for thousands of years, rooted in the beginnings of some of the world's oldest cultures. Over the past 30

or so years, with an increased focus on addressing the rights of women, female circumcision has been outlawed by nations and heavily criticized by influential organizations like the UN, yet it still holds prevalence in some parts of the world. My research explores the perceptions surrounding female circumcision in the eastern region of Harare, Ethiopia, where the practice is still prevalent. I have always been interested in the role that culture and human rights can play in influencing public health practices, and not only has female circumcision been viewed as a violation of the rights of a woman, but it has also been considered a major public health issue. Through conversations with medical practitioners, workers at non-governmental organizations, and local community members, I explored the nuanced discourse stemming from an intersection between culture and human rights, but in complex and unpredictable ways. My field interviews suggest that it is local players and perspectives that have had, and will continue to have, the biggest impact on influencing and changing the perceptions of community members when it comes to deeply rooted practices such as female circumcision.

#### ୬୦୧୪

#### Samantha Reznik

Faculty Advisor: Robin Nusslock.

#### The Effect of Helplessness Induction on Posterior versus Anterior Theta Activity

A vast body of work demonstrates that humans exposed to uncontrollable aversive events reduce approach motivation and eventually exhibit withdrawal and disruption of behavior. In a parallel literature, electroencephalographic (EEG) research indicates that greater posterior versus anterior theta activity (PZ-FZ theta scores) at rest is associated with individual differences in behavioral approach and agentic extraversion. PZ-FZ theta scores likely originate from anterior cingulate cortex theta activity. Yet, to the best of our knowledge, PZ-FZ theta scores have not been investigated in the context of a task designed to assess approach motivation. The aim of the present study was to begin to integrate research on PZ-FZ theta scores and human helplessness by examining PZ-FZ theta scores during an established helplessness induction paradigm. EEG data were collected from 77 participants who were exposed to either controllable (n = 28) or uncontrollable (n = 25) aversive noise bursts or a no-noise condition (n = 24). In line with prediction, individuals exposed to uncontrollable aversive noise bursts (i.e., helplessness induction) displayed a significant decrease in PZ-FZ theta scores relative to both individuals exposed to controllable noise bursts or the no-noise condition. Results suggest that the reduced approach related affect induced by learned helplessness may be reflected in decreased PZ-FZ theta scores. This provides additional evidence that PZ-FZ theta scores may serve as a useful neurophysiological index of approach related affect.

#### Alexandra Rodriguez

Faculty Advisor: Mercouri Kanatzidis

#### Intermetallic Compounds Grown in In Flux: EuIr<sub>2</sub>In<sub>8</sub>, EuIr<sub>4</sub>In<sub>2</sub>Ge<sub>4</sub>, Sm<sub>2</sub>Ir<sub>2</sub>InGe<sub>3</sub>

We report three novel rare- earth intermetallic compounds,  $EuIr_2In_8$ ,  $EuIr_4In_2Ge_4$ , and  $Sm_2Ir_2InGe_3$ , prepared by reaction in liquid In. As determined by single crystal diffraction,  $EuIr_2In_8$  crystallizes in the orthorhombic space group *Pbam* with the CeFe<sub>2</sub>Al<sub>8</sub> structure type and a unit cell of a= 13.890(3) Å, b= 16.174(3) Å, and c= 4.3996(9) Å and volume of 988.4(3) Å<sup>3</sup>. Single crystal refinements also show that  $EuIr_4In_2Ge_4$  adopts a tetragonal structure type in the space group *I-4* yielding unit cell parameters of a= 6.8981(10) Å, c= 8.7166(17) Å, and volume 414.77(12) Å<sup>3</sup>. Sm<sub>2</sub>Ir<sub>2</sub>InGe<sub>3</sub> adopts a structure in the *Immm* space group with an orthorhombic cell a= 4.2404(8) Å, b= 9.2541 (19)Å, and c= 16.203(3) Å, and volume of volume of 635.8(2) Å<sup>3</sup>.

#### ହ୍ୟ

## Holly Romaniak

#### Faculty Advisor: Richard Zinbarg

#### Individual Differences in Cognitive Reappraisal Ability in Highly Anxious Individuals

Anxiety is a normal reaction to stressful situations but can become pathological in excess. However, cognitive reappraisal strategies can moderate the effects of anxiety. The present study seeks to investigate how individual personality factors (Openness and Neuroticism) predict improvement in coping abilities in response to a cognitive reappraisal training paradigm (often part of Cognitive Behavioral Therapy [CBT]) in a group of high worriers. Sixty-one high-worrying college students were surveyed and scored on their Neuroticism and Openness, were trained in a computerized cognitive reappraisal task, and also rated their ability to cope, probability of the worry occurring, and how well they could master their worry before and after training. These results confirmed our hypotheses that individuals high Openness would significantly improve from the cognitive reappraisal training because of their quick adaptation of the strategies; however, no significant results were found for Neuroticism at the facet-level. The results supported for the use of cognitive reappraisal training for people high in Openness with limited generalizability. The present study was designed to provide future implications for individualized therapy treatment packages for clinical anxiety.

ഗ്രര

#### Andrew Rowberg

#### Faculty Advisor: Mark. Hersam

# Zinc Oxide Nanowires as an Electron Transport Layer in Carbon Nanotube-Based Organic Photovoltaic Devices

Research has suggested that the use of chemically inert semiconducting carbon nanotubes (CNTs) in the active layers of organic photovoltaic devices (OPVs) may lead to more efficient and more stable solar cells. We have been designing OPVs containing CNTs in their active layers under a variety of conditions with the hope of exceeding our previously achieved power conversion efficiencies (PCEs) of 3-6%. We have started fabricating cells in an inverted configuration, where the standard order of cathode and anode is reversed, in order to improve device stability and performance. Furthermore, we have begun incorporating zinc oxide nanowires as an electron-transport layer in these devices, as we hypothesize that the high surface area of the nanowire structures will facilitate charge collection from the OPV active layer. Through experimentation with various growth conditions, we have been able to grow nanowires at an optimal length of 60 nm. We are continuing to test inverted cells with the zinc oxide nanowire layer and additional layers, such as the organosilane APTES, which can functionalize the nanowire surface and improve contact with the active layer. Our most recent results confirm improved wetting of the nanowires by the active layer after the incorporation of APTES, leading to an enhancement in charge collection and overall PCE.

#### ନ୍ଧର

#### **Peter Santos**

## Faculty Advisor: Samuel Stupp

### Self Assembly of a DPP Tripod Chromophore Donor for Organic Photovoltaics

Solar power is increasingly becoming an important energy source as it replaces environmentally damaging fossil fuels. However, solar cells built with inorganic materials like single crystal silicon require high purity and large amounts of processing energy, making them too expensive to serve as a complete replacement. As an alternative, organic photovoltaics use extremely thin layers of inexpensive material and low cost solution processing techniques, but they lack the efficiency of currently marketed devices. To combat low efficiency, researchers are using strategies like self assembly to engineer the nanostructure of the solar cell to maximize their performance. This work focused on molecules with a triphenyl amine core and DPP chromophore arms to make a tripod shaped compound. Two compounds, one with branched ethylhexyl and the other with n-dodecyl solubilizing alkyl tails were synthesized. After optimization, the dodecyl compound showed a higher efficiency (3.65% vs 3.13%), with most of the improvement coming from the fill factor (57% vs 40%). Analysis with AFM and 2D GIWAX showed the dodecyl material forms nanowires in the film, while the ethylhexyl compound remains amorphous. Modeling with Hyperchem indicates that the branched alkanes interrupt self assembly, preventing that molecule from forming nanowires. This research demonstrates self assembled nanowires in organic photovoltaics can improve efficiency by increasing their fill factor, which could be an effect of the nanowires limiting recombination and trap sites. Moreover, this work provided evidence that branched alkanes can interrupt self assembly in small molecule chromophores.

#### ନ୍ଧର୍ୟ

## Paya Sarraf

## Faculty Advisor: Nyree Zerega

# Unraveling the Evolutionary History of a Cosmopolitan Plant Genus: Phylogeny and Biogeography of *Maclura* (Moraceae)

Maclura (family Moraceae) is a genus of plants comprised of twelve species that inhabit every continent except for Antarctica. The widespread distribution of Maclura, despite its limited number of species, brings up inquiries about its dissemination and proliferation, and may have implications for fields of research as diverse as biogeography, taxonomy and plant phylogenetics. Phylogenetic analyses, the study of evolutionary relationships among groups of organisms based on molecular data, was the primary method used in this study. First, we extracted DNA from Maclura individuals and then amplified the DNA using Polymerase Chain Reaction (PCR). Then, we sequenced the amplified DNA and used Bayesian inference methods to analyze these sequences, along with age constraints from Maclura fossils. This allowed us to estimate Maclura's age and origin and to explain its global distribution. Our study revealed that Maclura originated in South America, spread to North America, then Europe through the Eocene North Atlantic land connection and finally to Africa and Asia. Our results also provide strong support for the reclassification of Maclura africana from Section Cardiogyne to Plecospermum. This is because we discovered that M. africana exhibits close genetic similarities to Plecospermum, which provides additional evidence for our proposed biogeographic hypothesis of Maclura. Our findings are important because they not only help us understand the vicariance of Earth's landmasses and Maclura's biogeography, but also because they outline important evolutionary trends in Moraceae and help to conserve its vast biodiversity.

#### ନ୍ଧର

## **Elizabeth Schrier**

#### Faculty Advisor: Thomas McDade

# Immigrants in the Danish Healthcare System: Isolation Experiences Contributing to Poorer Quality of Care

All residents of Denmark receive the same access to healthcare services under Danish law, regardless of citizenship, country of origin or socioeconomic status. Denmark has the lowest number of nonwestern immigrants and first-generation citizens of all Scandinavian countries (Statistics Denmark 2013). While immigrants to Denmark may have access to the same health services as native Danes, their health and utilization statistics display that the Danish healthcare system has been structured to serve the needs of ethnic Danes and fails to provide the same quality of services for needs that may be unique to immigrants. Although healthcare and immigrant experiences in Danish healthcare, particularly within anthropology. This study aims to close that knowledge gap by presenting anthropological research on the unique health needs of immigrants. The data for this study is comprised of 12 semi-structured interviews, a materials and media analysis, and a greater literature review. This presentation will introduce a model identifying five aspects of the doctor-patient interaction where immigrants display unique needs and receive poorer care: language, health epistemology, trust, expectations of care and service utilization. This research will also display how greater immigrant isolation within Danish society contributes to the poorer quality of care in these areas. This model can serve as a basis for future research on the impacts of isolation on immigrant health in Denmark and beyond. This case is important to study to better understand how individuals with different backgrounds experience national, universal healthcare systems and how to best implement policies that can adapt to cultural change over time.

#### ନ୍ଧର୍ୟ

## **Margaret Shavlik**

#### Faculty Advisor: Renee Engeln

## Waistful Thinking: College Women's Fear of the Freshman Fifteen

We examined first year undergraduate women's intentions and worries concerning weight change during their first year of college. Though the majority predicted weight gain, most hoped for weight loss (even when already at a healthy weight). Predictions were generally inaccurate. Fear of the freshman fifteen significantly correlated with body dissatisfaction.

#### ନ୍ଧର୍ୟ

## Norah Shi

#### Faculty Advisor: Peter Carroll

#### The Changing Migration Pattern of Female Migrant Workers in Urban China

Since China's economic reform in 1980s, a large population of people have been migrating from rural areas to urban cities to participate in the country's modernization. Female migrant workers have become an essential labor force in the city, and they have contributed much to China's urbanization process. Many scholars have assumed that female migrant workers inevitably follow the migration pattern of going out of the village, experiencing the city and leaving the city eventually for home because of the social and economic pressures they face in the city. In fact, such assumption of Chinese rural residents' migration pattern might be wrong. This thesis argues that by creating alternative modes of belonging, female migrant workers leverage the limits and opportunities given and constructed fluid identities in the cities. On one hand, female migrants have subsisted in a style that did much less to protest against the urbanites' privilege directly. On the other hand, female migrants have created an unofficial intermediary group outside of direct government surveillance. They exploit freer capitalist market economy in the city where they gain more economic and social opportunities than in village. This paper consists of an ethnographic study that draws upon the experience of a selected group of female domestic workers in Shanghai. Migration is not a temporary interlude for rural women to escape the limits of village life, but rather is a mean to challenge the status quo of rural and urban residents and alter their fate. My goal of writing the thesis is to bring some of the most marginalized figure into the center of my analysis, raise awareness of labor conflicts within the socioeconomic order in China, and bring insights for nonprofit organizations or

institutions to recognize the needs of female migrant workers and to empower disadvantaged women in China.

#### ഗ്രര

#### Jennifer Siedjak

Faculty Advisor: Dan McAdams

# High Point, Low Point, No Point: The Relationship between Depression and Emotional Autobiographical Memories

Life narratives and the autobiographical memories from which they are constructed are used to study identity development. While previous research has largely examined depressed individuals' tendency to exhibit negativity bias, overgeneralness, and learned helplessness in their memories, little research has examined how depressed individuals engage in autobiographical reasoning within the narrative identity framework. The present study examined meaning-making, a type of autobiographical reasoning which measures the extent to which individuals reflect back on events, making sense of their experiences. Meaning-making can be expressed as a lesson (lowest level), vague meaning, or insight (highest level). Within the life story interview, we measured the levels of meaning-making expressed in the high point, low point, and turning point scenes for individuals with varying levels of depressive symptomatology. If rumination prevents depressed individuals from cutting through their cloud of negative thoughts to reach the kinds of lessons or insights characteristic of meaning-making, we hypothesized that depressed individuals would engage in lower levels of meaning-making than non-depressed individuals. A significant effect of meaning-making type was found for the turning point narratives, but not for the high point or low point narratives. Specifically, individuals with higher depressive symptomatology were more likely to express no meaning in their turning point memories, while healthier individuals were more likely to express vague meaning. These results suggest that depressive symptoms such as rumination may interfere with one's ability to express meaning-making. Alternatively, meaning-making may serve as a buffer for symptoms of depression, or a third variable may be responsible.

#### ନ୍ଧର୍ୟ

## Mark Silberg

Faculty Advisor: Mark Sheldon

# Technology as Moral Force: A Philosophical Defense of Ethical Extensionism, Creative Innovation, and Sustainability

This work explores the history of *ethical extensionism*— how legal protections of populations have grown to include new groups over time, and what metaphysical and ethical principles can explain this trajectory. In particular, I am interested in the development of what I call "space—" and "time– agnostic" ethics; that over time, legal institutions have become increasingly unconcerned with the geographic and temporal proximity of agents and their subjects-of-harm. In the 20<sup>th</sup> century we see a transition from *anthropocentric* or human-oriented legal protections, and the beginnings of protections of animals, species, and more abstract entities like ecosystems and future generations. In analyzing

these developments through political and moral lenses, I then turn to an exploration of climate change as a contemporary moral and political problem that demands a *space-time-agnostic* ethic. That is, climate change makes present human agents liable for their harms across both space and time. The fundamental question is, "how should governments respond to climate change." Relying on a framework of externalities derived from environmental science, I conclude that controlling population growth and affluence are unacceptable. This is not, I argue, for ethical reasons as such. Instead, taking action against population growth or affluence is *inconsistent* with the extension of legal rights. I then conclude by arguing first that technological innovation is the only plausible route for government involvement in solving climate change, and that, importantly, the failure of this activity is nothing to lament– for fearing societal collapse is as irrational as fearing our own deaths.

### ନ୍ଧର

## Maggie Smith

## Faculty Advisor: Michael Bailey

## Dimensions of Male Asexuality: Investigation of the Sexual Interests, Behaviors and Arousal Patterns of Asexual Males

Asexual men report experiencing low levels of sexual desire and sexual attraction compared with monosexual (heterosexual and homosexual) men. However, it is unclear whether asexual men have sexual interests, behaviors and arousal patterns distinct from those of monosexuals. In this study we examined the possibility that male asexuality may be characterized by deficits in relational experiences and interpersonal functioning, atypical sexual interests, and a unique pattern of sexual arousal. Online survey data from 144 asexual, 197 heterosexual and 136 homosexual men revealed that asexual men scored significantly higher on a measure of social deficits associated with an autism-spectrum disorder (ASD), and lower on measures of self-perceived mate-value compared to monosexuals. Mixed results were found for associations of asexuality with atypical sexual interests: asexual men were found to have fewer paraphilic interests in general, but scored significantly higher than monosexual men on a measure of autogynephilia, the propensity to be sexually aroused by the image one oneself as a woman. Subjective and genital measures of sexual arousal from 10 asexual, 31 homosexual and 34 heterosexual men indicated that asexual men had significantly lower responses overall to sexual stimuli compared with monosexal men. These results suggest that difficulties in relational experiences and autogynephilic interests may both be possible routes to the formation of an asexual-identity and also demonstrate that asexual men exhibit diminished genital arousal to sexual stimuli.

#### ନ୍ଧର୍ୟ

### **Riley Smith**

## Faculty Advisor: Hector Carrillo

## Healthcare Experiences of Lesbian and Bisexual Women in Cape Town, South Africa

Understanding the health needs and experiences of South African lesbians, bisexuals, and other women who have sex with women (WSW) is imperative for implementing effective and inclusive

public health strategies. Such understanding, however, is limited due to the exclusion of WSW from most existing research on healthcare access in the region. This project bridges that gap by investigating healthcare experiences of lesbians and bisexual women (LB) in Cape Town. Data were gathered from 22 interviews with LB community members and university students in the Cape Town area. Interviews explored obstacles women face in accessing LGBT-affirming services, fear of stigma or discrimination when accessing healthcare, availability of relevant sexual health information, and suggestions to improve existing programs. I found that South African LB women may have very different experiences in public versus private health services, that they use protective strategies when "coming out," and that they find that sexual health information pertinent to them is largely unavailable. These discussions contribute to a more inclusive understanding of the experiences of LB women in accessing healthcare and other services, and help to inform providers, thereby enabling them to deliver more meaningful care to LGBT persons in South Africa.

#### ഗ്രരു

## Jasmine Stephens

## Faculty Advisor: Renee Engeln

## The Perils of Positive Thinking: Effects of Body-Affirming Statements on College Women

We examined the effect of mentally reciting, "I love my body" (a common self-affirmation) versus "I am [participant's age] years old" (a neutral statement) on the body satisfaction of a sample of college women. After controlling for pre-existing trait levels of body dissatisfaction, participants in the "I love my body" condition displayed significantly *lower* body satisfaction.

#### ഗ്രര

## Jenna Stoehr

Faculty Advisors: Lonnie Shea and Jacqueline Jeruss

# Investigating the Impact of Therapeutic Drug Combinations on Triple-Negative Breast Cancer Cells

The standard treatment for breast cancer is a combination of surgery, chemotherapy and radiation. However, triple negative breast cancer (TNBC), a particularly aggressive sub- type that makes up 15% of diagnosed cases, does not respond well to standard therapy. These cancers, which are associated with a poor prognosis, can overexpress the cell cycle regulatory proteins cyclin D and E. Thus, targeted therapies, such as cyclin-dependent kinase (CDK) inhibitors, are being explored to combat the disease. When used in combination with traditional treatment regimens, these inhibitors may allow for the dose reduction of chemotherapy and thus potentially decrease the associated morbidity of systemic therapy. In this study, multiple CDK inhibitors were tested to determine which would have an effect on TNBC cells through proliferation assays. After identifying the most promising CDKi, dose curve experiments were conducted to determine the half maximal inhibitory concentration of CDKi and eribulin, a chemotherapy drug, was found to significantly reduce tumor cell growth compared to either treatment alone as evidenced using MTS assays. Ongoing studies are

being conducted to investigate this drug combination in influencing migration as well as to examine the mechanisms of drug action.

#### ୬୦୧୪

#### Nishant Subramani

Faculty Advisor: Sandy Zabell

# How Evil Are Turnovers?

When *Moneyball* became a bestseller, every sports fan was introduced to sports analytics. All major sports statisticians suddenly began to focus on baseball for two reasons: one, because it had a plethora of objective parameters, and two, because it was the sport that began the analytics revolution. It was studied to the ground. Basketball, like baseball, has many objective and quantitative parameters. Although basketball has its analysts and has experienced some of the fervor of the Moneyball revolution, much of the sport has been left untouched. Basketball analytics experienced a revolutionary change two years ago when John Hollinger created a Player Efficiency Rating system. However, basic team analytics has always been neglected. Due to that neglect as well as the volatility and game-changing nature of turnovers, turnover differential between two teams and its effect on winning and point differential were analyzed. Turnover differential, point differential, and outcomes for each game were obtained through basketball-reference's game logs of the 2011-2012 NBA season. Two analytic techniques were employed to understand the relationships. First, the logistic regression model was used to analyze turnover differential versus outcome. Next, a linear model was used to analyze turnover differential versus point differential. Both results were significant and found a strongly negative association between the parameters. These results support the qualitative claim that turnovers have exceedingly adverse consequences for the outcomes of games. This analysis provides significant concrete quantitative insight into a previously qualitatively philosophized and unsubstantiated claim, which may lead to a decrease of risk-oriented play in the NBA.

#### ନ୍ଧର

## Ji Young Suh

#### Advisor: Professor Eszter Hargittai

# What They Think vs. What They Do: Online Privacy Management via Different Devices in Different Locations

While past research suggests that people care about privacy, Facebook users continue to share millions of posts each day with people they do not know. With the rise in the use of mobile devices, people now share information on Facebook from both mobile and non-mobile devices in any location with Internet access. Considering this change, I examine whether using different devices or being in different locations affect the way people share information online. This paper presents 30 young adults' attitudes towards online privacy management and an analysis of 118 Facebook posts they shared from different devices and different locations. To assess the effectiveness of the participants' privacy management, I compare the intended audience and the actual audience of each

post. The interview data show that most participants are confident about their ability to manage their information, but in reality, close to two-thirds are not posted with the type of privacy setting the participants intended, resulting in wider exposure to content than the user envisioned. While there is no gender difference in the participants' privacy management behavior, younger participants are more likely to select the correct privacy setting than older participants. When examining all posts, the type of device and participants' physical locations do not relate to how people share posts on Facebook. However, when looking at the posts that are accidentally shared with "public" potentially anyone on the Web—the type of device seems to influence the participants' information sharing on Facebook more than their physical locations.

## ନ୍ଧର୍ୟ

## Sarah Suh

## Faculty Advisor: Margrit Urbanek.

# Impact of the Human Growth Hormone Receptor Exon 3 (hGHRd3) Polymorphism on Newborn Size

Healthy human growth and metabolism during childhood and adolescence can be significantly affected by fetal growth factors and conditions. Babies that are born small are at high risk of being developmentally delayed and having cardiovascular and metabolic problems later in life. They are ten times more likely to develop metabolic complications when they become adults. A particular polymorphism in the human Growth Hormone Receptor (hGHRd3) has been shown to be a fetal growth factor that affects the sizes of newborn babies. Some studies suggest that this polymorphism is associated with low birth weight and placental weight. However, this claim is not supported by other studies, which suggest opposite results or cannot determine any significant conclusions regarding the relationship. These conflicting findings suggest that previous research regarding the relationship between hGHRd3 and corresponding newborn size is inconclusive. Such inability to reach a consensus could be explained by small sample size and lack of diversity in subjects. This study is thus aimed at examining the relationship between hGHRd3 and newborn size by using a large and diverse sample of test subjects. 3,264 mother-baby pairs of various origins (Europe, Asia, and Caribbean) were genotyped and analyzed. The results are still pending; however, it is hypothesized that the presence of hGHRd3 reduces birth size with an additive effect. This project has the potential of yielding critical information for future research related to growth and healthy metabolic activity in humans.

## ନ୍ଧର

# Charlotte M. ter Haar

## Faculty Advisor: Michael C. Jewett

# Establishing a Cell-Free Biology Platform for the Production of Therapeutic Proteins

Imagine a world in which we could adapt biology to manufacture any therapeutic protein, both quickly and on demand. Industrial biotechnology is one of the most attractive approaches for addressing this need, particularly when large-scale chemical synthesis is untenable. Unfortunately,

engineering whole-cell microorganisms remains costly, risky, and slow. The most critical issues are the limitations imposed by cells themselves. Common challenges afflicting the current state-of-theart platforms include low volumetric productivities (g/L/hr), build-up of toxic intermediates or products, and byproduct losses via competing pathways. Living cells have their own growth and adaptation objectives that are often diametrically opposed to the overproduction and release of a single biomolecule. To overcome these limitations, we are re-conceptualizing the way we engineer biocatalytic ensembles designed to make a target product. Rather than attempt to balance the tug-ofwar between the cell's objectives and the engineer's objectives, we are developing new paradigms for designing, building, and testing cell-free systems that harness and modify biological systems involved in protein synthesis and metabolism. We have made significant efforts to develop cost-effective, high-throughput cell-free protein synthesis platforms. Cell-free biology is the activation of complex biological processes without using intact living cells. Instead, cells are lysed, resulting in a crude extract that is used as an ensemble of biocatalysts. Our cell extracts are prepared from E. coli cells harvested during the most productive phase of growth. Our work is enabling a deeper understanding of why nature's designs work the way they do and opening new frontiers for biomanufacturing.

#### ହ୍ୟ

## Michelle Thai, Sei Unno, and Simone Montgomery

## Faculty Advisor: Renee Engeln

# The Development and Validation of a Scale of Career Anxiety

This study investigated the development and validation of the Career Anxiety Scale (CAS), a scale devised to broadly capture career anxiety, from anxiety regarding career decisions to anxiety related to discussing career prospects. There is evidence supporting the psychometric soundness of the CAS. The CAS has high internal consistency and favorable construct validity. Scores on the CAS correlate positively with scores on measures of general anxiety and career indecision. Scores on the CAS do not correlate with scores on a measure of social desirability. Scores on the CAS discriminate between career-decided and career-undecided students, between students who have declared a major and students who have not, and between students with offers for jobs or for further schooling and students who do not. These findings support the ability of the CAS to measure levels of career anxiety. The CAS is an appropriate tool to measure career anxiety in undergraduate students and can be applied in research and counseling settings. This study was co-authored with Bryan Benitez.

#### ഗ്രരു

## Kathryn N. Thomas

Faculty Advisor: Blair D. Johnson, Mayo Clinic

# Augmented Carotid Body Chemosensitivity during Hyperthermia Is Blunted with Low-Dose Dopamine

We tested the hypothesis that ventilation ( $V_E$ ) and the hypoxic ventilatory response (HVR) during hyperthermia would be attenuated when carotid body chemosensitivity is blunted by an IV infusion

of dopamine (2 µg/kg/min) vs. IV saline. We studied 9 subjects (1 woman,  $32 \pm 2$  years,  $25.7 \pm 0.7$  kg/m<sup>2</sup>) over two randomized dopamine and saline study visits. We measured V<sub>E</sub> and HVR (3 minutes at: room air, 16% O<sub>2</sub>, and 10% O<sub>2</sub>) at baseline and during normothermia (NORMInf) and hyperthermia (HYPInf) (core temperature 1.2-1.5°C above baseline) infusion conditions. V<sub>E</sub> increased during HYPInf vs. NORMInf during dopamine (8.2 ± 0.3 vs. 10.2 ± 1.1 L/min; P = 0.04) and saline (8.9 ± 0.3 vs. 9.7 ± 0.5 L/min; P = 0.04) with no difference between conditions (P = 0.95). HVR during saline increased from baseline (0.30 ± 0.1 L/min/%SaO<sub>2</sub>; P < 0.01) and NORMInf (0.42 ± 0.1 L/min/%SaO<sub>2</sub>; P = 0.02) to HYPInf (0.77 ± 0.2 L/min/%SaO<sub>2</sub>). HVR did not change throughout the dopmaine visit (baseline = 0.38 ± 0.1; NORMInf = 0.27 ± 0.1; HYPInf 0.42 ± 0.1 L/min/%SaO<sub>2</sub>; P > 0.46). Dopamine HVR was lower than saline during HYPInf (P < 0.01). These data indicate that carotid body chemosensitivity to hypoxia is augmented during hyperthermia and that low dose dopamine was unable to lower normoxic V<sub>E</sub> during hyperthermia.

#### ନ୍ଧର୍ୟ

## Lauren Tindal

#### Faculty Advisor: William Revelle

#### Creating People-Driven Personality Feedback: The Holistic Narrative Approach

The Big Five provides a valid, reliable set of dimensions by which most psychologists evaluate personality; in contrast, the Myers-Brigg Type Indicator (MBTI) is the most ubiquitous personality assessment in the public forum, having demonstrated no validity or reliability at all. The prominent dissonance between what is accepted by the field of personality psychology and what is used by businesses, schools, and everyday people suggests that the feedback given by Big-Five based assessments is lacking in value to those taking it, and that the feedback given by the MBTI, while perhaps inaccurate, adds value to a users' life. As the field of personality psychology continues to develop and refine metrics to predict and explain behavior, we have created and tested a new form of feedback that serves as a bridge between the popular MBTI and the rigorously tested Big Five. This feedback includes holistic personality narratives that create paragraphs that describe a person's levels as scored on the higher order dimensions of Plasticity, Stability, and Social Cohesion. These narratives were evaluated by nine students in an advanced personality seminar on the Big Six dimensions as well as by their effect on the user's self-reflection and perception of others. We found that ratings of theoretically independent dimensions were skewed according to the context of the narrative, thus suggesting that a mere independent display of dimensions, as performed by the Big Five, is not sufficient to describe the complexity of how personalities and people are perceived by others. Such findings assert that the field of personality psychology should advance towards a more holistic, non-linear, and people-driven view of personality, and usefulness of personality feedback, as demonstrated by the MBIT, gives clues into the way that people understand others.

୬୦୧୪

## Amrit J. Trewn

## Faculty Advisor: Alexander Weheliye

#### Meditations on Violence, Suffering, and Humanity in the Algerian Diaspora

If Critical Theory is driven by a desire to draw out the intimate relations between the slippery textures of language and experiences of social and political domination, subjugation, and displacement, then what do Martin Heidegger, Emmanuel Lévinas, and Jacques Derrida as a few of its canonical writers contribute to thinking through iterations of post/colonial racism? This paper seeks to understand how race and histories of French colonialism interject into, unsettle, and redirect the philosophies of Heidegger, Lévinas, and Derrida. In another sense, this paper is an attempt to unsettle the contents under the heading 'Critical Theory'. With its peculiar obsession with the Nazi Holocaust, the language of traditional Critical Theory in France obscures and displaces experiences of French colonialism, anticolonial resistance in Algeria, and the broader Algerian Diaspora. I think through Heidegger's (white) 'death,' the (non-Sephardic) 'Jew' as victim par excellence in the work of Lévinas, and Derridian hauntology of race as trace. To conclude, I reflect on my analyses and gesture towards the possibilities of diaspora-as an analytic and subjectivity-to aid scholars of Critical Theory in theorizing the relations between colonialism, race, political violence, suffering, and the modern human beyond the particular manifestations of post/colonial racism. In other words, I argue that 'diaspora' has the potential to stretch scholars towards an onticontological understanding of racializing assemblages in our post/modern world.

#### ନ୍ଧର୍ୟ

# Jane Wang

#### Faculty Advisor: William Klein

#### Testing the NU4MNS Probe for Early Detection of Alzheimer's Disease

Alzheimer's Disease (AD) is the most common form of dementia and currently afflicts millions of people in the United States. Although notable progress has been made to improve diagnostics for AD, available tests still cannot detect the disease at its earliest stages before significant memory and brain loss have occurred. This project aims to develop a diagnostic probe that can bind to amyloidbeta derived diffusible ligands (ADDLs), the toxin responsible for AD, in a disease-dependent manner. The NU4 antibody, which is specific for ADDLs, was conjugated to magnetic nanostructures (MNS) to create the probe, which is predicted to act as a targetable MRI contrast agent. The functionality of the NU4MNS probe was tested by incubating rat hippocampal neurons with the probe and then imaging via fluorescence microscopy to view levels of binding. The neurons were prepared via incubation with fluorescently labeled ADDLs. The probe was also administered via intranasal injection to transgenic and wild type mice, and MRI images of the brains were obtained. Images of the neurons obtained via fluorescence microscopy indicated that the probe bound to ADDLs in a disease dependent manner, and overlay of images verified that the probe was binding to the toxins. MRI images revealed probe binding to the brains of transgenic mice, but not the wild type control. Ultimately, the probe shows potential as a diagnostic tool for detecting Alzheimer's Disease.

#### ନ୍ଧର୍ୟ

#### Michael Weinfeld

## Faculty Advisor: Jing Zheng

#### Interaction between CEACAM16 and Alpha-Tectorin

The outer hair cells of the cochlea play an important role in mammalian hearing. Outer hair cell motility fine-tunes vibrations in the basilar and tectorial membranes, allowing for improved frequency selectivity. One protein involved in outer hair cell function is CEACAM16, a secreted protein which is found on the tallest tips of the outer hair cell stereocilia and is mutated in cases of non-syndromic autosomal dominant hearing loss (DFNA). CEACAM16 binds to tectorial membrane proteins alpha-tectorin and beta-tectorin, suggesting that its role is to help maintain the interaction between the outer hair cells and the tectorial membrane. The goal of my project is to see which domains of CEACAM16 and alpha-tectorin are responsible for the binding between those two proteins. CEACAM16 contains two immunoglobin V-like domains and two immunoglobin Clike domains. I cloned each of the four domains of CEACAM16 as well as fragments of alphatectorin by inserting the DNA coding region for those protein fragments into expression vectors and transforming the vectors along with the inserts into E. coli. The next step was to perform coimmunoprecipitation to see if the different CEACAM16 and alpha-tectorin fragments or full proteins interact with one another. Finding out which domains of CEACAM16 and alpha-tectorin are responsible for those proteins binding to one another could lead to strategies for treating DFNA cases in which CEACAM16 is mutated and its interaction with the tectorial membrane is impaired.

#### ନ୍ଧର

## Zara Wright

#### Faculty Advisor: William Revelle

# Creating a Self-Report Measure of Psychopathy Using Items from the Personality Inventory for the DSM-5

Psychopathy is an existing psychological condition (marked by depleted empathy, impulsivity, callous affect, manipulative tendencies, and antisocial behavior) that has a long history as the focus of psychological research. The Personality Inventory for the DSM-5 (PID-5) is a public item domain pool with 220 self-report items that operationalize a variety of maladaptive personality traits as defined by criteria in the latest iteration of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). The current study aims to create a self-report measure of psychopathy by using a subset of these items. Such a scale would streamline the diagnosis of psychopathic personality traits by allowing clinicians who are already administering the PID-5 to detect psychopathy while screening for other personality disorders. To create our scale, we administered relevant PID-5 items alongside items from the latest version of the Self-Report Psychopathy Scale (SRP-III), a preexisting self-report measure of psychopathy. By extending the hierarchical factor structure from the SRP-III onto PID-5 items, we were able to create a scale that not only validly predicts SRP-III outcomes, but also demonstrates higher reliability, a cleaner factor structure, and stronger factor loadings than the SRP-III. The creation of this scale impacts the field of self-report measurement of psychopathy in two

important ways. First, it makes the detection of psychopathic traits more convenient by using a subset of items from a domain pool that can be used to detect other maladaptive personality traits. Second, it improves on the structure, reliability, and validity of past self-report scales of psychopathy.

#### ହ୍ୟ

## Chuyue Yang

## Faculty Advisor: Luis A. N. Amaral

# Usage Pattern and Significance of Internal Shine-Dalgarno-Like Sequences in *E. coli* Genome

Protein expression consists of transcription, transfer of information from DNA to mRNA, and translation, synthesis of proteins based on mRNA templates. In prokaryotes, translation initiation often involves the ribosome binding site known as Shine-Dalgarno (SD) sequence, which has a high affinity to the anti-SD sequence on 3' tail of 16S ribosome. Aside from its well-studied role as translation initiation signal, SD sequence and similar sequences located inside coding regions are recently reported to affect translation efficiency by temporarily pausing the ribosomes, probably via strong binding interactions with the anti-SD sequence. My project aims to understand the effect of internal SD-like sequences on protein translation by computationally examine the usage pattern of these sequences in E. coli genome and correlate the patterns with protein expression and protein secondary structure. The spatial distribution of SD-like sequences throughout the genes and near annotated protein secondary structures is examined; an SD-index is also developed to characterize the genes' SD usage. Comparison with randomized genomes reveals that SD-like sequences are globally depleted in real genomes. Compared with randomized genomes, they are even more depleted at sites near protein secondary structures, even though the amino acid composition there tends to increase the occurrence of SD-like sequences. In addition, a negative correlation between SD usage and protein expression is observed. Applying these results to design better artificial DNA sequences could lead to more efficient protein expression in genetic engineering projects based on E. coli, such as recombinant protein production.

## ନ୍ଧର

# Jeong Yun (John) Yang

Faculty Advisor: Thomas V. O'Halloran

#### Novel Strategy for Anticancer Drug Synergy with Multidrug Resistance Protein Inhibitors

Previous unpublished work has demonstrated synergistic anti-cancer activity when treating cancer cells with a combination of arsenic trioxide (ATO) and cisplatin (cisPt). By understanding the molecular mechanisms of this synergy, we hope to gain insight into the development of anti-cancer compounds and treatment regimens with the hope of improving the treatment of arsenic- and/or platinum-resistant cancers. In eukaryotes, drug resistance is sometimes achieved through multidrug resistance proteins (MRP1, MRP2), a family of membrane proteins that eliminate xenobiotic and anti-tumor agents via efflux pumps. Some MRPs efflux xenobiotics conjugated to glutathione

(GSH), a tripeptide molecule that neutralizes reactive oxygen species and protects cells from oxidative damage. We hypothesize that inhibiting MRP1, MRP2, and other proteins involved in the multi-drug resistance in cancer cells would decrease arsenic- and platinum-based drug resistance and, thus, make cancer cells hypersensitive. We also hypothesize that the synergistic anti-cancer activity between ATO and cisPt can be explained by accumulation of high concentrations of anti-tumor drugs in cells. We determined the IC<sub>50</sub> of drugs and inhibitors and discovered possible inhibitors that induce little toxicity and can result in synergy. We identified glutathione S-transferase (GST- $\pi$ ) as critical to both ATO and cisPt toxicity. GST- $\pi$  is a detoxification enzyme that catalyzes the conjugation of GSH to xenobiotic substrates to protect the cell against oxidative stress. Challenges that lower the therapeutic index of drugs, such as dose-limiting toxicity and rapid renal clearance, can be overcome by introducing multidrug resistance inhibitors to synergistic cytotoxicity. Effective cytotoxicity could be achieved through combining treatments of arsenic or platinum with different inhibitors.

#### ഗ്രരു

## Jessica Yu

## Faculty Advisor: Neda Bagheri

#### Agent-Based Models of Heterogeneous Tumor Cell Populations

Despite significant improvements in treatment and understanding, cancer continues to grow at an alarming pace, accounting for 1 in 8 deaths worldwide. For this reason it remains critical to identify the mechanisms that control cancer growth, understand how these mechanisms interact, and discern how to manipulate corresponding dynamics to develop treatment strategies. Given the expense and limitations of in vivo and in vitro experimentation, computational models are an invaluable tool for the analysis of such complex systems. Through model development and analysis we are able to better understand the regulation of cancer and inform therapeutic strategies. Given the rapid improvement in experimental tools, it is critical to develop a modeling platform that integrates local (i.e. subcellular) rules with more global (i.e. cellular) dynamics. We employ agent-based models (ABM) to study emergent behavior of heterogeneous tumor cell population, which incorporates dynamic agents that can change both state and location over time. Tumor growth was simulated based on rules suggested by two hypotheses: the cancer stem cell hypothesis and the clonal evolution model. Further simulations of various "treatments" to the tumor identify the caveats of common cancer therapeutic protocols, such as chemotherapy, and can point to alternative treatment strategies. Through the development and analysis of tumor behavior given different parameters and treatments, emergent behavior of these two models and their alignment with experimental data will help clarify the cellular and subcellular rules that govern cancer development and metastasis.

ജന്ദ
### Elina Zaonegina

### Faculty Advisor: Douglas Medin

### Moral Licensing and Cleansing Effects on Recycling Behavior

Promoting sustainable behaviors has become increasingly important because of human-induced climate change, but theories that consider values, beliefs, and actions fail to explain inconsistencies in people's environmental behaviors. Moral licensing, the idea that acting altruistically is costly and when people have high moral self-worth, they feel entitled to do something "less good," might account for such discrepancies. Moral cleansing is the opposite effect: low moral self-worth promotes altruism. In the first study, participants wrote a narrative using a list of positive or negative words to induce feelings of high or low moral self-worth, or a list of inanimate objects for a control condition. While most participants recycled their own paper after cutting it in the "scissor evaluation" task, those in the negative condition were significantly more likely to act altruistically by also recycling the crumpled paper lying on the desk assumed to be from the previous participant. This supports the moral cleansing hypothesis but not the moral licensing hypothesis. In a follow up study, we will manipulate the presence of a recycling bin, a trash bin, or both a recycling bin with a lid for only cans and a trash bin. We expect participants who are reminded of recycling but are unable to recycle because of the incongruent lid to donate their time to complete an optional survey in order to support an environmental non-profit organization. If this hypothesis is supported as well, we will have even stronger evidence that moral cleansing plays an important role in recycling behaviors.

#### ନ୍ଧର

### Michael A. Zingman

### Faculty Advisor: David M. Engman

#### Flagellar Calcium Signaling in Trypanosoma cruzi, the Parasite that Causes Chagas Disease

Chagas disease is a chronic illness caused by infection with the single-celled parasite Trypanosoma cruzi. Chagas is a major public health concern, particularly in Latin and South America, where over 18 million people are infected, resulting in 21,000 deaths annually. Chronic infection may lead to cardiomyopathy and sustained inflammation in the nervous system, digestive system, adipose tissue and heart. The trypanosome flagellum is vital for both motility and environmental sensing (antenna function) and a number of flagellar proteins are virulence factors in Chagas disease pathogenesis. FCaBP (flagellar calcium-binding protein) is a Ca<sup>2+</sup> acyl switch protein, which confers Ca<sup>2+</sup> regulation on its binding partners through the Ca<sup>2+</sup> acyl switch mechanism. FCaBP undergoes a Ca<sup>2+</sup>-dependent change in conformation that regulates partner binding. We identified several putative binding partners of FCaBP using GST-FCaBP affinity chromatography followed by mass spectrometry, and generated recombinant binding partners for in vitro binding studies and the production of specific antisera. We found that FCaBP has different Ca<sup>2+</sup>-dependent interactions with its partners that may be either dependent or independent of its ability to bind Ca<sup>2+</sup>. One partner, a membrane and cytoskeletal associated protein (MaCAP), binds to FCaBP in a Ca<sup>2+</sup>dependent manner. MaCAP and FCaBP are expressed in both insect and human stages of the parasite and are found in lipid rafts on the cell membrane. Another FCaBP partner is TcCALP1.1, a

flagellar, calpain-like cysteine peptidase that also binds to FCaBP in a Ca<sup>2+</sup>-dependent manner. The long-term goals of my project are to determine the functions of MaCAP and TcCALP1.1 and how they are regulated by FCaBP. This research will improve our understanding of Ca<sup>2+</sup> acyl switch proteins and their flagellar interactions, hopefully revealing new therapeutic targets for Chagas disease.

### ହ୍ୟ

### Fengwei Zou

### Faculty Advisor: Emily Weiss

### Preparation of Patchy Particles by Hierarchical Electrostatic Self-Assembly

A patchy particle is a particle patterned with at least one well-defined patch through which the particle can experience an anisotropic, directional interaction with other particles or surfaces. The potential applications of patchy particles lie in fabricating photonic crystals, targeted drug delivery, and electronics. Raspberry-like particles are patchy particles made of a central microsphere surrounded by satellite particles. In this work, we exploit the concept of hierarchical electrostatic self-assembly to create the first examples of ternary raspberry-like particles. We coated negatively charged central particles with a close-packed layer of positively charged microgel particles. We then coated the positively charged microgels with negatively charged gold nanoparticle (Au NPs) (see figure). We characterized the factors that determine the structure of the patchy particles by measuring the coordination number of the particles (number of microgel satellites per central latex particle) in the Scanning Electron Microscopy pictures. Our experimentally determined coordination numbers for three different sizes of latex particles are in good agreement with the coordination numbers predicted by the random sequential adsorption model, but not with the maximum coordination numbers. This result shows that the formation of microgel/latex heterostructures is kinetically, rather than thermodynamically, controlled. Future studies are aimed to use SiO<sub>2</sub>/microgel/Au NPs heterostructures to create gold patches on the surfaces of SiO<sub>2</sub> particles and latex/microgel/Au NPs heterostructures to prepare microgel Janus particles.

# **So** Guide to Undergraduate Research Programs at Northwestern University

Below is a partial listing of current Northwestern programs supporting independent undergraduate research and creative projects; more are available on the Office of Undergraduate Research web site. Many departments and program 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 (www.northwestern.edu/fellowships) can help students identify these external opportunities.

# Office of Undergraduate Research at Northwestern University

undergradresearch.northwestern.edu facebook.com/URatNU

# **Global Research Opportunities- Search Engine**

http://gro.northwestern.edu/

# Office of Undergraduate Research Programs

Academic Year Undergraduate Research Grants (AY URG) undergradresearch.northwestern.edu/ayurg Summer Undergraduate Research Grants (Summer URG) undergradresearch.northwestern.edu/summerurg Conference Travel Grants undergradresearch.northwestern.edu/ctg Undergraduate Language Grants undergradresearch.northwestern.edu/ulg Circumnavigators Travel-Study Grant undergradresearch.northwestern.edu/circumnavigators Undergraduate Research Assistant Program undergradresearch.northwestern.edu/urap

# **Other University-Wide Programs**

Residential Colleges Fellow Assistant Researcher Award (FARA): Nancy Anderson (res-colleges@northwestern.edu) Institute for Policy Research: www.northwestern.edu/ipr/ugradresearch.html Center for Global Engagement: http://www.cge.northwestern.edu/grant-opportunities/ Office of International Program Development: www.ipd.northwestern.edu/fellowships/index.html

# Weinberg College of Arts and Sciences

WCAS Awards: http://www.weinberg.northwestern.edu/undergraduate/honors-awards/ African Studies: www.northwestern.edu/african-studies/undergraduate-studies/awards.html Anthropology: www.anthropology.northwestern.edu/about/labs.html Astrophysics: ciera.northwestern.edu/Research/undergraduate\_research\_opportunities.php

# So Guide to Undergraduate Research Programs at Northwestern University, continued

## Biochemistry-Morimoto Laboratory Undergraduate Research Seminars:

www.biochem.northwestern.edu/ibis/morimoto/morimotolab/murs.html Biological Sciences: www.biosci.northwestern.edu/undergraduate/research.html Chemistry: http://www.chemistry.northwestern.edu/undergraduate/programs/index.html Chicago Field Studies Program: www.wcas.northwestern.edu/cfs/ History: Leopold Fellows of the Center for Historical Studies: http://www.historicalstudies.northwestern.edu/leopold-fellows/ Latin American and Caribbean Studies: www.wcas.northwestern.edu/lacs/grants/udggp.html Mathematics: www.math.northwestern.edu/undergraduate/summer.html Physics and Astronomy: www.physics.northwestern.edu/undergraduate/research.html Political Science: www.polisci.northwestern.edu/undergraduate/ginsberg.html Psychology: www.wcas.northwestern.edu/psych/undergraduate\_studies/research\_opportunities/

# School of Communications

Film & Theatre Projects: Rick Morris (r-morris@northwestern.edu) Undergraduate Research Grants and Fellowships: Jane Rankin (j-rankin@northwestern.edu)

# School for Education and Social Policy

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

# McCormick School of Engineering and Applied Science

### McCormickOpportunities:

www.mccormick.northwestern.edu/undergraduates/research/index.html Biomedical Engineering: http://www.bme.northwestern.edu/undergraduate/research.html

# Chemical & Biological Engineering:

www.chem-biol-eng.northwestern.edu/undergraduate/current/research/index.html Electrical Engineering and Computer Science:

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

## Materials Research Science and Engineering Center:

www.mrsec.northwestern.edu/content/educational\_programs/index.htm

McCormick Office of Corporate Relations, Corporate Partner Undergraduate Research Grants: http://www.mccormick.northwestern.edu/companies/index.html Nanoscale Science and Engineering Center: www.nsec.northwestern.edu/REU.htm

# Medill School of Journalism

Eric Lund Global Reporting and Research Fund: http://www.medill.northwestern.edu/experience/bsj/exclusives/eric-lund-global-reporting-research-grant.html

# **So** The Afterlife of 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. Another aspect of the afterlife of your research is how you transform it into new and related projects. Below are some examples of programs that have been developed at both Northwestern and nationally to help undergraduate researchers participate in and learn from the final step in the research process.

## Present Your Research

Northwestern's Annual Undergraduate Research and Arts Exposition: undergradresearch.northwestern.edu/expo

Chicago Area Undergraduate Research Symposium: www.caurs.com

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

Undergraduate Awards: www.undergraduateawards.com

### Publish Your Research

### Northwestern Undergraduate Research Journal: www.northwestern-urj.org/

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

Directory of Undergraduate Research Journals (UNC Office for Undergraduate Research): www.unc.edu/depts/our/students/students\_publish.html

## Transform Your Research

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

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