The Undergraduate Research Center Presents

28th ANNUAL

Undergraduate Research, Scholarship & Creative Activities Conference

POSTER SESSIONS
Friday, April 28, 2017
3-7 p.m. | ARC Pavilion

ARTS EXHIBIT
Friday, April 28, 2017
3-7 p.m. | ARC Pavilion

ORAL SESSIONS
Saturday, April 29, 2017
1:00-4:30 p.m. | Wellman Hall

UCDAVIS
UNDERGRADUATE EDUCATION

Director's Welcome

Welcome to UC Davis' annual exhibition of undergraduate research and creative activities!

I am delighted that you are here to join us as we celebrate the accomplishments of more than 700 students who are presenting their projects during this two-day conference. As you will see, research from these students spans an impressive diversity of topics, from chemistry and biotechnology to social justice and gender, from applied physics and plant biology to psychology and political science.

At UC Davis, all of our faculty, in every field, engage in intellectual and creative endeavors to advance the boundaries of knowledge. Promoting collaboration between students and faculty in their research is central to our mission at UC Davis because involvement in research not only enhances our students' educational experience, it also contributes numerous benefits to the society in which we live. Through involvement with research, students are developing essential skills in teamwork, leadership, and critical thinking, while creating new knowledge and exploring topics that they are passionate about. Now as they present at this conference, these students are also developing valuable communication skills as they showcase their creativity and communicate the significance of their work to experts in the field as well as friends and family.

To the student presenters, I congratulate you on your accomplishments!

To the faculty sponsors, thank you for inspiring and mentoring these scholars in their research and the skills of effectively presenting their work.

To all the friends and families, thank you for supporting these students in their education and research activities, and joining us here to celebrate their accomplishments.

I encourage everyone to engage in exploration and discover new knowledge for a wide range of topics as you have the opportunity to speak with these exceptional scholars about their research.

Sincerely,

Annaliese K. Franz
Faculty Director, Undergraduate Research Center

Welcome from the College Deans

"Undergraduate research is an important enrichment opportunity for our students as it allows them to collaborate with faculty on cutting-edge problems and experience firsthand the excitement of discovery. Participating in the Undergraduate Research Conference shows our students' commitment and dedication to scholarly work outside the classroom. I would like to offer my congratulations to the students for their accomplishments and to thank the faculty and scholars for mentoring these undergraduates."

Dean Jennifer Curtis
College of Engineering

"I would like to congratulate our bright and enthusiastic students for taking this critical and courageous step in communicating the significance of your research to experts, family, and friends. All of us in the College of Agricultural and Environmental Sciences are inspired by your discipline, creativity, and commitment to helping us solve critical issues with food, water, energy, climate change, and human health."

Dean Helene Dillard
College of Agricultural & Environmental Sciences

"Congratulations to all the student researchers at this year's conference. It is thrilling to see so many students from the College of Letters and Science presenting today, representing disciplines in the arts, humanities, mathematical and physical sciences, and social sciences. The act of putting your questions and ideas to the test through research and sharing your knowledge exemplifies the power of studying the liberal arts and sciences at UC Davis."

Dean Elizabeth Spiller
College of Letters & Sciences

"Participating in hands-on research is a great opportunity that UC Davis offers our students. Research transforms students' views of science, transforms their interests and abilities, and ultimately transforms their career aspirations. Our faculty are equally transformed and energized by working with these outstanding students, and look upon their accomplishments with great pride. I wish to congratulate all of the students who seek out these opportunities and who are presenting their research at this conference."

Dean Mark Winey
College of Biological Sciences

ACKNOWLEDGMENTS

The Undergraduate Research, Scholarship & Creative Activities Conference gratefully acknowledges the faculty sponsors and other individuals whose mentoring has contributed to the research produced by our presenters. We would also like to thank the many programs that generously support and encourage undergraduate research and creative activities at UC Davis. Among these are the following: Beckman Scholars Program; California Alliance for Minority Participation (CAMP); Educational Enrichment Outreach Programs (BUSP, BUSP-Honors, BSHARP-MARC, CURE, ADAR); Internship and Career Center; McNair Scholars Program; Mentor-Mentee Program in Humanities, Arts, Cultural Studies and Social Sciences; Mentorships for Undergraduate Research in Agriculture, Letters and Science (MURALS); Mentorships for Undergraduate Research Participants in the Physical and Mathematical Sciences (MURPPS); Provost's Undergraduate Fellowship; University Honors Program; UC Davis Washington Program; UC Leadership Excellence Through Advanced Degrees (UC LEADS), and Vertically Integrated Projects (VIP).

Thank you to our Sponsors

Student Affairs
University Library
Undergraduate Education
Undergraduate Research Center

Conference Chair

Tammy Hoyer | *Undergraduate Research Center*

Conference Organizing Committee

Lolita Adkins | *Undergraduate Research Center; CAMP, MURPPS*
Jacques Bowyer | *Graduate Studies, McNair Scholars Program*
Lili Bynes | *Dean's Office, College of Agricultural & Environmental Sciences*
Connie Champagne | *College of Biological Sciences; BUSP*
Elizabeth Dudley | *Dean's Office, College of Letters & Science*
Annaliese Franz | *Undergraduate Research Center*
Tom Hall | *Dean's Office, College of Biological Sciences*
Raynell Hamilton | *Student Academic Success Center; MURALS*
Ada Kwong | *Undergraduate Student Representative*
Daniel Potter | *Undergraduate Council--Committee on Special Academic Programs*
Kim Reinking | *Dean's Office, College of Engineering*

Design and Publications

Sharon Knox | *Undergraduate Education*
Steven A. Morse | *Undergraduate Education*

TABLE OF CONTENTS

AGENDA

Poster Sessions: Friday, April 28, 2017

3–7 p.m., ARC Pavilion

3–4 p.m. ..... Poster Session A
ARC Pavilion

4–5 p.m. ..... Poster Session B
ARC Pavilion

5–6 p.m. ..... Poster Session C
ARC Pavilion

6–7 p.m. ..... Poster Session D
ARC Pavilion

Arts Exhibit: Friday, April 28, 2017

(concurrent with poster session)
3–7 p.m., ARC Pavilion

3–7 p.m. ..... Arts Exhibit
ARC Pavilion

Oral Sessions: Saturday, April 29, 2017

1–4:30 p.m., Wellman Hall

Noon–1 p.m. ..... Presenter Check-in
Wellman Hall

1–2:30 p.m. ..... Oral Session 1
Wellman Hall Rooms

3–4:30 p.m. ..... Oral Session 2
Wellman Hall Rooms

Abeykoon, Yashodara	Session B	Poster 77	4:00 PM	Pavilion ARC
Abraham, Tanishq	Session 2	Oral	3:00 PM	126 Wellman Hall
Achanta, Niveditha	Session 1	Oral	2:00 PM	207 Wellman Hall
Ackermann, Bryce	Session A	Poster 65	3:00 PM	Pavilion ARC
Adaskaveg, Jaclyn	Session 1	Oral	2:15 PM	6 Wellman Hall
Addassi, Hala	Session B	Poster 92	4:00 PM	Pavilion ARC
Aderonmu, Oluwafunmike	Session 2	Oral	3:30 PM	229 Wellman Hall
Adhikari, Anna	Session A	Poster 66	3:00 PM	Pavilion ARC
Afzali, Kasra	Session A	Poster 76	3:00 PM	Pavilion ARC
Aguilar Mendoza, Casandra	Session A	Poster 67	3:00 PM	Pavilion ARC
Agung, Michael	Session B	Poster 30	4:00 PM	Pavilion ARC
Ahmad, Imran	Session 2	Oral	3:15 PM	107 Wellman Hall
Akre, Samir	Session B	Poster 51	4:00 PM	Pavilion ARC
Alcantara, Mary Monique	Session A	Poster 59	3:00 PM	Pavilion ARC
Alfaro, Christian	Session 2	Oral	4:15 PM	229 Wellman Hall
Allenbeck, Gabrielle	Session A	Poster 38	3:00 PM	Pavilion ARC
Allshouse, Aurora	Session 2	Oral	3:00 PM	205 Wellman Hall
Aluru, Teja	Session 2	Oral	3:30 PM	230 Wellman Hall
Alvarado, Cynthia	Session 1	Oral	1:30 PM	212 Wellman Hall
Alvarez, David	Session A	Poster 81	3:00 PM	Pavilion ARC
Alvarez, Kenneth	Session B	Poster 31	4:00 PM	Pavilion ARC
Amir, Nemrah	Session A	Poster 49	3:00 PM	Pavilion ARC
Anderson, Tyler	Session 1	Oral	1:30 PM	233 Wellman Hall
Andre, Camille	Session 1	Oral	1:15 PM	234 Wellman Hall
Andrews, Megan	Session A	Poster 27	3:00 PM	Pavilion ARC
Anglo, Claudine	Session D	Poster 54	6:00 PM	Pavilion ARC
Angulo, Shiela Leigh	Session D	Poster 17	6:00 PM	Pavilion ARC
Araica, Alida	Session 1	Oral	2:00 PM	229 Wellman Hall
Aristov, Michael	Session 1	Oral	1:15 PM	106 Wellman Hall
Armenta, Luis	Session A	Poster 104	3:00 PM	Pavilion ARC
Ashmore, Anne	Session D	Poster 99	6:00 PM	Pavilion ARC
Asnaashari, Sarah	Session 2	Oral	3:30 PM	216 Wellman Hall
Atamna, Doaa	Session 1	Oral	1:00 PM	229 Wellman Hall
Au, Jessica	Session C	Poster 96	5:00 PM	Pavilion ARC
Avey, Alec	Session C	Poster 86	5:00 PM	Pavilion ARC
Avila, Sandra	Session B	Poster 107	4:00 PM	Pavilion ARC
Baldwin, Laura	Session 2	Oral	4:15 PM	119 Wellman Hall
Bamrungpong, Taechini	Session D	Poster 46	6:00 PM	Pavilion ARC
Banathy, Gabrielle	Session 1	Oral	1:00 PM	212 Wellman Hall
Baradaran, Kimya	Session B	Poster 58	4:00 PM	Pavilion ARC
Barberio, Anna	Session A	Poster 50	3:00 PM	Pavilion ARC
Barcena-Martinez, Mariloli	Session C	Poster 53	5:00 PM	Pavilion ARC
Barrett, Dashiel	Session D	Poster 18	6:00 PM	Pavilion ARC
Bartel, Juliana	Session 2	Oral	3:30 PM	205 Wellman Hall
Bassil, Reina Angelica	Session B	Poster 75	4:00 PM	Pavilion ARC
Bates, Sofie	Session A	Poster 64	3:00 PM	Pavilion ARC
Begian, Marvin	Session 1	Oral	1:45 PM	226 Wellman Hall
Bell, Lisa	Session 2	Oral	3:15 PM	26 Wellman Hall
Bellinder, Jeff	Session A	Poster 60	3:00 PM	Pavilion ARC
Ben, Rong		Arts Exhibit	3:00 PM	Pavillion ARC
Benedict, Sarah	Session D	Poster 37	6:00 PM	Pavilion ARC
Beppler, Julie	Session 2	Oral	3:15 PM	207 Wellman Hall
Berg, Kimberley	Session 2	Oral	3:00 PM	212 Wellman Hall
Berhane, Elsa	Session D	Poster 110	6:00 PM	Pavilion ARC
Berrios, David	Session C	Poster 99	5:00 PM	Pavilion ARC
Bigelow, Benjamin	Session D	Poster 11	6:00 PM	Pavilion ARC
Bilodeaux, Jill	Session A	Poster 40	3:00 PM	Pavilion ARC
Birakos, Ashley	Session A	Poster 2	3:00 PM	Pavilion ARC
Bisen, Aanchal	Session B	Poster 44	4:00 PM	Pavilion ARC
Blackwell, Haley	Session C	Poster 37	5:00 PM	Pavilion ARC
Boardman, Kevin	Session A	Poster 96	3:00 PM	Pavilion ARC
Bons, Austin	Session A	Poster 10	3:00 PM	Pavilion ARC
Booker, Jacqueline	Session 2	Oral	3:30 PM	233 Wellman Hall
Bradley, RaNelle	Session 1	Oral	1:15 PM	216 Wellman Hall
Brockelsby, Kasey	Session 1	Oral	1:45 PM	2 Wellman Hall
Brown, Joseph	Session 2	Oral	3:45 PM	230 Wellman Hall
Buck, Taylor	Session 2	Oral	3:15 PM	229 Wellman Hall
Burger, Sydney	Session B	Poster 59	4:00 PM	Pavilion ARC
Burkhead, Aaron	Session 2	Oral	4:00 PM	230 Wellman Hall
Bussey, Tawny	Session D	Poster 106	6:00 PM	Pavilion ARC
Cai, Hongchang	Session B	Poster 32	4:00 PM	Pavilion ARC
Calaimany, Meena	Session 2	Oral	4:00 PM	233 Wellman Hall
Camarena, Ysidra	Session A	Poster 9	3:00 PM	Pavilion ARC
Canales Santiago, Arturo	Session D	Poster 27	6:00 PM	Pavilion ARC
Carlile, Jordan	Session 2	Oral	3:45 PM	207 Wellman Hall
Carr, Alexandra	Session B	Poster 60	4:00 PM	Pavilion ARC
Carranza, Angelica	Session B	Poster 109	4:00 PM	Pavilion ARC
Carranza, Jacqueline S.	Session B	Poster 61	4:00 PM	Pavilion ARC
Castro, Noemi	Session A	Poster 8	3:00 PM	Pavilion ARC
Chan, Chie Shan	Session C	Poster 6	5:00 PM	Pavilion ARC
Chang, Alene	Session 1	Oral	1:15 PM	205 Wellman Hall
Chang, Kelly	Session D	Poster 62	6:00 PM	Pavilion ARC
Chantel, Jensen	Session C	Poster 28	5:00 PM	Pavilion ARC
Chavez, Alexis	Session 2	Oral	3:00 PM	107 Wellman Hall
Chavez, Jessica	Session C	Poster 47	5:00 PM	Pavilion ARC
Cheah, Joleen	Session 2	Oral	3:45 PM	126 Wellman Hall
Cheema, Simranjeet	Session B	Poster 5	4:00 PM	Pavilion ARC
Chen, Catherine	Session A	Poster 83	3:00 PM	Pavilion ARC
Chen, Christopher	Session 1	Oral	2:15 PM	234 Wellman Hall
Chen, Dana	Session D	Poster 97	6:00 PM	Pavilion ARC

Chen, Hui Lin	Session 2	Oral	3:30 PM	26 Wellman Hall
Chen, Jonathan Yuxuan	Session B	Poster 34	4:00 PM	Pavilion ARC
Chen, Junlin	Session A	Poster 89	3:00 PM	Pavilion ARC
Chen, Lan	Session 2	Oral	3:30 PM	207 Wellman Hall
Chen, Zekun	Session 1	Oral	1:45 PM	233 Wellman Hall
Cheng, Douagee	Session 2	Oral	3:00 PM	2 Wellman Hall
Chesed, Liat	Session C	Poster 110	5:00 PM	Pavilion ARC
Chesnutt, Sonja	Session C	Poster 62	5:00 PM	Pavilion ARC
Cheung, Carly	Session A	Poster 68	3:00 PM	Pavilion ARC
Chhen, Aileen	Session B	Poster 78	4:00 PM	Pavilion ARC
Chin, Joanne	Session A	Poster 106	3:00 PM	Pavilion ARC
Chin, Shiang-Wan	Session 2	Oral	4:00 PM	207 Wellman Hall
Chiu, Kwan Lun (Victor)	Session 1	Oral	2:15 PM	202 Wellman Hall
Cho, Eunjin	Session B	Poster 104	4:00 PM	Pavilion ARC
Choi, Aaron	Session C	Poster 19	5:00 PM	Pavilion ARC
Chong, Cynthia		Arts Exhibit	3:00 PM	Pavillion ARC
Chong, Veronica-Rennea	Session D	Poster 57	6:00 PM	Pavilion ARC
Chris, Eva	Session D	Poster 58	6:00 PM	Pavilion ARC
Christensen, Lana	Session A	Poster 8	3:00 PM	Pavilion ARC
Chu, Rianna	Session B	Poster 72	4:00 PM	Pavilion ARC
Chuen, Andrew	Session 2	Oral	3:15 PM	230 Wellman Hall
Chum, Tanee	Session C	Poster 5	5:00 PM	Pavilion ARC
Claret, Miles	Session A	Poster 29	3:00 PM	Pavilion ARC
Clark, Brigitte	Session B	Poster 2	4:00 PM	Pavilion ARC
Clay, Cameron	Session 2	Oral	4:00 PM	106 Wellman Hall
Clogston, Michael	Session 1	Oral	2:15 PM	229 Wellman Hall
Coats, Matthew	Session B	Poster 105	4:00 PM	Pavilion ARC
Colin, Jacqueline	Session C	Poster 75	5:00 PM	Pavilion ARC
Congrave-Wilson, Zion	Session A	Poster 91	3:00 PM	Pavilion ARC
Conlin, Dana	Session D	Poster 56	6:00 PM	Pavilion ARC
Cony, Jacqueline	Session 1	Oral	1:45 PM	229 Wellman Hall
Cooley-Rieders, Chessie	Session B	Poster 1	4:00 PM	Pavilion ARC
Corbelli, Matthew	Session B	Poster 13	4:00 PM	Pavilion ARC
Cornejo, Zachary	Session D	Poster 37	6:00 PM	Pavilion ARC
Cornell, B	Session C	Poster 20	5:00 PM	Pavilion ARC
Crichton, Samuel	Session 2	Oral	3:15 PM	233 Wellman Hall
Crocker, Sonya	Session D	Poster 7	6:00 PM	Pavilion ARC
Crofton, Amanda	Session 2	Oral	4:15 PM	212 Wellman Hall
Croze, Benjamin	Session C	Poster 29	5:00 PM	Pavilion ARC
Cruz, Lizbeth	Session A	Poster 54	3:00 PM	Pavilion ARC
Cruz, Neiman	Session A	Poster 90	3:00 PM	Pavilion ARC
Cubillan, Mark Patrick	Session A	Poster 110	3:00 PM	Pavilion ARC
Cuervo Palacios, Jesica	Session A	Poster 14	3:00 PM	Pavilion ARC
Dahms, Petra	Session 2	Oral	4:00 PM	212 Wellman Hall
Dalager, Olivia	Session 1	Oral	2:00 PM	233 Wellman Hall
Danao, Mailee	Session 1	Oral	2:00 PM	2 Wellman Hall
D'Andrea, Mario	Session C	Poster 30	5:00 PM	Pavilion ARC
Daneshpooy, Saba	Session A	Poster 85	3:00 PM	Pavilion ARC
Davis, Joshua	Session 1	Oral	1:30 PM	229 Wellman Hall
De La Torre, Ubaldo	Session 1	Oral	1:30 PM	202 Wellman Hall
de Leon Sanchez, Erin	Session A	Poster 84	3:00 PM	Pavilion ARC
De Vera, Kestner Brae	Session C	Poster 64	5:00 PM	Pavilion ARC
De Vries, Dana	Session B	Poster 7	4:00 PM	Pavilion ARC
deGracia, Veronique	Session C	Poster 89	5:00 PM	Pavilion ARC
Dekeater, Jenna	Session D	Poster 113	6:00 PM	Pavilion ARC
Del Castillo, Zenjief	Session A	Poster 117	3:00 PM	Pavilion ARC
Del Rio, Antonio	Session B	Poster 105	4:00 PM	Pavilion ARC
Deng, William	Session 1	Oral	1:00 PM	233 Wellman Hall
D'Esposito, Zoe	Session A	Poster 109	3:00 PM	Pavilion ARC
Devalaraju, Venkata	Session C	Poster 21	5:00 PM	Pavilion ARC
Dewitt, Jaclyn	Session A	Poster 78	3:00 PM	Pavilion ARC
Dileep, Gayathri	Session 1	Oral	2:00 PM	205 Wellman Hall
Dimech, Amanda	Session C	Poster 79	5:00 PM	Pavilion ARC
Dinh, David	Session A	Poster 30	3:00 PM	Pavilion ARC
Dinh, Kevin	Session C	Poster 113	5:00 PM	Pavilion ARC
Diomino, Anthony	Session B	Poster 7	4:00 PM	Pavilion ARC
Ditzel, Alexander	Session B	Poster 74	4:00 PM	Pavilion ARC
Do, Tiffany	Session 1	Oral	1:15 PM	207 Wellman Hall
Doan, Nhu	Session B	Poster 70	4:00 PM	Pavilion ARC
Dombrowski, Miriam	Session 1	Oral	2:00 PM	126 Wellman Hall
Don, Anna	Session C	Poster 115	5:00 PM	Pavilion ARC
Dong, Chunyang	Session C	Poster 76	5:00 PM	Pavilion ARC
Doong, Joy	Session 2	Oral	3:00 PM	233 Wellman Hall
Dorrance, Emily	Session C	Poster 31	5:00 PM	Pavilion ARC
Dousa, Kevin	Session 2	Oral	3:15 PM	216 Wellman Hall
Drost, Jessica	Session A	Poster 31	3:00 PM	Pavilion ARC
Duckworth, Lauren	Session C	Poster 2	5:00 PM	Pavilion ARC
Dunsmore, Emily	Session C	Poster 79	5:00 PM	Pavilion ARC
Duveneck, Alexander	Session 1	Oral	2:00 PM	202 Wellman Hall
Edwards, Kasey	Session A	Poster 24	3:00 PM	Pavilion ARC
Eijansantos, Emily	Session 2	Oral	4:15 PM	233 Wellman Hall
Ellerby, Sophie	Session 2	Oral	4:00 PM	205 Wellman Hall
Ellison, Daniel	Session D	Poster 102	6:00 PM	Pavilion ARC
Erickson, Katherine	Session 2	Oral	4:00 PM	126 Wellman Hall
Erol, Daffcar	Session C	Poster 48	5:00 PM	Pavilion ARC
Esparza, Elsa	Session A	Poster 118	3:00 PM	Pavilion ARC
Estrada, John	Session 1	Oral	1:30 PM	2 Wellman Hall
Ewald, Makena	Session 2	Oral	4:15 PM	126 Wellman Hall
Farahvash, Ardavan	Session C	Poster 12	5:00 PM	Pavilion ARC
Farquhar-Leicester, Alexander	Session C	Poster 112	5:00 PM	Pavilion ARC

Fates, Valerie	Session D	Poster 4	6:00 PM	Pavilion ARC
Fernandez, Adriana	Session 2	Oral	3:30 PM	226 Wellman Hall
Fernandez-Rubio, Aleida	Session 2	Oral	3:00 PM	6 Wellman Hall
Figueroa, Alicia	Session A	Poster 15	3:00 PM	Pavilion ARC
Flores, Amber	Session 1	Oral	1:15 PM	6 Wellman Hall
Fong, Angel	Session D	Poster 35	6:00 PM	Pavilion ARC
Fonseca, Laura	Session D	Poster 34	6:00 PM	Pavilion ARC
Francis, Emmet	Session 2	Oral	3:15 PM	6 Wellman Hall
Franco, Konrad	Session 1	Oral	1:45 PM	107 Wellman Hall
Freund, Gabriel	Session C	Poster 77	5:00 PM	Pavilion ARC
Fukurai, Mihoka	Session C	Poster 55	5:00 PM	Pavilion ARC
Gabbert, Allison	Session 1	Oral	1:00 PM	226 Wellman Hall
Gabriel, Marina	Session C	Poster 22	5:00 PM	Pavilion ARC
Galicia, Mackenna	Session D	Poster 76	6:00 PM	Pavilion ARC
Gallegos, Rudolph	Session A	Poster 61	3:00 PM	Pavilion ARC
Gamez, Ruth	Session A	Poster 16	3:00 PM	Pavilion ARC
Gantulga, Tului	Session 2	Oral	4:15 PM	230 Wellman Hall
Gao, Esther	Session D	Poster 60	6:00 PM	Pavilion ARC
Garcia, Destiny	Session C	Poster 90	5:00 PM	Pavilion ARC
Garcia, Jazmin	Session D	Poster 51	6:00 PM	Pavilion ARC
Garcia, Tomas	Session 1	Oral	1:30 PM	106 Wellman Hall
Garcia-Ochoa, Roxana	Session C	Poster 50	5:00 PM	Pavilion ARC
Garibay, Nancy	Session C	Poster 65	5:00 PM	Pavilion ARC
Geary, Quirina	Session 2	Oral	3:00 PM	226 Wellman Hall
Gernes, Zachary	Session C	Poster 3	5:00 PM	Pavilion ARC
Ghalambor, Tara	Session B	Poster 11	4:00 PM	Pavilion ARC
Gil, Lindsey	Session B	Poster 71	4:00 PM	Pavilion ARC
Gizaw, Andreas	Session 1	Oral	1:45 PM	230 Wellman Hall
Goering, Mark	Session A	Poster 100	3:00 PM	Pavilion ARC
Goldman, Elissa	Session A	Poster 41	3:00 PM	Pavilion ARC
Goldman, Mitchell	Session A	Poster 82	3:00 PM	Pavilion ARC
(Withdrawn) Goley, Stephanie	Session A	Poster 119	3:00 PM	Pavilion ARC
Gomez, Blanca	Session B	Poster 16	4:00 PM	Pavilion ARC
Gomez, Carolina	Session B	Poster 6	4:00 PM	Pavilion ARC
Gonsalves, Alexander	Session D	Poster 77	6:00 PM	Pavilion ARC
Gonzales, Julia	Session D	Poster 25	6:00 PM	Pavilion ARC
Good, Ian	Session A	Poster 92	3:00 PM	Pavilion ARC
Gordon, Jacqueline	Session 1	Oral	1:00 PM	216 Wellman Hall
Goswami, Shelly	Session C	Poster 4	5:00 PM	Pavilion ARC
Gothberg, Ayumi	Session D	Poster 105	6:00 PM	Pavilion ARC
Gouw, Aaron	Session B	Poster 83	4:00 PM	Pavilion ARC
Grant, Connor	Session 1	Oral	1:15 PM	230 Wellman Hall
Greb, Alexandra	Session C	Poster 10	5:00 PM	Pavilion ARC
Grewal, Navtej	Session C	Poster 11	5:00 PM	Pavilion ARC
Gromova, Tatiana	Session 2	Oral	3:45 PM	212 Wellman Hall
Guillen, Jesus	Session D	Poster 89	6:00 PM	Pavilion ARC
Guitron, Daisy	Session A	Poster 26	3:00 PM	Pavilion ARC
Guorgui, Jacob	Session C	Poster 92	5:00 PM	Pavilion ARC
Gutierrez, Nathaniel-Georg	Session D	Poster 87	6:00 PM	Pavilion ARC
Haile, Saba	Session D	Poster 78	6:00 PM	Pavilion ARC
Halfon, Yaeir	Session C	Poster 23	5:00 PM	Pavilion ARC
Hamlett, Gabriella	Session A	Poster 111	3:00 PM	Pavilion ARC
Hampton, Angela	Session D	Poster 5	6:00 PM	Pavilion ARC
Hansen, Jacob	Session A	Poster 49	3:00 PM	Pavilion ARC
Hansen-Smith, Emma	Session D	Poster 35	6:00 PM	Pavilion ARC
Hargis, Lauren	Session 1	Oral	2:15 PM	226 Wellman Hall
Harris, Simon	Session A	Poster 33	3:00 PM	Pavilion ARC
Hartanto, Mario	Session B	Poster 11	4:00 PM	Pavilion ARC
Haugland, Megan	Session A	Poster 93	3:00 PM	Pavilion ARC
Hedbabny, Katharine	Session A	Poster 105	3:00 PM	Pavilion ARC
Hernandez, Pedro	Session D	Poster 63	6:00 PM	Pavilion ARC
Herrera, Veronica	Session 2	Oral	4:00 PM	226 Wellman Hall
Hickman, Elise	Session C	Poster 33	5:00 PM	Pavilion ARC
Hill, Dakota		Arts Exhibit	3:00 PM	Pavillion ARC
Hinojosa, Kevin	Session 2	Oral	4:00 PM	6 Wellman Hall
Hissen, Karina	Session A	Poster 1	3:00 PM	Pavilion ARC
Hoeft, Evan	Session 1	Oral	1:00 PM	2 Wellman Hall
Holland, Asa	Session A	Poster 33	3:00 PM	Pavilion ARC
Hong, Jason	Session 1	Oral	1:00 PM	6 Wellman Hall
Hook, Juliet	Session C	Poster 5	5:00 PM	Pavilion ARC
Howard, Zaahir	Session D	Poster 40	6:00 PM	Pavilion ARC
Hsieh, Caroline	Session D	Poster 64	6:00 PM	Pavilion ARC
Hsu, Alice	Session C	Poster 113	5:00 PM	Pavilion ARC
Hsu, Cheryl	Session A	Poster 3	3:00 PM	Pavilion ARC
Hsu, Emily	Session D	Poster 65	6:00 PM	Pavilion ARC
Hsu, Erin	Session C	Poster 103	5:00 PM	Pavilion ARC
Huang, Albert	Session B	Poster 23	4:00 PM	Pavilion ARC
Huang, Jorinna	Session C	Poster 13	5:00 PM	Pavilion ARC
Huang, Nanxi	Session B	Poster 7	4:00 PM	Pavilion ARC
Huang, Pin-Jui	Session 2	Oral	4:15 PM	202 Wellman Hall
Huang, Sabrina	Session 1	Oral	2:15 PM	230 Wellman Hall
Huerta, Alexandria	Session B	Poster 110	4:00 PM	Pavilion ARC
Huerta, Mayra	Session B	Poster 103	4:00 PM	Pavilion ARC
Hui, Tsz Ho	Session C	Poster 108	5:00 PM	Pavilion ARC
Hurzhyi, Anna	Session D	Poster 88	6:00 PM	Pavilion ARC
Huynh, Delvin	Session C	Poster 95	5:00 PM	Pavilion ARC
Huynh, Jenna	Session B	Poster 48	4:00 PM	Pavilion ARC
Hvasta, Matthew	Session 2	Oral	3:30 PM	119 Wellman Hall
Hwang, Hyeyeon	Session A	Poster 101	3:00 PM	Pavilion ARC
Ibraheem, Amenah	Session D	Poster 85	6:00 PM	Pavilion ARC

Ibrahim, Lara	Session C	Poster 83	5:00 PM	Pavilion ARC
Inoue, Hitomi	Session C	Poster 97	5:00 PM	Pavilion ARC
Ip, Pak See	Session D	Poster 55	6:00 PM	Pavilion ARC
Ivanova, Xenia	Session 2	Oral	3:45 PM	119 Wellman Hall
Ivey, Daniela	Session D	Poster 23	6:00 PM	Pavilion ARC
Jacobs, Dana	Session D	Poster 6	6:00 PM	Pavilion ARC
Jacobs, Kyleigh	Session B	Poster 17	4:00 PM	Pavilion ARC
Jaffe, David	Session 2	Oral	3:00 PM	106 Wellman Hall
Jayakumar, Mithya	Session C	Poster 116	5:00 PM	Pavilion ARC
Jhalani, Meenakshi	Session B	Poster 73	4:00 PM	Pavilion ARC
Jiang, Xueer	Session A	Poster 86	3:00 PM	Pavilion ARC
Jianu, Julia	Session 1	Oral	1:45 PM	205 Wellman Hall
Jimenez, Robert	Session B	Poster 9	4:00 PM	Pavilion ARC
Jin, Yihan	Session 1	Oral	1:30 PM	119 Wellman Hall
Joaquin-Morales, Zaira	Session A	Poster 22	3:00 PM	Pavilion ARC
Johnson, Bridgette	Session D	Poster 66	6:00 PM	Pavilion ARC
Johnson, Skylar	Session A	Poster 51	3:00 PM	Pavilion ARC
Joseph, Cierra	Session A	Poster 52	3:00 PM	Pavilion ARC
Joseph, Najah	Session 1	Oral	2:00 PM	226 Wellman Hall
Kaimal, Nikhil	Session B	Poster 93	4:00 PM	Pavilion ARC
Kanagawa, Naoki	Session B	Poster 4	4:00 PM	Pavilion ARC
Kao, Jo Hsuan	Session B	Poster 44	4:00 PM	Pavilion ARC
Kar, Anurupa	Session D	Poster 109	6:00 PM	Pavilion ARC
Karageuzian, Sergio	Session D	Poster 75	6:00 PM	Pavilion ARC
Kasraie, Kalen	Session B	Poster 24	4:00 PM	Pavilion ARC
Keith, Acacia	Session 1	Oral	2:00 PM	26 Wellman Hall
Kelly, Olivia	Session C	Poster 53	5:00 PM	Pavilion ARC
Kennedy-McDonnell, Erik	Session 2	Oral	3:45 PM	107 Wellman Hall
Ketvirtis, Sabuk	Session D	Poster 24	6:00 PM	Pavilion ARC
Khadilkar, Tanmayee	Session A	Poster 99	3:00 PM	Pavilion ARC
Khalid, Aliza	Session 2	Oral	3:45 PM	202 Wellman Hall
Khan, Nossin	Session B	Poster 45	4:00 PM	Pavilion ARC
Kim, Angela	Session 1	Oral	2:15 PM	26 Wellman Hall
Kim, Ashley	Session B	Poster 46	4:00 PM	Pavilion ARC
Kim, Elizabeth	Session B	Poster 53	4:00 PM	Pavilion ARC
Kim, Sung	Session 1	Oral	2:15 PM	107 Wellman Hall
Kincheloe, Gregory	Session C	Poster 82	5:00 PM	Pavilion ARC
Kirillova, Anna	Session A	Poster 69	3:00 PM	Pavilion ARC
Kise, Marguerite	Session 1	Oral	2:15 PM	212 Wellman Hall
Klein, Janine Rose	Session A	Poster 23	3:00 PM	Pavilion ARC
Kleinsmith, Douglas		Arts Exhibit	3:00 PM	Pavillion ARC
Klyver, John	Session 1	Oral	1:30 PM	207 Wellman Hall
Koehler, Samuel	Session A	Poster 94	3:00 PM	Pavilion ARC
Komarla, Anvita	Session A	Poster 53	3:00 PM	Pavilion ARC
Kopa, Ryan	Session D	Poster 24	6:00 PM	Pavilion ARC
Kopetzky, Jennifer	Session B	Poster 11	4:00 PM	Pavilion ARC
Kopparapu, Srujan	Session C	Poster 70	5:00 PM	Pavilion ARC
Kournoutas, Ioannis	Session C	Poster 63	5:00 PM	Pavilion ARC
Krelstein, Aaron	Session B	Poster 102	4:00 PM	Pavilion ARC
Kulinich, Andrea	Session 2	Oral	3:00 PM	26 Wellman Hall
Kulkarni, Sheila	Session D	Poster 15	6:00 PM	Pavilion ARC
Kumar, Nithya	Session 2	Oral	3:00 PM	119 Wellman Hall
Kurra, Sreevidya	Session A	Poster 62	3:00 PM	Pavilion ARC
Kwok, Eric	Session A	Poster 70	3:00 PM	Pavilion ARC
Kwong, Ada	Session 1	Oral	1:45 PM	106 Wellman Hall
Kwong, Ming Yin	Session D	Poster 16	6:00 PM	Pavilion ARC
Kwong, Stephen	Session 1	Oral	1:15 PM	119 Wellman Hall
La, Jennifer	Session D	Poster 111	6:00 PM	Pavilion ARC
La, Man	Session C	Poster 93	5:00 PM	Pavilion ARC
Labins, Jacqueline	Session A	Poster 5	3:00 PM	Pavilion ARC
Lafreniere, Marrisa	Session 1	Oral	1:15 PM	26 Wellman Hall
Laing, Emilia	Session B	Poster 62	4:00 PM	Pavilion ARC
Lam, Clinton	Session B	Poster 63	4:00 PM	Pavilion ARC
Lam, Tricia	Session A	Poster 17	3:00 PM	Pavilion ARC
Lardizabal, Erica	Session D	Poster 61	6:00 PM	Pavilion ARC
Lau, Allison	Session 2	Oral	3:45 PM	205 Wellman Hall
Lau, Elaine	Session D	Poster 84	6:00 PM	Pavilion ARC
Lau, Raymond	Session B	Poster 64	4:00 PM	Pavilion ARC
Law, Sophia	Session B	Poster 25	4:00 PM	Pavilion ARC
Le, Ann	Session D	Poster 37	6:00 PM	Pavilion ARC
Leal, Mariana	Session C	Poster 91	5:00 PM	Pavilion ARC
Leddy, Jason	Session 2	Oral	4:00 PM	26 Wellman Hall
Lee, Brian	Session C	Poster 15	5:00 PM	Pavilion ARC
Lee, Dong Hyun	Session C	Poster 16	5:00 PM	Pavilion ARC
Lee, Nancy	Session A	Poster 71	3:00 PM	Pavilion ARC
Lee, Sue Bin		Arts Exhibit	3:00 PM	Pavillion ARC
Leng, Lynn	Session B	Poster 79	4:00 PM	Pavilion ARC
Leon, Leslie	Session B	Poster 55	4:00 PM	Pavilion ARC
Leong, Aaron	Session B	Poster 33	4:00 PM	Pavilion ARC
Leslie, Chelsea	Session B	Poster 56	4:00 PM	Pavilion ARC
Lester, Nathan	Session D	Poster 25	6:00 PM	Pavilion ARC
Li, Jessica	Session B	Poster 90	4:00 PM	Pavilion ARC
Libert, Serena	Session 2	Oral	3:45 PM	26 Wellman Hall
Lim, Alicia	Session 2	Oral	3:15 PM	119 Wellman Hall
Lim, Kahui	Session D	Poster 25	6:00 PM	Pavilion ARC
Lin, Frank	Session B	Poster 80	4:00 PM	Pavilion ARC
Lin, Kristi	Session 1	Oral	1:45 PM	212 Wellman Hall
Linares, Monica	Session B	Poster 47	4:00 PM	Pavilion ARC
Lingel-Gary, Emma	Session 2	Oral	4:15 PM	2 Wellman Hall
Liu, Jessie	Session B	Poster 43	4:00 PM	Pavilion ARC

Liu, Stephen	Session D	Poster 28	6:00 PM	Pavilion ARC
Liu, Yiyun	Session B	Poster 15	4:00 PM	Pavilion ARC
Liu, Yuqing	Session C	Poster 17	5:00 PM	Pavilion ARC
Lo, Ia	Session D	Poster 50	6:00 PM	Pavilion ARC
Lo, Jamie	Session D	Poster 90	6:00 PM	Pavilion ARC
Long, Matthew	Session 2	Oral	3:45 PM	233 Wellman Hall
Lopez, Lia	Session B	Poster 99	4:00 PM	Pavilion ARC
Lopez Torres, Adriana	Session B	Poster 26	4:00 PM	Pavilion ARC
Lor, Yi	Session B	Poster 49	4:00 PM	Pavilion ARC
Lu, Eileen	Session D	Poster 112	6:00 PM	Pavilion ARC
Lu, Henderson	Session B	Poster 48	4:00 PM	Pavilion ARC
Lu, WeiYu	Session 1	Oral	1:45 PM	234 Wellman Hall
Lu, Yu	Session 2	Oral	3:00 PM	207 Wellman Hall
Luke, Jonathan	Session D	Poster 13	6:00 PM	Pavilion ARC
Luong, Phuc	Session C	Poster 18	5:00 PM	Pavilion ARC
Lyu, Su Hyun	Session B	Poster 37	4:00 PM	Pavilion ARC
Ma, Xinyu	Session A	Poster 98	3:00 PM	Pavilion ARC
Maas, Lauren	Session 1	Oral	1:45 PM	2 Wellman Hall
Mabry, Emily	Session C	Poster 102	5:00 PM	Pavilion ARC
Macedo, Danielle		Arts Exhibit	3:00 PM	Pavillion ARC
Macleod, Clara	Session 2	Oral	3:45 PM	226 Wellman Hall
Magadia, Danielle	Session A	Poster 25	3:00 PM	Pavilion ARC
Magana, Danica	Session C	Poster 1	5:00 PM	Pavilion ARC
Maginnis, David	Session A	Poster 19	3:00 PM	Pavilion ARC
Mahe, Karan	Session A	Poster 7	3:00 PM	Pavilion ARC
Mak, Tiffany	Session 1	Oral	2:00 PM	230 Wellman Hall
Makepeace, Caroline	Session 1	Oral	1:30 PM	26 Wellman Hall
Mallawa Arachchige, Upekshila	Session C	Poster 49	5:00 PM	Pavilion ARC
Mallya, Gita	Session 2	Oral	4:00 PM	202 Wellman Hall
Manning, Courtney	Session B	Poster 50	4:00 PM	Pavilion ARC
Mao, Michelle	Session 2	Oral	3:15 PM	126 Wellman Hall
Maquiling, Sophie		Arts Exhibit	3:00 PM	Pavillion ARC
Mark-Bachoua, Gabrielle	Session 1	Oral	1:15 PM	107 Wellman Hall
Martinez, Daniel	Session B	Poster 39	4:00 PM	Pavilion ARC
Martinez, Ernie	Session C	Poster 77	5:00 PM	Pavilion ARC
Martinez, Jeannette	Session B	Poster 65	4:00 PM	Pavilion ARC
Martinez, Steten	Session A	Poster 104	3:00 PM	Pavilion ARC
Mascareno, Daniel	Session A	Poster 20	3:00 PM	Pavilion ARC
Mashat, Bayan		Arts Exhibit	3:00 PM	Pavillion ARC
Masnaghetti, Megan	Session B	Poster 114	4:00 PM	Pavilion ARC
Mata, Rogelio	Session 1	Oral	1:15 PM	233 Wellman Hall
Matus, Patricia	Session A	Poster 37	3:00 PM	Pavilion ARC
Mazzetti, Joseph	Session A	Poster 13	3:00 PM	Pavilion ARC
McCluskey, Madeline	Session 1	Oral	1:45 PM	216 Wellman Hall
McCutcheon, Sean	Session 1	Oral	2:15 PM	202 Wellman Hall
Mckenzie, Gakpe	Session B	Poster 106	4:00 PM	Pavilion ARC
McLane, Spivey	Session B	Poster 17	4:00 PM	Pavilion ARC
McMillen, Shasta	Session D	Poster 91	6:00 PM	Pavilion ARC
McNeil, Patricia	Session 2	Oral	3:15 PM	205 Wellman Hall
Meany, Megan	Session D	Poster 45	6:00 PM	Pavilion ARC
Meckler, Joaquin	Session A	Poster 28	3:00 PM	Pavilion ARC
Medina, Jose	Session 2	Oral	3:45 PM	229 Wellman Hall
Mehta, Tarun	Session B	Poster 4	4:00 PM	Pavilion ARC
Melendez, Wendy	Session C	Poster 38	5:00 PM	Pavilion ARC
Milkey, Alexandra	Session B	Poster 11	4:00 PM	Pavilion ARC
Miller, Kristina	Session 2	Oral	3:45 PM	216 Wellman Hall
Ming-Whitfield, Brittni	Session 1	Oral	1:30 PM	234 Wellman Hall
Miyazaki, Matthew	Session C	Poster 66	5:00 PM	Pavilion ARC
Mohajerani, Niloufar	Session B	Poster 84	4:00 PM	Pavilion ARC
Mollhoff, Iris	Session 2	Oral	4:00 PM	119 Wellman Hall
Montgomery, Michael	Session D	Poster 52	6:00 PM	Pavilion ARC
Morales, Alondra	Session D	Poster 53	6:00 PM	Pavilion ARC
Morales, Anthony	Session 1	Oral	1:45 PM	207 Wellman Hall
Mueller, Tobias	Session C	Poster 39	5:00 PM	Pavilion ARC
Mukherjee-Roy, Neije	Session C	Poster 104	5:00 PM	Pavilion ARC
Mulcahy, Allyson	Session C	Poster 7	5:00 PM	Pavilion ARC
Mumbleau, Madeline	Session D	Poster 19	6:00 PM	Pavilion ARC
Mume, Biftu	Session 1	Oral	1:00 PM	234 Wellman Hall
Mummidivarapu, Nitika	Session B	Poster 81	4:00 PM	Pavilion ARC
Munji, Mariel	Session B	Poster 98	4:00 PM	Pavilion ARC
Munoz, Ariel	Session C	Poster 71	5:00 PM	Pavilion ARC
Murakami, Kalani	Session B	Poster 116	4:00 PM	Pavilion ARC
Murali, Mahitha	Session C	Poster 67	5:00 PM	Pavilion ARC
Murdock, Maylin	Session C	Poster 105	5:00 PM	Pavilion ARC
Murray, Kaitlin	Session 1	Oral	1:00 PM	202 Wellman Hall
Nagaraj, Maya	Session 1	Oral	1:30 PM	2 Wellman Hall
Nagourney, Alexander	Session 1	Oral	1:45 PM	6 Wellman Hall
Nakayama, Yuhei	Session D	Poster 39	6:00 PM	Pavilion ARC
Naseer, Misbah	Session 1	Oral	1:00 PM	126 Wellman Hall
Natividad, Monica Lyn	Session D	Poster 74	6:00 PM	Pavilion ARC
Nava Ultreras, Brandon	Session B	Poster 85	4:00 PM	Pavilion ARC
Needels, Jacob	Session 2	Oral	3:00 PM	230 Wellman Hall
Nelson, Seldy	Session C	Poster 8	5:00 PM	Pavilion ARC
Neuville, Raumin	Session C	Poster 68	5:00 PM	Pavilion ARC
Neverova, Ekaterina	Session 1	Oral	2:15 PM	119 Wellman Hall
Ng, Megan	Session B	Poster 57	4:00 PM	Pavilion ARC
Ng, Ralph	Session B	Poster 7	4:00 PM	Pavilion ARC
Ngo, Dana	Session B	Poster 94	4:00 PM	Pavilion ARC
Nguy, Phong	Session C	Poster 69	5:00 PM	Pavilion ARC
Nguyen, Alayna	Session B	Poster 10	4:00 PM	Pavilion ARC

Nguyen, Anh	Session D	Poster 81	6:00 PM	Pavilion ARC
Nguyen, Diana	Session C	Poster 106	5:00 PM	Pavilion ARC
Nguyen, Don	Session 1	Oral	2:00 PM	234 Wellman Hall
Nguyen, Hedda Hieu	Session 1	Oral	2:15 PM	126 Wellman Hall
Nguyen, Hoang Danh	Session B	Poster 43	4:00 PM	Pavilion ARC
Nguyen, Jennifer	Session B	Poster 87	4:00 PM	Pavilion ARC
Nguyen, Kara	Session C	Poster 44	5:00 PM	Pavilion ARC
Nguyen, Kelly	Session A	Poster 120	3:00 PM	Pavilion ARC
Nguyen, Kimsa	Session B	Poster 95	4:00 PM	Pavilion ARC
Nguyen, Lanchi	Session A	Poster 12	3:00 PM	Pavilion ARC
Nguyen, Michael	Session C	Poster 73	5:00 PM	Pavilion ARC
Nguyen, Minh	Session A	Poster 11	3:00 PM	Pavilion ARC
Nguyen, Ngan Kim	Session A	Poster 107	3:00 PM	Pavilion ARC
Nguyen, Thien-Y	Session B	Poster 86	4:00 PM	Pavilion ARC
Nguyen, Truc-Quan	Session C	Poster 53	5:00 PM	Pavilion ARC
Nguyen, Van	Session 2	Oral	3:30 PM	207 Wellman Hall
Nikzad, Shayla	Session C	Poster 42	5:00 PM	Pavilion ARC
Nirmal, Niba	Session 2	Oral	3:15 PM	202 Wellman Hall
Noronha, Adriana	Session 1	Oral	1:30 PM	205 Wellman Hall
Ochoa, Daisy	Session C	Poster 55	5:00 PM	Pavilion ARC
O'Donnell, Allison	Session C	Poster 52	5:00 PM	Pavilion ARC
Oelsner, Laura	Session 2	Oral	4:00 PM	234 Wellman Hall
Oguchi, Rino	Session A	Poster 95	3:00 PM	Pavilion ARC
Ohlin, Catherine	Session 2	Oral	3:30 PM	106 Wellman Hall
Olaya, Ivan	Session B	Poster 82	4:00 PM	Pavilion ARC
Orozco, Jessica	Session B	Poster 27	4:00 PM	Pavilion ARC
Ortega, Stephanie	Session A	Poster 21	3:00 PM	Pavilion ARC
Osborn, Ellen	Session A	Poster 97	3:00 PM	Pavilion ARC
Osei-Enin, Jasmine	Session C	Poster 41	5:00 PM	Pavilion ARC
Pabbisetty, Lakshmidevi	Session B	Poster 97	4:00 PM	Pavilion ARC
Pabon, Madelena	Session 1	Oral	1:00 PM	230 Wellman Hall
Palao III, Leon	Session C	Poster 80	5:00 PM	Pavilion ARC
Palmer, Rebecca	Session 1	Oral	2:15 PM	205 Wellman Hall
Palsgaard, Peggy	Session 2	Oral	4:15 PM	6 Wellman Hall
Pan, Xuankang	Session 2	Oral	3:45 PM	6 Wellman Hall
Pandya, Archana	Session D	Poster 103	6:00 PM	Pavilion ARC
Parakulam, Gokul	Session 3	Oral	4:15 PM	26 Wellman Hall
Park, Caroline	Session C	Poster 74	5:00 PM	Pavilion ARC
Park, Wesley J.	Session 1	Oral	1:30 PM	107 Wellman Hall
Parker, Walter	Session B	Poster 35	4:00 PM	Pavilion ARC
Parks, Andy	Session A	Poster 33	3:00 PM	Pavilion ARC
Parnay, Angela	Session D	Poster 8	6:00 PM	Pavilion ARC
Parsa, Viva	Session 1	Oral	2:00 PM	212 Wellman Hall
Pastor, Ilse	Session 1	Oral	2:15 PM	207 Wellman Hall
Patel, Kerul	Session C	Poster 98	5:00 PM	Pavilion ARC
Patel, Kishan	Session D	Poster 67	6:00 PM	Pavilion ARC
Patel, Miti	Session C	Poster 98	5:00 PM	Pavilion ARC
Patino, Christian	Session B	Poster 36	4:00 PM	Pavilion ARC
Patkar, Rasika	Session D	Poster 68	6:00 PM	Pavilion ARC
Patten, Christine	Session B	Poster 40	4:00 PM	Pavilion ARC
Paz, Dean	Session 1	Oral	1:30 PM	6 Wellman Hall
Paz, Margaret	Session B	Poster 117	4:00 PM	Pavilion ARC
Pearson, Kira	Session D	Poster 41	6:00 PM	Pavilion ARC
Peng, Felicia	Session A	Poster 87	3:00 PM	Pavilion ARC
Penrod, Corinne	Session 1	Oral	1:00 PM	106 Wellman Hall
Perez, Monica	Session A	Poster 32	3:00 PM	Pavilion ARC
Perez, Paola	Session 2	Oral	3:00 PM	202 Wellman Hall
Perry, Emily	Session B	Poster 3	4:00 PM	Pavilion ARC
Perucho Jaimes, Luis	Session 1	Oral	1:15 PM	226 Wellman Hall
Pesola, Loretta	Session 1	Oral	1:30 PM	216 Wellman Hall
Pham, Dahlia	Session D	Poster 20	6:00 PM	Pavilion ARC
Pham, Mary	Session B	Poster 111	4:00 PM	Pavilion ARC
Phan, Jason	Session D	Poster 96	6:00 PM	Pavilion ARC
Polsky, Lilian	Session C	Poster 32	5:00 PM	Pavilion ARC
Portillo Rivera, Alexia	Session A	Poster 18	3:00 PM	Pavilion ARC
Preciado, Cristian	Session D	Poster 115	6:00 PM	Pavilion ARC
Preston, Danielle	Session A	Poster 42	3:00 PM	Pavilion ARC
Proffitt, Allison	Session 1	Oral	1:15 PM	2 Wellman Hall
Pulido, Amber	Session B	Poster 38	4:00 PM	Pavilion ARC
Qi, Shuyi		Arts Exhibit	3:00 PM	Pavillion ARC
Qiu, Yijuan	Session B	Poster 118	4:00 PM	Pavilion ARC
Quan, Linh		Arts Exhibit	3:00 PM	Pavillion ARC
Quarshie, Claudia	Session C	Poster 85	5:00 PM	Pavilion ARC
Quino, Juanita	Session A	Poster 56	3:00 PM	Pavilion ARC
Quintanilla-Zarinan, Leslie	Session D	Poster 72	6:00 PM	Pavilion ARC
Rahai, Rouzbeh	Session 2	Oral	4:15 PM	226 Wellman Hall
Ramirez, Anacary	Session C	Poster 55	5:00 PM	Pavilion ARC
Ramirez, Eduardo	Session 1	Oral	2:00 PM	6 Wellman Hall
Ramirez Perez, Susana	Session C	Poster 24	5:00 PM	Pavilion ARC
Ramos, Sara	Session B	Poster 28	4:00 PM	Pavilion ARC
Ramos Carranza, Perla	Session D	Poster 59	6:00 PM	Pavilion ARC
Ratnavelsamy, Navaneethasri	Session C	Poster 107	5:00 PM	Pavilion ARC
Ravishankar, Pavitra	Session C	Poster 46	5:00 PM	Pavilion ARC
Reddy, Kalsha	Session D	Poster 95	6:00 PM	Pavilion ARC
Rencken, Camerin	Session A	Poster 39	3:00 PM	Pavilion ARC
Reyes, Juan	Session A	Poster 55	3:00 PM	Pavilion ARC
Reyes, Rosa	Session A	Poster 112	3:00 PM	Pavilion ARC
Riner, Jane	Session D	Poster 43	6:00 PM	Pavilion ARC
Rios, Cassandra	Session 1	Oral	2:00 PM	106 Wellman Hall
Rios, Hugo	Session 1	Oral	1:00 PM	107 Wellman Hall

Rivera, George	Session 1	Oral	1:15 PM	212 Wellman Hall
Robinson, Foxy	Session B	Poster 76	4:00 PM	Pavilion ARC
Rocha, Azucena	Session D	Poster 79	6:00 PM	Pavilion ARC
Rodriguez, Alan	Session 2	Oral	3:30 PM	202 Wellman Hall
Rodriguez, Marissa	Session B	Poster 110	4:00 PM	Pavilion ARC
Rodriguez Lombeida, Andres	Session B	Poster 119	4:00 PM	Pavilion ARC
Romo Duardo, Carmen	Session D	Poster 47	6:00 PM	Pavilion ARC
Rosenthal, Ingrid	Session C	Poster 117	5:00 PM	Pavilion ARC
Rossman, Zoë	Session 2	Oral	3:15 PM	106 Wellman Hall
Roth, Delaney	Session A	Poster 113	3:00 PM	Pavilion ARC
Roy, Julianna	Session A	Poster 114	3:00 PM	Pavilion ARC
Rudewicz, Lauren	Session 1	Oral	1:15 PM	229 Wellman Hall
Rudolph, Emma	Session 2	Oral	3:45 PM	234 Wellman Hall
Ruiz, Noe	Session C	Poster 25	5:00 PM	Pavilion ARC
Saakyan, Gayane	Session B	Poster 120	4:00 PM	Pavilion ARC
Sachs, Natalia	Session D	Poster 1	6:00 PM	Pavilion ARC
Sadlowski, Emma	Session A	Poster 115	3:00 PM	Pavilion ARC
Saeed, Rafal	Session B	Poster 95	4:00 PM	Pavilion ARC
Saeed, Sana	Session C	Poster 100	5:00 PM	Pavilion ARC
Sahabandu, Natalie	Session D	Poster 73	6:00 PM	Pavilion ARC
Salinero, Lauren	Session C	Poster 45	5:00 PM	Pavilion ARC
Sampana, Janelle	Session B	Poster 112	4:00 PM	Pavilion ARC
San Pablo, Alexandra Camille	Session C	Poster 26	5:00 PM	Pavilion ARC
Sancheti, Meghal	Session A	Poster 75	3:00 PM	Pavilion ARC
Sandoval, Jose	Session B	Poster 17	4:00 PM	Pavilion ARC
Sandvig, Elliot	Session B	Poster 88	4:00 PM	Pavilion ARC
Savage, Georgia	Session A	Poster 43	3:00 PM	Pavilion ARC
Sawhney, Sanjam	Session C	Poster 9	5:00 PM	Pavilion ARC
Sayenko, Mykhaylo	Session A	Poster 120	3:00 PM	Pavilion ARC
Schenkhuizen, Breanna	Session 1	Oral	2:00 PM	216 Wellman Hall
Schnitzer, Ciara	Session B	Poster 29	4:00 PM	Pavilion ARC
Schultz, Katharine	Session 2	Oral	3:45 PM	2 Wellman Hall
Scott, Alexandria	Session A	Poster 107	3:00 PM	Pavilion ARC
Sequeira, Amelia	Session C	Poster 72	5:00 PM	Pavilion ARC
Sethi, Karishma	Session C	Poster 46	5:00 PM	Pavilion ARC
Shabgahi, Venus	Session D	Poster 107	6:00 PM	Pavilion ARC
Shahrvini, Bita	Session D	Poster 80	6:00 PM	Pavilion ARC
Shaikh, Hashim	Session A	Poster 7	3:00 PM	Pavilion ARC
Shamlian, James	Session D	Poster 9	6:00 PM	Pavilion ARC
Shankar, Malavika	Session A	Poster 79	3:00 PM	Pavilion ARC
Sharma, Shonit Nair	Session C	Poster 27	5:00 PM	Pavilion ARC
Shatskikh, Marina	Session A	Poster 10	3:00 PM	Pavilion ARC
Shehadeh, Ayman	Session D	Poster 71	6:00 PM	Pavilion ARC
Shemery, Sarah	Session A	Poster 44	3:00 PM	Pavilion ARC
Shen, Erin	Session B	Poster 47	4:00 PM	Pavilion ARC
Sheth, Shyamal	Session C	Poster 87	5:00 PM	Pavilion ARC
Shi, Michelle	Session D	Poster 116	6:00 PM	Pavilion ARC
Shin, Minyoung	Session C	Poster 94	5:00 PM	Pavilion ARC
Shweyk, Amira	Session A	Poster 107	3:00 PM	Pavilion ARC
Sierra, Valentin		Arts Exhibit	3:00 PM	Pavillion ARC
Sillas, Andre	Session C	Poster 113	5:00 PM	Pavilion ARC
Silva, Selena	Session C	Poster 57	5:00 PM	Pavilion ARC
Simmons, Gabe	Session D	Poster 29	6:00 PM	Pavilion ARC
Sims, Riley	Session 2	Oral	3:15 PM	234 Wellman Hall
Singh, Alexis	Session D	Poster 108	6:00 PM	Pavilion ARC
Singh, Bhavdeep	Session B	Poster 113	4:00 PM	Pavilion ARC
Skots, Mariya	Session D	Poster 104	6:00 PM	Pavilion ARC
Smith, Erin	Session C	Poster 57	5:00 PM	Pavilion ARC
Smith, Kevin	Session D	Poster 82	6:00 PM	Pavilion ARC
Soba, Danielle	Session 1	Oral	2:00 PM	107 Wellman Hall
Soltanzadeh Zarandi, Sina	Session 1	Oral	1:00 PM	119 Wellman Hall
Sooch, Rajbir	Session B	Poster 95	4:00 PM	Pavilion ARC
Spence, Melissa	Session C	Poster 77	5:00 PM	Pavilion ARC
Sproul, Griffin	Session 2	Oral	3:15 PM	226 Wellman Hall
Stack, Emily	Session 2	Oral	4:00 PM	216 Wellman Hall
Staudenraus, Caroline	Session 1	Oral	1:00 PM	207 Wellman Hall
Steinberg, Danielle	Session D	Poster 10	6:00 PM	Pavilion ARC
Stokes, Patricia	Session D	Poster 14	6:00 PM	Pavilion ARC
Suarez, Sassan	Session 1	Oral	1:00 PM	205 Wellman Hall
Suk, Rachel	Session D	Poster 114	6:00 PM	Pavilion ARC
Sun, Manying	Session D	Poster 66	6:00 PM	Pavilion ARC
Supra, Rajesh	Session B	Poster 108	4:00 PM	Pavilion ARC
Swarovski, Michelle	Session A	Poster 102	3:00 PM	Pavilion ARC
Swedek, Michelle	Session 1	Oral	1:45 PM	202 Wellman Hall
Talavera, Vanessa	Session A	Poster 46	3:00 PM	Pavilion ARC
Talton, Mat	Session C	Poster 100	5:00 PM	Pavilion ARC
Tamizharasu, Jothika	Session C	Poster 43	5:00 PM	Pavilion ARC
Tan, Xiuping	Session D	Poster 92	6:00 PM	Pavilion ARC
Thai, Anthony	Session D	Poster 29	6:00 PM	Pavilion ARC
Thigpen, Brynna	Session A	Poster 109	3:00 PM	Pavilion ARC
Thorngren, Alison	Session C	Poster 61	5:00 PM	Pavilion ARC
Tom, Thalia	Session A	Poster 48	3:00 PM	Pavilion ARC
Tonooka, Jordan	Session A	Poster 4	3:00 PM	Pavilion ARC
Torres, Lisette	Session D	Poster 117	6:00 PM	Pavilion ARC
Torres, Teresa	Session 1	Oral	1:15 PM	202 Wellman Hall
Torres - Garcia, Tomas	Session B	Poster 42	4:00 PM	Pavilion ARC
Torres-Poblano, Nanci	Session C	Poster 118	5:00 PM	Pavilion ARC
Tran, Darlene	Session A	Poster 57	3:00 PM	Pavilion ARC
Tran, Franklin	Session B	Poster 41	4:00 PM	Pavilion ARC
Tran, Jacinda	Session C	Poster 88	5:00 PM	Pavilion ARC

Tran, Melanie	Session B	Poster 13	4:00 PM	Pavilion ARC
Tran, Nhi	Session D	Poster 93	6:00 PM	Pavilion ARC
Tran, Oanh	Session D	Poster 93	6:00 PM	Pavilion ARC
Tran, Randall	Session D	Poster 12	6:00 PM	Pavilion ARC
Tribble, Emma	Session B	Poster 17	4:00 PM	Pavilion ARC
Trinh, Shannon	Session D	Poster 118	6:00 PM	Pavilion ARC
Tseng, Isaac		Arts Exhibit	3:00 PM	Pavillion ARC
Tuan, Lo	Session 1	Oral	1:30 PM	226 Wellman Hall
Tucker, Liann	Session 1	Oral	1:00 PM	26 Wellman Hall
Tueros, Carlo	Session C	Poster 119	5:00 PM	Pavilion ARC
Tyer, Carly	Session C	Poster 34	5:00 PM	Pavilion ARC
Tyra, Alec	Session 2	Oral	4:15 PM	205 Wellman Hall
Vahldick, Hannah	Session A	Poster 88	3:00 PM	Pavilion ARC
Valentine, Kevin	Session 1	Oral	2:00 PM	119 Wellman Hall
Van, Richard	Session D	Poster 84	6:00 PM	Pavilion ARC
van der Zalm, Kyra	Session D	Poster 3	6:00 PM	Pavilion ARC
Van Grootheest, Chloe	Session C	Poster 40	5:00 PM	Pavilion ARC
Vandenberg, Alyssa	Session 2	Oral	3:00 PM	216 Wellman Hall
Vargas, Chenoa	Session A	Poster 58	3:00 PM	Pavilion ARC
Vargas Diaz, Oswaldo	Session 1	Oral	1:30 PM	126 Wellman Hall
Vary, Laura	Session 1	Oral	2:00 PM	2 Wellman Hall
Vashchenko, Maria	Session B	Poster 66	4:00 PM	Pavilion ARC
Vasquez, Adriana	Session B	Poster 100	4:00 PM	Pavilion ARC
Vasquez-Housley, Priscilla	Session C	Poster 35	5:00 PM	Pavilion ARC
Velazquez, Elvia	Session B	Poster 67	4:00 PM	Pavilion ARC
Velazquez, Marysol	Session D	Poster 83	6:00 PM	Pavilion ARC
Venegas, Paloma	Session 2	Oral	3:45 PM	106 Wellman Hall
Verberckmoes, Marie	Session B	Poster 89	4:00 PM	Pavilion ARC
Vieira, Candice	Session 1	Oral	1:45 PM	119 Wellman Hall
Vieira, Savanah	Session D	Poster 2	6:00 PM	Pavilion ARC
Villalobos Gomez, Natalie	Session A	Poster 45	3:00 PM	Pavilion ARC
Vinson, Yasmeen	Session D	Poster 31	6:00 PM	Pavilion ARC
Viruet, Jeannine	Session D	Poster 119	6:00 PM	Pavilion ARC
Vishnubhatt, Shailee	Session B	Poster 68	4:00 PM	Pavilion ARC
Vo, Linda	Session D	Poster 21	6:00 PM	Pavilion ARC
Vo, Quynh	Session A	Poster 72	3:00 PM	Pavilion ARC
Vo, Thai-Thanh	Session B	Poster 19	4:00 PM	Pavilion ARC
Wahaj, Syed	Session D	Poster 93	6:00 PM	Pavilion ARC
Walker, Melodie	Session A	Poster 5	3:00 PM	Pavilion ARC
Walther, Sandra	Session B	Poster 69	4:00 PM	Pavilion ARC
Wang, Colin	Session 1	Oral	1:30 PM	230 Wellman Hall
Wang, Jiaqi	Session B	Poster 52	4:00 PM	Pavilion ARC
Wang, Weizhou	Session D	Poster 22	6:00 PM	Pavilion ARC
Wang, Yu	Session 2	Oral	4:15 PM	207 Wellman Hall
Wang, Zunqiu	Session A	Poster 63	3:00 PM	Pavilion ARC
Ward, Tayler	Session 2	Oral	3:30 PM	107 Wellman Hall
Watson, Dean	Session B	Poster 101	4:00 PM	Pavilion ARC
Wen, William	Session A	Poster 5	3:00 PM	Pavilion ARC
White-Dobbs, Jade	Session D	Poster 42	6:00 PM	Pavilion ARC
Wigman, Benjamin	Session B	Poster 21	4:00 PM	Pavilion ARC
Williams, Wyatt	Session 2	Oral	3:15 PM	2 Wellman Hall
Wilson, Reese	Session A	Poster 5	3:00 PM	Pavilion ARC
Wirawan, Christian	Session A	Poster 80	3:00 PM	Pavilion ARC
Wolfe-Polgar, Moses	Session D	Poster 86	6:00 PM	Pavilion ARC
Wong, Amy	Session C	Poster 109	5:00 PM	Pavilion ARC
Wong, Clarice	Session 2	Oral	3:45 PM	207 Wellman Hall
Wong, Harley	Session 2	Oral	3:30 PM	2 Wellman Hall
Wong, Joyce	Session D	Poster 35	6:00 PM	Pavilion ARC
Wong Chang, Maria Angelica	Session 2	Oral	3:00 PM	229 Wellman Hall
Woolley, Erin	Session C	Poster 36	5:00 PM	Pavilion ARC
Wright, Brian	Session 1	Oral	1:15 PM	126 Wellman Hall
Wu, Haotian	Session A	Poster 47	3:00 PM	Pavilion ARC
Wu, Robert	Session D	Poster 32	6:00 PM	Pavilion ARC
Wu, Susan	Session D	Poster 98	6:00 PM	Pavilion ARC
Xiao, Zhiyu	Session D	Poster 33	6:00 PM	Pavilion ARC
Xie, Helen	Session A	Poster 73	3:00 PM	Pavilion ARC
Xiong, Na	Session 2	Oral	3:30 PM	212 Wellman Hall
Xu, Jihao	Session C	Poster 58	5:00 PM	Pavilion ARC
Xu, Karen	Session C	Poster 59	5:00 PM	Pavilion ARC
Xu, Mengda	Session B	Poster 13	4:00 PM	Pavilion ARC
Yaacoobi, Omar	Session C	Poster 101	5:00 PM	Pavilion ARC
Yan, Jia	Session D	Poster 100	6:00 PM	Pavilion ARC
Yang, Henry	Session C	Poster 111	5:00 PM	Pavilion ARC
Yang, Qiming	Session A	Poster 74	3:00 PM	Pavilion ARC
Yang, Yiying	Session D	Poster 101	6:00 PM	Pavilion ARC
Yee, Jacqueline	Session 2	Oral	3:30 PM	126 Wellman Hall
Yee, Victoria	Session B	Poster 20	4:00 PM	Pavilion ARC
Yeh, Albert	Session D	Poster 29	6:00 PM	Pavilion ARC
Yi, Chenxiong	Session D	Poster 29	6:00 PM	Pavilion ARC
Yim, Daniel	Session A	Poster 35	3:00 PM	Pavilion ARC
Yokoyama, Sae	Session A	Poster 103	3:00 PM	Pavilion ARC
Yonenaga, Jenna	Session A	Poster 36	3:00 PM	Pavilion ARC
Young, Clayton	Session 2	Oral	3:30 PM	234 Wellman Hall
Young, Vanessa	Session C	Poster 60	5:00 PM	Pavilion ARC
Yu, Muheng	Session 2	Oral	3:00 PM	234 Wellman Hall
Zadran, Amanullah	Session A	Poster 120	3:00 PM	Pavilion ARC
Zamora, Julio	Session C	Poster 14	5:00 PM	Pavilion ARC
Zarate, Juan	Session B	Poster 91	4:00 PM	Pavilion ARC
Zaw, Thant	Session C	Poster 81	5:00 PM	Pavilion ARC
Zeidan, Wafa	Session A	Poster 77	3:00 PM	Pavilion ARC

Zhang, Joshua	Session B	Poster 102	4:00 PM	Pavilion ARC
Zhang, Zhichao	Session D	Poster 48	6:00 PM	Pavilion ARC
Zhou, Jamie	Session D	Poster 14	6:00 PM	Pavilion ARC
Zhou, Jody	Session B	Poster 115	4:00 PM	Pavilion ARC
Zhu, Danjie	Session D	Poster 49	6:00 PM	Pavilion ARC
Zimmer, Julie	Session 2	Oral	3:30 PM	6 Wellman Hall
Zittel, Helena	Session 2	Oral	4:00 PM	2 Wellman Hall
Zokaie, Tooka	Session B	Poster 54	4:00 PM	Pavilion ARC

2 Wellman Hall, Moderator: Samantha Price

1:00 PM **Hoeft, Evan - Evolution, Ecology and Biodiversity**
Fineness and Phylogeny in Freshwater and Marine Fishes

1:15 PM **Proffitt, Allison - Biological Sciences**
Surveying Size: Body Size Transitions Between Freshwater and Saltwater Fishes

1:30 PM **Nagaraj, Maya - Undeclared—Life Sciences**
Just Keep Swimming: Caudal Peduncle Diversity in Marine and Freshwater Fishes

1:30 PM **Estrada, John - Animal Science**
Just Keep Swimming: Caudal Peduncle Diversity in Marine and Freshwater Fishes

1:45 PM **Brockelsby, Kasey - Evolution, Ecology and Biodiversity**
Fish Heads and Habitats: Diversity Within Teleost Head Morphology and the Trends Seen in Relation to Habitat

1:45 PM **Maas, Lauren - Animal Science**
Fish Heads and Habitats: Diversity Within Teleost Head Morphology and the Trends Seen in Relation to Habitat

2:00 PM **Vary, Laura - Marine and Coastal Science—Marine Ecology and Organismal Biology**
A Study of Body Diversity in Teleost Fishes as It Relates to Marine and Freshwater Environments

2:00 PM **Danao, Mailee - Biological Sciences**
A Study of Body Diversity in Teleost Fishes as It Relates to Marine and Freshwater Environments

6 Wellman Hall, Moderator: Barbara Blanco-Ulate

1:00 PM **Hong, Jason - Biochemistry and Molecular Biology**
Bioluminescence Resonance Energy Transfer (BRET)-Based Synthetic Sensor Platform for Drug Discovery

1:15 PM **Flores, Amber - Plant Biology**
Plasticity of Vascular Structure and the Implications on Fruit Quality in Tomato

1:30 PM **Paz, Dean - Cell Biology**
Pathogen Recognition by Plant Immune Receptors

1:45 PM **Nagourney, Alexander - Biochemistry and Molecular Biology**
Common Themes in Animal and Plant Immunity

2:00 PM **Ramirez, Eduardo - Biochemistry and Molecular Biology**
Analysis of Stomatal & Pavement Cell Densities in Tomato Introgression Lines Reveals Parental Traits Governed by Specific Regions of the Genome

2:15 PM **Adaskaveg, Jaclyn - Genetics and Genomics**
Genotyping of Double Mutants in Transcription Factors That Regulate Tomato Fruit Ripening

26 Wellman Hall, Moderator: Joshua Herrington

1:00 PM **Tucker, Liann - Sociology**
Peer Influence of Adolescent Depression

1:15 PM **Lafreniere, Marrisa - Psychology**
Addressing Postpartum Depression With Preventative and Educational Measures: A Review of Literature

1:30 PM **Makepeace, Caroline - Human Development**
Successful Caregiver Strategies to Engage Preschool Children With Autism

2:00 PM **Keith, Acacia - Religious Studies**
Religious Concerns in Abortion Policy

2:15 PM **Kim, Angela - American Studies**
Blepharoplasty as Domestication of the Asian: Constructing Korean Identities by White Hands

106 Wellman Hall, Moderator: Mariana Barboza Gardner

1:00 PM **Penrod, Corinne - Pharmaceutical Chemistry**
The Stereoselective Synthesis of Indolines via C-H Bond Insertion

1:15 PM **Aristov, Michael - Chemistry**
Adventures in Ruthenium Chemistry

1:30 PM **Garcia, Tomas - Pharmaceutical Chemistry**
Novel Cinchona Alkaloid-Derived Thioureas for Asymmetric Reactions

1:45 PM **Kwong, Ada - Pharmaceutical Chemistry**
Synthesis of Gyramide-Bound Photoaffinity Reagents for DNA Gyrase

2:00 PM **Rios, Cassandra - Genetics and Genomics**
Uncovering the Role of PLK-1 During C. elegans Spermatogenesis

107 Wellman Hall, Moderator: Michael Collins

1:00 PM **Rios, Hugo - International Relations**
The Yugoslav Crisis: Applicable Lessons on Nationalism

1:15 PM **Mark-Bachoua, Gabrielle - Philosophy**
Misnomers and Malpractice: Preserving Ancestry and Eliminating Biological Race from Medicine

1:30 PM **Park, Wesley J. - Philosophy**
Time-Relative Interests and Infanticide

1:45 PM **Franco, Konrad - Economics**
Lower Tail Earnings Inequality and Crime

2:00 PM **Soba, Danielle - International Relations**
Neocolonialism in Nigeria: Old System of Opression - New Beast

2:15 PM **Kim, Sung - History**
The Significance of Russo-Japanese War and the Treaty of Portsmouth

119 Wellman Hall, Moderator: Karen Ryan

1:00 PM **Soltanzadeh Zarandi, Sina - Neurobiology, Physiology and Behavior**
Neuroprotective Potential of Psychedelics

1:15 PM **Kwong, Stephen - Neurobiology, Physiology and Behavior**
Characterization of Embryonic Stem Cell Derived Retinal Ganglion Cells

1:30 PM **Jin, Yihan - Biological Sciences**
Investigating the Interaction of Molecular Signaling and Neuronal Activity in Retinotopic Map Formation

1:45 PM **Vieira, Candice - Biochemistry and Molecular Biology**
Characterizing the Structure and Function of the Amygdala in an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

2:00 PM **Valentine, Kevin - Biochemistry and Molecular Biology**
Evidence for an Imbalance in Brain Excitatory/Inhibitory Activity in a Mouse Model of FXTAS

2:15 PM **Neverova, Ekaterina - Neurobiology, Physiology and Behavior**
Cellular Pathology and Behavioral Characterization of an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

126 Wellman Hall, Moderator: Jillian Azevedo

1:00 PM **Naseer, Misbah - Political Science**
Where Is the Honor: Why Was 2016 the Year Pakistan Finally Decided to Act on Honor Killings?

1:15 PM **Wright, Brian - History**
Sovereignty and Slavery: Southern Whigs, a "British Conspiracy" and the Annexation of Texas

1:30 PM **Vargas Diaz, Oswaldo - History**
German, Jewish, and Queer: Exclusionary State Policies and Alfons Zinkower's Global Odyssey, 1917-1985

2:00 PM **Dombrowski, Miriam - History**
The Campaign to Criminalize Marital Rape in California

2:15 PM **Nguyen, Hedda Hieu - International Relations**
The Vietnam War Newspapers: The Press, the People, and the President

202 Wellman Hall, Moderator: Mark Winey

1:00 PM **Murray, Kaitlin - Neurobiology, Physiology and Behavior**
Postnatal Development of Mediastinal Lymph Nodes Can Affect Long-Term Immune Function

1:15 PM **Torres, Teresa - Microbiology**
Microbiota-Induced Epithelial PPAR-ɣ-Signaling Thwarts Dysbiotic Pathogen Expansion

1:30 PM **De La Torre, Ubaldo - Animal Science**
Utilization of Feces to Examine the Gut Microbiota of Foals From Birth to Weaning

1:45 PM **Swedek, Michelle - Biomedical Engineering**
Characterizing the Microbiota-Gut-Brain Axis in a Murine Model of Pediatric Inflammatory Bowel Disease

2:00 PM **Duveneck, Alexander - Biological Sciences**
Modulating Co-Culture of Bacteria Through Anti-Oxidants and Liposomes

2:15 PM **Chiu, Kwan Lun (Victor) - Biomedical Engineering**
CRISPR-dCas9 Expands Dynamic Range of Gene Expression From T7 RNAP Promoters

2:15 PM **McCutcheon, Sean - Biomedical Engineering**
CRISPR-dCas9 Expands Dynamic Range of Gene Expression From T7 RNAP Promoters

205 Wellman Hall, Moderator: Janine LaSalle

1:00 PM **Suarez, Sassan - Neurobiology, Physiology and Behavior**
Context Fear Conditioned Mice Do Not Reliably Use the Presence of a Specific Odor to Predict the Presentation of a Mild Shock

1:15 PM **Chang, Alene - Biological Sciences**
Examination of Cognitive Abilities in a MeCP2-e1 Deficient Mouse Model for Rett Syndrome

1:30 PM **Noronha, Adriana - Genetics and Genomics**
Evaluating Social Preference in a Novel Female Mouse Model of Rett Syndrome

1:45 PM **Jianu, Julia - Biochemistry and Molecular Biology**
Confirmation of Methylation Differences in Umbilical Cord Blood From Autism Subjects in the MARBLES Study

2:00 PM **Dileep, Gayathri - Neurobiology, Physiology and Behavior**
Investigating Rbfox3 Sufficiency for SNORD116 RNA Cloud Formation

2:15 PM **Palmer, Rebecca - Animal Science**
Validating the Methylation Status of Grb10 in the Augmented Maternal Care Paradigm

207 Wellman Hall, Moderator: Shirley Xueqi Li

1:00 PM **Staudenraus, Caroline - Sociology**
Academic Preparation, Cosmopolitanism, and Self-Efficacy of Chinese International Students at UC Davis

1:15 PM **Do, Tiffany - Asian American Studies**
The Campus-Community Debate: Re-Viewing Asian American Studies as a Community in the 1980s

1:30 PM **Klyver, John - Microbiology**
Statistical and Narrative Medical Analysis of the Success of an Inner-City Clinic

1:45 PM **Morales, Anthony - Human Development**
The Effectiveness of Exposing Prospective Transfer Students to University Life: A Pre-Post Test for the Discover UC Davis and Discover Weekend Events

2:00 PM **Achanta, Niveditha - Managerial Economics**
Common Core State Standards' (CCSS) Effects on SAT Scores

2:15 PM **Pastor, Ilse - Cognitive Science**
Testing Technology Breaks: A Novel Solution to Decrease the Impacts of Cell Phone Distractions on Academic Performance

212 Wellman Hall, Moderator: Naomi Janowitz

1:00 PM **Banathy, Gabrielle - Religious Studies**
Modern Communities in Religion

1:15 PM **Rivera, George - Cognitive Science**
Self-Regulation in Buddhism and Christianity: An Investigation of Hypo-Egoic Phenomena

1:30 PM **Alvarado, Cynthia - Religious Studies**
"It's a Bird! It's a Plane! No, It's Comic Con!": Comic Con as a Site of Modern Day Religion

1:45 PM **Lin, Kristi - Landscape Architecture**
Designing an Anti-Memorial to Land Lost

2:00 PM **Parsa, Viva - Sociology**
Environmental Justice: People, Communities and Water Video Project

2:15 PM **Kise, Marguerite - American Studies**
Environmental Justice: People, Communities and Water Video Project

216 Wellman Hall, Moderator: Cheryl Ross

1:00 PM **Gordon, Jacqueline - English**
The Aesthetics of Nature and Art in Medieval Literature

1:15 PM **Bradley, RaNelle - Comparative Literature**
Shakespeare's Adaptation of Golding's Venus and Adonis: From Narrative to Drama

1:30 PM **Pesola, Loretta - English**
Mortality in British Romantic Poetry

1:45 PM **McCluskey, Madeline - English**
Intentional Absurdities: Understanding Gertrude Stein's Nonrepresentational Literary Portraits of Picasso

2:00 PM **Schenkhuizen, Breanna - Comparative Literature**
Percy Jackson and the Olympians: Adapting Greek Mythology for a Middle Grade Audience

226 Wellman Hall, Moderator: Kenneth Kaplan

1:00 PM **Gabbert, Allison - Cell Biology**
TOR Complex 2-Ypk1 Signaling Regulates Caloric Restriction-Induced Autophagy Through the Calcium Channel Regulator Mid1

1:15 PM **Perucho Jaimes, Luis - Pharmaceutical Chemistry**
The Role of Septins in Autophagy During Nutrient Starvation

1:30 PM **Tuan, Lo - Neurobiology, Physiology and Behavior**
The Role of Autophagy in Sister Chromatid Resolution During Anaphase

1:45 PM **Begian, Marvin - Biological Sciences**
Condensin Complexes Organize Tangled Sister Chromatids to Regulate Anaphase Progression

2:00 PM **Joseph, Najah - Cell Biology**
Topological Signals That Trigger Regulation of the Spindle Associated Protein Bim1

2:15 PM **Hargis, Lauren - Genetics and Genomics**
Biochemical Regulation of Bim1 Complexes in Response to Replication Stress

229 Wellman Hall, Moderator: Sarah Perrault

1:00 PM **Atamna, Doaa - English**
The Functions of Grief and Elegy in the Poetry of Two Classical Arab Poetesses: Layla Al-Akhyaliyya and Al-Khansa

1:15 PM **Rudewicz, Lauren - English**
Truth or Dolos: The Disconnect Between Language, Suffering, and Experience in Frankenstein and the Philoctetes

1:30 PM **Davis, Joshua - English**
A Farewell to Alms: Hemingway's Development of American Existentialism

1:45 PM **Cony, Jacqueline - Comparative Literature**
Language Contact in the Latin American Novel

2:00 PM **Araica, Alida - English**
Hamilton and In the Heights: Constructing a Minority-American Identity

2:15 PM **Clogston, Michael - English**
Mimicry and Performance in Asian-American Characters

230 Wellman Hall, Moderator: John Richards

1:00 PM **Pabon, Madelena - Neurobiology, Physiology and Behavior**
Factors Related to Retention in a Longitudinal Study of Infants at Risk for Autism Spectrum Disorder (ASD)

1:15 PM **Grant, Connor - Neurobiology, Physiology and Behavior**
Methamphetamine Abuse and Emergency Department Utilization: 20 Years Later

1:30 PM **Wang, Colin - Neurobiology, Physiology and Behavior**
Cocaine- Versus Methamphetamine-Abusing Patients in the Emergency Department: How Do They Differ?

1:45 PM **Gizaw, Andreas - Biological Sciences**
Correlates of Ethiopian Orthodox Church Attendance and Mental Health in Ethiopian Immigrants in the Greater Sacramento Metropolitan Area

2:00 PM **Mak, Tiffany - Psychology**
Empathy, Anxiety, Sensitivity to Context, and Quality of Friendships

2:15 PM **Huang, Sabrina - Psychology**
Effects of Ideal Trait Preferences and Interaction Context on Friendship Formation

233 Wellman Hall, Moderator: Sudhindra Tripathi

1:00 PM **Deng, William - Biochemical Engineering**
Development of Software Capability to Enable 3D Display of Scanning Probe Microscopy Images

1:15 PM **Mata, Rogelio - Physics**
Evaluation of Dielectric Materials for Their Radiation Hardness

1:30 PM **Anderson, Tyler - Applied Physics**
Electric Field Dependence of Scintillation Light Yield in Liquid Xenon

1:45 PM **Chen, Zekun - Chemical Engineering**
Mechanical Study of Thermal Activation of Charged States in a Doped Organic Semiconductors

2:00 PM **Dalager, Olivia - Physics**
Creation of a UV-Sensitive Silicon Photomultiplier Array for Use in the Davis Xenon Experiment

234 Wellman Hall, Moderator: Mark Huising

1:00 PM **Mume, Biftu - Microbiology**
CDK9 Inhibitor Shown to Down Regulate HIV Latency Reactivation

1:15 PM **Andre, Camille - Biochemistry and Molecular Biology**
Proinsulin Expression in Immature and Dysfunctional Beta Cells

1:30 PM **Ming-Whitfield, Brittni - Animal Science**
Genome Wide Association Study of Juvenile Idiopathic Epilepsy (JIE) in Egyptian Arabian Foals

1:45 PM **Lu, WeiYu - Genetics and Genomics**
Multi-Modal Sensation From Culex quinquefasciatus

2:00 PM **Nguyen, Don - Global Disease Biology**
Newly Isolated Rubella Virus May Be Resistant to Current Vaccine-Derived Antibodies

2:15 PM **Chen, Christopher - Biochemistry and Molecular Biology**
Kaposi's Sarcoma-Associated Herpesvirus Hijacks RNA Polymerase II to Create a Viral Transcriptional Factory

2 Wellman Hall, Moderator: Susan Avila

3:00 PM **Cheng, Douagee - Design**
The Relationship Between Hmong Fashion and Hmong Women in the Central Valley

3:15 PM **Williams, Wyatt - Music**
Analyzing Popular Music: Identifying Elements of Popular Songs That Correlate to Success Within Specific Audiences

3:30 PM **Wong, Harley - Art History**
Restoring the Original: Gothic Architecture Reimagined

3:45 PM **Schultz, Katharine - Art History**
Uncovering Arcadia: A Re-Examination of William Blake's Illustrations to the Pastorals of Virgil

4:00 PM **Zittel, Helena - Art History**
Dickenson and Degas: Performing Ballet and Artistic Authority

4:15 PM **Lingel-Gary, Emma - Art History**
Patronage Trends of the Mogao Grottoes During the Northern Liang, Western Wei, and Tang Dynasties

6 Wellman Hall, Moderator: Volkmar Heinrich

3:00 PM **Fernandez-Rubio, Aleida - Neurobiology, Physiology and Behavior**
Decrease in Tumor Cell Viability After Treatment With KPT-330 Is Time-Dependent in Bladder Cancer Cell Lines T24 and UM-UC-3

3:15 PM **Francis, Emmet - Biomedical Engineering**
A Unique Look at Pure Chemotaxis in Human Neutrophils

3:30 PM **Zimmer, Julie - Biomedical Engineering**
Characterizing the Unique Phagocytic Behavior of Eosinophils One Cell at a Time

3:45 PM **Pan, Xuankang - Biochemistry and Molecular Biology**
Dual Labeling of RecBCD Enzyme by Site Specific Incorporation of Unusual Aminoacids for Single Molecule Förster Resonance Energy Transfer Analysis

4:00 PM **Hinojosa, Kevin - Biochemistry and Molecular Biology**
A Hydrogen Bond Network Promotes Inhibited Filaments in CTPS

4:15 PM **Palsgaard, Peggy - Biomedical Engineering**
Modelling Interactions of Urokinase Plasminogen Activator With Amiloride and Its Derivatives

26 Wellman Hall, Moderator: David Hawkins

3:00 PM **Kulinich, Andrea - Neurobiology, Physiology and Behavior**
Human Tissue Derived Animal Model for Childhood Vascular Anomalies

3:15 PM **Bell, Lisa - Neurobiology, Physiology and Behavior**
Examining the Basis for Differential Recovery Rates of Muscle Mass and Strength Between Aged Fischer Brown Norway and Fischer 344 Rats

3:30 PM **Chen, Hui Lin - Genetics and Genomics**
Secreted Factors During Myogenesis Inhibit Sost Expression

3:45 PM **Libert, Serena - Global Disease Biology**
BMP Signaling Mechanisms and Potential Clinical Impacts

4:00 PM **Leddy, Jason - Viticulture and Enology**
CDK9 Inhibition Prevents Injury-Induced Subchondral Bone Resorption by Targeting Osteoclast Precursors

106 Wellman Hall, Moderator: Gene Gurkoff

3:00 PM **Jaffe, David - Biological Sciences**
Detection of the Vector-Transmitted Bacteria, Bartonella henselae, in Small Indian Mongooses (Herpestes Auropunctatus) From Grenada Island

3:15 PM **Rossman, Zoë - Evolution, Ecology and Biodiversity**
When Yawning Occurs in Elephants

3:30 PM **Ohlin, Catherine - Evolution, Ecology and Biodiversity**
Post-Fire Regeneration of Coastal Redwoods, the World's Tallest Trees

3:45 PM **Venegas, Paloma - Animal Biology**
Effects of Human-Induced Isolation on Conspecific Behaviors in Captive Chimpanzees (Pan troglodytes)

4:00 PM **Clay, Cameron - Evolution, Ecology and Biodiversity**
The Differential Effects of Native and Invasive Earthworms on Native and Invasive Grasses

107 Wellman Hall, Moderator: Jeffrey Sacha

3:00 PM **Chavez, Alexis - Anthropology**
The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

3:15 PM **Ahmad, Imran - Managerial Economics**
The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

3:30 PM **Ward, Tayler - International Relations**
The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

3:45 PM **Kennedy-McDonnell, Erik - International Relations**
The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

119 Wellman Hall, Moderator: Savithramma Dinesh-Kumar

3:00 PM **Kumar, Nithya - Food Science**
Detecting Proteolytic Activity in Human Milk to Better Understand Infant Digestion

3:15 PM **Lim, Alicia - Chemistry**
Quantification of Oleuropein in Olive Leaf Supplements and Purification of Its Derivatives

3:30 PM **Hvasta, Matthew - Biochemistry and Molecular Biology**
Site-Specific Gene Expression During Lung Development Informs Respiratory Toxicology

3:45 PM **Ivanova, Xenia - Biomedical Engineering**
Impact of Cytochrome P450 Polymorphisms on Fentanyl Pharmacokinetics in Burn Patients

4:00 PM **Mollhoff, Iris - Biochemistry and Molecular Biology**
Structural-Functional Analysis of a Diterpene Synthase From Golden Larch Toward Manufacture of Biopharmaceuticals

4:15 PM **Baldwin, Laura - Biochemistry and Molecular Biology**
How Does a Plant Virus Affect Endosymbiont Bacteria in Its Aphid Vector?

126 Wellman Hall, Moderator: Soichiro Yamada

3:00 PM **Abraham, Tanishq - Biomedical Engineering**
Whole-Body Mathematical Models of Synthetic Biosensing Liposomes

3:15 PM **Mao, Michelle - Biomedical Engineering**
The Impact of Lipid Composition on Artificial Cell Functions

3:30 PM **Yee, Jacqueline - Biomedical Engineering**
Identification of Force-Sensitive Protein Interactions Surrounding Akt1 Using Proximity Dependent Biotin Identification

3:45 PM **Cheah, Joleen - Biological Sciences**
PiggyBac Transposon System Efficiently Integrates CRISPR/Cas9 for Gene Knockout

4:00 PM **Erickson, Katherine - Biomedical Engineering**
Identifying Fusion Proteins in Epithelial Cells

4:15 PM **Ewald, Makena - Biomedical Engineering**
Stretch-Dependent Akt Regulation and Nuclear Localization in Epithelial Cells

202 Wellman Hall, Moderator: Daniel Potter

3:00 PM **Perez, Paola - Environmental Science and Management**
Characterizing Transgenic Silencing in Lettuce Using DsRed

3:15 PM **Nirmal, Niba - Genetics and Genomics**
Waterproofing Root Systems: Responses to Drought and Flooding in Tomato

3:30 PM **Rodriguez, Alan - Plant Sciences**
DNA Library for Transgenic Marker Lines of Solanum lycopersicum and Solanum pennellii

3:45 PM **Khalid, Aliza - Neurobiology, Physiology and Behavior**
Mechanism of Autophagy in Plants

4:00 PM **Mallya, Gita - Plant Biology**
Mechanism of Signal Transduction During Plant Immunity

4:15 PM **Huang, Pin-Jui - Biological Sciences**
Importance of Jasmonaic Acid Pathway Proteins in Plant Immunity

205 Wellman Hall, Moderator: Jaimey Fisher

3:00 PM **Allshouse, Aurora - Anthropology**
The Archaeology of Extreme Continental Climates: Excavation and Study at Tolbor 16, Mongolia

3:15 PM **McNeil, Patricia - Anthropology**
Site Formation Processes and Human Use Analysis at Varsche Rivier 003, Western Cape, South Africa

3:30 PM **Bartel, Juliana - Anthropology**
Wildfire Burning Patterns on Modern Tortoise Skeletons

3:45 PM **Lau, Allison - Evolution, Ecology and Biodiversity**
Does Pair-Bond Quality or Androgen Level Explain Variation in the Structure of Vocalizations of Duetting Coppery Titi Monkeys Callicebus cupreus?

4:00 PM **Ellerby, Sophie - Anthropology**
Undoing Abjection: An Ethnography of Ecology House

4:15 PM **Tyra, Alec - Chemistry**
Paleotemperatures From Noble Gases in the Speleothem Record

207 Wellman Hall, Moderator: Kristin Kiesel

3:00 PM **Lu, Yu - Managerial Economics**
Evaluating Parking Demand and Elasticity Functions for Permits A and C at the University of California, Davis

3:15 PM **Beppler, Julie - Managerial Economics**
The Impact of Restaurant's Menu Design on Consumer Choices

3:30 PM **Chen, Lan - Biochemistry and Molecular Biology**
Influence of Demand and Supply on Labor Force Participation Rate

3:30 PM **Nguyen, Van - Economics**
Influence of Demand and Supply on Labor Force Participation Rate

3:45 PM **Wong, Clarice - Computer Science**
An App for Documentation of Roadkill

3:45 PM **Carlile, Jordan - Computer Science**
An App for Documentation of Roadkill

4:00 PM **Chin, Shiang-Wan - Managerial Economics**
Artificial Intelligence and Machine Learning in Financial Services

4:15 PM **Wang, Yu - Applied Mathematics**
Garnir Polynomials and Their Properties

212 Wellman Hall, Moderator: Bethany Henrick

3:00 PM **Berg, Kimberley - Genetics and Genomics**
Characterization of Novel Factors in RNA:DNA Hybrid Metabolism

3:30 PM **Xiong, Na - Genetics and Genomics**
Spo11 Is Necessary to Prevent the Generation of Aneuploid Offspring in Zebrafish

3:45 PM **Gromova, Tatiana - Biological Sciences**
The Role of Nucleoporin Nup2 During Prophase I of Meiosis

4:00 PM **Dahms, Petra - Genetics and Genomics**
Understanding the Role of XRCC2 in DNA Repair by Designing and Cloning Bacterial Plasmids for Complementation Tests

4:15 PM **Crofton, Amanda - Neurobiology, Physiology and Behavior**
Effect of Nutrition on Maternal mRNA Contribution to the Embryo in Drosophila melanogaster

216 Wellman Hall, Moderator: Sara Petrosillo

3:00 PM **Vandenberg, Alyssa - English**
The Role of Mothers in Shakespeare's Plays

3:15 PM **Dousa, Kevin - English**
Failing Masculinity/Machismo: On Junot Diaz's Short Story Collections

3:30 PM **Asnaashari, Sarah - English**
Diana Wynne Jones: Subverting Archetypes to Recast the Heroic Ideal in Children's Fantasy

3:45 PM **Miller, Kristina - English**
Gender, Cosmology and Mythology in John Milton's Paradise Lost

4:00 PM **Stack, Emily - English**
Painting Lions: Female Narratives Through Male Authorship in Chaucer's Wife of Bath

226 Wellman Hall, Moderator: Elvira De Lange

3:00 PM **Geary, Quirina - Linguistics**
The US Government Fails to Protect the Individual Rights of American Indians

3:15 PM **Sproul, Griffin - Political Science**
Capitol Chaos: Public Space, Protests, and Voter Turnout in California

3:30 PM **Fernandez, Adriana - Environmental Science and Management**
Indigenous Resistance Against Colonial Corporations

3:45 PM **Macleod, Clara - Environmental Policy Analysis and Planning**
Voluntary Action in Groundwater Management in California

4:00 PM **Herrera, Veronica - Community and Regional Development**
Identifying Transit Dependent Populations: A Method for Measure A Neighborhood Shuttle Systems

4:15 PM **Rahai, Rouzbeh - Environmental Science and Management**
Affective Air Pollution

229 Wellman Hall, Moderator: Benjamin Plourde

3:00 PM **Wong Chang, Maria Angelica - Pharmaceutical Chemistry**
Early-Stage Technologies and the Public University: Lessons About Intellectual Property and Social Responsibility From the UC Blackwelder Tomato Harvester

3:15 PM **Buck, Taylor - Political Science – Public Service**
Addressing Modern Electoral Manipulation: Gerrymandering's Challenge to Civil Rights

3:30 PM **Aderonmu, Oluwafunmike - International Relations**
A Conflict of Interests: Revisiting Development Assistance Committee Members' Tied Aid Policy Post 2001

3:45 PM **Medina, Jose - Political Science**
Asylum Acceptance: Do Political Ideologies of Ruling Parties in Destination Countries Affect Asylum Acceptance?

4:15 PM **Alfaro, Christian - Chicana/Chicano Studies**
Rediscovering the Original Political Thought

230 Wellman Hall, Moderator: Mohamed Hafez

3:00 PM **Needels, Jacob - Mechanical Engineering**
Numerical Simulation of Supersonic and Transonic Two-Dimensional Flows

3:15 PM **Chuen, Andrew - Aerospace Science and Engineering**
Numerical Simulation of Supersonic and Transonic Two-Dimensional Flows

3:30 PM **Aluru, Teja - Computer Engineering**
Implementation of Guided Policy Search Algorithms for Aerial Robotics

3:45 PM **Brown, Joseph - Materials Science and Engineering**
Controlling Magnetic Spin States in Patterned Perovskite Heterostructures

4:00 PM **Burkhead, Aaron - Mechanical Engineering**
Numerical Solutions of Bending and Buckling of Structural Mechanics

4:15 PM **Gantulga, Tului - Civil Engineering**
Numerical Solutions of Bending and Buckling of Structural Mechanics

233 Wellman Hall, Moderator: Aldrin Gomes

3:00 PM **Doong, Joy - Biomedical Engineering**
Engineering Improved Host Strains for Synthetic Genetic Oscillator

3:15 PM **Crichton, Samuel - Environmental Toxicology**
Methodologies for Decontamination of Food Waste

3:30 PM **Booker, Jacqueline - Neurobiology, Physiology and Behavior**
The Role of Nek Kinases in Flagellar Length Regulation in Giardia lamblia

3:45 PM **Long, Matthew - Biomedical Engineering**
Analysis of Myxococcus xanthus 5889: A Developmentally Essential Response Regulator

4:00 PM **Calaimany, Meena - Neurobiology, Physiology and Behavior**
The Effects of Indomethacin and Omeprazole on Proteasome Function

4:15 PM **Eijansantos, Emily - Neurobiology, Physiology and Behavior**
Is Ibuprofen-Induced Reactive Oxygen Species Generation in Cardiac Cells Dependent on NADPH Oxidase 4?

234 Wellman Hall, Moderator: Victoria White

3:00 PM Yu, Muheng - Communication
Am I the Right One for Muscular Men? A Glance at the Effects of Media Images of Ideally Muscular Men on Young Adult Women

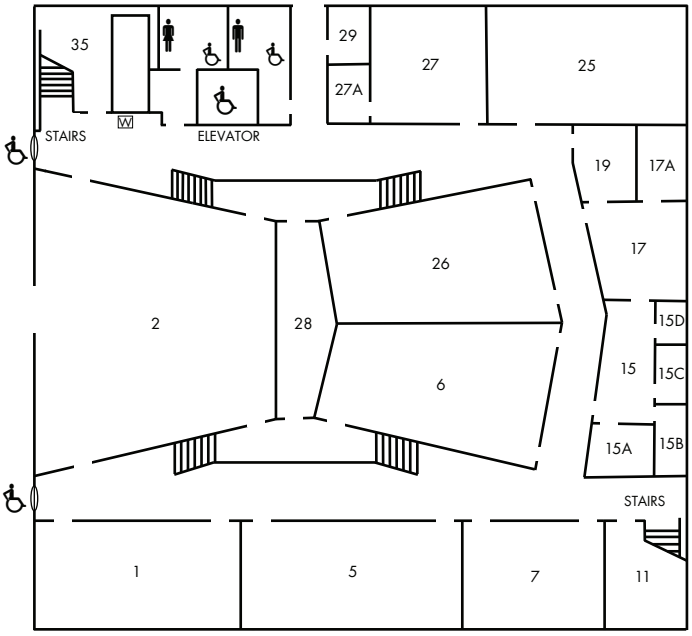
3:15 PM Sims, Riley - Psychology
An Eye Tracking Investigation of Attention Shifting Between Affective Central and Peripheral Faces

3:30 PM Young, Clayton - Psychology
Contralateral Delayed Activity During Visual Working Memory in the Presence of Intervening Consonant Clusters and Pseudowords

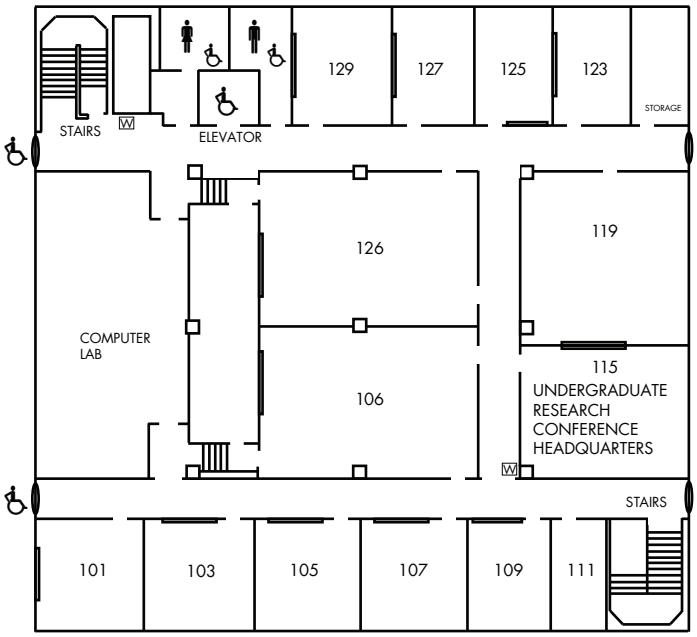
3:45 PM Rudolph, Emma - Communication
Necessary Criteria for Bullying: What They Are and How They Matter

4:00 PM Oelsner, Laura - Biomedical Engineering
Wearable Technologies: Quantifying Running Mechanics

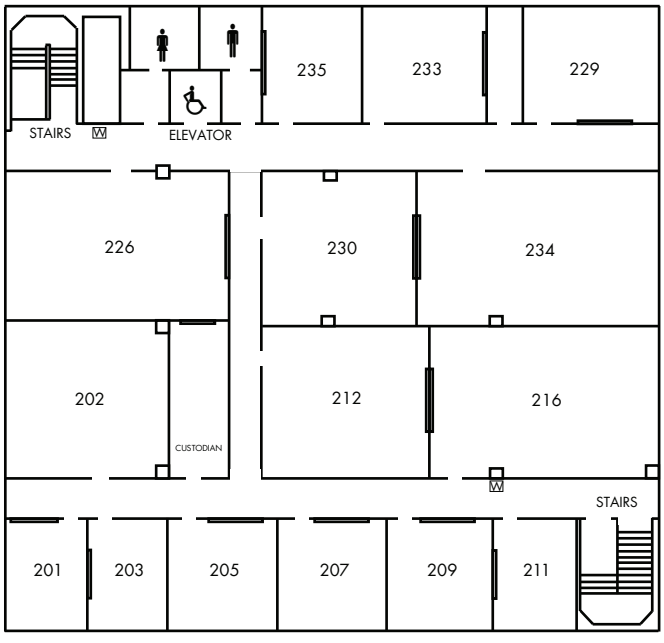
Lower Level



1st Floor



2nd Floor



= Building Entry - Exit = Wheelchair Access W = Water

= Front of Classroom

N
W E
S

ABSTRACTS

Characterization of PIWI-piRNA Pathway Genes in *Hydra* Using In-Situ Hybridization

Yashodara Abeykoon
Sponsor: Celina Juliano, Ph.D.
Molecular & Cell Biology

Hydra is a small aquatic animal with high regenerative ability, which appears to lack senescence; this is accomplished by stem cell populations comprising a large portion of its body. Three stem cell types support three different lineages: endodermal, ectodermal and interstitial. Endodermal and ectodermal stem cells are somatic; interstitial stem cell fates include both germline and somatic cells. The PIWI-piRNA pathway, a small RNA regulatory pathway, plays a role in all three Hydra stem cell types. At the heart of the pathway are PIWI proteins bound to small RNAs, called piRNAs. This pathway represses transposon RNAs in germline cells of many animals, but its function and target RNAs in somatic lineages are not understood. In Hydra, piwi is essential in somatic stem cells and may repress mRNAs that encode genes that promote differentiation. To gain insight into the somatic versus germline functions of the PIWI-piRNA pathway, we visualized the expression patterns of pathway genes through in situ hybridization. This clarifies which genes are exclusively expressed in germline or somatic cells versus which genes are expressed in all lineages. These data will allow us to elucidate both conserved and specialized functions of the pathway in somatic stem cells.

Whole-Body Mathematical Models of Synthetic Biosensing Liposomes

Tanishq Abraham
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Liposomes are commonly used as drug delivery and diagnostic systems for disease treatment. To date, mathematical models have been developed to predict the bioavailability of molecules released from liposomes. However, these models typically focus on the encapsulated molecules, instead of the liposomes, resulting in a lack of predictive models that simulate the distribution of liposomes inside human body. Here, we formulate a universal whole-body physiologically-based pharmacokinetic model (WPBPK) for various liposome sizes and transport processes. Such models will be critical in evaluating the biosensing efficacy of liposomes, as well as their toxicity in vivo. The model is validated using in vivo results from the literature. This work is important for mathematical modeling of liposomes, especially for the application of liposomes as biomimetic sensors. In this project, an application of liposomes for prevention of metastasis is also introduced. The importance of these models for this application of liposomes is shown. The future directions of the development of mathematical models for liposomes are discussed, as well as the importance of the physicochemical properties of liposomes on the pharmacokinetics of the liposomes.

Common Core State Standards' (CCSS) Effects on SAT Scores

Niveditha Achanta
Sponsor: Dalia Ghanem, Ph.D.
Ag & Resource Economics

Quantifying the impact of Common Core State Standards (CCSS) on learning outcomes has implications for education policy reform for public schools across the United States and California. This paper examines the effectiveness of Common Core State Standards, which are internationally benchmarked K-12 public education standards for English Language Arts (ELA) and Mathematics, first implemented in 46 states in 2010. I use Scholastic Aptitude Test (SAT) Verbal and Math scores as my response variables, employing a difference-in-differences approach to estimate the causal effect of Common Core on these scores. I use state level longitudinal data from 1995 to 2014 and California public high school longitudinal data from 1999 to 2015 in order to measure changes in SAT Math and Verbal scores before and after Common Core implementation. The preliminary results from my analysis suggest that Common Core had no statistically significant effect on these test scores during the period I examine.

Comparative Biophysics of Cytoplasmic-Class Dynein Motors

Bryce Ackermann
Sponsor: Richard McKenney, Ph.D.
Molecular & Cellular Bio

Cytoplasmic dynein is the largest and most complex of the microtubule motor proteins. Dyneins carry a large variety of intracellular cargoes toward the minus ends of the microtubule cytoskeleton. The cytoplasmic dynein family consists of dynein-1, responsible for all minus-end transport within the cytoplasm, and dynein-2 whose localization and function is highly restricted to retrograde intraflagellar transport. There has been rapid progress on elucidating the mechanisms and regulation of dynein-1. We aim to further the limited understanding of dynein-2. Using a reductionist approach, we are studying recombinantly isolated ~380kDa motor domains of human dynein-1 and dynein-2. We are interested in the functional differences between the isoforms, resulting from amino acid variations in functionally important sub-domains. We will use a combination of biochemical and biophysical approaches to investigate molecular differences between the cytoplasmic dyneins. We direct our focus to their microtubule binding domains (MTBD) through the analysis of MTBD swapped chimeric constructs. Because cytoplasmic and flagellar microtubules differ greatly in tubulin isotype and posttranslational modifications, we hypothesize that each dynein is evolutionarily adapted for transport along their respective filaments. Our chimeric constructs aim to dissect this possibility along with the role of the MTBD in dynein motility.

Genotyping of Double Mutants in Transcription Factors That Regulate Tomato Fruit Ripening

Jaclyn Adaskaveg
Sponsor: Barbara Blanco-Ulate, Ph.D.
Plant Sciences

Fruit ripening is a highly controlled developmental process. In tomato, several transcription factors have been identified as ripening master regulators, including RIPENING-INHIBITOR (RIN) and NON-RIPENING (NOR). Tomato lines with mutations in RIN and NOR are valuable for studying ripening events. The rin mutation is a 3kb deletion of an intron between RIN and a neighboring gene, while nor is a 2 bp deletion that leads to a premature stop codon. Although these mutations have similar phenotypes (fruit lack the normal ripening pattern), they can be differentiated by coloration and size. Characterization becomes more complicated for double mutants obtained through crosses between rin and nor because epistasis occurs. Therefore, to identify homozygous rin/nor mutants, various genotyping strategies were tested. First, endpoint PCR was used to identify wild-type and mutant alleles. Due to inconsistent results, SYBR green-based quantitative PCR was used to evaluate gene amplification. This improved consistency for NOR alleles but did not resolve discrepancies in RIN alleles. TaqMan-based quantitative PCR will be used to increase primer specificity and discrimination between alleles. Overall, validating the genotypes of the rin/nor double mutant population will serve as an excellent tool to investigate the interactions between these transcription factors during ripening.

Analysis of Soybean LEAFY COTELEDON1 Function

Hala Addassi
Sponsor: John Harada, Ph.D.
Plant Biology

Embryonic seed development is divided into two stages: morphogenesis and maturation. LEAFY COTELEDON1 (LEC1) is a central regulator of seed development that plays a key role during the maturation stage of embryonic development. LEC1 is detected in soybean and Arabidopsis species, however, conservation in their function is unknown. Mutation in the LEC1 will result in desiccation intolerance and produce seeds with morphological deformation. Previous research has shown similarities in development in soybean and Arabidopsis, allowing for the speculation of complementary function of soybean LEC1 and Arabidopsis LEC1. The objective of this study is to analyze the function of soybean LEC1 through testing its complementation to the function of Arabidopsis LEC1. A soybean LEC1 construct was generated through use of recombinant DNA technology, involving ligation of soybean LEC1 with Arabidopsis LEC1 regulatory regions. The construct was transformed into Arabidopsis devoid of LEC1 (lec1 mutant) via agrobacterium transformation experiments. Presence of the construct in Arabidopsis was confirmed through DNA extraction and gel electrophoresis. Preliminary results demonstrated 1:3 ratios of lec1 mutant embryos to wild type embryos ($P < 0.05$) suggesting the confirmation of functional similarity of the Arabidopsis and soybean LEC1.

A Conflict of Interests: Revisiting Development Assistance Committee Members' Tied Aid Policy Post 2001

Oluwafunmike Aderonmu
Sponsor: Jeannette Money, Ph.D.
Political Science

Evidence against the use of tied foreign aid has driven a push in the international development community to untie more aid, as the 2001 Recommendation to Untie Aid illustrates, which called on OECD donor countries to untie their bilateral aid to the greatest extent without reducing aid flows. Despite commitments made by donor countries, not all members have fully untied their bilateral aid due to pressures from domestic interest groups which favor tied aid. Given this, I argue that use of informal aid tying mechanisms evident in the pervalence of de facto tied aid serves to mitigate pressures donors face from domestic interest groups and the international community such that donor states with a stronger record of development-friendly initiatives will see a rise in proportion of de facto tied aid. I conduct a statistical correlation analysis examining the effect of donors' scores on the Commitment to Development Index (CDI) and the proportion of aid contracts granted to firms from the donor country as tied aid in the years 2007, 2009, 2010 and 2013. The findings do not suggest that a stronger record of development-friendly initiatives leads to an increase in the proportion of de facto tied aid among donor countries.

S1K-TAT Truncations

Anna Adhikari
Sponsor: David Segal, Ph.D.
MED: Biochem & Molecular Med

Angelman syndrome is a neurodevelopmental disorder caused by the loss of a maternal copy of an imprinted gene, Ube3a. Bailus et al. (Segal lab, UC Davis) showed that DNA binding protein S1K-TAT, injected s.c., crossed the blood-brain barrier and unsilenced the epigenetically silenced Ube3a gene. S1K-TAT contained N-terminal maltose binding protein (MBP), a cell penetrating peptide (TAT), a red fluorescent protein (mCherry), an HA epitope tag, and a nuclear localization signal, SV40-NLS. Following the successful activation of Ube3a, Segal lab needed to determine whether a smaller construct would elicit similar results. For this project, multiple truncations of S1K-TAT were cloned with His-tag for purification. All truncated protein constructs contained the HA epitope tag and SV40-NLS; however, they varied in terms of the presence of other components: MBP, TAT, and mCherry. The analysis of successful delivery in treated mouse brains will be done by Western blot and immunofluorescence. The activation of Ube3a gene will be determined by immunohistochemistry of hippocampus and cerebellum.

RXR Agonists Enhance Thyroid Hormone-Induced Metamorphosis in *Xenopus laevis* Tadpoles

Kasra Afzali
Sponsor: J. David Furlow, Ph.D.
Neuro Physio & Behavior

The Thyroid Hormone Receptor (TR) regulates gene expression of many biological processes of development, such as cell proliferation, cell differentiation, and cell death. TRs bind to sequence-specific Response Elements (TRE) as homodimers or heterodimers with Retinoid X Receptors. Recent studies have shown TH-induced gene expression in a mammalian pituitary TH-responsive reporter cell line, GH3.TRE-Luc, is enhanced in the presence of RXR agonists. TH is necessary to induce metamorphosis in amphibians. To further investigate the role of RXR in thyroid hormone responses in vivo, we studied the effect of two RXR agonists in thyroid hormone dependent development in Xenopus laevis tadpoles: Bexarotene, an RXR agonist used as an antineoplastic drug, and LG268, a synthetic RXR agonist. Our findings suggest RXR agonists have no significant impact on morphological changes associated with metamorphosis in the absence of TH. However, in the presence of triiodothyronine(T3), RXR agonists enhance the morphological changes in a dose dependent manner. In another experiment on transgenic tadpoles in which a luciferase reporter gene was associated with a TRE, RXR agonists increased the luciferase activity only in the presence of T3. These findings further support the role of retinoid derivatives in thyroid hormone regulation.

Dissecting the Upstream Regulatory Pathway of Tau in Neurodegeneration

Casandra Aguilar Mendoza
Sponsor: Kassandra Ori-McKenney, Ph.D.
Molecular & Cellular Bio

Tau, a microtubule(MT)-associated protein important for the development and maintenance of nerve cells in the brain has been related to Alzheimer's disease, frontotemporal dementia, Parkinson's disease and other neurodegenerative diseases. In healthy neurons, tau helps stabilize MTs in certain regions of the neuron. In diseased or injured neurons, tau dissociates from the MT and forms large aggregates, neurofibrillary tangles (NFTs), which can disrupt the transport of cellular organelles and signaling proteins, thus destroying the cell. Using the model organism Drosophila melanogaster, we can misexpress variations of the tau protein gene and observe how it affects neurodegeneration. Then, investigate the proteins that regulate tau and determine which proteins contribute the most to the neurodegenerative phenotypes. We will examine the kinases, Par-1, MNB, and GSK-3ß. These kinases are enzymes that phosphorylate tau, disrupting its normal function and causing it to fall off the MT and form NFTs. We will use the binary GAL4/UAS system with the eye-specific GMR-GAL4 driver and a sensitive fluorescence based method to map the upstream regulatory pathway for tau dissociation. This system will allow us to determine which kinase contributes the most to tau dissociation and help us understand the regulatory pathway of tau.

Rapid 3D Surface-Profiling Fluorescence Lifetime Imaging of Resected Ex Vivo Tumor Tissue Samples

Michael Agung
Sponsor: Laura Marcu, Ph.D.
Biomedical Engineering

Fluorescence lifetime imaging (FLIm) is a technique that utilizes the autofluorescence properties of tissue to provide biochemical and structural information without using a contrast agent. It relies on the fluorescence intensity decays generated from a pulsed laser to characterize the properties of the sample. It has shown potential to delineate cancer in areas such as oral, brain, breast, prostate and thyroid. Currently, the setup analyzes tumor resection samples from surgeries, with the tip of the fiber-optic scanned 1-10mm above the sample (depending upon its size and shape). This large distance and range is problematic, as a significant amount of signal is not collected by the fiber-optic. Hence, to have a reduced and consistent distance, a new platform is engineered. The platform has a rotating stage for the sample to be placed on and a translational arm for the aiming beam and fiber-optic to be mounted on. This setup first generates a 3D map of the sample, which guides a second scan to obtain the FLIm data within the targeted distance. With this setup, we aim to reduce the fiber-optic-to-surface distance to be less than 1.00±0.25mm, while also performing the scan in a time period appropriate for the clinical setting.

The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

Imran Ahmad
Sponsor: Suad Joseph, Ph.D.
Anthropology

The term "Egypt" was used by the West in reference to both ancient and modern day Egypt. I examined 15,881 articles published from 1930 to 1939, and critically analyzed 213 relevant articles where the term "Egypt" was used by New York Times correspondents. I discovered that the while present day Egypt was represented as ahistorical and inferior to the West, ancient Egypt was depicted as a prosperous and model "civilization." I argue that this depiction of an affluent ancient Egypt was used as a contrast to further the representation of present day Egypt as subordinate, which justified British colonial acts that claimed to "save" the people of modern day Egypt from chaos and disorder. This misrepresentation engraved into American society that the people of the East were backwards and inferior. I suggest that such news media misrepresentation which is persistent in the 21st century, served as an opportunity for the West to portray itself and Christianity as heroic, modern, and advanced in order to depict the East and Islam as backwards. This research is part of an analytical project of the New York Times over 150 years conducted in Dr. Suad Joseph's lab.

Human DNA Decontamination Software for WMS Comparison and Optimization Using in Silico and In Vivo Datasets

Samir Akre
Sponsor: David Mills, Ph.D.
Food Science & Technology

Whole metagenomic sequencing (WGS) is commonly used to study human associated microbiomes. On problem with WGS sequencing files is that they may contain human derived reads. This poses an ethical issue because personally identifiable information may be present in these datasets. Therefore, the Human Microbiome Project recommends two potential tools: Deconseq and BMTagger to remove human reads. We sought to compare Deconseq and BMTagger for their abilities to remove human DNA reads. Comparisons of the accuracy of BMTagger and Deconseq in removing human reads are ongoing, with construction of an in silico dataset containing a mix of human and microbial sequences. Both BMTagger and Deconseq have successfully identified a set of human-origin sequences in infant WGS datasets. We are currently determining the overlap in reads identified by these two tools, and using BLAST to confirm the origin of a subset of reads – especially those identified as human by only one tool. We will report calculations of the sensitivity and specificity of BMTagger and Deconseq based on the in silico dataset. We plan to use the tool(s) that maximizes both the removal of human reads and the retention of microbial reads in future WGS based studies of the human microbiome.

Characterizing *Salmonella enterica* serotype Enteritidis Respiration Oxidases

Mary Monique Alcantara
Sponsor: Yael Litvak, Ph.D.
MED: Medical Microbiology & Imm

Salmonella enterica serotype Enteritidis is one of the most widespread causes of foodborne disease. It is commonly transmitted through the infection of poultry, which occurs due to the colonization of Salmonella in the gut of the chicken. The adult gut is normally inhabited by a community of strictly anaerobic bacteria that can only survive in this type of oxygen-free environment. This microbiome protects its host from outside colonization of bacteria such as Salmonella. Newly-hatched chicks lack this microbiome and are vulnerable to pathogens. It is still unknown what mechanisms lie behind these anaerobes' ability to render colonization resistance. Salmonella can survive with or without oxygen and has an advantage when it is able to respire. Salmonella has several key cytochrome oxidase genes that are involved in respiration: cydA, cyxA, and cyoA. To further investigate the role of Salmonella respiration in gut colonization, we used S. enteritidis mutants lacking one of these genes and grew them in competitive cultures with the wild type strain at differing oxygen levels. The resulting number of bacteria were then counted and compared to see how much of an advantage was conferred.

Rediscovering the Original Political Thought

Christian Alfaro
Sponsor: Susy Zepeda, Ph.D.
Chicano Studies

The Constitution of the United States is seen by Western Democratic countries as a document that perfectly exemplifies the idea of a "government of the people, by the people, and for the people." History has said that the framers of The Constitution were heavily influenced by the thinkers of the Enlightenment era and the democratic philosophies of Ancient Greece. However, history has buried the original ideas that were most influential in The Constitution, leaving behind as to what may appear to be a whole discipline of political thought that originated in the North American continent waiting be rediscovered. The Iroquois League created The Great Law of Peace, a constitution whose primary goals were; freedom, democracy, and a confederation where one federal government controlled the states. Beyond the apparent similarities between The Great Law of Peace and The Constitution, the Iroquois League stemmed their ideas from their natural environment creating a different approach in political thought. In this paper, I argue how The Great Law of Peace may serve as a method that can complement western political thought.

Optimization of DNA Extraction and ITS Amplification of Pathogenic Fungal Species in Field Samples of *Vitis vinifera*

Gabrielle Allenbeck
Sponsor: Dario Cantu, Ph.D.
Viticulture & Enology

Grapevine permanent woody structures are affected by a variety of fungal diseases that cause yield and quality reduction as well as significant economic losses. In many cases, a grapevine's symptoms are not entirely attributable to a single causal organism and it is not uncommon to find the DNA of several organisms in infected tissues. This raises questions about the dynamics of these microbial communities and how their interactions may contribute to disease development and progression in the vineyard. This work aims to optimize metagenomic and metatranscriptomic sequencing methods for the detection, identification and quantitation of fungal trunk pathogen species in grapevines. The thesis project is a component of this larger project in the Cantu Laboratory in the Department of Viticulture and Enology. This thesis research specifically addresses the optimization of DNA extraction to include fungal DNA which is present in incredibly low quantities relative to the amount of grapevine DNA. Additionally, this thesis project addresses the optimization of Internal Transcribed Spacer primer efficiency for sequencing, which is the current standard for fungal community studies and is used as a reference in the larger project.

The Archaeology of Extreme Continental Climates: Excavation and Study at Tolbor 16, Mongolia

Aurora Allshouse
Sponsor: Nicolas Zwyns, Ph.D.
Anthropology

The Last Glacial Maximum (LGM) is a cold climatic event that occurred roughly 24,000 to 18,000 years ago. The resulting sea level drop allowed humans to disperse into the Americas from Northeast Asia via the Beringian land bridge. However, how people survived this environmental crisis and adapted to the open steppe tundra is yet unclear. The open air site of Tolbor 16 in northern Mongolia provides an opportunity to examine how prehistoric people lived and moved in just such an environment. This project includes excavation and study of the material culture from an archaeological layer which has been dated to include the LGM. First, I examine the geological processes that formed the layer, to determine the role humans had in shaping the site. Next, I look to the artifacts people left behind as a proxy for settlement patterns. From this, implications of heightened mobility—one strategy proposed as a means of combatting harsh environments and scarce resources— are considered in the broader context of population movement at this crucial time in human prehistory.

Implementation of Guided Policy Search Algorithms for Aerial Robotics

Teja Aluru
Sponsor: John Owens, Ph.D.
Elect & Comp Engr

Reinforcement learning has proven to be a viable method for implementing autonomous high velocity drone flight. However, traditional reinforcement learning methods are prone to overfitting during minimization. Guided Policy Search alleviates this issue by providing guiding samples to avoid non-optimal local minima. The use of guiding samples in conjunction with actual trajectories turns the minimization problem into an easily parallelized ADMM (alternating direction method of multipliers) problem. While the backflow problem is easily solved by guided policy search methods, there is still a need to run the forward propagation algorithm in a time efficent manner given the nature of drone flight. While previous work has been able to show that the algorithm is efficient in principle, it has never been implemented outside of simulation. We look to increase the performace of the forward pass of the neural network, and test the efficiency of these methods using hardware in the loop simulation.

"It's a Bird! It's a Plane! No, It's Comic Con!": Comic Con as a Site of Modern Day Religion

Cynthia Alvarado
Sponsor: Naomi Janowitz, Ph.D.
Religious Studies

Comic Con, the annual US Comic Convention, is not a typical site of religion; it is a site better known for its appreciation for modern storytelling and fantasy. However since its conception in the 1970's, Comic Con has seen exponential growth in its popularity and attendance due to its ability to provide a large-scale social community to specialized communities known as Fan Domains, "Fandoms". In 1994 Michael Jindra's study of Star Trek fandom suggested that individuals who participate in fandoms parallel the level of devotion acted out within religious movements. An exploration of the ritual affinities present at Comic Con validates Comic Con as a site of secular religion. Argumentation for ritual as a prevalent factor at Comic Con explores the overarching effects of communitas and costume play. Comic Con also provides a platform to examine performativity, identity and social experimentation as secular forms of religion for its participants. Comic Con's function as a modern site of religion serves as a reflection of the societal culture and values relevant in the 21st century.

Biomagnetic Iron Oxide Particles for Preventing MAR Autism

Kenneth Alvarez
Sponsor: Jamal Lewis, Ph.D.
Biomedical Engineering

Autism Spectrum Disorder (ASD), consisting of a broad range of developmental disorders in early childhood, is characterized by underdeveloped social skills and communication problems. In the U.S, an estimated one in sixty-eight children have some form of autism. Current research is underway at the Lewis Lab to develop a prophylactic for Maternal Autoantibody Related (MAR) autism, a specific type of autism affecting a quarter of autism cases. In this type of autism, specific antibodies bind to proteins expressed in the fetal brain hindering brain development. The Van de Water lab has identified the seven primary protein targets for MAR autism, including lactate dehydrogenase A and B, cypin, and stress-induced phosphoprotein 1. We plan to use this information to produce a peptide-functionalized iron oxide nanoparticulate system which would work as a biomagnetic-trap attracting the disease-causing MAR autoantibodies. The central idea is that upon intravenous injection, the iron oxide nanoparticles will circulate through the mother's circulatory system and ligate the MAR autoantibodies, which would in turn prevent antibody transport across the placenta, preventing MAR autism. In addition, the magnetic properties of the iron oxide nanoparticles allow for easy tracking and antibody co-localization studies via magnetic resonance imaging.

Neurons in Culture: Comparing How Media Supplements Influence Cell Health

David Alvarez
Sponsor: Johannes Hell, Ph.D.
MED: Pharmacology

Primary cell culture provides a working system in which it is possible to study closely the effects of prospective pharmaceuticals. Culturing neurons is an integral technique for cellular and molecular neuropharmacology as it allows for cell-isolated observations in a defined setting. The aim of this study is to establish how different supplements for neuronal media affect cell health of primary hippocampal neurons. Here I compare different neuronal supplements, including commercial B27 & GS21 and homemade NS21 & MP21, for overall effects on neuronal health. Through the use of immunofluorescent imaging, I monitored over time the functional and physiological status of neurons cultured from rats. Synaptic health was assessed by looking at the presence of PSD95/synapsin puncta staining, showing post- and pre-synaptic localization, respectively. Cell morphology on the other hand was analyzed by observing the complexity of neurons using Sholl analysis, which looks specifically at the dendritic branching. Utilizing these methods, we are working to understand how each of the mentioned supplements affect cell health in primary cell culture.

Investigating the Effects of Exposure to Father and Romantic Partner Disengagement Cues on Health Attitudes and Risk Taking

Nemrah Amir
Sponsor: Jay Belsky, Ph.D.
Human Ecology

Extensive research indicates that father's disengagement, both physical and emotional, is associated with problematic child development, including sexual and non-sexual risk taking. Because most work is correlational, it remains unclear whether it documents true casual effects of uninvolved fathering. In attempt to advance understanding, a recent experimental study found that presenting young adults with father disengagement cues, as opposed to father engagement cues, increased willingness to engage in risky sexual behavior. We sought to replicate these findings using a more diverse sample, while extending them to determine if results varied as a function of (actual) childhood family structure (i.e., 1 vs. 2 parent) and susceptibility to environmental effects, while also determining effects of romantic-partner disengagement cues. Thus, we exposed 318 undergraduates to one of three conditions, father disengagement, father engagement, or romantic-partner disengagement, by asking participants to describe a time when they experienced these in real life. Afterwards, participants reported their health attitudes, general and sexual risk taking, environmental sensitivity, and childhood family structure. Data are being collected to test the hypotheses that both sets of disengagement cues will promote problematic functioning, especially in the case of highly sensitive individuals and one's from single-parent families.

Electric Field Dependence of Scintillation Light Yield in Liquid Xenon

Tyler Anderson
Sponsor: Sudhindra Tripathi, Ph.D.
Physics

Liquid xenon based detectors have emerged as the most sensitive devices in searches for rare phenomena in particle physics, such as dark matter scattering or neutrinoless double beta decay. Understanding the response of liquid xenon to charged particles under various environmental conditions is important in order to fully calibrate such detectors. One such parameter is the light yield due to the scintillation process as a function of an applied external electric field. I will make a measurement of this using the DAX detector which has been developed at UC Davis. A data acquisition system consisting of field-programmable gate arrays will be implemented for this purpose. Data will be collected using various radioactive sources under an electric field varying in the range of 100 V/cm to 1000 V/cm. This data can then be analyzed to determine the field dependent properties of liquid xenon. Preliminary results and future plans will be presented.

Proinsulin Expression in Immature and Dysfunctional Beta Cells

Camille Andre
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

Type 1 diabetes, a chronic illness affecting millions, is caused by the immune system's destruction of the insulin producing pancreatic beta cells. A challenge in the search to cure T1D is discovering how to regenerate beta cell mass after autoimmunity has destroyed most beta cells. Research suggests that new beta cells may regenerate throughout life. Understanding this process may provide insight into the ability to promote beta cell regeneration. My research focuses on finding immature beta cells in human pancreas that produce insulin but lack necessary markers of mature beta cells. The problem is that these immature beta cells resemble beta cells that are dysfunctional as a consequence of diabetes. Currently, there is no way to differentiate between immature and dysfunctional beta cells. I hypothesize that the amount of proinsulin (the precursor form of insulin) detectable in beta cells may differentiate between the two types of beta cells. In young, non-diabetic pancreas donors, I observed immature cells that express less proinsulin in comparison with mature cells. If we can use proinsulin as a marker to distinguish between immature and dysfunctional beta cells, this could inform on the number of beta cells being formed and destroyed in both diabetics and non-diabetics.

Legless Lizard Lineage: Population Genomics of the Genus *Anniella* Throughout Its Range

Megan Andrews
Sponsor: Brian Todd, Ph.D.
Wildlife & Fisheries Biology

The California legless lizard is an intriguing, yet elusive animal that until recently was thought to be one species, Anniella pulchra, ranging from northern California down to the Baja Peninsula. These lizards spend their lives underground in loose soil and are difficult to observe in situ. Due to anthropogenic disturbance and effects of California's drought, finding individuals to study is a challenging endeavor. Collection efforts and molecular studies show great diversity among populations of certain regions, splitting them into five genetically distinct species: A. pulchra, A. alexanderae, A. campi sp. nov., A. grinnelli, and A. stebbinsi. Several of these occupy ranges of small, unremarkable areas around central California, making their endemic habitat particularly vulnerable to development. Population genomics carried out on exemplars from across known species ranges reveal significant distinctiveness among populations, such as variable ventral color and number of vertebrae. Given A. pulchra was a single species of Least Concern under the IUCN, efforts should be made to reassess the conservation status of these four new species. Taking into account the delicate microhabitats and limited dispersal of the newly described Anniella species, action is needed to study and protect these populations before their study changes from difficult to impossible.

Let Me Help: How Parent Involvement Lessens Internalizing Problems for Kids With Disabilities

Claudine Anglo
Sponsor: Nicole Hollis, Ph.D.
Human Ecology

It is well known that children with disabilities tend to have higher internalizing behaviors (e.g., Hauser-Cram & Woodman, 2016), but the approach to modifying these behaviors is often convoluted. For example, although treatments for ADHD are generally ineffective, parent involvement lessened internalizing symptoms (Corcoran & Dattalo, 2006). The current study examines whether parent involvement mediated the relation between children's disability status (i.e., having a disability or no disability) and internalizing problems. We used data from the Early Childhood Longitudinal Study: Kindergarten Class of 1998-1999 (U. S. Department of Education, National Center for Education Statistics, 2013). We found that children with disabilities in Kindergarten were more likely to have internalizing problems in third grade, controlling for prior levels of internalizing problems (ß = -.03, $p < .05$). Further, when compared with children with no known disability, children with disabilities in kindergarten have more involved parents in third grade (ß = -.02, $p < .05$), and in turn, lower levels of internalizing problems in fifth grade (ß = -.02, $p < .05$), controlling for prior levels of internalizing problems and parent involvement. This study illustrates that parent involvement can buffer children from the development of internalizing problems over time.

Redox and Coordination Chemistry of Bis(pyridylimino)isoindoline Complexes of Ga(III) and Al(III)

Shiela Leigh Angulo
Sponsor: Louise Berben, Ph.D.
Chemistry

Ligands that are redox-active and cooperative offer much more than their ancillary counterparts; they actively participate in redox reactions and bond-breaking and bond-making processes. Coined "non-innocent ligands," this vast array of ligands incorporates a dynamic area of research in coordination and organometallic chemistry. The ligand 1,3-Bis(2-pyridylimino)isoindoline (BPI) consists of an isoindoline core with two pyridyl groups attached through an imine bridge. This ligand has been shown by Dang and Bender to complex with Group 13 metals in a redox neutral state, coordinating to boron as a bidentate N^N ligand and to aluminum, gallium and indium via a tridentate N^N^N interaction. Studies by Hale and coworkers have shown that ortho-CH_3 substituents on this ligand complexed to Ru are involved in a catalytic cycle, stabilizing an intermediate in the double dehydrogenation of primary amines without requiring oxidants or hydrogen acceptors. On these grounds, I have investigated the redox and coordination chemistry of complexes formed from gallium and aluminum with BPI and their potential for catalytic transformations. These results will provide new insight into coordination complexes, offering greater implications for various fields, including dehydrogenation chemistry, catalysis and materials science.

Hamilton and *In the Heights*: Constructing a Minority-American Identity

Alida Araica
Sponsor: Desiree Martin, Ph.D.
English

Historically, popular American literature has featured predominantly Anglo-American protagonists who typically have more fleshed-out roles than characters of color within those same stories. With musicals like Lin-Manuel Miranda's Hamilton and In the Heights though, marginalized Americans have been put at the forefront of the American narrative. In the 21st century, writers like Miranda are deconstructing the association of whiteness with the American identity by including minority cultures—like African American, Latino and rap culture—in their musicals. The musicals act as minority discourses that attempt to overcome and subvert the hegemonic culture that has overrun American musical theatre and literature by reimagining a diversified America. These works push the audience towards seeing America from a different perspective, and allow authors of color and their readers to reclaim America and in Hamilton's case, American history. Miranda's musicals undermine the dominant culture, allowing minority Americans to reclaim and reflect a diverse America that has always existed but has not always been portrayed. With this research, I hope to explore how Miranda's musicals are changing the landscape of American history and the perceptions of America today by simultaneously constructing a minority-American identity and deconstructing the Anglo one.

Adventures in Ruthenium Chemistry

Michael Aristov
Sponsor: Alan Balch, Ph.D.
Chemistry

In previously presented work, the reactivity of tris(triphenylphosphine)ruthenium(II) dichloride, $RuCl_2(PPh_3)_3$, with carbon disulfide was studied through a combination of single crystal X-ray diffraction and ^{31}P NMR. Carbon disulfide was shown to form a series of coordination compounds with $RuCl_2(PPh_3)_3$ by bonding to the metal center through either the carbon or sulfur. These resulting complexes were fairly bulky, so the reactivity of a smaller molecule, hydrazine, was also investigated. This resulted in a complex that had a dual hydrazine bridge linking two ruthenium centers by a nitrogen-nitrogen single bond. Given our knowledge of $RuCl_2(PPh_3)_3$ reacting with terminal nitrogen, sulfur, and/or carbon, we also began to study ligands bearing these atoms in an accessible conformations. The linkages isomers, thiocyanate ($-SCN^-$) and isothiocyanate ($-NCS^-$), were of particular note due to their reactive potentials. Additionally, $RuCl_2(PPh_3)_3$ is known to spontaneously oxidize in solution, so we chose to investigate its reactivity with oxygen containing ligands that bear elongated π-systems. Presented here are the results of these exploratory reactions.

Sodium Butyrate's Effect on Depressive Behavior Within Rhesus Macaques

Luis Armenta
Sponsor: Erin Kinnally, Ph.D.
Psychology

Depression is a widespread problem in American society without an effective pharmaceutical treatment. However, epigenetic mechanisms (changes in gene expression without alteration of DNA sequence) may play a role in reducing depression. Studies show that an increase of histone acetylation, a mechanism allowing DNA to become more accessible, reduces depressive behavior in rats. Since histone deacetylase inhibitors like sodium butyrate (SB) ultimately facilitate HA, we hypothesize that SB reduces depressive behavior. Twenty-five rhesus macaques (Macaca mulatta) were relocated indoors for two consecutive trials to induce temporary depressive behavior. Fifteen received a vehicle control, while 10 orally received 500 mg/kg SB during the second trial. Blood was collected on the 1st, 8th, and 15th day of the second trial to quantify HA levels via ELISA. A standard monkey ethogram and five hours of video documentation was used to code the monkeys' behavior, including activity and depressive responses. While data are still being analyzed, current results show an increase in depressive behavior for monkeys treated with SB in comparison to controls. This evidence contradicts our initial hypothesis. These results, if confirmed, may suggest that re-organizing HA during stress may potentiate, rather than attenuate, the effects of stress in adolescent monkeys.

Fruit Morphology and Developmental Deviation Within *Vanilla pompona* Subspecies

Anne Ashmore
Sponsor: Sharman O'Neill, Ph.D.
Plant Biology

Vanilla is a tropical orchid that grows in equatorial climates. Its cultivation is a multi-billion dollar industry, and it is regarded as the most popular aroma in the world. There are three main species of vanilla: V. planifolia, V. pompona, and V. tahitensis, but V. planifolia produces the vast majority of commercial vanilla. However, climate change has drastically reduced global V. planifolia populations, leading many to consider alternative sources of the flavor. This study examines a subspecies of V. pompona, referred to as V. pompona subsp. grandiflora, as a potential commercially viable plant. In addition, it seeks to provide a morphological comparison of V. pompona's subspecies in order to suggest that it be reclassified as an independent species. To obtain relevant data, I will use a digital caliper to measure the daily growth of V. pompona subsp. grandiflora and V. pompona subsp. pompona fruits. In addition, I will collect information about significant fruit development milestones, including column loss, column mass, and flower loss. If significant, these data will suggest that V. pompona subsp. grandiflora is its own species. This will provide new grounds for considering V. pompona subsp. grandiflora as a commercially viable alternative to V. planifolia.

Diana Wynne Jones: Subverting Archetypes to Recast the Heroic Ideal in Children's Fantasy

Sarah Asnaashari
Sponsor: Frances Dolan, Ph.D.
English

"You stole that from Tolkien. Use your own ideas."—Diana Wynne Jones, Fire & Hemlock. An incredibly broad genre with origins in myths, fairy tales, and folk legends, fantasy fiction depicts worlds in which the impossible is the accepted reality, but otherwise has no restrictions. With the popularization of J.R.R Tolkien's Lord of the Rings in the 1960s, however, cultural perception of the genre underwent commercialized standardization as a slew of writers, frequently referred to as Tolkien-imitators, produced works full of now-archetypal, plot-driving elements. This paper seeks to examine how fantasist Diana Wynne Jones satirizes commodity fantasy within her own works to create a metacritique of the genre and innovate tired tropes. Texts of study include Charmed Life (1977), Howl's Moving Castle (1986), and Dark Lord of Derkholm (1998). Within these texts, Jones addresses conventional tropes by deploying them with calculated modifications, often emphasizing character over plot and portraying the mundane as fantastic in her world-building. Both implicit and explicit forms of intertextual references to famous fantasy-influencing works inform the character tropes satirized, which include the paradigms of the philosophical wizard guide, the hero on a journey, dark lord/wicked witch, and the domestic sphere-bound heroine.

The Functions of Grief and Elegy in the Poetry of Two Classical Arab Poetesses: Layla Al-Akhyaliyya and Al-Khansa

Doaa Atamna
Sponsor: Noha Radwan, Ph.D.
Comparative Literature

This venture analyzes and compares two elegies written by Arab women during the seventh century. This was a time when poetry reigned supreme among the Arab literary arts. Critics widely regard the poetry of both Layla al-Akhyaliyya and al-Khansa as excellent examples of elegies, historically a predominantly feminine genre. Their elegies engage with death and grieving, al-Khansa for her brother and al-Akhyaliyya for the murder of her young lover. Both complicate perceptions of grief to relay messages to the public sphere about life, death, honor and shame as well as the role of the poetry and its value. This creates an intersection between the public and the personal domains and requires putting the deeply personal on display through carefully constructed verse with the intention to manipulate how deaths are perceived and remembered. The use of rhetoric and misdirection in these poems reveals the genius of both poetesses, and their unique approaches to what is sometimes dismissed as a constrained genre. By analyzing one poem written by al-Akhyaliyya and using al-Khansa's as a tool to access its historical placement in the genre I engage and critique the many nuances in the Arabic elegiac tradition.

Nonlinear Dynamics of Cardiac Action Potential and Its Relation to Cardiac Arrhythmias

Jessica Au
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Sudden cardiac death is one of the leading causes of deaths in the United States and is known to be caused by abnormalities of heart rhythm, or cardiac arrhythmias, such as ventricular fibrillation and tachycardia. Action potential duration (APD) alternans, which is a long-short-long-short alternating sequence of APD, is a precursor of arrhythmias. Ventricular tachycardia and fibrillation are associated with a spiral wave and its breakup, respectively. APD restitution, which is the relation between APD and the preceding diastolic interval, controls instabilities of APD alternans and spiral waves. In this study, using a mathematical model of a rabbit heart, we investigated how the change in properties of ion channels such as conductance, affects instabilities of alternans at the cellular level and spiral waves at the tissue level. We determined the APD restitution curves from the single cell model under various conditions (normal, pathological, etc). In this poster, we show that the steepness of the APD restitution curve correlates to the appearance of APD alternans and break-up of spiral waves. We demonstrate that by using nonlinear dynamics, we can theoretically predict susceptibility to arrhythmias in patients from the properties of a single cell.

Reversing Inflammatory Tendinitis in an Engineered Tissue Model

Alec Avey
Sponsor: Keith Baar, Ph.D.
Neuro Physio & Behavior

Tumor necrosis factor alpha (TNF-a) is a cytokine believed to play a role in inflammatory tendonitis. Previous work has asserted that TNF-a inhibits type I collagen synthesis in cultured fibroblasts by stimulating the repressive CCAAT/enhancer proteins (C/EBPs). In a separate study, betulinic acid, a naturally occurring product found in goat's milk, was found to inhibit C/EBP activity. The current study was therefore conducted to determine whether betulinic acid could reverse the effects of TNF-a on engineered ligament function and collagen. Cells isolated from human ACLs were used to engineer 3D ligament constructs in vitro. Constructs were treated for the last 6 days of a two-week culture period with A) Vehicle (DMSO and BSA); B) 15ng/ml TNF-a; C) 20μM betulinic acid; or D) 15ng/ml TNF-a and 20μM betulinic acid. After treatment we measured the mechanics -- maximal tensile load (MTL), ultimate tensile strength (UTS), modulus -- and collagen content of each construct. Our initial studies demonstrate that engineered ligaments treated with TNF-a had a 50% decrease in MTL and UTS that was minimally affected by betulinic acid. Further work is underway to confirm the effects of betulinic acid. Initial studies suggest that in human ligaments TNF-a alters function independent of C/EBPs.

Socio-Emotional Functioning in Adolescent Girls Is Associated With Alterations in Prefrontal Cortex and Amygdala Volumes

Sandra Avila
Sponsor: Veronika Vilgis, Ph.D.
Center For Mind & Brain

Previous studies have found that social self-worth and self-competence are linked to anxiety symptoms and have reported associations between socio-emotional measures and structural changes in the prefrontal cortex and amygdala in adolescents. In the present study, we assessed 17-year-old girls (N = 139) on social self-worth and self-competence alongside anxiety to test for significant associations using the Perception of Peers and Self Inventory questionnaire and the Screen for Child Anxiety Related Disorders respectively. In addition, social self-worth, self-competence, and anxiety were examined with respect to girls' amygdala and orbitofrontal cortex (OFC) volumes bilaterally. Results showed that both social self-worth and self-competence were positively correlated with anxiety symptoms, although only social self-worth showed variation in relation to brain volume. Specifically, there was a positive trend between social self-worth and the bilateral OFC and right amygdala. Furthermore, there was a significant positive correlation between anxiety symptoms and right OFC volume, and a significant negative correlation between anxiety symptoms and left amygdala volume. These findings indicate that elevated levels of social self-worth and self-competence are characteristic of higher anxiety symptoms in 17-year-old girls, and suggest that these variables are linked to volumetric size alterations in brain regions known to support effective socio-emotional functioning.

How Does a Plant Virus Affect Endosymbiont Bacteria in Its Aphid Vector?

Laura Baldwin
Sponsor: Clare Casteel, Ph.D.
Plant Pathology

Many groups of insects host endosymbiotic bacteria in a mutually beneficial relationship. Buchnera aphidicola is an important endosymbiont of aphids. Buchnera produce amino acids essential to the aphid host, and there is also evidence that Buchnera may be important in promoting aphid-mediated transmission of some plant viruses, including Potato Leafroll Virus (PLRV). PLRV is an important pathogen causing major crop losses worldwide. Recent data from my lab show an increase in messenger RNA corresponding to certain Buchnera genes in aphids infected with PLRV compared to uninfected aphids. The purpose of this project is to investigate whether 1) this increase stems from an increase in the endosymbiont population in PLRV-infected aphids or 2) virus infection leads to the upregulation of particular transcripts within a Buchnera population of stable size. We are using quantitative PCR (qPCR) to determine the relative abundance of Buchnera DNA compared to constant aphid DNA, allowing us to quantify any changes in Buchnera populations in infected versus uninfected aphids, as well as reverse transcriptase qPCR to analyze relative abundances of mRNAs corresponding to Buchnera genes identified as being potentially affected by PLRV infection.

Colorimetric Sensor for Detection of Chloropicrin Fumigant Vapor

Taechini Bamrungpong
Sponsor: Gang Sun, Ph.D.
Textiles & Clothing

Chloropicrin or trichloronitromethane is one of the most common pesticides used to fumigate soil against various kinds of pests. It is released from soil as vapor and can cause serious toxic effects to human, thus, it has been a serious concern in agriculture production. California has a permissible exposure limit of chloropicrin of 73 ppb in air. With this, a fast reacting and easy to recognize sensor is needed for the detection of chloropicrin vapor level in the environment to warn people from exposure to the fumigant. Most pesticides interact with biomolecules such as glutathione in human bodies to provide toxic effects, thus, glutathione is selected in this sensor design to chemically detect chloropicrin. The reaction between these two chemical compounds results in glutathione being oxidized by chloropicrin, which can quantitatively and qualitatively reveal the amount of the fumigant. A colorimetric reaction between residual glutathione with an indicator can produce colored product, and its intensity change shows the concentration difference. Reaction conditions, including pH, reaction time, solvents, and fumigant vapor concentrations were varied to find the optimized conditions. The detection results are quantified with colorimeter, and the reaction mechanism was proved by UV-vis spectrophotometer.

Modern Communities in Religion

Gabrielle Banathy
Sponsor: Naomi Janowitz, Ph.D.
Religious Studies

Large celebratory community gatherings such as the Starwood Festival, a week-long Neo-Pagan and New Age multicultural world-music festival, demonstrate how sites of religion do not have to be structured like other, more ancient traditions. Many of the festival attendees themselves do not consider the gathering to fit into the western monotheistic mold, or to be religious at all. However, this event creates an egalitarian community for all of the people inhabiting the sacred space. The community is formed through the location and practice of the ritual and adopts an identity separate from any external worldly characterizations. This concept of a unique group identity being formed amongst those partaking in a ritual is enveloped in the modern concept of the term "communitas," as created by scholars Victor Turner and Arthur van Gennep. This idea of rituals creating a new community amongst the partakers allows for the formation of a group identity separate from the rest of the world that simultaneously unifies the participants via collective experience. Changes from one occurrence of a ritual to the next event alter both the group amalgamation as well as each participant's resulting individual sense of identity from one occurrence of practice to the next.

Health Benefits of Fitbit Charge Physical Activity Trackers in the General Population

Kimya Baradaran
Sponsor: Gretchen Casazza, Ph.D.
UC Davis Sports Medicine

Physical inactivity is a major killer since it is a determinant of common health problems including obesity, hypertension, heart disease and cancer. We hypothesize that physical activity trackers will motivate the general public to increase fitness, resulting in improved health. Current studies showing effects of physical activity trackers are limited due to short studies, discontinuous tracking, uncontrolled environments, and testing specific populations. The purpose of our study is to measure health changes in the general public during and after using the Fitbit Charge physical activity tracker for 6 months. Our study consists of logging resting and exercise values recorded in a controlled environment upon receiving the Fitbit, and on 2 follow-ups. Thus far, results of the first follow-up have shown significant improvements in waist circumference, waist to hip ratio, resting and exercise heart rates, diastolic and mean arterial blood pressures, and relative and absolute maximal oxygen uptakes. Our study will compare short and long term health changes as well as required and optional Fitbit usage, with results applicable to the general population. In this way, physical activity trackers can be shown to result in health benefits and aide in the prevention of several diseases.

The Effect of the Relationship Between Adoptive and Birthmother on the Birthmother's Feelings of Comfort and Acceptance With Open Adoption

Anna Barberio
Sponsor: Jay Belsky, Ph.D.
Human Ecology

Within the last 30 years, adoption has moved from closed to open, allowing some degree of information sharing or contact between the adoptive parents, biological parents, and adoptee following placement. Much research has been done to ensure that this arrangement is healthy for the adoptee, with results indicating openness in adoption is beneficial. Currently, the consensus among adoption experts is that open adoption is advantageous to the birthmother's psychological adjustment post-placement. However, little research has been done to evaluate this claim. It seems likely that the nature and quality of this birthmother-adoptive mother relationship would affect how the birthmother adapts to placing her child. To test this, 40 pairs of birthmothers and adoptive mothers will complete an online questionnaire to assess similarity in parenting style, social attitudes and values, and relationship quality with each other. Birthmothers will then fill out an additional questionnaire aimed at determining their feelings of comfort and acceptance towards the open adoption. The current study will evaluate whether birthmothers who have a close relationship with their child's adoptive mother are more comfortable with their decision to place their child in adoption, and explore potential determinants of the quality of the birthmother-adoptive mother relationship.

Episodic Memory for Emotion Words With Extended Delays

Mariloli Barcena-Martinez
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

Thermoelectric Properties of $Yb_{14}MnSb_{11}$ Prepared by Expedited Metallurgical Synthesis

Dashiel Barrett
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Thermoelectrics (TEs) are materials that convert heat energy to electric power via the Seebeck effect. $Yb_{14}MnSb_{11}$ is a TE currently under development for applications in deep-space exploration for its efficiency at high temperatures. Traditional synthesis techniques for producing $Yb_{14}MnSb_{11}$ either restrict composition manipulation and create excess waste (as in the Sn-flux synthesis) or involve lengthy processes (as in the powder metallurgical synthesis). Considerable resource and time savings were achieved over previously reported powder metallurgical techniques by eliminating heat treatment and synthesizing $Yb_{14}MnSb_{11}$ directly with spark plasma sintering (SPS). Direct synthesis was accomplished through optimizing ball milling parameters for consistent intermediate phase powders and SPS parameters for fully dense $Yb_{14}MnSb_{11}$ pellets. Powder X-ray diffraction and thermoelectric property measurements for samples produced via expedited synthesis confirm that phase-pure $Yb_{14}MnSb_{11}$ was formed during SPS and is comparable in performance to samples prepared via previously reported techniques. Expedited synthesis demonstrates a more environmentally friendly and economical process chain for materials science researchers and device engineers working on $Yb_{14}MnSb_{11}$ and other TE phases.

Wildfire Burning Patterns on Modern Tortoise Skeletons

Juliana Bartel
Sponsor: Teresa Steele, Ph.D.
Anthropology

One of the small prey species commonly found in the archaeological record in many places, including South Africa, is the tortoise. Tortoises are easy to gather, and many of their bones are found at archaeological sites; often these bones are burnt. Because these animals are slow moving, they are especially susceptible to wildfires, making it difficult to tell whether the animal was burned naturally or cooked. This study uses a sample of 49 angulate tortoises (Chersina angulata) from the Cape Point Region (Gifkommetiji and Circular Drive) of Table Mountain National Park, South Africa, that were burned in a series of wildfires in order to determine burning patterns of natural fires. We recorded the degree of burning on each bone using one of nine categories in order to determine which elements will show more evidence of burning. Using this data, we hope to determine if there is a difference between burning patterns from a natural fire and a purposeful cooking fire. This difference can tell us whether or not bones found in the archaeological record were cooked or collected after being naturally burned and further, whether or not tortoises were a purposefully exploited resource, or a more opportunistic resource.

Dissecting the Role of BRD4 as a Mutant p53 Transcriptional Cofactor

Reina Angelica Bassil
Sponsor: Shannon Lauberth, Ph.D.
Molecular & Cellular Bio

Cell cycle regulator TP53 is the most commonly mutated gene in cancers and leads to a loss of tumor suppressor function and gain-of-function activities that promote tumorigenesis. Evidence supports mechanisms underlying mutant p53 oncogenic activities connected to mutant p53-dependent regulation of gene expression including mutant p53 interactions with other transcriptional regulators and cofactors that recruit mutant p53 to corresponding target genes.This study sought to evaluate the role of the bromodomain-containing protein 4 (BRD4) in functioning as a key cofactor for mutant p53-dependent activation of tumor promoting genes. BRD4 is a chromatin regulatory protein that binds to epigenetic modifications, specifically histone acetylation. We recently identified a physical association between BRD4 and mutant p53 in human colon cancer cells. To gain mechanistic insight into this association, we will assess levels of acetylation, BRD4, and p53 recruitment at mutant p53 target genes in p53 knockout cells using ChIP and qPCR. A small molecule inhibitor of BRD4, JQ1, will also be used to examine BRD4 function in cell invasiveness. These experiments will provide insight into a new underlying mechanism by which mutant p53 drives colon cancer.

Up-Regulation of Ube3a in Brain Tissue of a Mouse Model via ZF-FOG1

Sofie Bates
Sponsor: David Segal, Ph.D.
MED: Biochem & Molecular Med

In Angelman syndrome, a genetically based neurological disorder that causes epilepsy and severe mental deficits, the Ube3a gene is nonfunctional. In every individual, the paternal Ube3a allele is repressed by an interfering lncRNA. Non-affected individuals have a functional maternal allele; however, people with Angelman syndrome have a non-functional maternal Ube3a allele and consequently cannot produce the Ube3a enzyme. This study aims to show restored function of the paternal Ube3a allele in a mouse model. Mice were injected subcutaneously with ZF-FOG1 over a two-week time period. ZF-FOG1 is comprised of a DNA binding zinc-finger as well as a FOG1 domain that represses transcription of the lncRNA, thereby restoring functionality of the paternal Ube3a allele. RNA analysis of brain tissue via RT-qPCR showed an up-regulation of Ube3a in the brain after ZF-FOG1 injection as compared to non-injected mice, and therefore ZF-FOG1 crossed the blood brain barrier. Protein extracts from brain tissue will be analyzed via Western blot and fluorescent microscopy. Based on the results of the RNA analysis, we are hopeful that protein analysis will also show an up-regulation of Ube3a. This research will help increase understanding of Angelman syndrome and may be helpful in developing a potential therapy.

Condensin Complexes Organize Tangled Sister Chromatids to Regulate Anaphase Progression

Marvin Begian
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

DNA compaction involves linkages between condensin proteins. Condensins form protein rings that bind chromatin segments in certain ways resulting in the organized compression of them into a smaller physical area. This organization is seen across sister chromatids but becomes especially important in mitosis, and even more so in anaphase, in the budding yeast Saccharomyces cerevisiae. Work from our lab suggest that failure to resolve sister chromatids signal to modulate anaphase progression to ensure the proper resolution of sister chromatids. However, the exact molecular cues that signal from unresolved sister chromatids are uncertain. We hypothesize a model whereby the condensin organized domains of unresolved sister chromatids forms an important physical feature necessary to generate the signal that regulates anaphase progression. To test this hypothesis, I grew condensin mutants (ycg1-1 and smc2-4) at non-permissive temperature to characterize the impact on sister chromatid resolution in anaphase. In subsequent experiments, I will observe the contribution of condensins to anaphase signals.

Examining the Basis for Differential Recovery Rates of Muscle Mass and Strength Between Aged Fischer Brown Norway and Fischer 344 Rats

Lisa Bell
Sponsor: Sue Bodine, Ph.D.
Neuro Physio & Behavior

Sarcopenia is the gradual loss of muscle mass and strength associated with aging. The impact of aging on the size and strength of muscle tissue was examined by performing hindlimb suspension and reloading on two strains of aged rats, Fischer Brown Norway (FBN) and Fischer 344 (F344). The hindlimb muscles were examined after 14 days of unloading, and following 3, 7 and 14 days of reloading. Both strains showed significant hindlimb muscle atrophy and decreases in force production after unloading, but the F344 rats recovered more strength and muscle mass after two weeks of reloading compared to the FBN rats. To investigate this disparity in recovery rate of the two strains, protein levels of ER stress markers and expression of genes associated with the neuromuscular junction (NMJ) were measured in the tibialis anterior (TA), soleus, and medial gastrocnemius (MG) muscles following unloading and reloading. In addition, specific fiber-type cross-sectional area analysis was performed in the TA. Preliminary data indicated elevated levels of ER stress and NMJ instability in the FBN rats. A better understanding of the mechanisms responsible for impaired muscle regrowth with age could contribute to future advances in the prevention of muscle loss in the growing elderly population.

Investigating the Roles of the Rad51 Paralogs in Yeast

Jeff Bellinder
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

A variety of exogenous and endogenous threats such as radiation or genotoxic chemicals frequently threaten the integrity of our genomes by causing double-stranded DNA breaks (DSB). To repair DSBs, our cells utilize a heavily regulated pathway called homologous recombination (HR). HR is a multistep pathway that involves protein-protein interactions including proteins known as the Rad51 paralogs, such as Psy3, Csm2, Rad55, and Rad57 in yeast. These proteins, along with their human variants, are indispensable for the HR pathway. Gene knockouts of the Rad51 paralogs have been shown to lead to embryonic lethality in mice, and increased cancer disposition in humans. Despite a clear link between the Rad51 paralogs and cancer disposition, their exact functions and mechanisms remain unclear. Research is currently being aimed at better understanding the interactions between the Rad51 paralogs and ATP/protein. To study this, mutations were introduced in the ATP binding regions in some of the paralogs. Using western blot analysis and co-immunoprecipitations, Rad51 paralog steady state levels and protein interaction will be characterized, respectively. With a better understanding of Rad51 paralog function and mechanism, future research will have a better foundation to combat human cancer and disease.

Development of Grab and Go Coat for Earthquakes

Rong Ben
Sponsor: Helen Koo, Ph.D.
Design Program

Earthquake is one of the most destructive disasters for human beings and social properties. California, with a large population of nearly 12% of the US population and population density of 239.1 people per square mile, has been the state that occurred earthquake the most frequently with high damages. Usually, when the earthquake occurs, it is hard for people to be safe, stay alive and wait until the rescuers arrive. The purpose of this research is to develop a convenient Grab and Go coat for the earthquake that people can easily put on, stay alive and safe before the rescuers arrive when they encounter a scary earthquake. Ideally, this coat will provide a hard shelter to prevent the victims from being hurt as well as emergency necessities like water, oxygen, and food. This project aims to help people pass the hazardous period safely when they get into an earthquake. The process of this project will include market research, material research, interview, data analysis, prototype-developing, evaluation, and reports.

Nitrogen Footprint Analysis of UC Davis

Sarah Benedict
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Reactive nitrogen is an integral part of human life. An excess of this resource contributes to a wide range of environmental and human health problems. These problems include worldwide declines in biodiversity, climate change, and compromised air and drinking water quality for people. A nitrogen footprint (NF) provides a standardized measure for the amount of reactive nitrogen released by a given institution, thereby guiding opportunities for reductions in excess nitrogen use and enhancement of sustainability. Using the Nitrogen Footprint Tool developed by the University of Virginia (UVA), we present results for UC Davis' NF, including energy, fertilizer, and food sectors. Results point to a relatively low NF for UC Davis' transportation and energy portfolio compared to those of other universities. This quantitative measurement, as well as the predictive scenarios and projections provided by the Nitrogen Footprint Tool, will aid in the formation of future abatement targets and sustainable management actions.

The Impact of Restaurant's Menu Design on Consumer Choices

Julie Beppler
Sponsor: Kristin Kiesel, Ph.D.
Ag & Resource Economics

Within America today there is an increasing trend in eating away from home. While these food choices have become a prominent part of the consumer's diet, Wansink finds that our decisions are often mindless, and highly influenced by the situational environment (2006). In this research, I focus on individual restaurant menus within Downtown Davis. More specifically, I research how restaurants utilize their menu design to promote certain items. I consider aspects such as production cost and price of the item, while also investigating implications regarding choosing healthy versus non-healthy items based on menu placement. A restaurant's choices regarding featuring items on the menu might contribute to consumers making less healthy food choices in this context. I am analyzing how production cost levels and prices affect menu placement, and what implications it has for placement of healthier items in a regression framework. In addition to contributing to the debate regarding obesity trends, this study's results can provide additional insight regarding menu labeling regulations that are currently only targeting chain restaurants.

Characterization of Novel Factors in RNA:DNA Hybrid Metabolism

Kimberley Berg
Sponsor: Frederic Chedin, Ph.D.
Molecular & Cellular Bio

Co-transcriptional RNA:DNA entanglements, or R-loops, form when an RNA transcript has the opportunity to anneal to a complementary strand of DNA, displacing the other strand of the DNA duplex. These three-stranded nucleic acid structures are known to cause genomic instability. However, research has also correlated R-loop formation with numerous biological processes, supporting the existence of R-loop-mediated pathways. Given this, I hypothesize that proteins have evolved to bind RNA:DNA hybrids and serve to mediate the function of these nucleic acid structures. The goal of this project is to characterize proteins that interact with RNA:DNA hybrids in order to answer two fundamental questions: 1) What are the molecular pathways in humans that mediate R-loop metabolism in normal cells; and 2) How do perturbations in R-loop metabolism lead to RNA:DNA hybrid-driven genomic instability? Informed by two independent screens, I postulate that ILF2, ZFR, MATR3, FUS and DHX9 are primary factors in RNA:DNA hybrid metabolism. To test the model, I will perform knockdowns of candidate genes in human cells and observe changes in nuclear morphology and RNA:DNA hybrid levels by high-resolution immunofluorescent microscopy.

Early Gut Microbiota Composition and Cognitive Development in 6 Month Old Infants

Elsa Berhane
Sponsor: Lisa Oakes, Ph.D.
Psychology

During early infancy, several factors affect the development of the gut microbiota. For instance, breast milk and the supplementation of infant formula with prebiotics has shown to positively influence the gut by promoting growth of beneficial bacteria. Similarly, the gut composition of infants born via cesarean differs greatly from that of infants born vaginally. Recent studies suggest this difference may impact early brain development (Wong-Kee-You, 2015). In this study, we focused on whether differences in pregnancy experiences (which may impact early development of the gut microbiota) would lead to differences in development in 6- month old infants. Mothers filled out a health history questionnaire including questions about her health during pregnancy and delivery. Some of these questions included birth mode (vaginal versus cesarean section delivery), infections, and vitamin intake during pregnancy. We identified several questions that have been potentially linked to the composition of the gut microbiota; we created a risk score using the participant's answers from those questions. It is predicted lower risk scores – which indicate exposure to fewer factors associated with poor gut microbiota – will be associated with more effective performance on visual attention tasks.

Structural-Functional Analysis of Key Diterpene Synthases Mediating Stress Responses in Corn (*Zea mays*)

David Berrios
Sponsor: Philipp Zerbe, Ph.D.
Plant Biology

Diterpenes are a diverse class of plant metabolites with important functions in development and ecological adaptation. Maize contains a large diterpene synthase (diTPS) family. Two recently identified class I diTPSs (ZmKS2 and ZmKS4) play key roles in diterpene-mediated stress responses of maize. ZmKS2 forms ent-isokaurene, an intermediate in the formation of anti-microbial kauralexins, and ZmKS4 forms dolabradiene, a molecule with a possible role in enhancing drought tolerance. In my project, I investigate the chemical defense system of maize by characterizing the structural-functional relationships of ZmKS2 and ZmKS4. By investigating the effect of amino acid mutations on the catalytic activity of ZmKS2 and ZmKS4, I gain insight into the evolutionary events that led to their functional divergence. I have identified several mutations that have altered KS2 and KS4 product profiles to that of other diTPS, such as pimaradiene products which are produced by specialized diTPSs in monocot and dicot plants, and ent-hydroxy-kaurene, a diterpene produced by an ancestral bifunctional diTPS of Physcomitrella patens. My findings highlight the catalytic plasticity of diTPS that gave rise to new functions, and offer opportunity for the targeted engineering of novel natural or nature-like diTPS functions.

Using an Ex Vivo Approach to Study the Gut-Brain Axis

Benjamin Bigelow
Sponsor: Helen Raybould, Ph.D.
VM: Anat Physio & Cell Biology

The vagal afferent neurons (VAN) provide a neural communication pathway between the central nervous system and the gastrointestinal tract. This pathway allows for the transduction of endocrine signals, released from the gastrointestinal tract, into neural signals in the VAN. These signals cause changes in feeding behavior level. A comprehensive understanding of this neural-endocrine pathway is vital to address the growing trend of obesity and diabetes. This research investigates the potential of using cultured VAN as a model for further studies. VAN tissue collected and cultured ex vivo will be exposed to stimulation by endocrine signals such as CCK or Leptin and/or by changing the media environment to represent a fasted or fed state. Western blot and immunocytochemistry will be used to measure receptor expression and changes in secondary messenger levels. It is proposed that the phenotypic changes observed during treatment of ex vivo tissue will resemble those observed when an animal is treated using similar conditions in vivo. We will determine if ex vivo cultured VAN neurons are an accurate model by comparing data from current experiments to previous studies done in vivo. The use of an ex vivo approach will allow for further understanding of the gut-brain axis.

Role of Lactic Acid and Acetic Acid Bacteria in Problematic Fermentations

Jill Bilodeaux
Sponsor: Linda Bisson, Ph.D.
Viticulture & Enology

Problematic wine fermentations can arise despite meticulous care and management. In the event of a slow or stuck fermentation, the yeast's performance is greatly reduced. Under certain conditions, yeast undergoes a metabolic change to [GAR+] prion state that has decreased fermentation capacity. In this state, yeast metabolize alternative carbon sources even in the presence of glucose, the preferred carbon source. The presence of certain bacteria has been shown to induce the [GAR+] prion in yeast. The incidence of problematic fermentations has been found to be higher in the simultaneous presence of both lactic acid and acetic acid bacteria in the grape must. Our study focused on analyzing the ability of lactic acid and acetic acid bacteria that have been isolated from commercial arrested fermentations to affect the yeast's fermentation capability and/or induce the [GAR+] prion phenotype. To test this, fermentations were conducted in triplicates in filtered grape juice with varying levels of 2 of the isolated bacteria, Acetobacter pasteurianus and Lactobacillus kunkeei, individually and in combination. By monitoring the fermentation progression and testing for [GAR+] incidence at the end of the fermentations, the yeast's performance was analyzed. Preliminary results indicate oxygen levels impact the yeast's response to varying bacterial levels.

Comparison of Perching Behavior in Laying Hens With Two Types of Enriched Colony Cages

Ashley Birakos
Sponsor: Maja Makagon-Stuart, Ph.D.
Animal Science

This study evaluated whether perching behavior is influenced by perch substrate and shape. W-36 hens (52-60 weeks old) were housed in 8 enriched colony cage systems (ECC) (60 hens/cage) with access to square PVC or round metal perches (4 replicates/type). Hens were observed on two days within a 21-day trial. Perching frequencies and durations were recorded for two hens per cage (16 hens total). Behaviors were recorded three times per day in two-hour blocks (morning, midday and evening). Hens housed with round perches spent, on average, 80. 987 seconds on the perch during the analyzed time frame, while hens with square perches averaged 146.261 seconds (t-test, $p = 0.0916$). Hens housed with square perch used the perch an average of 25.5 times per bird and those housed with round perches averaged 12.7 per bird during the analyzed period (Mann-Whitney $U=2$, $p>0.05$). Overall, the differences in the duration and frequency of perching by hens housed with square versus round perches was not statistically significant. However, as more data is collected we may find that perch type influences perching behaviors.

Tale of the Tail: How Habitats Influence the Shape of the Caudal Peduncle

Aanchal Bisen
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

In fish evolution and ecology, the anatomical variance between fresh and marine water fishes is debated. Freshwater Teleost lineages may be more diverse because of greater likelihood for barrier formation, alternatively marine environments may provide more complex habitats and thus enable greater diversification. Because of these conflicting views, this paper will work with a larger dataset to compare the variation between marine and freshwater fish within the same group, producing a more confident resolution to this debate. We will use Ovalentaria, a big Teleost fish group that includes clownfishes,cichlids, etc. measuring the minimum Caudal Peduncle Width and Depth to obtain a Compression Index. The Caudal Peduncle is the area just before the tail fin and is crucial for fish locomotion. The Caudal Peduncle Compression Index reflects how fish swim and maneuver through their environment, with deeper Caudal Peduncles indicating more complex habitats. We will be using a dataset collected at the Smithsonian Museum and running statistical tests compare morphological diversity between habitats, while taking into account evolutionary relationships.

Effects of Relatedness on Sibling Fitness in a Marine Snail

Haley Blackwell
Sponsor: Richard Grosberg, Ph.D.
Evolution & Ecology

Siblings should "have each other's back", as they share much of their genetic make-up, and increasing each other's fitness is beneficial for their genetic lineage. Within families, half-siblings are less related to each other than full-siblings, therefore competition between them should be more pronounced. This study aims to test this hypothesis in the marine snail Nucella canaliculata. Females of this species mate with multiple males before laying egg capsules containing several embryos and food for the embryos. These egg capsules are therefore ideal arenas to assess competition between siblings. The objective of the study is to determine whether there are multiple fathers per egg capsule and to test for a correlation between fitness and relatedness, which decreases with increasing numbers of fathers per egg capsule. Genetic paternity analysis will be utilized to establish whether embryos in the same egg capsule are full- or half-siblings. Embryo size and number of embryos per capsule will be used as measures of fitness. This study will help to clarify the importance of mating systems for the fitness of family members.

Characterization of Symbiosis Genes in Maize

Kevin Boardman
Sponsor: Jeffrey Ross-Ibarra, Ph.D.
Plant Sciences

Symbiotic relationships between plants and microbes are essential to plant productivity, but are complex and depend on many plant genes for normal function. A common symbiosis between plants and arbuscular mycorrhizal fungi (AMF) is required for normal nutrition in many land plants, including important crop species such as maize. Previous work suggests that nodulin-protein encoding gene relatives may affect mycorrhizal interactions. I selected candidate nodulin-protein encoding gene relatives from the maize genome. For each candidate gene, I ordered seed stock with a transposon mutation expected to knock-out function of the gene. I grew seed stocks in AMF-inoculated soil to determine if knocking out the candidate gene affected AMF symbiosis and I genotyped plants to determine if one or both copies of the gene were mutated. I expect to find that the mutant plants have a reduced amount of AMF-root colonization as well as reduced height and stem width. Next, I will self-fertilize two to three stocks with mutations of significant effect. I will grow these seeds to measure links between genotype, gene expression, and phenotypes. Determination and characterization of plant genes involved in symbiosis highlight gene targets for breeding efforts to reduce fertilizer dependence and environmental impacts of crop production.

Design and Synthesis of Bithiazole Compounds Containing Amides Close to Sulfur, Showcasing the Sulfur-Lone Pair Interaction

Austin Bons
Sponsor: Mark Kurth, Ph.D.
Chemistry

Bithiazoles are used to correct defective cellular processing of the ΔF508 mutant cystic fibrosis transmembrane conductive regulator (CFTR) protein. Misfolding of this protein prevents proper maintenance of chloride and sodium ion gradients, which has adverse effects on osmotic balance. The result of this is increased water retention within cells, dehydration of the extracellular space and onset of cystic fibrosis. Constrained bithiazoles were recently used by our group for correction of ΔF508 CFTR protein function. These bithiazoles have an improved effectiveness compared to non-constrained bithiazoles because they are reported to have more favorable entropy of binding in formation of the corrector-bound-CFTR complex due to the presence of a sulfur-lone pair interaction. Currently, we are investigating the extent of this effect within bithiazoles. Two bithiazole compounds containing amides close to sulfur were designed and synthesized to showcase the sulfur-lone pair interaction. This interaction will be explored further through oxidation reactions, such as those using oxone, bleach, hydrogen peroxide and similar reagents. It is hypothesized that through this lone pair interaction we can modulate sulfur's reactivity. Insights from this work have implications for enzyme structure, design and drug development, especially in small molecule drug libraries generated in silico.

The Role of Nek Kinases in Flagellar Length Regulation in *Giardia lamblia*

Jacqueline Booker
Sponsor: Scott Dawson, Ph.D.
Microbiology & Molec Genetics

There is much to explore in terms of how cells regulate the size of various organelles, including cytoskeletal structures. NIMA-related serine/threonine kinases (Neks) regulate cilia length and cell division in eukaryotes [1]. While most eukaryotes have fewer than 11 Neks, Giardia lamblia has nearly 200 [2]. Our research aims to study the role of this expanded family of kinases in the regulation Giardia's complex microtubule cytoskeleton. We identified two Neks, GlNek_14897 and GlNek_11311, that specifically localize to flagella. We hypothesize that GlNek_14897 and GlNek_11311 contribute to flagellar length regulation due to their localization to sites that control flagellar length dynamics. To determine the contribution of these Neks to flagellar length, we knocked down expression of GlNek_11311 and GlNek_14897, and measured changes in flagellar length by immunostaining the microtubule cytoskeleton of trophozoites. Our results show that the knockdown of GlNek_14897 increased the length of anterior flagella by 16% and caudal flagella by 12%, while knockdown of GlNek_11311 did not significantly affect flagellar length. These results demonstrate that GlNek_14897 likely contributes to the regulation of the size the flagella, which supports our hypothesis that the expanded family of Neks contribute to the regulation the size and distribution of Giardia's diverse cytoskeletal structures.

Shakespeare's Adaptation of Golding's Venus and Adonis: From Narrative to Drama

RaNelle Bradley
Sponsor: Cheryl Ross, Ph.D.
Comparative Literature

Shakespeare's Venus and Adonis, an adaptation of Ovid's myth published in 1593, was a huge success in his lifetime. A close reading of Shakespeare's Venus and Adonis reveals that Shakespeare adapts the familiar story from Ovid—known mostly through Golding's English version—from a narrative mode to a dramatic one, while consideration of the context and audience for the poem provides insight into why he shifts the original into this strikingly different approach. How can Shakespeare's Venus and Adonis give us insight into the complicated process of an adaptation? Why did Shakespeare adapt the poem in a dramatizing way? The success of Shakespeare's adaptation raises questions concerning both the adaptation process and the reception of an adaptation. Answers may be found with an understanding of the social status of playwriting versus the status of writing poetry. Perhaps, a moment when the theaters were closed could have provided an opportunity for writing to add to the social status of the playwright when he returned to his primary occupation of writing for the public stage.

Fish Heads and Habitats: Diversity Within Teleost Head Morphology and the Trends Seen in Relation to Habitat

Kasey Brockelsby
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Freshwater and marine environments, while both aquatic, may exert different selection pressures on the organisms living within them. Because marine habitats are generally more varied and complex, they have more available niches, and we therefore hypothesize this will allow for a greater diversity of morphologies. The purpose of this study is to examine the relationship between head shape diversity and habitat in teleost fish. Using morphological data on approximately 800 preserved species collected from the Smithsonian, we will look at head depth, lower jaw length, and mouth width as fundamental measures of head shape and compare them to habitat data to determine if there are any overarching trends. There may be a connection between these traits and diet, adding another dimension to our research and plausible findings. We intend to use a phylogeny to compare different lineages of freshwater and marine fish, giving evolutionary context to any statistical trends we may find. Preliminary results have already shown a greater variation in head shape among marine species, including a greater array of extreme outliers. Finding clear trends in head shape diversity between freshwater and marine lineages would illuminate the differences in selection pressures, demonstrating broader evolutionary trends between these two habitats.

Controlling Magnetic Spin States in Patterned Perovskite Heterostructures

Joseph Brown
Sponsor: Yayoi Takamura, Ph.D.
Materials Science & Engineering

A class of materials, known as perovskites, have received the attention of researchers due to the unique properties they exhibit as well as the fact that they can be further manipulated when confined to nanoscale dimensions, when they are mechanically strained, or when interfaces are created between dissimilar materials. In our research, we investigated the effects of these external factors on ferromagnetic and antiferromagnetic perovskite thin films in order to control their magnetic spin states. To accomplish this, we used soft x-ray photoemission electron microscopy, with a resolution of 50 nm, to image the magnetic domains in each layer and used imaging software to characterize the orientation of the antiferromagnetic spin axis. This process allowed us to elucidate the coupling effects occurring at the interface between the two types of magnetic layers and to observe how nanostructuring controls the magnetic domain orientation of the film. By understanding how these factors affect the magnetic properties of the perovskite thin films, we have found a mechanism to manipulate their magnetic spin states, which provides guidance for the design of next generation information storage devices.

Addressing Modern Electoral Manipulation: Gerrymandering's Challenge to Civil Rights

Taylor Buck
Sponsor: Mark Verbitsky, Ph.D.
Political Science

Manipulating electoral boundaries to benefit one political party, a practice known as gerrymandering, is a common but discriminatory process that threatens to undermine citizens' basic voting rights. As political parties seek to establish majorities in state and federal legislatures, the process of subtly adjusting voting districts for favorable ideological or racial composition outcomes results in substantial voter disenfranchisement, particularly among minority communities. Though this issue directly impacts the constitutional voting rights of citizens, the Supreme Court of the United States has not ruled firmly on a standard for identifying and eliminating gerrymandering. With two upcoming Supreme Court gerrymandering case decisions, McCrory v. Harris and Bethune-Hill v. Virginia Board of Elections, my research addresses the judicial precedents establishing the current conditions in which electoral manipulation takes place, as well as considering the modern argument both supporting and condemning the practice. My research focuses on racial gerrymandering, and establishes the ways in which minority voting rights have evolved through the twentieth century and how gerrymandering serves as a modern challenge to those rights. Through this analysis, I identify the numerous factors contributing to the current gerrymandering process and potential judicial outcomes arising from upcoming cases.

Analysis of Ground Reaction Force and Knee Flexion During Jump-Landing Task in Male and Female Youth Gymnasts and Implications on Training Programs and Competition Requirements

Sydney Burger
Sponsor: Gretchen Casazza, Ph.D.
UC Davis Sports Medicine

Risk of injury is an inherent part of playing sports. Knee injuries to the anterior cruciate ligament (ACL) can be particularly traumatic to athletes due to the long recovery time ranging from 6-12 months. While interventions cannot be made on many of the factors that contribute to injury risk, the manipulation of biomechanics through training regimens has been the focus of much research. Analysis methods such as the Landing Error Scoring System (LESS) have been shown to be useful tools in analyzing jump-landing biomechanics and measuring an athlete's risk for non-contact ACL injury. LESS uses hip and knee flexion angles, ankle, knee, and shoulder width, and other measurements from video recordings to determine an athlete's overall injury risk. This study used LESS to analyze the injury risk of young male and female gymnasts. We found that gymnasts' LESS scores showed a high risk for injury which could be due the inherent positioning of the feet and knees required for high scores. Results from this study have the potential to guide coaches and judges in making changes in the training programs and competition requirements to reduce knee injuries in the sport.

Numerical Solutions of Bending and Buckling of Structural Mechanics

Aaron Burkhead
Sponsor: Mohamed Hafez, Ph.D.
Mechanical & Aerospace Engr

In order to approximate solutions to mathematical problems that are difficult to solve, or have no known analytical solution, various numerical methods are used. We are investigating the application of two numerical approximations, the finite difference method and the shooting method, to the differential equations describing the structural phenomena of bending and buckling in beams or columns. The finite difference method approximates differential equations with difference equations derived via Taylor Series. The shooting method aims to convert a boundary value problem into an initial value problem and requires iteration to reach the desired boundary condition. Initial work has been done in writing code and observing the accuracy of the finite difference method when applied to structural problems with known solutions. In order to attempt to increase the accuracy of the approximations, the shooting method, using splines, is employed for both the bending and buckling problems for linear and nonlinear cases. For large deflections, accounting for the nonlinear effects is important. The present study will demonstrate quantitatively the limitations of the classical linear theories.

Emotional Face and Eye Gaze Processing in Typically and Atypically Developing Children

Tawny Bussey
Sponsor: Susan Rivera, Ph.D.
Psychology

The ability to recognize emotion and follow gaze is essential for social learning in children and can impact object processing. Children with fragile X syndrome (FXS) and autism spectrum disorder (ASD) share many social traits, but impairments in emotional processing may differ. This study examines these processes in three groups of children—typically developing (TD; N=67, ages 6¬-71 months), ASD (N=19, ages 32-68 months), and FXS (N=22, ages 10-79 months). On an eye tracker, participants were shown a neutral or fearful face, with an object on each side, for one second. Next, the eyes on the face stimulus shifted gaze towards one object (target object) for 5 seconds. Lastly, the objects were shown alone for 5 seconds. Results indicate, regardless of age, children in the TD and FXS groups look more to the target than distractor object on neutral, but not fearful trials. Children with ASD do not look more to the target than the distractor in either emotional condition. These findings suggest children with ASD may not follow the social cue, while TD and FXS groups follow the cue of the neutral but not the fearful face. Future analyses will explore overall looking behavior to the face itself.

Buffering Capacity of Dairy Products as Related to Simulated Gastric Digestion

Hongchang Cai
Sponsor: Gail Bornhorst, Ph.D.
Biological & Ag Engineering

Food digestion in the gastric environment may be influenced by food properties, such as buffering capacity. Resistance to change with environmental pH may influence the contribution of gastric pH. The objective of this study was to understand differences in buffering capacity of three dairy products —whole milk, half and half, and heavy whipping cream. The buffering capacity was measured by monitoring the sample pH during the addition of 0.5 mL increments of 0.2 M HCl until the pH reached 1.5. Particle size was measured by laser diffraction. Moisture content (wet basis) was calculated by the weight difference after drying at 110°C until constant weight. The buffering capacity for whipping cream (1.95 mL HCl per unit pH reduction) was significantly smaller ($p < 0.05$) than whole milk and half and half (>3.00 mL HCl per unit pH reduction). Whole milk had the highest moisture content (88.3% wet basis) and whipping cream had the lowest (54.6% wet basis). The type of milk influenced its buffering capacity related to the performance in gastric environment. Understanding the relationship between buffering capacity, moisture content, and particle size can help people develop the products with pH-dependent properties.

The Effects of Indomethacin and Omeprazole on Proteasome Function

Meena Calaimany
Sponsor: Aldrin Gomes, Ph.D.
Neuro Physio & Behavior

Indomethacin is a commonly used nonsteroidal anti-inflammatory drug (NSAID) that works by reducing levels of prostaglandins, lipids with hormone-like effects that cause inflammation and pain. Indomethacin has been shown to inhibit tumor growth in a mouse model but is hypothesized to have detrimental effects on the heart. In our study mice treated with indomethacin showed significantly decreased levels of proteasome function in the heart compared to the vehicle group. The proteasome is a proteolytic complex that degrades 60-80% of intracellular proteins. Omeprazole is a proton pump inhibitor that decreases the amount of acid produced in the stomach; it is commonly used to treat acid reflux symptoms. Mice treated with omeprazole and indomethacin showed slightly elevated levels of proteasome function compared to the group treated with only indomethacin. This suggests that omeprazole reduces the effect of indomethacin has on decreasing proteasome function in the heart or may be able to restore some of the side effects after treatment with indomethacin.

Studying the In-Vivo Role of Rbx2 During Adult Neurogenesis Through the Characterization of an Alternative Conditional Rbx2 Knockout Mouse Model

Ysidra Camarena
Sponsor: Sergi Simo Olivar, Ph.D.
MED: Cell Biology & Human Anat

Adult neurogenesis (AN) is the process of generating new functional neurons during adulthood, that in humans, mainly occurs in the hippocampal dentate gyrus and contributes to memory formation. Failures in AN have been associated to neurodegenerative disorders such as Alzheimer's disease. Rbx2 protein is a key player in the Reelin-Dab1 signaling pathway; a passageway that's vital in neurogenesis. The in-vivo inactivation of Rbx2 in mice [$Rbx2^{-/-}$] is embryonically lethal, and its conditional inactivation Nestin-CRE promoter mediated [$Rbx2^{c/c;NES\text{-}CRE}$] results in hydrocephalus mutant mice that die by P20-30. We'll characterize a new and alternative Rbx2 conditional knockout mouse [$Rbx2^{c/c;EMX1\text{-}CRE}$], to investigate the in-vivo role of Rbx2 during AN; without the interference of the hydrocephaly phenotype and in mice that survive through adulthood. We'll investigate the consequences of the conditional Rbx2 inactivation mediated by the specific promoter EMX1 mainly in the hippocampus, through a phenotypic characterization that includes immunofluorescence analysis of: 1) cell proliferation markers [Ki67]; 2) cell identity markers [Sox2, GFAP, DCX, and NeuN]; and 3) hippocampal anatomical markers [Calbindin, RGS14, and WSF1]. At the molecular level, we'll assess protein and mRNA levels of key Reelin-Dab1 signaling pathway players by western blot analysis and qRT-PCR [Rbx2, Dab1, Cul5, and Socs7].

Zeta Potential of Olive Oil in Lipid Emulsions

Arturo Canales Santiago
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering

Excess amounts of stored triglycerides in the human body can lead to heart disease and other deleterious health effects. Studies have shown that olive oil consumption can reduce these excess triglycerides due to its phenolic components. Oil-in-water emulsions (OIWE) are a novel way to characterize the properties of triglycerides as well as their interactions with lipids. The mixture of triglycerides and lipids mimics how cells store and transport triglycerides in the body. By varying oil particle size (100 nm- 10 µm) and concentration (water: oil of 8:1 6:1 4:1 and 2:1), zeta potential and light scattering measurements can provide information about the droplets such as their stability, zeta potential (electrostatic charge) and transport. Zeta potential measurements directly measure the OIWE particle velocity using light scattering after an electric field is applied to the system. The results of this study will provide a greater understanding of electrostatic properties of olive oil and lipid particles when present in the body.

An App for Documentation of Roadkill

Jordan Carlile
Sponsor: Fraser Shilling, Ph.D.
Environmental Science & Policy

The ability to obtain observation data from third parties is a crucial tool in research, and the motivation behind this project for the Department of Environmental Science and Policy. To supplement Professor Fraser Shilling's research of wildlife/roadkill observation, we built a mobile app that enables everyday users and Caltrans maintenance workers to take photos of roadkill they have come across. Data collected through the app includes images, geolocation information, and timestamps, which will be used by Caltrans workers for roadside pick-up. With a larger set of users to collect observations on animal-related incidents on the road from, we are hoping to help Caltrans be able to make roadkill pickup a more efficient process in addition to identifying their locations more accurately. Another result of this expanded data set is that we wI'll be able to better understand the relationship between road collisions and accidents involving wildlife on highways/roads, and ultimately, minimize roadkill occurrences.

Myelin Thickness in the Temporal Lobe in Autism

Alexandra Carr
Sponsor: Cynthia Schumann, Ph.D.
MED: Psychiatry & Behav Sci

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by behavioral abnormalities that include difficulties with communication and social interactions. Physiologically, individuals with ASD have a lower degree of functional brain connectivity meaning that the brain activity between specific regions is not properly synchronized as it is in neurotypical individuals. This hypo-connectivity in the brain of individuals with autism may be due to decreased levels of myelin which is necessary to form proper brain connections. Post-mortem brain samples were taken from the temporal lobe white matter and subjected to electron microscopy imaging. High magnification images (8400x) were used to measure myelin thickness in randomly selected myelinated axons. Our results show a linear increase in myelin thickness with age in neurotypical individuals, in accordance with previous findings. In contrast, individuals with autism exhibited myelin thickness decreases with age. This result was observed across all axons regardless of their size. These results may provide a structural basis for understanding the connectional disruptions observed in autism. Future studies will examine how the function and regulation of oligodendrocytes, the individual cells that form myelin, may be disrupted in individuals with autism.

Parent Emotion Conversations and Child Emotion Regulation

Angelica Carranza
Sponsor: Paul Hastings, Ph.D.
Psychology

Emotion socialization is how parents' expressions, reactions, and discussions of emotions play an important role in their child's emotional development. Previous studies have shown that more emotional responsiveness from mothers is associated with children having more positive self-regulation strategies and fewer internalizing and externalizing problems (Hastings et al., 2008). Studies have also demonstrated that poor parental feedback and limited parental support in response to their child's emotions has implications for a child's future emotion regulation abilities (Denham, Basset, & Wyatt, 2007). Respiratory sinus arrhythmia (RSA) is an aspect of autonomic physiology that supports emotion regulation (Kahle & Hastings, 2015). Thus, I am investigating how mothers' responses to their children's emotions in an emotion conversation task are related to children's RSA during these conversations. The study includes 50 6 year-old children and their mothers. Emotion conversations were coded to assess how mothers interacted with their child on questions meant to generate recollections of past events and elicit various emotional responses from the child (e.g., happy, sad). I expect that more positive parental support during emotion conversations will correlate with a child's better ability to self-regulate, as shown in RSA. Preliminary data analyses from 15 children and their mothers will be presented.

Public Health Collaborations for Chronic Disease Prevention in California

Jacqueline S. Carranza
Sponsor: Diana Cassady, Ph.D.
MED: Public Health Sciences

Public health organizations aim to improve community health for all and tend to collaborate to achieve their goals. Research suggests that a high degree of synergy, or how organizations with similar goals collaborate in order to better utilize all their resources, predicts success. This study examines synergy and communication in five collaborations intended to reduce chronic diseases, whether they are meeting their goals by sharing resources, and if ultimately there is an effective collaboration among them. Ninety-six members of the collaborations received online surveys using validated questions on synergy and communication in 2016, which 36% responded. For example, 4 out of 5 partnerships displayed high communication scores. Data from 2016 depicted that staff and partners scored synergy an average of 4.57 and 3.96 and communication 4.21 and 3.94 (out of 5), respectively, indicating an overall positive impact with public health collaborations. These partnerships also presented an average score of 4.18 that they are advancing towards their goals and 3.94 that they are receiving the benefits from collaborating. Survey results from 2016 will be compared to pending results from 2017 including a quantitative analysis for both. The results represent how synergy can improve public health collaborations.

Establishing an Animal Model for Studying Primary Microcephaly by CRISPR/Cas9 Gene Knockout

Noemi Castro
Sponsor: Li-En Jao, Ph.D.
MED: Cell Biology & Human Anat

Autosomal recessive primary microcephaly (MCPH) is a rare human disorder characterized by an abnormally small head size in infants due to a reduction of the cerebral cortex. MCPH is generally caused by autosomal recessive mutations in genes that encode proteins found in the centrosome such as the Abnormal Spindle-like Microcephaly-associated Protein (aspm). Currently, it is unclear how centrosome dysfunction can lead to developmental abnormalities such as MCPH. Our goal is to understand how mutations in the aspm gene result in the development of one of the MCPH entities, MCPH5, using the zebrafish model. Therefore, we used the CRISPR/Cas9 system to generate mutations in the zebrafish aspm gene. This was done by microinjecting Cas9 ribonucleoprotein complexes targeting aspm into one-cell stage zebrafish embryos. Mutation in aspm will be confirmed by PCR. Mutated fish will be crossed with wild type to generate heterozygous F1 families. Desired mutations will be selected via polyacrylamide gel electrophoresis and sequencing. Zebrafish with desired frameshift mutations will then be crossed to generate a homozygous mutant F2 generation. In the future, we will compare the neurogenesis of the homozygous aspm mutant and the wild type embryos. Through this process, we expect to discover the cellular mechanisms underlying microcephaly.

Water Quality Deterioration Caused by *Microcystis* Blooms Under Severe Drought Conditions in the Sacramento and San Francisco Delta

Chie Shan Chan
Sponsor: Tomofumi Kurobe, Ph.D.
VM: Anat Physio & Cell Biology

The drought conditions experienced in California in 2014 and 2015 may impact aquatic health. In comparison to previous wet years, Microcystis blooms increased significantly. Microcystis has been linked to water quality deterioration due to the production of toxins (cyanotoxins) and also the release of algal cell lysate. To test the water quality deterioration by Microcystis blooms, a fish toxicity test was performed with Medaka embryos and ambient water samples collected from the Sacramento and San Joaquin Delta in 2014 and 2015. Results displayed a high mortality rate due to the growth of bacteria, which was identified to be Aeromonas. To determine whether the algal lysate from Microcystis is associated to the growth of Aeromonas, a test was conducted as follows; Mycrocystis algal cell lysate was prepared in three concentrations: high, medium, and low. Each concentration includes an equal volume of Aeromonas isolated from Medaka toxicity testing is used. Our results suggested that the number of Aeromonas increased with the concentration of algal lysate, indicating that Microcystis lysate supports growth of bacteria. This result indicates a possible threat to aquatic life and safe water quality due to Microcystis blooms.

An Apple a Day or an Apple a Week: The Role of Home Food Availability on Fruit and Vegetable Liking Across 4-6 Graders

Kelly Chang
Sponsor: Lenna Ontai, Ph.D.
Human Ecology

Many U.S. children have fruit and vegetable (F&V) intakes below recommended levels (Lorson et al. 2009). Examining a major factor influencing children's food liking – home food availability – may help increase F&V consumption (Arcan et al. 2006). Many studies examine meals eaten at home, but the role of home food availability on F&V liking away from home is still unclear. This study aims to determine the relationship between home F&V availability and children's liking of F&V at school, and whether that relationship differs by grade level. It is hypothesized that (1) there will be a positive relationship between liking F&V at school and home F&V availability, and (2) this relationship will be stronger in lower grades than higher ones, given that older children have had more exposure to food choices outside the home. Elementary school children (grades 4-6, N=69) reported snack foods they liked to eat during lunch, and the proportion that was F&V was coded. Children's parents reported on F&V availability at home. Linear regression models will examine the relationship between F&V availability and liking, and how that relationship may be moderated by grade level.

Examination of Cognitive Abilities in a MeCP2-e1 Deficient Mouse Model for Rett Syndrome

Alene Chang
Sponsor: Janine LaSalle, Ph.D.
MED: Medical Microbiology & Imm

Rett syndrome (RTT) is a rare late onset neurological disorder caused by mutations in the methyl CpG binding protein 2 (MeCP2) gene, an epigenetic transcription factor that binds methylated DNA. RTT occurs in 1:10,000 female live births. Hallmarks include apparently normal development followed by a plateau and then a regression in motor and language skills. Visual and aural deficiencies can often lead to a diagnosis of autism. Two isoforms are produced of MeCP2 due to the alternative splicing of exons 1 and 2 to exons 3 and 4. Loss of function MeCP2 experimental models have shown that subtle changes in the morphology brain cells and synapses have profound consequences on network activities that underlie critical brain functions. One of the major deficits in RTT is loss of purposeful hand movements and disruption of general motor function. Due to these severe motor impairments, it can be difficult to accurately evaluate cognitive abilities. We assessed learning, memory, and anxiety as measures of cognitive function in a mouse model of the human MeCP2-e1 mutation. Future work is necessary to expand cognitive testing and to identify suitable targets for therapeutic intervention.

Slip Rate Analysis of the Northern Strand of the Altyn Tagh Fault at the Pingding Shan Restraining Bend

Jensen Chantel
Sponsor: Michael Oskin, Ph.D.
Earth And Planetary Sciences

As an earthquake advances through a fault stepover, the rupture length varies based on the efficiency of the fault bend. If the barrier formed by a stepover can be breached, a much larger earthquake will result. The area of my study, the Pingding Shan (Mountain Range), is the location of one of four restraining bends found on the Altyn Tagh fault, an active strike-slip fault in western China. As restraining bends develop with fault slip and become more efficient, their geometries change to link separate strands and form a duplex structure of one or more fault-bounded slivers of rock isolated within the bend. The purpose of my study is to determine whether the slip on a portion of the northern strand of the Altyn Tagh fault is primarily thrust or strike slip, and to produce a slip rate based on displacement-age relationships in faulted fluvial fans. Samples collected on fan surfaces cut by the fault will be dated with cosmogenic ^{36}Cl to determine a slip rate at my study site. Based on my findings, the Pingding Shan restraining bend can be identified as still early in its development and acts as a barrier to through going earthquake ruptures.

Rhetoric and Scientific Writing

Jessica Chavez
Sponsor: Sarah Perrault, Ph.D.
University Writing Program

To date, there has been much research done on the structural, rhetorical, and conventional aspects that typify genres and the roles that differing rhetorical components play in effective scientific writing. Genres that fall within the realm of academic science have been divided into two generalized discourse communities—the "hard" and "soft sciences". However, within these categories, the rhetorical nuances of many niche genres are not well analyzed or are over-generalized as belonging to a broad discourse community and therefore not well understood. In this pilot study, I analyze grant and scientific research writing, two related sub-genres within the "hard sciences". Each text analyzed is written by the same author, allowing the distinction of rhetorical choice to be directly attributed to the academic context of each text and the purpose that each text successfully serves. My research on the rhetorical nuances within scientific academic writing aims to showcase the varying typifications that exist amongst related sub-genres and how audience and overall context influence these nuances. Ultimately this research contributes new insights in a growing area of attention within rhetorical studies of scientific writing.

The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

Alexis Chavez
Sponsor: Suad Joseph, Ph.D.
Anthropology

The term “Egypt” was used by the West in reference to both ancient and modern day Egypt. I examined 15,881 articles published from 1930 to 1939, and critically analyzed 213 relevant articles where the term “Egypt” was used by New York Times correspondents. I discovered that the while present day Egypt was represented as ahistorical and inferior to the West, ancient Egypt was depicted as a prosperous and model “civilization.” I argue that this depiction of an affluent ancient Egypt was used as a contrast to further the representation of present day Egypt as subordinate, which justified British colonial acts that claimed to “save” the people of modern day Egypt from chaos and disorder. This misrepresentation engraved into American society that the people of the East were backwards and inferior. I suggest that such news media misrepresentation which is persistent in the 21st century, served as an opportunity for the West to portray itself and Christianity as heroic, modern, and advanced in order to depict the East and Islam as backwards. This research is part of an analytical project of the New York Times over 150 years conducted in Dr. Suad Joseph’s lab.

PiggyBac Transposon System Efficiently Integrates CRISPR/Cas9 for Gene Knockout

Joleen Cheah
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

The CRISPR (clustered regularly interspaced short palindromic repeats)/Cas9 system produces gene knockout by inducing double stranded breaks at a target sequence, which initiates repairs that lead to indel mutations and renders the encoded protein inactive. However, available CRISPR/Cas9 plasmids rely on viral transfection for efficient integration into cells’ genomes. My goal is to design and construct an alternative to viral transfection for CRISPR by introducing PiggyBac (PB) transposition sites at the ends of the CRISPR/Cas9 expression cassette. This guides the transposase to efficiently “cut and paste” the Cas9 sequence into cells’ genomes. Using PB-CRISPR against the gene Akt1, we successfully generated stable MDCK cell lines with knockout of Akt1. With concerns regarding the long-term effects of Cas9 in cells and the chances of off-target mutations, we plan to excise the Cas9 sequence using excision-only transposase. Furthermore, we will construct an inducible Cas9 plasmid to control Cas9 expression and study changes in cell phenotype resulting from the loss of the target protein over time. By reliably incorporating the CRISPR/Cas9 cassette into cells’ genomes, PB-CRISPR enables us to produce knockout cells against any gene of interest with ease, and our approach will eliminate potential artifacts from Cas9 over-expression.

Dynamic Role of Let-7 in Neuronal Progenitor Cells

Simranjeet Cheema
Sponsor: Anna La TorreVila, Ph.D.
MED: Cell Biology & Human Anat

MicroRNAs (miRNAs) are small non-coding RNA molecules that regulate many biological functions by inhibiting translation and mRNA stability. Previous studies have suggested that microRNAs (miRNAs) are important during the development of mammalian Central Nervous System (CNS). In the retina, one of these miRNAs, Let-7, elicits important functions during the temporal progression of retinal stem cells to produce the seven cell types that comprise the retina. Here, we show that during development Let-7 expression changes in different regions of the CNS. In addition, the level of Let-7 also fluctuates during the cell cycle to affect spatial progression of the retinal stem cells. Using Her10 cell line, we validated that Let-7 activity is dynamic throughout the cell cycle and the level of Let-7, in turn, affects the progression of the cell cycle. Together, this data suggests that Let-7, along with other miRNAs, may play an important role in the development of CNS.

Phosphodiesterase Type 5 and Beta-Adrenergic Receptor Interaction in Diabetic Cardiomyopathy

Dana Chen
Sponsor: Yang Xiang, Ph.D.
MED: Pharmacology

Recent studies have demonstrated the effectiveness of sildenafil, commercially marketed as Viagra, as a potential treatment for improving the symptoms of cardiomyopathy in patients diagnosed with type 2 diabetes mellitus. Sildenafil inhibits phosphodiesterase type 5 (PDE5), which is itself an inhibitor of cyclic guanosine monophosphate (cGMP), an important regulator of various cellular pathways responsible for normal cardiac function. By investigating the molecular mechanism underlying PDE5 inhibition, we will be able substantiate the use of sildenafil as a treatment for patients suffering from diabetic cardiomyopathy. Preliminary results from studies conducted in the Xiang Laboratory suggest that the increased PDE5 expression found in diabetic mouse hearts hinders performance in a beta-2 adrenergic receptor (B2AR)-dependent manner. Therefore, we hypothesize that there is a physical interaction between PDE5 and B2AR, which disrupts proper cardiac function. Here, we show data from a series of co-immunoprecipitation analyses which indicates that PDE5 does indeed complex with B2AR, but not with beta-1 adrenergic receptor (B1AR). Future studies utilizing B1AR and B2AR fusion proteins in co-immunoprecipitation will be conducted to identify the precise amino acid sequence on B2AR that PDE5 binds to, which will in turn provide us with further insight into how this complex interferes with myocardial contractility.

The Function of a Sub-Unit of Gamma-Tubulin Complex (GCP6) in *Arabidopsis thaliana*

Junlin Chen
Sponsor: Bo Liu, Ph.D.
Plant Biology

Microtubules are cytoskeletal filaments essential for growth and reproduction among eukaryotic organisms. Actively growing cells have new microtubules generated constantly in order to form dynamic arrays. Microtubule nucleation depends on the γ-tubulin complex made of γ-tubulin (GCP1), GCP2, and GCP3 as the essential core components, plus additional subunits of GCP4, GCP5, and GCP6 whose functions are not well understood. In this project, I investigated the function of GCP6 in the model plant Arabidopsis thaliana by approaches of genetics and cell biology. At first, I isolated mutants carrying a T-DNA insertion at the GCP6 locus. The gcp6 homozygous mutant plant exhibited multifaceted growth phenotypes. At first, mutant leaf hairs or trichomes often had more than four branches while the wild-type controls predominantly had three branches. Moreover, the mutant gcp6 plant showed a great reduction on fertility. To investigate the localization of GCP6, a plasmid for expressing a GCP6-GFP fusion protein was constructed and transformed into the gcp6 mutant plants, aiming at complementing the mutation. I aim to relate the intracellular activities of GCP6 with its physiological function in plant growth and reproduction.

Manufacturing of Hydroxyapatite-poly(lactide-co-glycolide) Composite Scaffolds With Reproducible Pore Geometry

Jonathan Yuxuan Chen
Sponsor: Jonathan Leach, Ph.D.
Biomedical Engineering

Mesenchymal stem cells (MSCs) are a promising cell source for bone tissue engineering due to their osteogenic potential and generous secretion of trophic factors. In order to create osteogenic grafts, MSCs require appropriate soluble and/or mechanical stimulation. In vitro perfusion culture of MSCs on osteoconductive materials provides a biophysical and biochemical environment that directly benefits cell proliferation and osteogenic differentiation. We previously demonstrated the osteogenic potential of MSCs in dynamic conditions when cultured on macroporous hydroxyapatite (HA)-poly(lactide-co-glycolide) (PLG) (HA-PLG) composite scaffolds manufactured using a gas foaming/particulate leaching method. However, these scaffolds lack a consistent, repeatable pore geometry, thereby limiting their applicability for predictive studies of fluid flow and related stresses through the scaffold. To address this challenge, we employed a solvent phase separation method to manufacture HA-PLG scaffolds with reproducible geometries. The compressive modulus was measured using an Instron machine to determine the bulk substrate stiffness. Undifferentiated MC3T3 were cultured on the scaffolds to test biocompatibility. Future studies include perfusion culture and using computational fluid dynamics to model fluid flow-induced shear stress with the overall goal to enhance osteogenic differentiation of MSCs for bone tissue engineering.

Kaposi's Sarcoma-Associated Herpesvirus Hijacks RNA Polymerase II to Create a Viral Transcriptional Factory

Christopher Chen
Sponsor: Yoshihiro Izumiya, D.V.M.,Ph.D.
MED: Dermatology

Kaposi's sarcoma-associated herpes virus (KSHV) is responsible for AIDS-associated malignancies, such as Kaposi's sarcoma, primary effusion lymphoma, and some types of Castleman's disease. Like other herpesviruses, KSHV rotates between latency and lytic replication. In a latently infected cell, KSHV exists as multiple episomes attached to the host's DNA, where most of its viral gene expression is silenced. After specific stimulation, KSHV 'wakes up' and enter its lytic stage, where the virus replicates its genome and synthesizes the necessary proteins to produce progeny. With a combination of RNA-FISH and immune-fluorescence studies, we examined KSHV gene expression at a single episomal level for the first time. The results showed that actively transcribing viral genomes gather and recruit a significant fraction of cellular RNA Polymerase II to form transcription factories. With the exception of a few cellular genes, we noticed a global reduction in cellular gene expression, which may contribute to KSHV' immune evasion. Additionally, we found that viral DNA replication was required for the formation of transcriptional factories. Together, our studies point towards a unique mechanism to prepare a "factory" for viral transcription and DNA replication designed for efficient virus production.

Calmodulin Dependence of Cardiac CaMKIIdelta

Catherine Chen
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

Calcium/calmodulin (Ca2+/CaM) dependent protein kinase II delta (CaMKIId) is an important regulator of cardiac function and pathology (e.g. heart failure, arrhythmias). Recent studies have identified several novel post-translational modifications (PTMs: oxidation, GlcNacylation, and nitrosylation) that all alter CaMKIId structure and activity. All these PTMs occur adjacent to the known autophosphorylation site and have been shown to individually contribute to autonomous CaMKII activity. It is not known how these PTMs synergize to regulate CaMKII activity nor is it known how individual novel PTMs influence CaMKII memory (e.g. lifetime of autonomy, CaM affinity/interaction). Here we use the Camui biosensor, consisting of the full length kinase flanked by the CFP-YFP FRET pair, to monitor CaMKII activity and activation. We find that multiple hits such as autophosphorylation and oxidation or GlcNacylation can promote one another and likely stabilize the chronic CaMKII activation. These experiments should provide key insight into our understanding of the chronic CaMKII activation seen in heart disease.

Mechanical Study of Thermal Activation of Charged States in a Doped Organic Semiconductors

Zekun Chen
Sponsor: Adam Moule, Ph.D.
Chemical Engineering

Organic semiconductors (OSCs) can be doped to control optical and electrical properties. The mechanism for doping OSCs, however, is more complicated because the dopants are molecules instead of atoms and only 5% of the doping induced charges on the OSCs are known to contribute to charge conductivity. We used temperature dependent UV-Vis-Nir and electron paramagnetic resonance (EPR) spectroscopies of the polymer poly-3-hexylthiophene (P3HT) doped with 2,3,5,6-Tetrafluoro-7,7,8,8-tetracyanoquinodimethane (F4TCNQ) in different ratios. Both measurements were executed in a temperature setting from 90~290 Kelvin. The two measurements give seemingly contradictory results. From UV-Vis-Nir, we measure a constant density of charged sites in P3HT with decreasing temperature. Using EPR we detect a large reduction of unpaired charges with decreasing temperature. We hypothesize that this contradiction can be resolved by proposing the existence of Columbically bound /unbound electron/hole pairs. The bound pairs are EPR inactive which means that the total number of charges is constant but the ratio of bound to unbound pairs increases with decreasing temperature. Using an Arrhenius plot, we calculate that the population distribution of free charge carriers at room temperature is approximately 5%, consistent with published results.

Influence of Demand and Supply on Labor Force Participation Rate

Lan Chen
Sponsor: Bagher Modjtahedi, Ph.D.
Economics

Labor force participation rate—the percentage of population willing and able to work—has been declining for prime-age American men (25 to 54 years old) over the last sixty years. There is no agreement among economists as to the reasons for this decline. Some argue that the decline is the result of reductions in demand for labor that is due to labor-saving technological progress and globalization that have eliminated many manufacturing jobs. Others argue that the decline is because of reductions in the supply of labor that have been caused by such factors as generous government subsidies such as unemployment benefits, health issues, family conditions, and the rise of the services sector. These competing explanations have opposite effects on the real wage. This research utilizes the labor market and other economic data on such variables as participation rates, real wages, and industrial production to shed light on the issue. We will investigate the correlations between the participation rates and other economic variables to understand possible causes of the decline in the prime-age male labor-force participation rate.

Secreted Factors During Myogenesis Inhibit Sost Expression

Hui Lin Chen
Sponsor: Damian Genetos, Ph.D.
VM: Anat Physio & Cell Biology

Sclerostin is a potent inhibitor of bone formation by antagonizing the bone anabolic function of Wnt signaling. Sost expression is transcriptionally regulated by its promoter and a downstream evolutionarily conserved region termed ECR5. While studies have traditionally focused on how skeletal muscle mechanically loads bone, the potential influence of muscle secreted factors on bone mass is an emerging theme. We hypothesize that factors secreted during myogenic differentiation may regulate Sost expression in osteoblasts. To test the hypothesis, conditioned media (CM) from C2C12 murine myoblasts throughout myogenic differentiation was used to treat the osteoblastic rat osteosarcoma cell line (UMR 106.01) transfected with luciferase reporters under the control of the Sost promoter and the ECR5 enhancer. CM inhibited the luciferase reporter by targeting ECR5 and the human Sost promoter. To further characterize the responsible factor(s), we fractionated the CM by size. Our data indicate that factors larger and smaller than 3kDa target ECR5, suggesting a metabolite secreted during myogenic differentiation might be partially responsible for Sost inhibition. Identification of such factors can be useful therapeutically for diseases characterized by osteosarcopenia.

The Relationship Between Hmong Fashion and Hmong Women in the Central Valley

Douagee Cheng
Sponsor: Susan Avila, M.F.A.
Design Program

This research project examines the relationship between Hmong fashion and Hmong women in the Central Valley. Hmong women have assimilated into the American culture yet they continue to negotiate their identities through the commercialization and consumption of Hmong fashion. Through this cultural authentication framework, Hmong women are agents of change by selecting, characterizing, incorporating, and transforming Hmong fashion trends and techniques. Social media and Hmong media have become major sites for transmitting trends. Increase in personal capital of Hmong women fosters the growth of the Hmong fashion industry. This qualitative research examines personal experiences and observations of Hmong women who identify as entrepreneurs, producers, consumers, and self-designers in the Hmong fashion industry. The analysis of historical data and artifact collection constructs a timeline of fashion trends suggesting three time periods: Wrap Turban Era (Early 20th Century-1975), French Coin Era (1975-2000), and Eclectic Fusion (2000-present). While there are published works about Hmong culture in the early California settlement, there is a lack of studies on current Hmong fashion and Hmong women. For this reason, this research will expand on the existing academic works and gallery archives of Hmong fashion.

Parent and Infant Coordinated Attention Through Gaze Following

Liat Chesed
Sponsor: Lisa Oakes, Ph.D.
Psychology

The coordination of visual attention among social partners is a vital component to infant development, specifically through the reciprocal interaction between a parent and their child during play. Previous research has focused on gaze following, which occurs when an infant follows the direction of their parent's gaze, as a primary pathway for the coordination of looking behaviors between social partners. In our study, we are examining how parents and infants coordinate their attention through gaze following as they interact in a naturalistic setting. Using a head mounted eye tracker, we measure looking behaviors during play between mother and infant. Specially, we are focusing on how infants' looks to their parent's face influence infants' subsequent looking behaviors. If gaze following is in fact a primary pathway used by infants to coordinate attention with a social partner, we predict that greater proportions of time spent looking to the parent's face during the play session will result in an increase in looks to the target of the parent's gaze. Knowing how infants use gaze following during play will further our knowledge about how parents influence their infant's looking behavior during play.

Dental and Temporomandibular Joint Pathology of the American Black Bear (*Ursus americanus*)

Sonja Chesnutt
Sponsor: Frank Verstraete, D.V.M.
VM: Surg/Rad Science

Dental pathology resulting in pain, reduced food intake, and infection, contributes to morbidity and mortality in wild animals. Despite this, dental health has not been evaluated for most species in the wild. The aim of this study was to determine the nature and prevalence of dental and temporomandibular joint(TMJ) pathology in the American black bear by examining museum specimens. Museum specimens (maxillae and/or mandibles) from 371 American black bears (Ursus americanus) acquired between 1889 and 2006 were examined macroscopically according to predefined criteria, and 348 were included in this study. Predefined criteria included tooth form, number of roots, supernumerary teeth, persistent deciduous teeth, attrition and abrasion, tooth fractures, periodontitis, enamel hypoplasia, periapical disease, and TMJ osteoarthritis. A wide variety of dental lesions were documented in this study. Lesions consistent with mild TMJ osteoarthritis were observed in 50% of the total number of black bear specimens, with a significantly greater proportion of males affected than females. The occurrence and severity of the dental pathology encountered in this study may play an important role in the morbidity and mortality of the American black bear.

Determining the Critical Amino Acid Sequences That Generates a Functional Nup2 Protein During Meiosis in Budding Yeast

Carly Cheung
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

The budding yeast Nup2 and Ndj1 proteins have important roles in Prophase I of meiosis to produce viable haploid gametes (e.g. sperm and egg). Nup2 is a nucleoporin protein that facilitates the transport of macromolecules into and out of the nucleus. When Nup2 and Ndj1 are both deleted, yeast cells are unable to go through meiosis to produce spores. Previous analysis identified a 125-amino acid region in Nup2, called the Meiotic Autonomous Region (MAR), that completely complements the function of Nup2 protein. My project is to determine the specific sequences in the MAR that allow Nup2 to operate accurately. To do so, I will randomly introduce mutations into the MAR sequence with error-prone Polymerase Chain Reaction. These mutated sequences will be used to transform yeast cells deficient for Nup2 and Ndj1. Transformed cells that do not sporulate will identify yeast cells with dysfunctional MAR sequences in their genome. Analyzing the mutations that result in defective sporulation with genetic tools could provide insight into the MAR's structure-function relationship. This work may help to explain how the nucleoporin Nup2 contributes to the correct production of haploid gamete cells during meiosis.

Disconnects Between Pre-Clinical and Clinical Studies Influencing Hsp90 Inhibitor Success as a Chemotherapeutic

Aileen Chhen
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Hsp90 is a molecular chaperone protein that facilitates protein homeostasis during cell stress. As a result, Hsp90 contributes to the stabilization and over expression of client proteins characteristic of canonical cancerous phenotypes. Pre-clinical studies demonstrated that chemical inhibitors of Hsp90 are effective in degrading clients in cancer cells, highlighting the potential of Hsp90 as a chemotherapeutic. However, 30 years of clinical trials have shown only modest impacts on patient outcomes. Our hypothesis is that the lack of clinical progress will correlate with a disconnect between pre-clinical findings. To test this hypothesis, we will compare clinical studies with distinct patient responses to the pre-clinical data for the specific drug and cancer type. We predict there will be a strong correlation between the success of the clinical trial and the adherence to pre-clinical findings. I have chosen to focus on clinical trials involving Tanespimycin, an Hsp90 inhibitor, given to patients with blood cancers, such as leukemia and myeloma. I will compare the efficacy of the clinical treatment and the biomarkers measured with data published in pre-clinical studies using the same inhibitor and cancer types. I will create a correlation index to present the degree of connection between clinical outcome and pre-clinical findings.

Age Effects on the Relationship Between Working Memory and Long-Term Memory

Joanne Chin
Sponsor: Tamara Swaab, Ph.D.
Psychology

Recent evidence has suggested working memory skill may contribute to proficiency in long-term memory tasks, but not much is known about how aging influences the relationship between working memory and long-term memory. In our study, we recruited 40 young (ages 18-26) and 40 older (ages 60-80) adults to perform a working memory task and a long-term memory task in order to determine whether older and younger adults show a similar correlation between the memory constructs. The long-term memory task tested the participants' susceptibility to false lures, or induced false memories; we found no significant difference in accuracy and confidence in response to false lures between the two age groups. When comparing how performance on the working memory task correlated with responses to false lures on the long-term memory task, we found that young adults with higher working memory were less likely to inaccurately respond to false lures than young adults with lower working memory, but no long-term memory differences were found among older adults as a function of working memory. These results suggest that aging may dissociate skills associated with working memory from long-term memory.

Artificial Intelligence and Machine Learning in Financial Services

Shiang-Wan Chin
Sponsor: Martin Hilbert, Ph.D.
Communication

In the modern time there is a lot of uncertainty with regard to automation and artificial intelligence. There are many industries being transformed by this technology. Specifically focused in financial services, there are many branches of evolution. As with change there are always optimistic adopters and those that resist it. Understanding the nature of markets is a crucial skill in developing understanding of how technology will be implemented. The biggest areas of interest within the realm of artificial intelligence and machine learning is around risk management. An area that is focusing in on this subject is within the stock market. With traders using trading algorithms they aim to increase their profitability. The nature of finance and the stock market has transformed because of these new methods of trading. The bid ask spread between trades is shrinking as a direct result of artificial intelligence, although many traders argue that there is still arbitrage yet to be priced into many trades.

CRISPR-dCas9 Expands Dynamic Range of Gene Expression From T7 RNAP Promoters

Kwan Lun (Victor) Chiu
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Catalytically inactive Cas9 (dCas9) has been used extensively to explore functional genomics by modulating gene expression at the transcriptional level. However, alternative applications of CRISPR-dCas9 in genetic engineering may help improving the control on recombinant gene expression. Here, we investigate the efficacy of dCas9 to increase the dynamic range of expression systems by repressing leaky expression. We use mathematical models based on experimental data to establish the mechanism by which dCas9 increases the dynamic range of our expression system. We discover that dCas9 is significantly more effective than several conventional methods for increasing the dynamic range of the T7 RNAP promoter without affecting the maximum gene expression level. We also enhance the maximal expression levels of our system by introducing mutations in the T7 promoter sequence. These findings demonstrate that CRISPR-dCas9 can serve as a useful and novel tool to expand the dynamic range of gene expression. This application of dCas9 could improve the performance of expression systems that suffer from the leaky expression of toxic proteins. Furthermore, this system offers versatility as it could be extended to other promoters by simply changing the sequence of single guide RNA.

Cloning, Sequence and Comparative Analysis of an Agronomically Beneficial Transcription Factor From Wild Species of Tomato (*Solanum* spp.)

Eunjin Cho
Sponsor: Diane Beckles, Ph.D.
Plant Sciences

The aim of this work was to clone and characterize orthologues of the Arabidopsis, AtzDof Transcription Factor (TF) in wild tomato species. A transgenic tomato line transformed with AtzDof resulted in 30% higher fruit yield compared to the control, and six-week old transgenic plants accumulated higher biomass when grown on 1/100-fold lower nitrogen (N) or elevated CO_2. These traits would be beneficial for agriculture due to the threat of global climate change. Therefore, analysis and manipulation of zDof genes in tomatoes could improve production and sustainability. Wild tomato species grow in harsh environments with limited N-resources and could provide insight on the role of this zDof gene in N-utilization. Our hypothesis is that polymorphisms of this zDof gene may have occurred during domestication and subsequent intensive agriculture which uses high N. Using the recently sequenced tomato genome and various bioinformatics tools, three possible orthologues in tomato were identified. They are highly similar to each other, suggesting recent gene duplications. Protein-protein interaction tools predicted that the products of one of these genes is involved in regulating N-utilization genes, consistent with AtzDof's role. The results of the cloning and sequencing analysis of this gene in wild species will be presented.

Use of Skipping Strategies to Improve Monitoring Performance in Processes With Autocorrelated Data

Aaron Choi
Sponsor: Ahmet Palazoglu, Ph.D.
Chemical Engineering

In industrial processes today, data are collected on a vast scale and in an attempt to monitor the process performance, it is customary to use statistical process control (SPC) charts. An important feature of this data is that they exhibit serial dependence (autocorrelation) due to frequent sampling and process dynamics. Many basic statistical methods used in SPC however assume time independent data. Subsequently their performance gets affected gravely in the presence of serial dependence. In this paper, we study the impact of autocorrelation on the performance of Hotelling T^2 control chart and explore a recently proposed approach of iterative skipping method where a pre-determined number of observations are skipped from the time dependent dataset to construct the control chart. The lag after each sample is imposed to lessen the autocorrelation caused by high frequency sampling. Another approach is to split the entire data into many groups based on the skipping strategy to avoid discarding the skipped observations. We believe this approach can potentially be applied for principal component analysis (PCA) based control charts that are also adversely affected by serial dependence. We plan to demonstrate that the skipping strategies would lead to earlier fault detection and lower false alarm rates.

Differences in Victimization Between More and Less Ethnically Diverse Schools

Veronica-Rennea Chong
Sponsor: Adrienne Nishina, Ph.D.
Human Ecology

Victimization research finds that there are multiple causes and correlates that may increase instances of victimization. Hanish and Guerra (2000) found a school's ethnic makeup may be an important correlate to consider. Specifically, within ethnically diverse schools, white students reported the most victimization experiences compared to other ethnic groups; with Black students reporting the lowest level of victimization (Hanish & Guerra, 2000). Latino/a students were the least victimized in both settings. These findings may indicate that victimization is a function of proximal ethnic composition as opposed to national ethnic compositions. In other words, the majority group may be more likely to victimize the minority group regardless of ethnicity. In the current study, we intend to complement Hanish and Guerra's (2000) study by testing for replicated findings within Black, White, and Latino/a students, but also include Asian students (who are unrepresented in previous related work). We expect that the rate of victimization among Asian students will vary by the size of the Asian group. This study uses data from three middle schools with various ethnic makeups to investigate the role of ethnic population as a moderator of victimization.

The Colorful and Imaginary Wonderland

Cynthia Chong
Sponsor: Lisa Oxley, M.F.A.
Art

Everyone has their own personal experience and way of self-expression, but how do I communicate mine to the public? My inspiration comes from my valuable life experiences, memories, imagination and dreams. These are as important to me as the elements of colors, meanings, emotions and creativity. Art is powerful in a way that the imagination is endless. In some of my artworks, there are messages or meanings behind the paintings. Metaphors help me to communicate an idea without exposing them obviously and that's made the art interesting with an open interpretation. It requires everyone to think and appreciate my art in different ways. The mediums I used for art are various, but oil paint, acrylic, gouache, and watercolors are the mediums I covered in these artworks. From the abstract to the realistic styles of my paintings, I aim to demonstrate my ideas behind the colors and imagination as a form of visual communication to the public.

Who Is Victimizing Whom in Ethnically Diverse Middle Schools? Exploring Links Between Inter and Intra-Ethnic Victimization, Victimization Attributions, and Coping Mechanism in American Middle Schools

Eva Chris
Sponsor: Adrienne Nishina, Ph.D.
Human Ecology

The "misfit" theory suggests that children who are victimized will deviate from the group norm (Nadeem and Graham 2005). Ethnic minority students in classrooms with a small proportion of ethnic minority peers might be vulnerable and at high risk of victimization (Jackson et al. 2006). This study seeks to examine the association between victimization, victimization attributions, and coping mechanism between and within ethnic groups. Coping strategies were examined as potential moderators of the effects of peer victimization. We hypothesize that numerically smaller ethnic minority will report higher levels of inter-ethnic victimization, and the victims with negative contact experiences are likely to develop prejudice and social erosion among different ethnic groups. (Pettigrew 2008).Middle school students completed sets of questionnaires that assessed self-perceptions of victimization, attributions for victimization reasoning, and internal psychological factors. Results indicated that multiethnic, Native American, Alaskan, and Pacific Islander students report higher victimization, while Mexican American students report the lowest victimization. However, further analyses conducted to examine the causes of interethnic victimization were inconclusive. The data suggest that early onset racial disputes or dominance over others could be investigated and school efforts to teach empathy, openness and acceptance towards diversity could offset the victimization patterns in school.

Establishing an Animal Model for Studying Primary Microcephaly by CRISPR/Cas9 Gene Knockout

Lana Christensen
Sponsor: Li-En Jao, Ph.D.
MED: Cell Biology & Human Anat

Autosomal recessive primary microcephaly (MCPH) is a rare human disorder characterized by an abnormally small head size in infants due to a reduction of the cerebral cortex. MCPH is generally caused by autosomal recessive mutations in genes that encode proteins found in the centrosome such as the Abnormal Spindle-like Microcephaly-associated Protein (aspm). Currently, it is unclear how centrosome dysfunction can lead to developmental abnormalities such as MCPH. Our goal is to understand how mutations in the aspm gene result in the development of one of the MCPH entities, MCPH5, using the zebrafish model. Therefore, we used the CRISPR/Cas9 system to generate mutations in the zebrafish aspm gene. This was done by microinjecting Cas9 ribonucleoprotein complexes targeting aspm into one-cell stage zebrafish embryos. Mutation in aspm will be confirmed by PCR. Mutated fish will be crossed with wild type to generate heterozygous F1 families. Desired mutations will be selected via polyacrylamide gel electrophoresis and sequencing. Zebrafish with desired frameshift mutations will then be crossed to generate a homozygous mutant F2 generation. In the future, we will compare the neurogenesis of the homozygous aspm mutant and the wild type embryos. Through this process, we expect to discover the cellular mechanisms underlying microcephaly.

Dissecting the Crosstalk Between Synapsis Checkpoint Pathway and DNA Damage Checkpoint Pathway in Oocytes

Rianna Chu
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

DNA damage is one of the most common and fatal challenges faced by all cells. DNA damage can occur exogenously from radiation or endogenously from errors in cell division, affecting the viability of cells and leading to dangerous outcomes for the organism. We are interested in how errors in meiosis, particularly in recombination and synapsis, affect the female oocyte pool. To do this, we examined the function of Spo11, which induces double strand breaks (DSBs) during recombination, and Sycp1, which holds homologous chromosomes together in a zipper-like fashion in the synaptonemal complex (SC). Knock-out mice were used to quantify oocytes for single and double lines of Spo11 and Sycp1. Data has shown that a single Spo11 mutant will decrease the oocyte pool by nearly 90% at 1dpp and gradually deplete by 18dpp while Sycp1 mutants have shown a more immediate depletion by 0.5dpp. Interestingly, double mutants have data similar to the Spo11 mutant, indicating a potential rescue from the Spo11 mutation due to the absence of SPO11-generated DSBs. We propose that lacking the SC may trigger a DNA damage checkpoint pathway independent of the synapsis checkpoint pathway depleting oocyte pools of Spo11-/- and Spo11-/-Sycp1-/- at a later time.

Numerical Simulation of Supersonic and Transonic Two-Dimensional Flows

Andrew Chuen
Sponsor: Mohamed Hafez, Ph.D.
Mechanical & Aerospace Engr

Supersonic flows over thin, pointed airfoils are simulated based on linear and nonlinear small disturbance potential equation and linearized boundary conditions using a second order finite difference explicit scheme marching with the flow. Compression and expansion waves are calculated over different airfoils. The results are compared with literature. For transonic flows over blunt bodies, the pseudo-unsteady, full nonlinear potential equation is solved using a second order finite difference scheme, marching in time to reach a steady state solution. The scheme is augmented by artificial viscosity for numerical stability and shock waves are captured for both subsonic and supersonic free stream conditions. For the latter, a bow shock is formed and the detachment distance agrees with reported results. These codes can be used for airfoil design in supersonic and transonic aerodynamics research. The present calculations will be used to verify water table experiments at UC Davis, based on the theory of Hydraulic Analogy between shallow water surface waves and compressible fluid flow patterns.

Preliminary Field School Findings From CA-SCL-330 in Mount Hamilton, San Francisco Bay

Tanee Chum
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

This study focuses on findings from CA-SCL-330, an inland Late Period site that was excavated by the U.C. Davis Archaeological Field School in the summer of 2016. CA-SCL-330 is situated on the west slope of Mount Hamilton, in the U.C. owned Blue Oak Ranch Reserve. Characterized by its rolling hills and sparse oak woodland, this undeveloped 3,280-acre nature reserve has numerous unrecorded and uninvestigated prehistoric archaeological sites within its boundaries. Units and shovel test pits were plotted and excavated based on previous site record data and surface finds to yield a viable, investigatory sample size. Groundstone collected during survey and excavation at the Mount Hamilton site were categorized within an ordinal scale to determine use-wear. Olivella biplicata shell beads found at the site were typed through known comparison, along with radio carbon data, to infer period of occupation. Preliminary analysis of artifacts and faunal remains excavated from CA-SCL-330 provide one of the few insights into the lifeways of prehistoric populations in this region.

Determining the Environmental Cues for Emergence in *Asclepias fascicularis* and *Asclepias speciosa*

Miles Claret
Sponsor: Louie Yang, Ph.D.
Entomology/Nematology

Phenology is the study of seasonal life cycle events, especially in relation to climate. Understanding the environmental cues that regulate life history events is crucial to determine how climate change will alter species interactions. Milkweeds (Asclepias spp.) are plants that can die back to below-ground winter states. Milkweeds and monarch butterflies (Danaus plexippus) have a unique ecological relationship because monarch caterpillars require an exclusive milkweed diet to develop. A growing concern is that climate change will aggravate monarch population decline by creating a phenological mismatch between butterflies and the host plants on which they oviposit. To understand this, we first need to study the environmental cues regulating milkweed emergence. Through a series of growth chamber experiments, I am investigating how temperature and precipitation affect the emergence of two native milkweeds, A. fascicularis and A. speciosa. Using logistic regressions, I will model emergence as a function of accumulated temperature over time, or degree-days. I hypothesize that milkweeds in warmer, drier environments will experience advanced emergence. With my experimental data, we could predict future changes in the timing of milkweed emergence as a function of climate change. The resulting ecological consequences for monarchs are unknown and will require further research.

Assessing Basal Stress and Immunity in Juvenile White Sturgeon With Different Ploidies

Brigitte Clark
Sponsor: Anne Todgham, Ph.D.
Animal Science

White sturgeon are naturally polyploid and have 8 copies of their genome (8N). Different aquaculture practices result in sturgeon with abnormal ploidies (12N and 10N). This is of concern because abnormal ploidy fish have been shown to be less stress tolerant than natural ploidy fish, including other species of sturgeon. To investigate whether white sturgeon with abnormal chromosome numbers are more susceptible to stressors, we measured basal indices of the generalized stress response (blood parameters, cortisol, glucose, lactate) and immune function (lysozyme activity, cells counts) in 8N and10N sturgeon. We predicted that 8N fish would have lower levels of bioindicators of stress and higher immune function compared to 10N fish. Results showed significantly higher red blood cell concentration in 8N sturgeon, and significantly higher lactate levels in 10N fish. Taken together, the results indicate a lower aerobic and oxygen carrying capacity of 10N fish that could lead to lower stress tolerance and immune capabilities when exposed to a chronic stressor. Cortisol levels were more variable in the 8N fish compared to 10N, potentially suggesting a dampened stress response in 10N fish. It is still unclear whether sturgeon of different ploidies have different responses to acute and long term stressors.

The Differential Effects of Native and Invasive Earthworms on Native and Invasive Grasses

Cameron Clay
Sponsor: Sharon Strauss, Ph.D.
Evolution & Ecology

Invasive species are having drastic impacts on the environments in which they are introduced, displacing native species and having a strong impact on global biodiversity (Doherty et. al, 2016). In California, one of the most dramatic impacts is the introduction of exotic grasses, which have displaced the majority of native grass species across the state. Recently, it has been found that invasive earthworms are associated with these invasive grasslands, and while native earthworms are similarly found more often in native grasslands (Winsome 2006), this correlation has not been studied further. This study seeks to determine if native and invasive earthworm species are having differential effects on these plant communities. In separate greenhouse treatments, native and invasive grasses were raised in unprocessed field soils that are inoculated with either native or invasive earthworms. Plant height, biomass and flowering time are measured for each treatment, to estimate the overall impact of each type of earthworm. This study will hopefully shed light on the dynamics of an understudied invasion, and potentially inform restoration ecologists in their fight to bring native grasslands back to California by revealing whether earthworms are playing an important role in the success of native or invasive plants.

Mimicry and Performance in Asian-American Characters

Michael Clogston
Sponsor: Hsuan Hsu, Ph.D.
English

Asian-American characters in contemporary literature are often represented as the model minority, the angry Asian male, or the "Fresh Off the Boat" Asian. I define the model minority as intelligent, financially successful, and law-abiding. I define the "Fresh Off the Boat" Asian as a person who was born in an Asian country, who has English as a second language, and a lack of understanding of American social constructions. These categories repackage the characters, or present them in a medium that falls under stereotypes for the consumer, to fit into Western society. Asian-American characters often acknowledge and play into these stereotypes against their will because they internalize that their persona as the only way to be accepted. Despite this effort, Asian-American characters are still seen as other and foreign. I enter conversation with past scholars' work on stereotypes as I analyze modern Asian-American characters and the phenomenon of when repackaging characters into stereotypes is justifiable by circumstance. I draw upon Asian-American works Fresh Off the Boat: A Memoir and The Gangster We Are All Looking For to display how characters partake in a form of mimicry and repackaging gone wrong as a result of the desire to assimilate to mass consumerism.

Building Immunity Against *Batrachochytrium dendrobatidis* Using Skin-Associated Microbiota From *Rana sierrae*

Jacqueline Colin
Sponsor: David Coil, Ph.D.
UC Davis Genome Center

Frog populations are declining worldwide, with >30% species considered globally threatened. The pathogenic aquatic fungus, Batrachochytrium dendrobatidis (Bd), has caused the decline or extinction of hundreds of amphibian species. Bd causes a skin disease called chytridiomycosis, which disrupts processes of respiration, osmotic regulation, and electrolyte transfer across the skin, leading to physiological imbalance and cardiac arrest. Skin-associated microbes can provide disease protection to amphibians facing Bd through inhibiting fungal growth. Therefore, by studying the frog microbiome we may identify bacterial isolates antagonistic to Bd that could be used in disease therapies. In the California Sierra Nevada mountains, Rana sierrae (the Sierra Nevada yellow-legged frog), has experienced particularly severe declines. Currently, I am working on culturing bacteria from samples of the Rana sierrae skin-associated microbiome and identifying isolates by analyzing DNA amplicon sequences and constructing phylogenetic trees. I will also test individual bacterial isolates and combinations of isolates for their ability to inhibit Bd growth in the lab using in vitro Bd inhibition assays. These results will improve our understanding of the interactions between bacterial isolates and Bd, which we hope to apply to the conservation of Rana sierrae populations in the future.

Optimizing the Use of a Nonpathogenic Fungus to Control a Disease That Threatens Lettuce Production in California

Zion Congrave-Wilson
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

The use of biological control agents in controlling plant diseases has become an increased area of study as these agents can be essential aspects of environmentally conscious disease management systems. Many organisms can be used as biological control agents, from non-pathogenic fungi to viruses. In my project, the biological control agent under study is a non-pathogenic strain of the fungus, Fusarium oxysporum (strain Fo47). The experiment focuses on timing of the addition of Fo47 and its effect on a disease of lettuce known as Fusarium wilt. Three treatment are being evaluated: early addition of Fo47, late addition of Fo47, and no addition (control). Two susceptible cultivars of lettuce will be subjected to each treatment. It is my hope that results from this experiment will provide insight into the mechanism(s) of action by which Fo47 reduces the incidence and severity of disease. Some previous research suggests that Fo47 reduces the frequency of infection through competition with the pathogen, whereas other studies report that Fo47 acts by inducing plant defense against infection. Understanding the mechanism of action may facilitate more effective deployment of the fungus to minimize the impact of Fusarium wilt affecting lettuce and other crops.

Internalizing Problems as an Antecedent to Peer Victimization: With Problem-Solving Coping as a Moderator

Dana Conlin
Sponsor: Adrienne Nishina, Ph.D.
Human Ecology

Children who experience peer victimization develop depression and/or anxiety (Hawker & Boulton, 2000); subsequently, children who display withdrawn or anxious behaviors are likely to be victimized (Hodges, & Perry, 1999). Problem-solving coping has been associated with decreases in depression (Nezu, 1986) which may combat the negative effects of victimization. However, the pathway from internalizing behaviors to victimization needs further exploration as well as whether coping abilities moderate potential consequences. We hypothesize that youth reporting higher levels of depression/anxiety will also report more victimization. However, for adolescents who are more proficient at problem-solving coping, reporting higher levels of depression/anxiety are not expected to be associated with victimization. Measures of depression, anxiety, and problem-solving coping were collected from sixth grade students via in-school surveys (N = 836). There was a significant, positive association between depression/anxiety and instances of victimization. Data also indicated a significant interaction such that students with competent problem-solving techniques and high levels of depression/anxiety experienced less victimization than those with high levels of depression/anxiety but low problem-solving skills. These results suggest that teaching problem-solving techniques early on in school may decrease the negative outcomes of victimization and diminish the likelihood of ever becoming a victim.

Language Contact in the Latin American Novel

Jacqueline Cony
Sponsor: Robert Newcomb, Ph.D.
Spanish & Portuguese

This research project explores the communicative tensions, challenges, and limitations of interaction between members of different speech communities as represented in Latin American literature. Edwidge Danticat's novel The Farming of Bones and the vignettes "Newark, Newark" and "An Indian" from Luiz Ruffato's There Were Many Horses represent this communication through plot, narrative voice, dialogue, and non-English words and phrases inserted into text written in English or translated into English presumably for a monolingual, transnational, English-speaking readership. The following questions will be addressed: Is true communicative understanding possible between members of different speech communities with little to no shared language? In what ways do those in power use linguistic differences to scapegoat or marginalize other groups? Because this project is in its initial phases, additional texts by authors of Latin American origin such as Los pañamanes by Fanny Buitrago and The Brief Wondrous Life of Oscar Wao by Junot Díaz may be included.

The Effect of Seastar Predator Cues on Muscle Biomechanics and the Concentration of Twitchin Within the Adductor Muscles of the California Mussel (*Mytilus californianus*)

Chessie Cooley-Rieders
Sponsor: Anne Todgham, Ph.D.
Animal Science

Biotic and abiotic conditions within the rocky intertidal affect the distribution limit of the ecologically important California mussel (Mytilus californianus). Seastar predation by prying the mussel's shells is a biotic factor limiting the lower distribution of mussels in the intertidal zone. Seastar presence can cause growth of adductor muscles in some mussel species to presumably resist prying by holding the valves closed. Twitchin, a specialized 'catch' tissue within the adductor muscle, is responsible for low energy closure of the valves. It is unknown whether twitchin concentrations within the adductor muscle are related to the ability of mussels to resist prying, or if exposure to predation can affect twitchin concentrations. To examine whether the presence of predators affects the capacity of mussels to resist prying and alters the properties of mussel adductor muscles, Mytilus californianus were exposed to seastar (Pisaster ochraceus) predator cues for a 6-week period. Individuals who received seastar cues are expected to have elevated twitchin concentrations within the adductor muscle and show greater resistance to a prying test using a Material Testing System. This study provides insight into the influence of predation on essential components of mussel's adductor muscles and mechanisms underlying predator-prey dynamics of mussel-seastars interactions.

Mathematical Models to Extract Key Features Determining Superconducting Properties on Iron Arsenic Compounds

Matthew Corbelli
Sponsor: Yulia Zaikina, Ph.D.
Chemistry

Our research begins by datamining superconductive compounds and performing machine learning analysis to uncover correlation between superconducting properties that can help prediction and classification of materials. These compounds are separated by class demonstrating differences in structure, composition, and symmetry elements that may affect their superconducting properties. Although a single structural parameter that defines the magnitude of critical temperature (Tc) has not been identified for, they all have in common the superconducting iron arsenic layer. Our main task is to uncover which features are important for the compound to exhibit superconducting properties. Hence, this study focuses on different classes of iron arsenic superconductors and implements several analytical techniques to accurately predict superconductivity within iron arsenic superconductors, such as Sparse Logistic Regression, Artificial Neural Network, SVD Decomposition, Support Vector Machine and SPCA. We also created an interactive webpage which allows the user to visualize information about this data in three dimensions. The standard k-means clustering algorithm in Javascript was implemented to help on the task of classifying which compound is a superconductor or not.

Nitrogen Footprint Analysis of UC Davis

Zachary Cornejo
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Reactive nitrogen is an integral part of human life. An excess of this resource contributes to a wide range of environmental and human health problems. These problems include worldwide declines in biodiversity, climate change, and compromised air and drinking water quality for people. A nitrogen footprint (NF) provides a standardized measure for the amount of reactive nitrogen released by a given institution, thereby guiding opportunities for reductions in excess nitrogen use and enhancement of sustainability. Using the Nitrogen Footprint Tool developed by the University of Virginia (UVA), we present results for UC Davis' NF, including energy, fertilizer, and food sectors. Results point to a relatively low NF for UC Davis' transportation and energy portfolio compared to those of other universities. This quantitative measurement, as well as the predictive scenarios and projections provided by the Nitrogen Footprint Tool, will aid in the formation of future abatement targets and sustainable management actions.

Creating Line of Sight Constraints on Darkmatter Using DarkSky Simulation

B Cornell
Sponsor: David Wittman, Ph.D.
Physics

We have very limited knowledge of dark matter even though it makes up 80% of our universe. Much of our knowledge about dark matter comes from studying merging galaxy clusters, but our single point of view from Earth limits our ability to understand them. By studying simulated analogs of real galaxy cluster mergers, we put further constraints on the dynamics of these mergers, bolstering our understanding of dark matter. In our research, we examine the DarkSky Simulation to put constraints on the line of sight of several known galaxy cluster mergers. We first find the probability that many simulated mergers represent the real analog at a large number of possible points of view. We then use this information to compile the probabilities of all the simulated mergers at these data points to find the relationship between the viewing angle and the probability of the simulated systems representing the real mergers. By doing so, we constrain the line of sight of real mergers using methods that are completely independent of any previous estimates. The data we find is useful in learning more about galaxy cluster mergers, and, therefore, the properties of dark matter itself.

Methodologies for Decontamination of Food Waste

Samuel Crichton
Sponsor: Karen Riveles, Ph.D.
Environmental Toxicology

After natural disasters or power outages, industrial food-holding facilities must respond to food spoilage or contamination prior to disposal of adulterated food. This project will review a variety of methods for decontamination and disposal of these wastes, two of which include the usage of anaerobic digesters (AD) and microbial fuel cells (MFCs) in place of traditional rendering. Rendering uses conventional cooking methods to convert animal products into supplements and edible commodities for livestock. MFCs use aqueous materials, such as sludge, to harbor bacteria, which then convert the waste into bioenergy. AD takes organic material and converts it into methane, which is then combusted to carbon dioxide. Rendering is still the most common industrial practice. MFCs are less industrially efficient, though more environmentally friendly than AD, which relies on production of methane gas (biofuel) for combustion. Improvements for these methods are in development, though incentives are more commonly being pushed toward anaerobic digestion.

Replicating History: Using 3D Printing to Materialize Antiquity

Sonya Crocker
Sponsor: Nicolas Zwyns, Ph.D.
Anthropology

Although 3D imaging and printing offers promising applications for the documentation, visualization, and reproduction of archeological objects, the potential and limitations of these new methods have yet to be explored. My research examines advantages and constraints of 3D software and hardware applied to stone tools of varying shapes and sizes. To accomplish this, I digitized experimental and archeological objects using Agisoft Photoscan software. I then printed a copy of the objects using a Zortrax M200 desktop 3D printer. The models produced are compared with the original object and tested for accuracy using visual and morphometric attributes. Even though the printed models do not preserve the exact texture of the digital model, some key features most relevant to archeologists such as platform, flake scars, and cortex remain visually identifiable. Other essential features such as flake edge, ripples, and fissures, however, are more difficult to reproduce. In addition, I was able to build a composite refitting that combined printed and original parts of a single object. Here, I propose possible solutions to improve digital and printed models which will serve as an avenue for future research; particularly as it pertains to analysis of quantitative data and qualitative features of reprinted stone tools.

Effect of Nutrition on Maternal mRNA Contribution to the Embryo in *Drosophila melanogaster*

Amanda Crofton
Sponsor: Susan Lott, Ph.D.
Evolution & Ecology

Maternally deposited RNAs and proteins drive early embryonic processes prior to zygotic genome activation. Also, in the presence of environmental stressors and decreased maternal reproductive resources, there is a tradeoff between offspring number and size. While increased offspring size improves fitness in harsh nutritional conditions, it becomes maladaptive in postnatal environments with greater nutrient availability. However, the interaction between parental nutrition and maternal contribution of mRNA to the embryo is largely unknown. This study seeks to characterize the entire transcriptome of maternally deposited mRNA under varying parental nutritional conditions. To determine this, Drosophila melanogaster individuals were placed in environments with 100%, 25%, 10%, or 5% of standard nutritional content, where they developed from embryos into adult flies. Offspring were collected as stage 2 embryos, since all mRNA transcripts are maternally derived at this point in development. Single-embryo RNA extraction isolated maternal mRNA, which was made into RNA-Seq libraries and sequenced. The data will show whether, as nutritional content decreases, there is less mRNA deposited per offspring, or more mRNA deposited per offspring and fewer total offspring. The results will also elucidate transcripts and genes that are important to animal development and survival against environmental stressors experienced by the previous generation.

Quantifying Paraguayan Air Quality by Determining Amounts of Organic and Elemental Carbon Using Fourier Transform Infrared Spectroscopy and Spectral Calibrations

Benjamin Croze
Sponsor: Ann Dillner, Ph.D.
Air Quality Research Center

Because people usually spend many hours per day in their home, indoor air quality is a major determinant in health and life expectancy. To evaluate indoor air quality in homes that use wood-burning cook stoves, 166 particulate matter (PM) samples were collected on Teflon (PTFE) filters from June to August 2016 in approximately 100 homes, in cities, rural areas, and villages in Paraguay. From these filters, organic carbon (OC) and elemental carbon (EC) amounts were determined using a calibration based on Fourier Transform infrared spectroscopy (FT-IR) and OC and EC reference measurements. A preliminary examination of the FT-IR spectra indicated high PM absorption and potential for large OC and EC estimation errors from contaminant scattering of infrared radiation. In order to properly extract desired OC and EC mass concentrations, spectra were numerically preprocessed to ensure accurate determination by the FT-IR calibration. Four different calibrations were implemented to check for variations across the different models and validate predictions. Two of the four models predicted very similar OC and EC masses for collected samples suggesting that FT-IR OC and EC may be quantified by extrapolating existing calibrations. These results validate the prediction models and help to better quantify air quality in Paraguay.

Characterization of Transcription Factors Involved in Glucosinolate Metabolism and Root Development in *Arabidopsis thaliana*

Neiman Cruz
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

Transcription factors (TFs) are a class of proteins that are not only involved in regulatory roles in transcription, but also in a wide variety of other biological processes. For example, plant-specific TFs are found to regulate pathways required for the biosynthesis of secondary metabolites. Secondary metabolites are important for interaction of the organism and its environment. This study aims to characterize three transcription factors (HB21, ILR3, and ZFP7) in Arabidopsis thaliana that have been identified to regulate glucosinolate metabolism as well as plant growth and development. Arabidopsis mutant lines for these TFs were then obtained and crossed to generate higher-order mutants to study the interactions of these gene mutations. Different phenotypes such as root length, rosette growth, and glucosinolate accumulation were analyzed statistically using RStudio. We are also studying how these TFs might link to sugar metabolism by looking at primary root growth under different sucrose treatments. Characterizing these TFs could further enhance our understanding of the mechanisms in which these TFs regulate plant secondary metabolism, growth and development.

El Disilineamiento de los Pilares de Existencia: Mente y Cuerpo de la Juventud de el Valle Central

Lizbeth Cruz
Sponsor: Mary Lou de Leon Siantz, Ph.D.
Betty I Moore Nursing School

The aim of this study is to evaluate the depression rates of Mexican-origin teenage girls who participated in the Developing Educational Strengths: Promoting Individual Early Reproductive Teen Awareness (DESPIERTA) study. The significance of the research addresses the publich health problem of teen depression in a rural Latino community and the exisiting literature. The study takes a Community-Based Participatory Research (CPBR) methodology which is regarded as a valid approach to prevent disease and promote health by enhancing relationships that lead to better interventions and positive health outcomes. Validated surveys were collected from participants in California's Central Valley to access depression and self-esteem rates of the study participants. These surveys will be scored giving us data about how many of the participants suffer of depression. Findings based on the survey data will be presented. The findings contribute to existing knowledge concerning prevention of depression of rural Latina/o adolescents, an understudied, vulnerable population. The findings can help researchers and health educators implement programs to help this vulnerable population.

Attentional Capture While Dual Tasking

Mark Patrick Cubillan
Sponsor: Steven Luck, Ph.D.
Psychology

In day-to-day life, we constantly search complex visual scenes for objects that are relevant to our immediate goals. One key question is whether certain kinds of salient stimuli can involuntarily "capture" our visual attention. For example, do we attend to a stop sign simply due to its bright red color? In the current study, we measured how cognitive control to avoid salient distractors may wax-and-wane with increasing task demands. More specifically, we compared performance on a visual search task under full and divided attention. To divide attention, we had participants perform a visual search task with a concurrent tone counting task. We predicted that if cognitive demands were increased through a concurrent dual-task, cognitive control would decrease causing increased attentional capture by the salient task-irrelevant distractors. However, much to our surprise, both electrophysiological and behavioral evidence suggest that a concurrent dual-task does not increase attentional capture to task-irrelevant stimuli. We will discuss implications and directions for future research.

The Importance of Increasing Fellowship Resources for Undocumented Students

Jesica Cuervo Palacios
Sponsor: Luis Esparza, M.A.
Internship & Career Center

The number of Undocumented students at the University of California system continues to grow every year. Fortunately, they are resources available for Undocumented students such as programs, scholarships and student centers. However, the majority of Undocumented students experience a lack of fellowships opportunities that helps them navigate their journey in their field of interest. The lack of fellowships opportunities for Undocumented students, creates a barrier that stops them from learning new skills, that can help them increase their career development experience. This research focuses on the importance of developing fellowships opportunities that allows students to develop a set of skills, as well as a memorable experience that can benefit their career goals. This research will be exploring the structures of fellowships available to Undocumented Students in higher education and comparing them to the Mentorship and Professional Development Fellowship program at UC Davis. As a result this research will also propose ways to increase and improve fellowship resources to help prepared the undocumented students on college campuses and allow them to gain professional experience. This research aims to contribute to increase the opportunities and representation for Undocumented students in the field of Student Affairs and Career Development.

Understanding the Role of XRCC2 in DNA Repair by Designing and Cloning Bacterial Plasmids for Complementation Tests

Petra Dahms
Sponsor: Jacqueline Barlow, Ph.D.
Microbiology & Molec Genetics

XRCC2 is a DNA repair protein belonging to the RecA/Rad51 protein family and is involved in homologous recombination-mediated repair of DNA in humans. DNA repair proteins are important because they help maintain chromosome stability by repairing DNA damage. Although XRCC2 plays an important role in DNA repair, its precise role in homologous recombination is not known. Previous work in our lab has found that antibodies for XRCC2 are nonspecific, which provides no accurate way to study XRCC2 in cell culture. The goal of my research is to develop a method to find where XRCC2 localizes in the cell in response to DNA damage. This may aid in understanding the role of XRCC2 in DNA repair and how the XRCC2 protein is modulated in response to DNA damage-inducing treatments. I have designed and cloned various plasmids containing XRCC2 tethered to GFP. These plasmids will be used for complementation tests in XRCC2 knock-out mammalian cell lines, where the insert XRCC2-GFP will allow us to monitor XRCC2 expression using GFP-specific antibodies. By finding where XRCC2 acts in the cell, I hope to learn more about its specific role in homologous recombination.

Creation of a UV-Sensitive Silicon Photomultiplier Array for Use in the Davis Xenon Experiment

Olivia Dalager
Sponsor: Sudhindra Tripathi, Ph.D.
Physics

Tetraphenyl butadiene (TPB) is a known UV to blue wavelength shifter. We use this compound to improve the efficiency of silicon photomultipliers (SiPMs), solid state light detector. By shining 250 nm UV light at different thicknesses of TPB deposited on fused silica wafers, we determine the optimal TPB thickness that maximizes the ratio of relative transmittance and reflectance of photons interacting with TPB. This project was done as part of a larger project to test the efficacy of SiPMs to detect UV scintillation light from dual phase liquid noble time projection chambers. To this end, our group has spent the last year constructing the Davis Xenon Experiment (DAX), a test-bench for dual phase liquid noble element direct detection dark matter detectors. This talk will go in depth about my work determining the optimal thickness of TPB to coat a SiPM array and an experimental overview of the goals for DAX.

A Study of Body Diversity in Teleost Fishes as It Relates to Marine and Freshwater Environments

Mailee Danao
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Freshwater and marine environments each produce their own unique selective pressures which result in variation in body morphology in teleost fishes. Relative body depth may be affected by many factors, including pressures to heighten maneuverability. Given that conditions vary extensively between marine and freshwater environments, we hypothesize that there is a disparity between the variation of body depths between fish from marine habitats and those in freshwater habitats. Furthermore, considering that saltwater is comprised of a larger amount of habitats, we expect to see a larger body depth diversity among marine species. Using morphometric data collected from the Smithsonian, we will take the measurements of body depth and standard length to compare marine and freshwater teleost fishes. Our preliminary findings indicate that freshwater fishes have deeper body depths than marine fishes, however until further analyses are conducted that take phylogeny into account, it is difficult to relate this to overall body depth diversity. Analysis of these data will provide new insight into the variations of morphology across vastly differing habitats, allowing us to better understand morphological consequences of residence in a freshwater or marine environment, as well as macroevolutionary trends across teleost fishes.

Waste Reduction and Carbon Sequestration Through Compost Production and Spreading

Mario D'Andrea
Sponsor: Camille Kirk, Ph.D.
Environmental Stewardship

Carbon dioxide has a lifetime of tens of decades in the atmosphere, which means that simply halting carbon emissions will not halt climate change. For this reason, we must investigate methods of capturing atmospheric carbon and storing it in a form that cannot act as a greenhouse gas -- a process known as sequestration. Research from The Marin Carbon Project shows that compost, when applied to rangeland, sequesters approximately one ton of carbon per acre per year. In the context of California, if compost were applied to 5% of the state's rangeland and sequestration occurred uniformly at this rate, nearly 8% of the state's total annual emissions would be offset. Based on these findings, the UC Davis office of sustainability wished to determine the carbon sequestration potential of compost amendments on campus soil. By determining the amount of organic waste produced by UC Davis and the area of land available for the application of compost, we were able to calculate the amount of carbon that could be sequestered on campus lands. These findings will be incorporated into the campus' climate action plan, which details the steps UC Davis will take to achieve the UC-wide goal of carbon neutrality by 2025.

Hyperglycemia-Induced Activation of Exchange Protein, Epac, in Cardiac Myocytes

Saba Daneshpooy
Sponsor: Laetitia Pereira, Ph.D.
MED: Pharmacology

One of the most common causes of death among diabetics is heart disease. Epac, an exchange protein directly activated by cAMP, is emerging as a key player in heart failure and arrhythmia, as seen in diabetes. Recently, a study has found that diabetic arrhythmia can be induced by hyperglycemic dependent activation of Ca^{2+}-Calmodulin Kinase II (CaMKII), a downstream effector of Epac. However, the role of Epac in the activation of CaMKII during hyperglycemia has never been addressed. The scope of this project is to study the activation of Epac in hyperglycemia in cardiac myocytes. We used freshly isolated rabbit cardiac myocytes obtained by Langendhorff perfusion method. In hyperglycemic conditions, Epac was activated as seen by the increase of Rap1-GTP production assessed by pull-down assay and western blots. Functional Epac activation was confirmed, using confocal microscopy, by Epac translocation observed in cardiomyocytes loaded with the Epac-specific fluorescent dye, F-O-Me-cAMP. Our data suggest that Epac is indeed activated in hyperglycemia and as such could be involved in diabetic arrhythmia. This project will help develop new therapeutic treatments for diabetic arrhythmia and heart failure.

A Farewell to Alms: Hemingway's Development of American Existentialism

Joshua Davis
Sponsor: Mark Jerng, Ph.D.
English

In the late nineteenth and early twentieth century, the academic examination of the theological and philosophical understanding of an absolute objective truth was well underway. However, the treatises of Existentialists such as Kierkegaard and Nietzsche, which railed against dogma created by Platonism and Christianity, did not enter popular discourse until the 1930's. I argue that the incomprehensible physical and psychological violence of the First World War, which could not be reconciled with rigid interpretations of Platonism and Christianity, acted as the catalyst that opened discourse of Existentialism. Authors such as Dos Passos, Cummings, and Hemingway, who themselves were disillusioned by the sufferings they witnessed, exported this discourse to the American public. Although some products of this disillusionment veered inevitably toward a nihilistic cliff, others turned to a more immediate and empirical good. In this project, I intend to analyze the ways in which Hemingway's A Farewell to Arms and Our Time register and respond to the existential crisis at the turn of the century. I propose that the intervals of respite that act as counterpoints to the prevailing theme of fatalism in his works posit a humanist response to the trauma of the Great War as an alternative to nihilism.

Utilization of Feces to Examine the Gut Microbiota of Foals From Birth to Weaning

Ubaldo De La Torre
Sponsor: Michael Mienaltowski, D.V.M.,Ph.D.
Animal Science

Very few studies have been conducted to understand the gut microbiota of foals. A healthy gastrointestinal (GI) tract with a properly established microbiota is necessary for a foal to develop into a healthy weanling/adult. Thus, the foal's health can be critically impacted by aberrations in the microbiome leading to symptoms including diarrhea. Much still needs to be understood regarding the gut microbiota of diarrheic foals. We hypothesize that the establishment of the gut flora in foals is directly correlated to the diet consumed and environmental exposure and may be predicted using Next-Generation Sequencing (NGS). In this study, fecal samples from 42 sets of foals and mares were collected at multiple time points ranging from birth to weaning. Bacterial DNA was isolated from the samples and 16S rRNA gene sequencing was performed to characterize the microbiome as well as the relative abundance of microbiota present. With the detection of specific microbiota, we will be able to recognize which bacterial populations should be present in healthy vs. unhealthy foals and more importantly may be able to define the role of certain populations in future studies.

Interactome Analysis of CaMKII in Cardiac Myocytes Using a Proximity Labeling Approach

Erin de Leon Sanchez
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

Numerous studies find that Calmodulin-dependent protein kinase II delta C (CaMKIIδC) plays an essential role in pathological cardiac remodeling and arrhythmogenesis. Nonetheless, little is known about CaMKIIδC targeting, and many of its substrates and regulators have yet to be identified. Here we use a proximity labeling approach with a third generation biotin ligase (BirA*) to identify the CaMKIIδ interactome in cardiomyocytes. Using site-directed mutagenesis, we created a range of CaMKIIδ-BirA* fusion proteins: δB and δC isoforms, N- and C-termini fusions, short and long linkers, wildtype and T287A and T287D mutants. These fusion proteins and the functionality of BirA* were verified in human embryonic kidney cells (HEK293) before proceeding with adenovirus generation for experiments in cardiomyocytes. Following expression of the CaMKIIδ-BirA* fusion proteins, cardiomyocytes were exposed to 500 µM biotin for ten minutes to two hours. Following the labeling period, myocytes were lysed and biotinylated proteins were purified with streptavidin dynabeads. Samples were submitted for proteomic analysis following on-bead trypsin digestion. Preliminary data indicates that proximity labeling with BirA* is a viable approach to identify new substrates and novel regulators of CaMKII in cardiac myocytes.

Compliant Usage of High Efficiency Air Cleaners for Children With Asthma

Kestner Brae De Vera
Sponsor: Deborah Bennett, Ph.D.
MED: Public Health Sciences

Indoor air pollution can cause severe respiratory health in many communities. Particulate matter, with other airborne chemicals, have been linked to affect children's health in low-income areas. A study conducted in two regions across California (Fresno and Riverside) helped look at the compliance of households with asthmatic children. With stand-alone air cleaners installed into 200 homes, looking at the efficiency of family home usage provided data to measure utilization of this form of respiratory health issue intervention. Collected data from the households were documented every six months, each with a setup during the beginning of the six month mark and added documentation a week after. For the first six months at the beginning of the sampling week for both regions, the average home usage ratio of the stand-alone air cleaners in 21 random houses was 85.34% (median of 99.79%). For the twelve month data at the beginning of its sample week, the ratio given 20 random houses was 82.72%. (median of 91.97%). These give implications of a potential intervention method that show signs of effective compliance. These results are useful in determining new and continuing ways to improve asthma care and public health for communities.

Measuring the Effect of MSC-secreted PGE2 on T and B Cell Activation

Dana De Vries
Sponsor: David Simpson, Ph.D.
VM: Pathology, Micro, & Immun

Feline chronic gingivostomatitis (FCGS) is a severe inflammatory disease that affects 0.7%-10% of the general cat population. Full mouth tooth extraction is currently the only FDA approved treatment for cats suffering from FCGS. Oral mucosal inflammatory diseases, such as FCGS, are linked to overactive T and B cells that mediate chronic inflammation. Mesenchymal stem cells (MSCs) were shown to have immunomodulatory effects that reduce inflammation and alleviate the clinical symptoms of FCGS. However, because not all MSCs tested were capable of mediating a positive effect, a potency assay was conducted to help predict MSC bioactivity before delivery to FCGS patients. MSCs secrete anti-inflammatory proteins such as Prostaglandin E2 (PGE2) which downregulates the proliferation of cytotoxic T cells and B cells which secrete pro-inflammatory cytokines such as interleukin-2 (IL-2).Thus, we hypothesized that if activated T and B cells were cultured with MSCs, the concentration of IL-2 would decrease due to the immunomodulatory effects of PGE2 from MSCs. PGE2 and IL-2 production was measured using ELISA to determine the effect of MSCs on T and B cells. Potency assays are important in controlling for the consistent quality of a product by identifying the essential parameters that affect its efficacy.

The Effect of Gut Methanogenic Archaea on Microbial Ecology and SCFA Production

Veronique deGracia
Sponsor: John Newman, Ph.D.
Nutrition

Methanogenic archaea are among the 200-1000 colonic microbes. Their presence may affect polysaccharide fermentation into short chain fatty acids (SCFA), which affects glucose homeostasis. We compared microbial species' effect on SCFA concentrations in feces and blood. Twenty-two overweight or obese adults consumed 0, 15 or 30 g/d of fructooligosaccharide (FOS) for 3 weeks. After each treatment period participants underwent a 9-hour meal challenge, during which 12 blood and 9 breath gas samples were collected. Participants consumed half their dose of FOS with breakfast followed by a standard lunch. Five-day stool collections were analyzed for SCFA and microbial abundance. SCFAs were also measured in the blood. Fecal clostridium cluster I abundance was higher in methane-producers (MP) than in non-methane producers (NP) ($p<0.05$). The percentage of fecal butyrate declined with abundance of lactobacillus lactis_subsp_cremoris in MP ($p<0.05$) but not in NP while formate increased with L. lactis in MP ($p<0.05$) but not in NP. Treatment with FOS did not affect species abundance or SCFA concentration. The presence of methanogenic archaea may affect the ecology of the microbiota, colonic SCFA production, and metabolic health in general.

Physiological Versus Perceived Stress in Children and Adolescents

Jenna Dekeater
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Stress is an inevitable part of life and the accumulation of daily stressors can have negative long-term consequences on our overall health. Early-life stress, in particular, can contribute to health problems later in life. The ability to accurately perceive one's stress level may be an important tool in self-regulation and stress management. This study examined the difference in the ability to accurately estimate stress levels during a stress test between a group of children (ages: 9-10 years old, N = 81) and a group of adolescents (ages: 15-16 years, N = 79). Children and adolescents underwent the Trier Social Stress Test (a laboratory stress task including a public speaking challenge and a mental arithmetic task). Salivary cortisol samples were used as a physiological measure of stress reactivity. Participants then self-reported their perceived stress level on a scale from 1 to 5. Statistical analyses showed that adolescents' perceived stress was more strongly correlated with their biological stress levels assessed by cortisol ($r = 0.277$, $p = .012$) than children's ratings were ($r = 0.086$, $p = .451$). This suggests that interventions could be used to aid young children's recognition of feeling stressed, which might help them better regulate their stress responses.

White Guys Only? Racialized Language and Self-Esteem on Grindr

Zenjief Del Castillo
Sponsor: David Orzechowicz, Ph.D.
Sociology

Building on studies about race relations in the Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, and Asexual (LGBTQIA) community, I examine how gay and bisexual white men and men of color experience racially inclusive and non-inclusive language on Grindr. Grindr, a geo-social networking app primarily used by queer-identified men, is useful for studying the intersectionality of race and sexuality because it is one important way that these men seek out specific types of sexual, romantic, and platonic relationships. Particularly, Grindr is an important socio-digital space for queer men to initiate and build different types of social relationships. Drawing on original data from an online survey about Grindr use, I find that racial identity and racialized language shape how men experience the app in unequal ways. While certain elements of the Grindr experience surpass racial identities, such as its impacts on self-esteem and negative feelings associated with racially non-inclusive language, other experiences are unique to non-white men. I consider the implications of these findings for the racial inequalities in the LGBTQIA community.

Development of Software Capability to Enable 3D Display of Scanning Probe Microscopy Images

William Deng
Sponsor: Gang-Yu Liu, Ph.D.
Chemistry

3D nanoprinting is currently a frontier area of research and development in additive manufacture as well as academia, due to its ability to print object by design with high precision. The application potential of the end products are highly promising, from nanoelectronics and photonics devices, quantum computing, chemical sensors, biosensor, to scaffold-making in tissue engineering. While 3D printers and printing are relatively routine, reaching nanometer precision is challenging. Our team has been in the forefront in developing technology to enable 3D nanoprinting. The base technology is scanning probe microscopy (SPM), including Atomic Force Microscopy (AFM). While nanometer resolution can be reached by AFM during imaging and lithography, the software in today's SPM does not support 3D option, neither lithography nor display. This is due to the intrinsic limitation of SPM, e.g. imaging surface morphology in 2D. This presentation reports our effort in adding new capabilities to enable imaging 3D structures layer-by-layer, then stacking them with nanometer precision. The program developed is integrable to today's SPM data acquisition software platform, such as IgorPro. The principle and results of this development will also be discussed.

Episodic Future Thinking and Math Achievement

Zoe D'Esposito
Sponsor: Simona Ghetti, Ph.D.
Psychology

Episodic future thinking is the mental simulation of first-person future event with rich detail of context (Tulving, 2005). Though knowledge about a possible future event (semantic prospection), or reasoning about alternative outcomes of past events (counterfactual reasoning) may provoke future-oriented behavior, episodic future thinking may do so more strongly because it allows one to experience the thoughts and feelings associated with desired future events before they happen (Tulving, 2005). We test this hypothesis by comparing the effects of episodic future thinking, semantic prospection, and counterfactual reasoning on performance of a challenging math task in 9- to 12-year-olds and college students using a novel paradigm. We also look at the number of process-based versus outcome-based strategies used in each condition. We predict that episodic future thinking will result in greater performance gains and more process oriented strategies compared to the other mentalization conditions (semantic prospection and counterfactual reasoning), oriented but that this may not be true for all age groups given developmental differences in these abilities.

Proof of Concept for UC Davis Inspector Satellite Attitude Control System

Venkata Devalaraju
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The purpose of my research is to provide proof of concept for a system that tracks and controls the orientation of the UC Davis inspector satellite. My research consists of testing acceleration sensors, light sensors, and motors. My plans are to use light sensors to detect a change in orientation. I plan to implement motors to react according to this change in orientation and use the flywheel attached to the motor to generate enough spin to control the direction the inspector satellite is pointing. My preliminary results include successful real-time accelerometer data, albeit with error. Currently, I am focusing my efforts on refining the acceleration sensors in order to eliminate error. My next steps include testing appropriate motors and manufacturing flywheels. The importance of my project lies in the need for proper orientation of a satellite launched by UC Davis.

Developing a Peer Mentoring Program for the UC Davis University Honors Program

Jaclyn Dewitt
Sponsor: J. David Furlow, Ph.D.
Neuro Physio & Behavior

Peer mentoring has been shown to provide clear benefits for both mentors and mentees by allowing mentors to develop transferable leadership skills and mentees to have a sense of community and support as they transition into college. In an attempt to determine if a peer mentoring program is a good fit for the University Honors Program (UHP) at UCD, I have studied the benefits and risks of mentoring, contacted other university mentoring programs, and received current student feedback through surveys and focus groups. This process based on previous research and student voice has led to the development of a peer mentoring framework to pair incoming first-year with second- and third-year UHP students. This framework extends to trainings, workshops, and a handbook to prepare mentors with expectations for and support in the program. Moving forward, this framework can be used as the basis for a UHP Peer Mentoring Program at the beginning of next Fall Quarter.

Investigating Rbfox3 Sufficiency for SNORD116 RNA Cloud Formation

Gayathri Dileep
Sponsor: Janine LaSalle, Ph.D.
MED: Medical Microbiology & Imm

Prader-Willi syndrome (PWS) is a complex neurodevelopmental disorder caused by the absence of a paternal gene, normally an individual's only active copy of this gene, on chromosome 15. The SNORD116 gene in this region produces RNA, which forms a cloud in the nucleus of neurons. RNA needs to be processed, or spliced, in order to form an RNA cloud. This may require the protein Rbfox3, which is only found in neurons. In non-neuronal cells, however, these RNA clouds do not form, potentially due to the absence of Rbfox3. Thus far, Rbfox3 has been shown to be necessary in the formation of RNA clouds, since the clouds do not form once it is taken out of neurons. We will investigate whether Rbfox3 is also sufficient for the formation of RNA clouds, by testing if the addition of Rbfox3 results in RNA cloud formation in cells where they do not normally form. For this experiment, we will insert an active form of Rbfox3 in non-neural brain cells called astrocytes, in which RNA clouds do not usually form. If Rbfox3 is sufficient for the formation of RNA clouds, we should later find RNA clouds in the nucleus of these astrocytes.

Discovering the Relationship Between the Microbial Community and Hummingbird Health: An Inspection of Feeders, Flowers, and Gut Microbiome

Amanda Dimech
Sponsor: David Coil, Ph.D.
UC Davis Genome Center

The purpose of our project is to study how the microbes in floral nectar and hummingbird feeder solutions can affect the microbiome in hummingbirds. Very little is known about the microbiome among birds and how it relates to their health. Thus, it is beneficial to see in what ways hummingbirds' microbiomes are affected so that they can be linked to certain pathogenic sources. Our methods for conducting this research include collecting fecal and oral samples from collected hummingbirds (as well as their health and demographic variables), along with flower, insect, and feeder samples and identifying the bacteria and fungi found in those samples. From there, we will examine the association between the microbiome of the bird and floral nectar and how this association may affect bird health parameters. The preliminary results have produced nearly 35 isolations of a variety of bacteria and fungi within the cultures that can be further studied to aid us in comprehending the microbial composition and its effects on the hummingbird population. In conclusion, the further extrapolations from this data will help to delineate potential pathogens and this information could be used towards bird conservation.

Tomato Spotted Wilt Virus Infection Effects Salivary Gland Gene Expression in a Vector Insect

David Dinh
Sponsor: Diane Ullman, Ph.D.
Entomology/Nematology

The Western flower thrips (WFT), Frankliniella occidentalis, is the primary vector of Tomato spotted wilt virus (TSWV), a pathogen that infects food, fiber and ornamental crops worldwide. The virus-insect relationship is an intimate one; efficient transmission requires virus acquisition by larvae, and inoculation to plant hosts by adults. Infection of the thrips primary salivary gland is required for virus inoculation to a plant, which occurs during insect salivation while feeding. Virus infection alters thrips feeding behavior; specifically males increase plant probing thought to lead to more efficient virus inoculation and females increase their predatory feeding on mite eggs. Investigation of gene expression in the salivary glands is important because saliva is key to interactions between the insect and the virus and insect and plant. At least 147 genes have enriched expression in the salivary glands and among female insects, virus infection decreased expression of at least one of these genes. In this study, I hypothesized that TSWV infection may also alter expression of these genes in the male primary salivary gland. I used quantitative reverse-transcription polymerase chain reaction (qRT-PCR) to verify enriched expression of four genes in the salivary glands and examined their expression in infected and non-infected male thrips.

The Moderating Role of Ethnic Centrality Between Perceived Stigmatization and Anxious Arousal Levels in Latinx Individuals

Kevin Dinh
Sponsor: Paul Hastings, Ph.D.
Psychology

Little is known whether perceived racial discrimination impacts mental health above and beyond perceived general stressors in the general Latinx community. Further, less is known whether ethnic centrality, or defining one's self primarily as Latinx, confers risk or resilience. This study examined the associations between perceived stigmatization by others, general perceived stress, and ethnic centrality on psychological distress. We hypothesized that perceived stigmatization would robustly predict anxious arousal when compared to general perceived stress. Further, we hypothesized that stronger ethnic centrality would moderate the associations between perceived stigmatization and anxious arousal such that individuals who reported high ethnic centrality and who perceived more stigmatization would show the highest anxious arousal. Latinx participants completed measures of perceived discrimination and general stress, ethnic centrality, and anxious arousal. Our results suggested that perceived ethnic and general stress predicted symptoms of anxious arousal (R^2=0.33, F(6, 94)=7.81, p<0.01). Also, ethnic centrality moderated the association between perceived stigmatization and anxious arousal. Participants who perceived more stigmatization and were more ethnic centric showed more anxious arousal (b=0.62, t(3, 97)=5.90, p<0.001). These findings suggest that, in the context of perceived stigmatization, ethnic centrality may underscore a person's racial or ethnic identity status and therefore exacerbate anxious arousal.

Measuring the Effect of MSC-secreted PGE2 on T and B Cell Activation

Anthony Diomino
Sponsor: David Simpson, Ph.D.
VM: Pathology, Micro, & Immun

Feline chronic gingivostomatitis (FCGS) is a severe inflammatory disease that affects 0.7%-10% of the general cat population. Full mouth tooth extraction is currently the only FDA approved treatment for cats suffering from FCGS. Oral mucosal inflammatory diseases, such as FCGS, are linked to overactive T and B cells that mediate chronic inflammation. Mesenchymal stem cells (MSCs) were shown to have immunomodulatory effects that reduce inflammation and alleviate the clinical symptoms of FCGS. However, because not all MSCs tested were capable of mediating a positive effect, a potency assay was conducted to help predict MSC bioactivity before delivery to FCGS patients. MSCs secrete anti-inflammatory proteins such as Prostaglandin E2 (PGE2) which downregulates the proliferation of cytotoxic T cells and B cells which secrete pro-inflammatory cytokines such as interleukin-2 (IL-2).Thus, we hypothesized that if activated T and B cells were cultured with MSCs, the concentration of IL-2 would decrease due to the immunomodulatory effects of PGE2 from MSCs. PGE2 and IL-2 production was measured using ELISA to determine the effect of MSCs on T and B cells. Potency assays are important in controlling for the consistent quality of a product by identifying the essential parameters that affect its efficacy.

Targeted Mutagenesis to Assess the Role of DMC1 SUMOylation in Meiosis

Alexander Ditzel
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Defects in Homologous Recombination (HR) is a hi-fidelity DNA double-strand break (DSB) repair mechanism that plays key roles in maintaining genomic integrity of mitotic cells, and chromosome segregation in meiotic cells. Meiosis is a specialized reductive cell division in which a diploid parent undergoes two rounds of divisions to give rise to four haploid daughter cells. In budding yeast, this leads to the formation of four spores encased in a spore wall. Meiotic HR is tightly regulated through post-translational modification (PTM) of proteins. SUMO (Small Ubiquitin-like MOdifier) is a PTM that binds specific lysine on its protein substrates, and modifies their structure and function. We found that DMC1, a key component of the meiotic HR machinery, is SUMOylated during meiosis in budding yeast. We mutated the SUMO sites in DMC1 using Gibson assembly, and made yeast strains defective in DMC1 SUMOylation (DMC1-SNM). We then analyzed the spore viability and recombination rates in these strains. Here we report our results.

The Campus-Community Debate: Re-Viewing Asian American Studies as a Community in the 1980s

Tiffany Do
Sponsor: Richard Kim, Ph.D.
Asian American Studies

Asian American studies emerged from the late 1960s social movements. As part of the broader movements for social change in American society, the core principles of Asian American studies emphasized social transformation, empowerment, and knowledge production. These principles also stressed the importance of community engagement as communities were viewed as primary sites for social change. The 1980s, however, brought significant challenges to the field such as demographic changes in Asian American communities, neoconservatism, and institutional cooptation. Out of these struggles, a campus-community debate emerged that contended scholars on college campuses were disconnected from the communities they were studying and supposed to serve in keeping to the founding principles of the field. In my thesis, I challenge this dichotomization of the campus and community. I argue that scholars' responses to the dilemmas of the 1980s reveal the ways the campus can be viewed as a form of community in itself. The 1980s were a critical time for Asian American studies, as the field struggled to secure its position within the academy while adapting to the changing times. As many of the challenges of the 1980s have continued, reexamining the campus-community debate has implications for how we view the field today.

High Resolution Imaging to Understand the Complex Non-Homologous Chromosomal Associations During Meiosis

Nhu Doan
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Meiosis is a complex cell division involving pairing of homologous chromosomes, crossover formation and chromosome segregation. Faithful completion of each step is essential for the formation of eggs and sperms. Meiotic impairments are associated with failure to complete the meiotic division, apoptosis and thus infertility. Here we describe a unique mouse model with high incidence of non-homologous chromosome pairing and embryonic lethality. We employed super-resolution imaging to understand these complex chromosomal associations and observed that the non-homologous connections were being stabilized by crossover formation. Regardless of such abnormal non-homologous associations during meiosis, these mice showed no obvious difference in testis size and sperm count suggesting that such connections completely escape meiotic checkpoint machinery. However, the litter size was significantly smaller and these mice also presented with high incidence of embryonic lethality suggesting aneuploid gametes formation. Our investigation provided the insight into the possible mechanism for enriching chromosomal aneuploidy during gamete formation.

The Campaign to Criminalize Marital Rape in California

Miriam Dombrowski
Sponsor: Lisa Materson, Ph.D.
History

Historians have pointed to Oregon v. Rideout as the case that catapulted marital rape into the mainstream consciousness, and thereby catalyzed the successful campaign to criminalize forced marital intercourse in all 50 states. At the time of the 1978 trial, 45 states, as well as federal and military laws, made exemptions from prosecution for marital rape. However, although all state governments either withdrew or judicially voided these exemptions by 1993, most state laws continued to categorize victims of rape based on their legal relationship to the perpetrator. This paper examines the history of California's campaign to criminalize marital rape in 1978 extending to the present day, drawing on oral interviews, as well as transcripts of congressional committee meetings and trials in order to analyze the arguments policy makers put forth to defend past and current victim distinctions. Arguments by prevalent political players have philosophical roots in English common law and can be connected to the broader function and significance of the institution of marriage in the United States: maintaining the status quo.

The Effects of Infants' Looks to Parents' Face on Play Behavior

Anna Don
Sponsor: Lisa Oakes, Ph.D.
Psychology

The interaction between parent and infant is vital for human development, specifically the dynamic reciprocal action that occurs between mother and child during play sessions. Previous research has shown that infants use their caregivers as a "secure base" during exploratory play behavior, which demonstrates the importance of parental involvement in infant's learning about the world around them. We are exploring this parental influence on play behavior using eye-tracking data collected during mother-infant play in the lab. Specifically, as mothers and 8- to 10-month-old infants play with toys, we ask how infants' look to their mothers' faces is related to the infants' subsequent play behavior and exploration of the toys. Past research has indicated that infants' attention to parents' gaze can guide play interaction, thus we predict that looks to the mothers' face will be associated with a change in infants' play behavior (e.g., more touching of puzzle). We also predict that parent and infants' simultaneous attention to each other's faces, known as "mutual looks" will result in a change in infants' subsequent play activity. This study will help increase our knowledge of the effects parents have on their infants' play and exploratory behavior.

A Photoconvertible Genetically Encoded Glutamate Indicator for Neuronal Imaging

Chunyang Dong
Sponsor: Lin Tian, Ph.D.
MED: Biochem & Molecular Med

The need for molecular tools is becoming more and more critical to help to define the complex patterns of neural activity at multiple synapses interact to drive changes in circuit connectivity. In particular, the specific patterns of neural activity at individual synapses can drive the growth, stabilization, and elimination of synaptic connections. Recently, improved genetically encoded indicators of neuronal activity have allowed for functional measurements through optical recordings of calcium, glutamate, and voltage. These applications have significantly advanced the field of systems neuroscience by permitting optical recordings in specific subpopulations of neurons; however, they don't provide information to link the activity to the structural changes. Here a class of photo-convertible genetically encoded glutamate indicator was developed that would enable one to specifically record glutamate activity in subcellular compartments, such as single spines and axonal termini within the densely labeled neurons. Promising candidates were selected by absorbance reading, and we demonstrate the utility of this novel glutamate indicator in cells by measuring dF/F under a confocal microscope. We also expect that our design strategy can be applied to other types of neurotransmitter indicators which allow multiplex imaging of synapses or super-resolution imaging, etc.

Engineering Improved Host Strains for Synthetic Genetic Oscillator

Joy Doong
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

A genetic oscillator is a genetic circuit that switches between two states with a consistent period. This could act as a timekeeper or counter in complex biological devices. Previously published oscillator circuits have delivered inconsistent and unsustained oscillating outputs. We hypothesize that improvements can be made by reducing the influence of two factors: (1) the potential for non-linear inducible response to external stimuli and (2) the molecular crosstalk between the oscillator circuits and the related pathways in the host. To address these factors, we are building new genomically engineered host strains by deleting specific genes using the Scarless Cas9 Assisted Recombineering method, which we have successfully adapted and refined to make single modifications in about two weeks. Thus far, we have made two of the four planned modifications, verified by either genetic or functional screens. We will sequence the genomes to verify our modifications, and then test the knockout strains by examining differences in the input-output behavior of promoters in response to exogenous inducers. Finally we will study how the new host strains influence the behavior of the oscillator circuits.

The Efficacy of Philanthropy in Establishing Equitable Park Access: A Study of Public-Private Partnership (P3) Parks

Emily Dorrance
Sponsor: Gwendolyn Arnold, Ph.D.
Environmental Science & Policy

Public-private partnerships have become popularized as a strategy to fund the creation of urban green spaces, yielding high profile parks such as the High Line in New York and Grand Park in Los Angeles. While P^3 arrangements are highly varied, encompassing everything from financial deals to development agreements to stewardship contracts, there are concerns that the planning processes for P^3 parks do not adequately incorporate a discussion of municipal objectives or equitable access for marginalized communities. This study evaluates community outreach efforts and discussions of equity for several P^3 parks through analysis of planning documents and news articles. Next, these intentions are compared to actual equity outcomes through evaluation of subsequent news coverage as well as spatial analysis. Finally, this analysis aims to identify shortcomings of current methods, as well as channels for improving equity outcomes in P^3 parks in order to provide the public health benefits of green spaces to key populations.

Failing Masculinity/Machismo: On Junot Diaz's Short Story Collections

Kevin Dousa
Sponsor: Hsuan Hsu, Ph.D.
English

Scholarly work seems to attribute to Junot Diaz' texts the stance that the works are a holistic and penetrating view of Latino-American identity. However, what these scholars leave open for questioning is how exactly does Diaz's text make possible that representation of identity. In this text I will explicate how Junot Diaz, in his collection of short stories entitled, Drown and This is How You Lose Her, complicates Latino male gender identity by calling into question the operation and presentation of male bodies through problems with nationality, queerness, and white supremacy. Throughout the stories, the male body is the the main motif, if you will, on what actions comprise the limits of masculinity in the face of the aforementioned complicating categories (nationality, queerness, white supremacy). Thus, the assumptions, social powerlessness, and anxieties sustained by Latino male bodies are exacerbated by a failure of "machisimo," which is demonstrated through a troubled relationship to American-ness, fear of queerness, and the negative coercive cognitive effects of the internalization of white beauty standards. These collections of short-stories work as the chronicling of the emasculation of the Latino immigrant man foremost demonstrated by his inability to regulate his body according to impossible gendered standards.

Effects of Variation in Floral Resource Availability on the Pollen Resources Collected by the Yellow-Faced Bumblebee (*Bombus Vosnesenskii*)

Jessica Drost
Sponsor: Neal Williams, Ph.D.
Entomology/Nematology

Anthropogenic land-use change frequently reduces the availability of floral resources on which all bees rely for food, and is thus a major driver of ongoing bee declines. Understanding which plant species bees rely on for food resources is fundamental to mitigating such declines. We used experimental bumblebee colonies (n=7) and surveys of floral resources in the landscape to evaluate how variation in the abundance and temporal distribution of flowering plants affected the types and amount of pollen resources collected by the Yellow-Faced Bumblebee (Bombus vosnesenskii). Pollen loads were collected weekly from returning foragers of each colony from May to July (2016). We identified pollen from each sample and characterized the nutritional value of pollen from dominant host plants. These data were used to determine (1) which plants were the most important pollen sources for colonies across the season, (2) how plant use varied among colonies, and (3) whether the representation of different plants in the collected pollen samples was (a) simply a reflection of their abundance in the local environment or (b) related to their nutritional quality.

The Relationship Between Admixture Proportion, Shape, and Morphological Integration in the Dentition of Rhesus Macaque Subspecies and Their Crosses

Lauren Duckworth
Sponsor: David Katz, Ph.D.
Anthropology

This study tests the relationship between admixture proportion, shape, and morphological integration in the dentition of rhesus macaque subspecies (Chinese and Indian Macaca mulatta) and their crosses. Admixture proportions in the sample (n~65) vary widely. I segmented CT-scans in order to produce 3D surface models (in Avizo Lite) for the macaque skull sample. From these models, I collected three-dimensional landmarks along the upper and lower dentition. A total of nine cranial and mandibular landmarks were collected per specimen and will be analyzed using the Generalized Procrustes Analysis (GPA) in R studio. The study will estimate correlations between admixture proportion (percentage genetic contribution from each full bred line) and the primary patterns of (1) dental shape, and (2) covariance between the maxillary and mandibular tooth rows. The analysis quantifies morphological variation as it applies to interbreeding. The results may provide insight into how functional morphology responds to interbreeding between relatively isolated lineages.

Discovering the Relationship Between the Microbial Community and Hummingbird Health: An Inspection of Feeders, Flowers, and Gut Microbiome

Emily Dunsmore
Sponsor: David Coil, Ph.D.
UC Davis Genome Center

The purpose of our project is to study how the microbes in floral nectar and hummingbird feeder solutions can affect the microbiome in hummingbirds. Very little is known about the microbiome among birds and how it relates to their health. Thus, it is beneficial to see in what ways hummingbirds' microbiomes are affected so that they can be linked to certain pathogenic sources. Our methods for conducting this research include collecting fecal and oral samples from collected hummingbirds (as well as their health and demographic variables), along with flower, insect, and feeder samples and identifying the bacteria and fungi found in those samples. From there, we will examine the association between the microbiome of the bird and floral nectar and how this association may affect bird health parameters. The preliminary results have produced nearly 35 isolations of a variety of bacteria and fungi within the cultures that can be further studied to aid us in comprehending the microbial composition and its effects on the hummingbird population. In conclusion, the further extrapolations from this data will help to delineate potential pathogens and this information could be used towards bird conservation.

Modulating Co-Culture of Bacteria Through Anti-Oxidants and Liposomes

Alexander Duveneck
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Microbial consortia are often designed to study natural phenomena and to synthesize new biological products. However, co-culturing anaerobic and aerobic bacteria together remains a challenge. Here, I develop a co-culture of Lactobacillus acidophilus and Escherichia coli under aerobic conditions to study their interactions. My results suggest 1% (volumetric ratio) antioxidants can help the growth of L. acidophilus with negligible effect on the growth of E. coli. Additionally, L. acidophilus might inhibit E. coli through the production of antimicrobial peptides. To this end, I am supplementing liposomes in the co-culture to sequester secreted compounds from L. acidophilus, which is expected to mitigate inhibitory interactions between bacterial species and therefore stabilize the co-culture. My work will demonstrate the first co-culture between liposomes, facultative anaerobic bacteria, and aerobic bacteria. Furthermore, because E. coli and L. acidophilus exist in the natural gut microbiome, this simple ecosystem will also demonstrate the potential for liposomes to direct species selection in the gut microbiome.

Understanding Solute Location Effects on Photolysis of Nitrate in the Medium of Ice

Kasey Edwards
Sponsor: Cort Anastasio, Ph.D.
Land Air & Water Resources

Snow can act both as a photochemical source and sink for atmospheric pollutants. However, reactions rates within snowpacks are the subject of debate due to the complex nature of ice as a reaction medium. The photolysis of nitrate is one such contested reaction. Solutes in snow concentrate into three primary locations: (1)liquid-like regions at grain boundaries and the surface of air bubbles, (2) distributed within the bulk ice matrix, and (3) at the air-ice interface. The effect of these different locations on the photolysis of nitrate in ice was examined via measurement of the quantum yield. Nitrate photolysis proceeds via two major pathways: (1) $NO_3^- + hv \rightarrow NO_2^- + O(^3P)$ and (2) $NO_3^- + hv \rightarrow NO_2 + OH$. Prior research has suggested that the quantum yield at the Air-Ice Interface may be enhanced Here, we investigate the quantum yield of nitrite formation in each of the three solute locations. Our results indicate that there is an enhancement of up to three fold at the air-ice interface relative to the other solute locations.

Is Ibuprofen-Induced Reactive Oxygen Species Generation in Cardiac Cells Dependent on NADPH Oxidase 4?

Emily Eijansantos
Sponsor: Aldrin Gomes, Ph.D.
Neuro Physio & Behavior

Non-steroidal anti-inflammatory drugs (NSAIDs) like Ibuprofen (IB) are used by over thirty million Americans daily for pain relief from a variety of conditions. Ibuprofen is among the prescription pain medications linked to increased risk of cardiovascular disease, though the molecular mechanism by which this occurs is unknown. Experiments in our laboratory with rat cardiac H9c2 cells treated with physiologically relevant concentrations of Ibuprofen (100 µM) show an increase in reactive oxygen species generation that is statistically significant compared to control cells. Increased concentrations of Ibuprofen (500µM and 1000µM) in treated cells show an even greater increase in ROS generation. We hypothesize that the increase in ROS generation in cardiac cells is due to both the activation of NADPH oxidase 4 and mitochondrial dysfunction induced by IB. We are currently investigating whether there are changes in NOX4 activity by measuring its product, the superoxide anion, in control and treated cells using a lucigenin luminescence assay with the presence and absence of the NOX4 inhibitor, GKT137831. We will also be using a more sensitive luminol superoxide detection assay, as well as investigating changes in mitochondrial ROS generation.

Undoing Abjection: An Ethnography of Ecology House

Sophie Ellerby
Sponsor: Timothy Choy, Ph.D.
Science & Technology Studies

Ecology House was the first publicly funded low-income housing community for people with multiple chemical sensitivities (MCS). For those with MCS, exposure to low doses of chemicals and materials found in the built environments of late-capitalism produce chronic injury. Although biomedical apparatuses rendered MCS an illegitimate diagnosis, local MCS activism led the U.S. Department of Housing and Urban Development to define MCS as a disability and to subsequently fund their community development. The translation of the MCS to city officials, federal departments, and the local community somehow emerged culturally intelligible against biomedical, political, and social abjection of the illness. I refer to "abjection" as Judith Butler and Michelle Murphy do, as a way to theorize the social entanglements that produce not only social exclusion but also impossible social subjects. Scholars have detailed how MCS as an emergent illness has become abject in different contexts, but Ecology House presents a site to theorize how abjection is undone. I provide an ethnographic account of Ecology House through fieldwork and interviews with Ecology House activists and residents. In my research, I trace how social entanglements particular to Marin County made Ecology House possible and evoke the notion of a partially undone abjection.

Dissecting QTLs by Creating Large Chromosomal Deletions Using CRISPR/Cas9

Daniel Ellison
Sponsor: Richard Michelmore, Ph.D.
Plant Sciences

Fine scale genetic mapping of phenotypic traits is traditionally reliant on recombination events or radiation-induced mutations. Both are time-consuming approaches and therefore mapping and determining causal genes is slow and expensive. To address this issue we will attempt to create large chromosomal deletions using CRISPR/Cas9 genome editing in protoplasts of lettuce (Lactuca sativa). In order to make these deletions we will use polycistronic gRNA constructs containing upwards of 20 gRNAs. We will assess how gRNA orientation in the plasmid affects the efficiency of generating deletions. We will also quantify how the efficiency of making large deletions decreases with increasing distance between gRNA targets. The use of protoplasts enables us to test many experimental parameters in parallel, while keeping experimental turnaround times short. Ultimately, we will use the information gained from the protoplast experiments to create plants with varying large deletions in order to do fine scale QTL mapping. The QTL that we will attempt to dissect determines resistance to corky root rot in lettuce caused by the bacterium Rhizomonas suberifaciens. In conclusion, this research aims to optimize CRISPR technology to create large chromosomal deletions, so that this approach can be utilized for genetic mapping.

Identifying Fusion Proteins in Epithelial Cells

Katherine Erickson
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Cell-cell fusion is a rare event in multi-cellular organisms, but plays a key role in events like zygote and muscle formation. While only specialized cells are thought to undergo cell-cell fusion, we have previously shown that normal epithelial cells (MDCK) can fuse, albeit only at self-contacts, and may express unidentified fusion protein(s). We are using the viral protein p14FAST, known to induce cell-cell fusion, as a "bait" protein to identify other fusion-related proteins. Our hypothesis is that this p14FAST protein hijacks endogenous proteins to induce cell fusion, and these proteins may also aid membrane fusion at self-contacts. The plan is to make stable MDCK cell lines expressing p14FAST tagged with BioID2 (which biotinylates nearby proteins), isolate and identify the biotinylated proteins, and then assess their role in fusion. To prevent unwanted cell fusion, I designed and constructed inducible plasmids containing p14FAST and BioID2. Upon induction, large syncytia with up to 30 nuclei were observed, suggesting that p14FAST protein is functional. With these inducible cells, I will isolate and identify biotinylated proteins, and quantify their roles in fusion. With a better understanding of cell membrane fusion, new therapies based on specifically-targeted, fusion-mediated drug delivery systems may be possible.

The Effects of New Room Accommodations on the Recollection of Exam Materials

Daffcar Erol
Sponsor: Jillian Azevedo, Ph.D.
University Writing Program

Recollection is a type of episodic memory, and it is defined as the process of remembering in great detail a prior event or a previously learned piece of information. This process uses context associations that include spatial cues to facilitate the recollection of information that is learned in a particular space. However, recent research has reported that successful recollection may be vulnerable to distractions, brain injury, and cognitive decline that is concomitant with age. In this study, I am investigating new room accommodations, provided to UC Davis students with disabilities to take their exams, as potential distractions and absence of spatial cues. The method will involve both surveys and interviews of both students who utilize room accommodations for their exams, and those who do not. The results of the analysis of room accommodations will help understand whether room accommodation provides an equal opportunity for students with disabilities to succeed academically or a disadvantage.

The Healthy Beverage Initiative: An Early View of the Metabolic Substudy

Elsa Esparza
Sponsor: Laura Schmidt, Ph.D.
Health Policy

Consumption of sugar-sweetened beverages may be a key contributor to the obesity epidemic because of the incomplete compensation for total energy (Malik 2016). In response to these concerns, UCSF launched the Healthy Beverage Initiative (HBI) in an effort to align campus policies with the growing body of literature regarding the negative impact of excessive sugar consumption on health. UCSF is the first university that included both the campus and the medical center to ban the sale of SSBs. Embedded within the larger HBI study is a randomized trial of 214 UCSF employees who report heavy SSB consumption at baseline (The Metabolic Substudy). Within this substudy, participants were randomly selected to receive a motivational intervention. The intervention group reduced sugary beverage consumption compared to those in the control group (83.91% of intervention participants said they reduced, 61.36% of control participants said they reduced; $p = 0.0008$). For both the control and intervention groups, we saw a marginally statistically significant decrease in BMI, along with a decrease in waist circumference over the entire metabolic substudy sample. There is some promise that a multi-level intervention that includes changing the food/beverage environment and individual counseling may be more effective than policy change alone.

Just Keep Swimming: Caudal Peduncle Diversity in Marine and Freshwater Fishes

John Estrada
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

A fish's caudal peduncle, the attachment point of the tail fin, can affect its maneuverability, speed, and swimming style. We are studying depth and width of the caudal peduncle in marine and freshwater fishes to find differences in average shape and to analyze whether shape diversity is more varied in freshwater or marine habitats. By comparing caudal peduncle shapes of related species in different environments, we hope to discover if increases in body shape variance are more connected to the greater space and niche availability in oceans, or to the potential for population-splitting events in rivers and lakes. Transitions between freshwater and saltwater habitats in the past could have encouraged changes in body shape to fit new lifestyles. For this study, we took linear body measurements of specimens in the Smithsonian Museum of Natural History's collections. Previous studies on body shape variance in different habitats have focused on smaller groups of species; ours includes over 800 species. Using R, a programming language for statistical computing, we are looking for trends in relative caudal peduncle depth and width, depth to width ratios, and variance from the average size.

Stretch-Dependent Akt Regulation and Nuclear Localization in Epithelial Cells

Makena Ewald
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Physical force has emerged as a key regulator of tissue homeostasis, and plays an important role in embryogenesis, tissue regeneration and cancer progression. During metastasis, cancer cells must invade dense extra-cellular-matrix, and are thus exposed to mechanical stimuli. To probe signaling molecules that regulate mechano-responses, we designed a simple, easy-to-fabricate, large-scale cell stretch device for biochemical analysis. Using phospho-specific antibodies, we analyzed Akt signaling (often misregulated in cancer) in epithelial cells exposed to prolonged cyclic substrate stretch. Although the overall Akt levels did not change upon stretch, Akt phosphorylation at S473, and thus Akt kinase activity, decreased, suggesting that Akt-mediated signaling is inhibited upon cell stretch. Additionally, while phosphorylation of other Akt effectors remained unchanged, phosphorylation of GSK3ß, a downstream effector of the Akt pathway, was reduced with stretch. These data suggest the Akt-GSK3ß pathway is force-sensitive. Interestingly, Akt localizes to the nucleus shown previously and confirmed by GFP tagged Akt. We hypothesize that cyclic stretch activates Akt nuclear function to regulate gene expression. Currently, we are biochemically analyzing Akt localization and the consequences of decreased Akt kinase activity. These results demonstrate the force dependence of Akt regulation and possible localization, and highlight potential Akt functions in cancer.

Investigating a Missing Link in the Mechanism of Cytochrome c oxidase: Prediction and Analysis of Internal Water Chains

Ardavan Farahvash
Sponsor: Alexei Stuchebrukhov, Ph.D.
Chemistry

Cytochrome C Oxidase (CcO) is the terminal enzyme in the respiratory electron transport chain; its bi-nuclear center (BNC) catalyzes the reduction of oxygen to water. Key to understanding the mechanism of this catalysis is the question of how protons are transported to the BNC – presumably by water chains in the enzyme, which have not been resolved in experimental X-ray structures so far. Here we present an analysis of the solvation of CcO near the BNC, and a potential solution to the problem of missing water chains in X-ray structures. Through analysis of the BNC with the solvation software Dowser++, recently developed in our group, it was shown that there are several energetically favorable solvation sites near the BNC, and that these sites could account for the missing water chains leading to the BNC. MD simulations were performed to investigate the dynamic nature of water molecules in these predicted solvation sites.

Subjective, Sexual Well-Being Among LGBTQIA College Students: An Exploration of the Role of Social Networking Sites and Applications

Alexander Farquhar-Leicester
Sponsor: Paul Hastings, Ph.D.
Psychology

The Internet and, specifically, social networking sites (SNSs) have been shown to provide myriad functions for sexual minority individuals, including managing their identity, exploring their sexuality in a safe, mediated space, and the opportunity to engage in experiential learning (Craig & Mclnroy, 2013; Fox & Ralston, 2016; Hiller, Mitchell, & Ybarra, 2012). However, little research has examined the role that SNSs and applications—specifically those geared towards sexual encounters, dating and relationships—play in the lives of young lesbian, gay, bisexual, transgender, queer, questioning, intersex, and asexual (LGBTQIA) adults. Employing grounded theory methodologies, this study explores the role that SNSs and applications, geared towards sexual encounters, dating, and relationships play in the lives of LGBTQIA college students (n = 15). Additionally, this study aims to understand the ways in which such SNSs and applications may, or may not, contribute to the subjective, sexual well-being of LGBTQIA college students. Emerging conceptual categories and themes will be presented from the interview data, currently in its initial stage of open coding.

Effect of Age on the Tenogenic Ability of Tendon Proper-Derived and Peritenon-Derived Progenitor Cells in a Murine Model

Valerie Fates
Sponsor: Michael Mienaltowski, D.V.M.,Ph.D.
Animal Science

Tendons become more susceptible to injury with age. The effect of age on the two distinct regions of the tendon, the peritenon and the tendon proper, has yet to be studied. Since differences exist between the ability of progenitor cells in tendon proper and peritenon to generate tendon-like tissue in vitro, examining how these properties change with age will help further our understanding of possible repair mechanisms in vivo. This study will compare the effects of age on tenogenic capabilities of tendon proper and peritenon-derived progenitor cells from the Achilles tendon of mice. Thus far, progenitor cells isolated from two tendon regions of young and old mice have been cultured and seeded in a regenerative construct model. Tenogenic properties of these constructs will be tested through biomechanical strength testing, a collagen content assay and gene expression assays, namely RT-qPCR (reverse transcription quantitative polymerase chain reaction). These methods will reveal tendon like properties via physical strength, production of structural tendon components and expression of known tenogenic genes. Upon its completion, this project will contribute to the understanding of this tendon repair model and enable improvement of medical treatment for tendon injury.

Indigenous Resistance Against Colonial Corporations

Adriana Fernandez
Sponsor: Jonathan London, Ph.D.
Human Ecology

On June 30th, 2016 I had the privilege to travel to Ecuador for a month to take two Native American studies courses through the University of California, Davis and their Study Abroad Program. We traveled to three regions: Northwestern cloud forest of the Andes, Andes highlands, and the Amazon. We were taught by humble and knowledgeable people of Ecuador, which included the mestizo communities of Intag Valley, Kichwa communities of Otavalo and Cotacachi, the Kichwa people of Sarayaku, and the Secoya people of the Aguarico River along with my professors. We learned about the resistance of indigenous communities against petroleum, mining, palm oil corporations, the government, and colonization. Ever since the oil was found in Ecuador in 1967, many of the indigenous communities have been negatively affected due to the high amounts of contamination the oil and mining corporations have caused on the lands of these communities. Although for many years there continues to be extraction of minerals, and oil by big corporations in the homes of the indigenous communities, the communities continue to work to together to resist against these big corporations. They were successful in being part of the constitution, having eco tourism, and suing big oil corporations.

Decrease in Tumor Cell Viability After Treatment With KPT-330 Is Time-Dependent in Bladder Cancer Cell Lines T24 and UM-UC-3

Aleida Fernandez-Rubio
Sponsor: Maria Mudryj, Ph.D.
MED: Medical Microbiology & Imm

Bladder cancer is the fifth most common type of cancer and the ninth leading cause of cancer death in the US. However, the standard of care for the disease has not changed in the last 30 years. In the search for a new line of treatment, the retinoblastoma (Rb) protein pathway is a good target. As a tumor suppressor, Rb localizes to the nucleus and plays an important role in controlling cellular growth and proliferation. Chromosome region maintenance 1 (CRM1) is a nuclear exporter protein that includes Rb as one of its 200 cargoes. Its expression increases Rb export from the nucleus to the cytoplasm, facilitating uncontrolled growth of tumor cells. KPT-330, a selective inhibitor of CRM1, decreases cellular viability of T24 human bladder carcinoma cells in a time-dependent fashion. In a same way, I expect that cell viability of UM-UC-3 human bladder transitional-cell carcinoma cell line will decrease after treatment with KPT-330. To test this hypothesis, I will treat UM-UC-3 cells with KPT-330 for six days measuring cell viability every two days. I anticipate that the viability of UM-UC-3 will decrease over the time course as the response to KPT-330 is time-dependent.

Children's Empathy, Perspective Taking Skills, and Beliefs About Individuals in Poverty

Alicia Figueroa
Sponsor: Rashmita Mistry, Ph.D.
Education

The recent U.S. Census Bureau population report states that there are 15.5 million children under 18 living in poverty. Previous research indicates that children develop ideas about social class during early childhood. During this period, children's moral behavior is developing in terms of their empathy and perspective taking abilities. This study focuses on how developmental differences in young children's empathy and perspective taking skills relate to their beliefs about individuals living in poverty. Specifically, we ask if children's empathy and perspective taking skills and trait attributions for individuals living in poverty are related and do they vary across kindergarten, first and second grade? Data came from a larger study that assessed children's understanding of social class in these classrooms. Students completed two measures: an empathy and perspective taking measure that captured students' emotions and responses to other children's distress, and a trait attribution measure that assessed children's endorsement of trait attributes for individuals living in poverty. Results revealed that primary students attributed more negative traits to people living in poverty and had more developed perspective taking skills than kindergarteners. It is apparent that with age, children strongly associate negative attributes with poor people and become less disposed to help them.

Plasticity of Vascular Structure and the Implications on Fruit Quality in Tomato

Amber Flores
Sponsor: Neelima Sinha, Ph.D.
Plant Biology

By the year 2050 the global population is expected to reach 9 billion. In order to feed the growing population with the decreasing amounts of arable land, there is a need for a better understanding of how to maximize crop quality and yield. For tomato (Solanum lycopersicum), fruit quality is measured by degree of BRIX, or the amount of sugar in the fruit. Within a plant sugars are transported from the leaves to the developing fruit through vascular tissue. It is currently unknown whether mature leaves can adapt their vasculature density, to what extent developing leaves change their vasculature to acclimate to stress, and to what extent this impacts fruit quality. This study aims to further our understanding of leaf vascular tissue by analyzing how vasculature responds to abiotic stress. Leaf vasculature density was measured before and after application of abiotic stress and the resulting data used to determine correlations between the change in vasculature density and the amount of BRIX in the fruit. The results from this project will help us better understand the factors that enhance tomato fruit quality and can potentially be used in the future to develop higher quality crops.

Heavy Metal Sequestration by Douglas Firs on Serpentine Soil

Angel Fong
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Serpentine soils are derived from ultramafic rocks, creating harsh soil environments with heavy metals that are toxic to plants such as Ni, Cr, and Mg. Some evergreens respond to heavy metal toxicity by sequestering heavy metals in their foliage, roots, or bark. Black spruce growing in soils contaminated with heavy metals sequesters Cu and Pb in their needles (Aznar et al., 2009), while Turkish red pine has been found to to sequester heavy metals from the air in its bark (Dogan et al., 2010). Douglas fir (Pseudotsuga menziesii) is an evergreen tree species that is widespread across the Pacific Northwest. It is non-endemic to serpentine environments but is found growing on serpentine soils in the California coast ranges. We examined potential Douglas fir adaptations to heavy metal toxicity in serpentine soils by collecting foliage from Douglas firs located on serpentine and adjacent, non-serpentine soils in the California coast ranges. Preliminary results from elemental analysis of these foliage samples suggest elevated heavy metal accumulation in needles of Douglas firs growing on serpentine soils as compared to Douglas firs growing on adjacent, non-serpentine soils. Our findings have important implications for understanding the ways evergreens adapt to heavy metal toxicity in soils.

The Effects of Emerging Amphibian Pathogens and the Implications on Natural System Health and Human Disease Incidence

Laura Fonseca
Sponsor: Michael Springborn, Ph.D.
Environmental Science & Policy

Biodiversity decline due to natural and anthropogenic shocks poses a threat to ecosystem services that underpin human well-being. The collapse of key species can have cascading effects, for example when the loss of predators of disease vectors leads to increased threats to human health. To explore the linkage between biodiversity decline and impacts to human welfare, we analyze pathogen-driven decline in amphibian populations and the connection to rising incidence of vector-borne diseases in Central America, such as malaria and dengue. We take advantage of the spatiotemporal pattern of amphibian chytrid fungus (Bd) infection and die-offs in Panama and Costa Rica to isolate the associated change in outbreaks of vector-borne human diseases. While human diseases are driven by multiple factors, the west-to-east spatiotemporal pattern of amphibian decline provides a "natural experiment"—i.e. a source of externally-driven, systematic variation in amphibian populations—that facilitates statistical identification of how these populations serve to control human disease risk. This case study empirically assesses linkages between natural system health and human well-being. The results also provide new insight for conservation and risk-management strategies in regions like the United States that are under invasion threat from emerging amphibian pathogens.

A Unique Look at Pure Chemotaxis in Human Neutrophils

Emmet Francis
Sponsor: Volkmar Heinrich, Ph.D.
Biomedical Engineering

Chemotaxis in immune cells is vital to the human immune response, and has therefore been widely studied. However, in most studies, the cells are adherent, and so they inevitably experience a multitude of chemical and mechanical cues, making it difficult to study the underlying mechanisms. In our experiments, we limit the cues experienced by a human neutrophil (type of white blood cell) by holding a non-adherent cell at the tip of a glass micropipette, and using a second micropipette to bring a source of chemoattractant towards the cell. The neutrophil responds by protruding towards the source. We call this "pure chemotaxis", because it is purely mediated by chemoattractant molecules binding to the cell. We used this method to quantify the sensitivity of neutrophils to the chemoattractant C5a by measuring the maximum distance at which the cell responds to chemoattractant sources of different sizes. Moreover, combining this technique with fluorescence microscopy, we monitored the intracellular calcium concentration during our experiments. We found that large calcium fluxes consistently accompany phagocytosis, but pure C5a-mediated chemotaxis neither requires nor causes such calcium bursts. These ongoing studies provide new insight into how human neutrophils integrate chemical and mechanical signals to produce a specific response.

Lower Tail Earnings Inequality and Crime

Konrad Franco
Sponsor: Giovanni Peri, Ph.D.
Economics

Economists have long attempted to explain crime by examining how the propensity to commit crime reacts to fluctuations in the expected utility of legal and illegal activity. For any given individual, if the expected utility of crime exceeds the expected utility of legal work, then the individual is predicted to engage in criminality. Earnings inequality serves as a proxy measure for the disparity between illegal and legal gains and is therefore theorized to be correlated with the occurrence of crime. Using a state-level panel dataset of the United States of America from 1980 to 2014 this paper interrogates the relationship between crime rates and the inequality of earnings in the lower tail of the earnings distribution. Since labor market wages and crime rates are simultaneously determined, changes to each state's legislated minimum wage are used to identify the casual relationship between lower tail earnings inequality and the incidence of crime. The favored regression model also includes several key fixed effects, to avoid omitted variable bias. We find weak evidence for the hypothesized relationship between changes in lower tail earnings inequality and crime rates. Our findings are robust to alternative model specifications.

Bounds for the Minimum Step Number for Two-Component Links in the Simple Cubic Lattice

Gabriel Freund
Sponsor: Francisco Arsuaga, Ph.D.
Molecular & Cellular Bio

The structural analysis of DNA molecules in spatial confinement has long been a topic of interest. Recently mathematicians have begun analyzing the natural linking in DNA to better understand its biological structure and function as well as its applications to nanotechnology. An important open question is to determine the minimal number of nucleotides necessary to build a DNA molecule with a pre-specified topology. Our research determines the minimum step number needed to form prime two-component links in the simple cubic lattice. Links are naturally found in mitochondrial DNA and also form during bacterial DNA replication. To accomplish this we are employing a Monte-Carlo algorithm known as the BFACF, which generates a Markov chain that samples the set of all polygonal conformations of a given link type in the simple cubic lattice. We examine all of the sampled polygons and select the one with the fewest edges. Our results include numerical bounds for the minimum step number for prime two-component links up to 9 crossings as well as their coordinate representations. These numerical bounds can be used to further the understanding of DNA in confinement and may be applied in the design of nanotechnological systems.

Episodic Memory for Emotion Words With Extended Delays

Mihoka Fukurai
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

TOR Complex 2-Ypk1 Signaling Regulates Caloric Restriction-Induced Autophagy Through the Calcium Channel Regulator Mid1

Allison Gabbert
Sponsor: Edmund Powers, Ph.D.
Molecular & Cellular Bio

Autophagy is a catabolic process in which cells degrade and recycle their own components to cope with an environmental stress. Dysregulation of autophagy leads to human diseases including cancer, Parkinson's, and Alzheimer's. The budding yeast S. cerevisiae is an ideal model organism to study autophagy because it is simple, easy to manipulate genetically, and the majority of its autophagy components are conserved in humans. In S. cerevisiae, autophagy is regulated by the kinase Target of Rapamycin (TOR), which forms two distinct protein complexes, TOR Complex 1 (TORC1) and TOR Complex 2 (TORC2). Both complexes regulate autophagy under different nutrient stresses. I am investigating autophagy induced by caloric restriction (CR) or low glucose levels, which our lab has shown is regulated by TORC2 through a downstream kinase, Ypk1. I am identifying components of the CR-induced autophagy pathway by exposing candidate knockout mutants to CR media and monitoring the processing of the autophagy protein Atg8 to measure autophagy flux. I recently determined that Mid1, a calcium channel regulatory protein, plays a novel role in CR-induced autophagy downstream of TORC2-Ypk1. I am currently identifying additional components that function downstream of Mid1 within the CR-mediated autophagy pathway.

Quantifying the Level of In Vivo Neovascularization in Ischemic Muscle Tissue Using Immunohistochemistry Techniques

Marina Gabriel
Sponsor: Eduardo Silva, Ph.D.
Biomedical Engineering

Ischemic vascular diseases remain the main cause of mortality in the US. Despite enormous investments and advances in the medical field, vascular diseases such as peripheral artery disease (PAD) are considered untreated. One promising strategy for treating PAD patients relies on the therapeutic delivery of proangiogenic factors including sphingosine-1-phosphate (S1P). Our lab works on developing novel biomaterials for the controlled delivery of S1P. My contribution in the lab efforts focused on quantifying the level of in vivo neovascularization elicited by S1P when delivered by a biomaterial. Specifically, ischemic murine muscle tissue was treated with either bolus S1P or S1P/biomaterial formulations. Immunohistochemistry techniques were used to quantify the density of blood vessels in the muscle tissue. Cluster of differentiation 31 (CD31) was used as marker of the presence of blood vessels, and muscle tissue sections were immunostained for CD31. Interestingly, bolus S1P induced a higher number of blood vessel densities as compared with S1P delivered from biomaterials. The results of this work are promising and suggests that further optimization of the biomaterial delivery system must be accomplished in order to obtain therapeutic relevant vascularization.

The Use of K-mer Minimizers to Identify Bacterium Genomes in High Throughput DNA Sequence Data

Mackenna Galicia
Sponsor: Matthew Settles, Ph.D.
Genome Center Service Cores

Bioinformatics combines the elements of biology, computer science, and statistics to work with genome sequencing. My project utilizes a sequence analysis technique, kmer minimizers, to identify bacterium from a shotgun genomic DNA sample. We used the algorithm Bevel to compare DNA sequences against standardized reference genomes in the PATRIC whole genome bacterial database. Bevel is a sequence similarity tool that uses a minimizer database. Minimizers are representative k-mers, subsequences of length k observed to have the minimum hash value across a genomic region and are therefore unique and comparable to that genomic region. The two databases are queried against each other, resulting in a list of positions where two or more sequences match. I am developing two Python applications that first, process the results of the algorithm and secondly, return a score that enable the ranking of bacterium matches. The higher the score, the better the match between the unknown bacteria and the standardized reference genome. The goal of this experiment is to show that minimizers are a fast mean of characterizing bacterial shotgun assembly contigs.

Producing hRAD54 for Structural Studies and Rational Inhibitor Design

Rudolph Gallegos
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Homologous recombination (HR) promotes high fidelity DNA repair. The HR pathway involves many proteins including RAD54, a double-stranded DNA-dependent ATPase and translocase. Recent work in the Heyer laboratory has focused on the hypothesis that RAD54 inhibitors could increase cancer cell sensitivity to anticancer treatments that produce interstrand crosslinks, a type of DNA damage normally repaired by HR. Crystallization of RAD54 will allow us to better understand how the protein interacts with DNA, and may enable rational inhibitor design. The objective of my project is to express human RAD54 (hRAD54) protein in Sf9 cells to provide starting material for crystallization attempts. To accomplish this, I used Sf9 (Spodoptera frugiperda) cells to produce hRAD54 expressed from baculovirus. I have successfully conducted high multiplicity of infection (MOI) for large scale protein production. Currently, I am upscaling cell production and aiding in DNA substrate preparation. A recent model of how hRAD54 binds to DNA suggests that the motor domain binds to dsDNA, while the N-terminus binds to single stranded DNA. We anticipate that crystallizing hRAD54 bound to dsDNA with a single strand overhang will provide a binding site for the N-terminal region, stabilizing this domain for crystallization of full length RAD54 bound to DNA.

Analyzing, Improving and Expanding Resources and Programs for Undergraduate Undocumented Students at UC Davis

Ruth Gamez
Sponsor: Andrea Gaytan, M.A.
AB540 Student Resource Center

UC Davis is home to over 500 undocumented students. As undergraduate students they have all the personal and professional qualities to succeed in the professional world. However, UC Davis does not currently offer a variety of resources tailored to undocumented students to fully develop their skills in professional settings. There is only one program that offers an opportunity for Undocumented students to obtain a paid internship: The Mentorship and Professional Development Fellowship Program offered by the AB540 & Undocumented Center (MPD Program). Due to the lack of financial assistance this program currently helps only 17 students out of more than 500 undocumented students at UC Davis (estimates coming from the AB540 & Undocumented center). This research seeks to investigate and analyze the resources available on campus for undocumented students. Additionally it will compare the life of a documented citizen and an undocumented citizen and their opportunities and qualities. This will be accomplished by conducting interviews in collaboration with the center, and the current participants of the MPD program. Results of this study will be useful to school administrators, and educators who are looking to develop more programs and support for the undocumented communities in the schools.

Numerical Solutions of Bending and Buckling of Structural Mechanics

Tului Gantulga
Sponsor: Mohamed Hafez, Ph.D.
Mechanical & Aerospace Engr

The purpose of this research is to simulate linear and nonlinear bending and buckling of structural phenomenon using a numerical technique called "Finite Difference Method" with computes. FDM splits a given region into "n" many node and applies a specified differential equation, which is turned into a function that takes in nodes with finite difference and calculates bending and buckling. Two main conditions are used, which are Boundary Condition and Initial Condition. Depending on the properties of the beam, i.e. simply supported or one end fixed, boundary and initial conditions vary. A boundary condition provides details on how the beam behaves under loading at its left and right boundaries. An initial condition only focuses on one end and provides as much information as possible with one variable missing and iterates until desired results are obtained. This is called the "Shooting Method." The accuracy can be increased by using splines. Splines connect each node and provide at least first order continuity to the numerical result. Nonlinear theory of bending and buckling are also considered and solved through different methods. The results obtained from each theory is compared with the "true" or the analytical solution that is obtained using calculus.

Gender Differences in Food Similarities Between Best Friend Dyads

Esther Gao
Sponsor: Lenna Ontai, Ph.D.
Human Ecology

Given the high obesity prevalence among adolescents, and that early eating behaviors track into adulthood, there is a need to improve adolescent dietary habits. Adolescent eating patterns may develop in relation to their peers. For example, adolescents are more likely to consume unhealthy snacks around same-gender peers than around their mother (Salvy et al, 2010). Research is limited regarding (1) food liking similarities within friendships as well as (2) whether this relationship differs by gender. It is hypothesized that female best friend dyads will have more similar food liking when compared to male best friend dyads due to girls' greater desire for peer acceptance (Barbu et al., 2011). The current study will use food liking and friendship data reported by elementary-aged youths, grades 4-6 (N = 320). Food liking was measured by asking students to report lunchtime snack foods they liked. This study examines similarities in the proportion of foods liked that are nutrient-dense out of the total list of foods reported. The research objectives will be assessed through (1) descriptive information to determine the similarity between best friend food liking and (2) using independent samples t-tests to compare similarity of food liking for boy dyads and girl dyads.

Nihilism in Metacinema: A Linguistic Approach

Jazmin Garcia
Sponsor: Karma Waltonen, Ph.D.
University Writing Program

Metafiction is incredibly nuanced and not one thing in literary discourse. Scholar Patricia Waugh defines it as "a term given to fictional writing which self-consciously and systematically draws attention to its status as an artefact in order to pose questions about the relationship between fiction and reality." Similarly, metacinema sees techniques working together to bring attention to its overall form, but like its literary counterpart, its 'meta' component can be differently achieved. For instance, 'meta' can be used to describe a film about filmmaking, a film that has characters directly acknowledging its audience, and a film that refers to itself as a film. Depending on their approach to 'meta,' these films stake a unique claim about the relationship between fiction and reality. Analyses of these films often verge on nihilism, which is a stance bolstered by the characters' language. In this sense, a linguistic lens would provide further insight into these films' self-referential techniques. Considering that meta-films call attention to their status as films, it would also be interesting to denote when reflexive pronouns are used and how they help blur the line between fiction and reality and subsequently inform nihilistic stances, as the philosophical doctrine also envelops different forms.

Cortisol Responsiveness to Consuming a Meal High in Fat May Depend on Body Mass Index

Destiny Garcia
Sponsor: Kevin Laugero, Ph.D.
Nutrition

The adrenal hormone, cortisol, is a primary mediator of energy metabolism, body composition, and eating behavior. Several stimuli including stress and food consumption tend to trigger a cortisol response, leading to elevated concentrations; This response is adaptive and beneficial to the human body. However, cortisol levels vary across individuals. Abnormally high and low cortisol responsiveness is linked to metabolic and psychological dysfunction and disease. Overconsumption of high fat foods has also been found to be linked to metabolic dysfunction, obesity, and altered cortisol activity. Little is known about the variation between different individuals' cortisol responsiveness to a meal and whether differences in responsivity may help explain differences in BMI or obesity risk. Therefore, we examined 50 participants cortisol reactivity to a meal challenge high in fat. We hypothesized (1) there would be a range of cortisol responsiveness to the high fat meal and (2) participants with a higher BMI would have a lower cortisol response. Salivary cortisol was collected at 0 (pre-meal), 30, 60, and 90 minutes after consuming a standardized milkshake high in fat. Saliva was processed and assayed for cortisol through an enzyme immunological assay. Differences in cortisol reactivity are expected to be observed 30 and 60 minute.

Novel Cinchona Alkaloid-Derived Thioureas for Asymmetric Reactions

Tomas Garcia
Sponsor: Jared Shaw, Ph.D.
Chemistry

Metal-free Asymmetric catalysis has been shown to be a powerfull tool in organic synthesis. This is the process of using a chiral catalyst so that the formation of one stereoisomer is favoured. Cinchona-derived catalysts possess many interesting structural features that are desirable in a catalyst.Previous work using Cinchona Alkaloid derived catalysts has demonstrated the effectiveness of these bifunctional catalysts for various types of chemical transformations. The bifunctionality of these catalysts refers to the dual activating properties of having both lewis basic and lewis acidic functionality on the same catalyst. Building off of previous work, we modified the existing structure by introducing a cyano substituent which significantly increased the acidity of the thiourea. This led to the formation of three new catalysts which have not been previously reported. We tested our three catalysts by running them in Anydride Mannich reactions with homopthalic anhydride and a benzaldehyde derived imine and found modest increases in enantiomeric selectivity and significant increases in diastereomeric selectivity.

Latinas Facing Adversity in STEM Academic Settings

Roxana Garcia-Ochoa
Sponsor: Yvette Flores, Ph.D.
Chicano Studies

Underrepresented Faculty in Science, Technology, Engineering and Math (STEM) fields are limited. Women of color account for a small percentage of doctorates with academic leadership positions. Latinas in particular, represent only 2% of total female scholars who have doctorate degrees in STEM related fields (Machado-Casas, 2013; NSF, 2013). The purpose of study was to understand the career experiences of Latina STEM faculty in academia. Participants from this study include a national sample of Latinas in academic positions in all STEM fields. Qualitative methods were used to analyze the academic trajectories of Latinas in academia and their experiences of academic success that have led them to persist as faculty. The interviews depict barriers in their personal and academic lives that provide insight on the obstacles faced while achieving tenure as an underrepresented scholar. Findings point to the importance of institutionalizing resources that promote the advancement of underrepresented minorities in academic STEM fields.

EEG Signal Analysys of Treatment Effectiveness in Tetramethylenedisulfotetramine-Induced Status Epilepticus

Nancy Garibay
Sponsor: Dorota Zolkowska, M.D.,Ph.D.
MED: Neurology

Tetramethylenedisulfotetramine is a highly lethal neurotoxic rodenticide that acts as a noncompetitive GABA A receptor antagonist. Severe TETS intoxication in humans produces refractory convulsive status epilepticus. Previously obtained behavioral data suggested that the neurosteroid allopregnanolone stops continued seizure activity faster than benzodiazepines. The aim of this study was to utilize EEG signal analysis to assess the effects of allopregnanolone, diazepam and midazolam on electrographic seizure measures in the TETS SE model. Both benzodiazepines were administered at a dose equivalentby allometric scaling to that shown effective in the treatment of SE in humans. Allopregnanolone (12 mg/kg, IM), midazolam or diazepam (both at 1.8 mg/kg, IM) were administered 40 min after the first myoclonic twitch. EEG recordings were scored for 150 min after TETS exposure for the presence of persistent seizure activity and organized seizures (≥ 5s, ≥ 2Hz). Allopregnanolone prevented mortality within 72 h. Allopregnanolone terminated persistent EEG seizures within 6 min while Diazepam and Midazolam within ~21 min. Diazepam and midazolam did not stop or only transiently eliminated continued EEG seizures. In summary, analysis of the EEG signal allows the time to cessation of SE tobe precisely measured. Rapid and more complete termination of SE may improve long-term survival

The US Government Fails to Protect the Individual Rights of American Indians

Quirina Geary
Sponsor: Sarah Faye, M.A.
University Writing Program

In the United States, tribal sovereignty goes beyond casino profits and tax-free cigarettes. In fact, sovereignty provides tribal governments immunity from civil and human rights violations of its own tribal membership. Violations have increased since the upswing of tribal gaming. Many tribal governments have chosen to disenroll their members to increase their profits. Since the Indian Gaming Regulatory Act of 1988, there have been over 9000 people from 79 tribes that have been disenrolled, removing them from their traditional homelands, denying them medical services, and stripping them of their tribal identity. The disenrolled members have no legal right to sue their tribal governments as American Indians are not protected under the Fifth Amendment of the US Constitution and the Indian Civil Rights Act of 1968 (ICRA) does not authorize legal actions against tribes. Therefore, tribal governments have the legal right to violate its member's civil and human rights. I will discuss how the laws, court cases, and government entities have failed to protect the individual rights of American Indians.

Emoji and the Globalization of Social Media Language and Culture

Zachary Gernes
Sponsor: Li Zhang, Ph.D.
Anthropology

Digital communication is not only changing the way in which we interact with others, but with how we are now able to communicate across cultures. By using emoji, a pictographic form of writing used with short message services (SMS), people who may speak a wide range of languages and come from a multitude of cultures can understand each other with ease. Is it because emoji are in fact a universal language, or is there an underlying reason that has more to do with the way in which SMS language and, by extension, emoji, has changed the way we interact with each other on a global scale? From the first introduction of the emoji to simplify data transmission to the naming of the "Tears of Joy" emoji as the Word of the Year by the Oxford Dictionary, it is impossible to deny that there is something happening culturally, but what? Through this project, I explore three research samples, three academic articles, and a range of published discussions on the nature of emoji and how their formation and use reflects the way in which digital communication has brought about a shift in globalizing culture while still retaining a stark divide between individuals.

Evolution of Students' Knowledge Structures Over General Chemistry Courses

Tara Ghalambor
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Constructivist theory states that knowledge is a dynamic entity that changes constantly. Experts' ability to effectively solve problems highlight that meaningful learning does not occur unless knowledge is organized. A learner is required to metacognitively revise the interaction between existing and gained knowledge. The organization of these structures is an important predictor for one's success in problem solving. A word association test was developed by selecting major concepts in the first course of Chemistry 2 as stimulus words. This test was modified with concepts from the second and third courses in the series. For each test, students were asked to provide five response words within forty- five seconds of reading each stimulus word. After determining the frequency of the responses, the top twenty-five responses for each stimulus word were used to calculate relatedness coefficients, which measure the relationship between words. Pathfinder and Gephi, network generating programs, were utilized to interpret the data and determine knowledge structures. Depending on the differences in these knowledge structures, methods will be recommended to strengthen students' ability to monitor their knowledge structures. Connections between existing and new concepts from later courses will illuminate how successful a student is at constructing his or her knowledge structure.

Gut Microbiota Differences Between Mice From Different Vendors Affects Susceptibility to *Salmonella*

Lindsey Gil
Sponsor: Andreas Baumler, Ph.D.
MED: Medical Microbiology & Imm

Our research focuses on how naturally occurring bacteria that live in the mammalian digestive tract (gut microbiota) can protect their host against diarrheal infections. Every individual has a diverse community of microbes colonizing their intestine, and each is unique, even among healthy individuals. We wanted to know whether natural variation in the microbiota composition between individuals contributes to disease susceptibility. To address this, we tested whether subtle changes in gut microbiota composition, such as those observed between laboratory mice from different vendors, could alter Salmonella infection susceptibility. First, we extracted DNA from feces and performed 16S rRNA sequencing followed by analysis using QIIME. We identified several bacterial groups that differentiated mice from each vendor. Thus, although all were healthy mice, they had subtle differences in microbiota based on their origin of purchase. Next, we challenged mice from different vendors with Salmonella to see if there were differences in susceptibility to a pathogen. We found that susceptibility to Salmonella infection of mice from different vendors differed by several orders of magnitude, which may have implications for human health and microbiome research. Our findings show that microbiota plays a significant role with infection and could determine who gets infected in an outbreak.

Correlates of Ethiopian Orthodox Church Attendance and Mental Health in Ethiopian Immigrants in the Greater Sacramento Metropolitan Area

Andreas Gizaw
Sponsor: Patrick Koga, M.D.,Ph.D.
MED: Public Health Sciences

The immigration process can be very disorienting and devastatingly stressful for immigrants unaware of the challenges they face once they arrive at their intended destination without proper guidance and support. Their inability to deftly adjust to life in a new country leaves them susceptible to mental illnesses such as anxiety, depression, and Post Traumatic Stress Disorder (PTSD). The Ethiopian Orthodox Church may have mental protective effects on its immigrant constituents by boosting their resilience in a forum where they can receive guidance regarding employment, health, and educational systems, all while providing emotional support for one another. Using the Ethiopian immigrant population in Sacramento as my study sample, my research aims to investigate the correlation between church attendance and mental resilience in Ethiopian Christian immigrants during their five years of resettlement in the Sacramento area. I will use two psychometric instruments: a) CDPH 8418 A (01/2011) Screening Form used by my faculty supervisor Dr. Patrick Marius Koga at Sacramento County Refugee Clinic, and b) the 25 item Connor-Davidson Scale (CD-RISC) on a sample of 50 Ethiopian immigrants. I hypothesize that the Ethiopian immigrants with higher church attendance will have increased resilience and lower rates of depression, anxiety, and PTSD.

Fire Intensity Effects on Coastal Redwood Recruitment

Mark Goering
Sponsor: Andrew Latimer, Ph.D.
Plant Sciences

Fire is a powerful disturbance that has played a prominent role in shaping California's ecosystems. The coastal redwood (Sequoia sempervirens) communities of Big Sur are no exception, as these trees have evolved many fire resistant traits. This study examines redwood's basal sprouting ability as a post-fire response and how it correlates to fire severity. We measured the size of 'parent' trees, classified burn damage, and counted the number of basal sprouts. The number of clonal trees surrounding a 'parent' tree was positively related to our burn severity metrics. Trees with higher char marks on their bark, as well as trees with more severe indicators of burn damage, produced more clones. This strong correlation is true even when the positive influence of tree size on overall clone production is accounted for. This has important implications for fire management; research has not only demonstrated that redwoods can tolerate fire, but that they can directly benefit from fire exposure. A better understanding of how this iconic tree species responds to harsh environmental effects, like fire damage, will enhance our ability to allow populations of coastal redwoods to flourish in an uncertain future climate.

Characterizing the Stress Response of *Lactobacillus plantarum*

Elissa Goldman
Sponsor: Maria Marco, Ph.D.
Food Science & Technology

Lactobacillus plantarum (Lp) is a bacterial inhabitant of plants, animal and insect digestive tracts, and fermented foods. The capacity of Lp to grow in such diverse habitats indicates that it is a genetically robust species capable of withstanding inhospitable environmental conditions. Presently, the Lp genes and enzymatic pathways necessary for conferring stress-tolerance are not fully understood. This study investigated the capacity of 14 Lp strains to tolerate ethanol, acid, alkaline, detergent and oxidative conditions. The strains could be grouped according to their capacity to survive. Lp WCFS1 and 8.1 both exhibited superior tolerance to ethanol (solvent) stress, with growth rates of 0.32and 0.39 respectively, when compared to strains K4 (growth rate of 0.30) and B13 (growth rate of 0.01 h^{-1}). These differences in strain robustness agree with prior studies on heat and osmotic stress tolerance. Gene and protein sequence alignment were used to identify differences between Lp WCFS1, K4, 8.1 and B1.3. Initial findings revealed mutations in multiple stress-inducible proteins among the strains. In clpL, a protease identified to be involved with alterations in the cell membrane during heat shock, there are four amino acid mutations in B1.3 which may result in a dysfunctional protein.

The Influence of Diacylglycerol and Cysteine-Rich Domains in Spaciotemporal Regulation of Protein Kinase D1 in Cardiac Myocytes

Mitchell Goldman
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

Protein Kinase D1 (PKD) is a key regulator in the signaling pathways that control heart contractility, gene transcription, energy-substrate use, and cell survival. Diacylglycerol (DAG) and phorbol esters are signaling molecules which cause membrane localization of protein kinases by binding to their cysteine-rich domains. PKD possesses two cysteine-rich domains (C1A and C1B). In vitro, C1A has a greater affinity for DAG, while C1B possesses a higher affinity for phorbol esters and contains a nuclear localization sequence. To test the contribution to spatiotemporal regulation of PKD in cardiomyocytes, we designed several GFP-tagged PKD1 mutants with deletion or substitution of either or both C1 domains, and compared their localization in response to phorbol esters and endogenous DAG production. We measured membrane translocation using total internal reflection fluorescence (TIRF) and nuclear translocation using confocal microscopy. Our results have confirmed that C1A and C1B have greater affinities for DAG and phorbol esters respectively, and suggest inhibitory interactions between the two domains. Surprisingly, we did not observe a direct relationship between DAG production and nuclear PKD localization. This suggests further regulatory mechanisms of PKD exist in cardiac myocytes. Further understanding of PKD regulation may help contribute to pharmacological targeting of PKD signaling in cardiac diseases.

Investigating Modern-Day Structural Violence in Science and Healthcare

(Withdrawn) ***Stephanie Goley***
Sponsor: Patrick Carroll, Ph.D.
Sociology

Despite a popular belief that racism and sexism are a thing of the past, numerous inequalities still remain. As we enter into a new political climate, there is a sense of uncertainty for what is yet to come. Using critical-interpretive synthesis to examine the political, economic, and social structures which affect human health, I attempt to discern the violence against vulnerable populations historically, looking specifically at examples including the Tuskagee syphilis experiments, forced sterilizations, and the horrors of the Holocaust and Japanese internment camps. By exploring historical events of oppression against vulnerable populations, I have been able to observe parallels depicting structural violence in current instances of present-day America, such as the potential repeal of the Affordable Care Act and the re-instatement of the Global Gag Rule. In addition, I aim to delineate some of the other major impacts race/ethnicity, gender, and poverty have on healthcare, defining the differences in health outcomes and the barriers people in these groups face in receiving care.

An Analysis of the Structure-Activity Relationship Between Novel Diamide Molecules and Their Fluorescence Characteristics

Blanca Gomez
Sponsor: Annaliese Franz, Ph.D.
Chemistry

Fluorescent compounds are utilized in a variety of imaging techniques, which allow for a better understanding of biological processes. Malonamides are a class of organic molecules that exhibit fluorescent properties and have a diamide structure with potential applications as ligands for metals, nuclear waste sequestration and fluorescent chemosensors. Our lab has developed a multicomponent reaction catalyzed by metal salts to access indolylmalonamides, a new class of indole-substituted malonamides. These diamide compounds show interesting properties that are affected by their chemical structure. Of specific interest is the phenol moiety of these malonamides. To assess the involvement of the hydroxy group of the phenol structure on fluorescence, a series of new indolylmalonamides was synthesized that vary the electronic effects to study the structure activity relationship (SAR). A series of indolylmalonamides was synthesized using three different coumarin carboxylates to afford the electron-withdrawing, electron-donating, neutral and phenyl indolylmalonamide derivatives. The absorbance, excitation and emission spectra were analyzed in order to assess the quantum yields, Stokes shifts and molar absorptivity values of the indolylmalonamide compounds. Phenyl derivatives are currently being synthesized in order to assess the effect that they hydroxy groups of the phenol has on the photophysical properties as well as the multicomponent reaction.

A Serological Test to Determine the *Toxoplasma* Strain Type in Human Toxoplasmosis Patients

Carolina Gomez
Sponsor: Jeroen Saeij, Ph.D.
VM: Pathology, Micro, & Immun

The zoonotic intracellular parasite Toxoplasma gondii can cause chronic infection in many species, including humans. Previous research suggests strain type is a key determining factor in disease presentation and severity in humans. Approximately 90% of reported Toxoplasma isolates in the U.S. are one of three types - I, II, or III. However, currently there is no non-invasive test that can distinguish each strain nor link disease states to a strain type. In this study, we aim to develop a serological test that can accurately predict a Toxoplasmosis-infected patient's strain type. Our test is based on the fact that many host antibodies are produced against highly polymorphic parasite proteins. By coating an enzyme-linked immunosorbent assay (ELISA) plate with these peptides from different strains and monitoring serum reactivity, a prediction of the infecting strain can be made. Preliminary results suggest that strain-specific antibodies found in mice sera recognize some polymorphic antigens. We will then test human serum samples with a known infecting parasite strain and assess whether strain-specific peptides can identify the genotype causing infection. In the future, linking strain type to disease state would facilitate the development of a rapid, highly sensitive, and noninvasive method of diagnosing humans infected with Toxoplasma.

Investigating Bioactive Compounds From Sea Sponge-Derived Actinomycetes

Alexander Gonsalves
Sponsor: Justin Siegel, Ph.D.
MED: Biochem & Molecular Med

Actinomycetes are a phylum of gram-positive, high GC-content bacteria that produce many of our naturally-derived antibiotics. They produce secondary metabolites under appropriate environmental conditions, some of which combat fungi and other bacteria. However, diseases are evolving resistance to existing antibiotics and the discovery of novel drug candidates from soil-derived actinomycetes has reached an inflection point. Marine actinomycetes present an attractive opportunity to discover novel bioactive compounds. Sea sponges are an exemplary source of marine bacteria because they filter a remarkable volume of seawater. Our lab cultivated bacteria derived from sea sponges near Kagoshima prefecture, Japan. I stocked visibly morphologically distinct colonies on Difco ISP2 media. I amplified our strains' 16S rDNA by PCR and identified them with NCBI's BLAST. To test for bioactivity, the strains underwent a two-stage liquid cultivation. First, I cultivated them in Tryptone Soya broth to increase the cell count. Next, I inoculated the pre-culture in both A16 and 2M media to encourage differential metabolite production. After 5 days, the supernatants were assayed against indicators Saccharomyces cerevisiae and Bacillus subtilis to test for antifungal and antibiotic activities, respectively. Strains that show bioactivity will undergo HPLC fractionation to find the specific compound that confers bioactivity.

The Minimization of Ammonia Volatalization in Urine and Ammonia Distillate Samples Using Mineral Oil

Julia Gonzales
Sponsor: Harold Leverenz, Ph.D.
Civil & Environmental Engr

Improper fertilizer storage can result in ammonia loss due to volatilization. Physical treatment methods for the long-term storage of urine and ammonia distillate samples taken from urine collection systems designed for nutrient recovery are being assessed for their effectiveness at preventing ammonia loss. A 10 week controlled monitoring program is in progress to characterize the effectiveness of physical barriers by quantifying the rate of ammonia loss in tanks containing urine or ammonia distillate under different storage conditions. A vented incubation chamber was constructed to maintain samples at 20^{o}C while venting ammonia from the headspace. The storage conditions under evaluation are samples (a) open to the atmosphere and (b) under a 10 mm layer of mineral oil. Nitrogen loss is being quantified using colorimetric ammonia and total nitrogen concentration measurements. A preliminary monitoring program supports other scholarly investigations that ammonia loss is not only dependent on parameters such as pH, and alkalinity, but is also affected by physical barriers acting on the samples. In general, the preliminary study revealed that the addition of an oil layer preserves at least 75% of initial ammonium content in both urine and distillate samples, where as a vented tank experienced effective ammonium depletion.

Evaluating the Potential of *Trichoderma* spp. as a Biological Control Agent of *Phellinus tuberculosus*

Ian Good
Sponsor: David Rizzo, Ph.D.
Plant Pathology

Phellinus tuberculosus is a pathogenic fungus which infects and decays prune trees, leading to significant limb breakage and lost yield. Trichoderma spp., a pervasive soil fungus and a proven biological control agent (BCA), has possible applications in treating pathogenic fungi in prune orchards. Through a variety of mechanisms, Trichoderma spp. is able to protect plants from fungal infections by inhibiting the growth of pathogenic fungi, through competition, antagonism, or by direct mortality through mycoparasitism. In preliminary tests, two Trichoderma sp. strains, isolated from infected prune orchards, halted the growth of P. tuberculosus, and grew over the existing P. tuberculosus colony. This indicates that Trichoderma spp. can potentially be used to inoculate prune trees against infection. Further experiments need to be performed in vitro to determine the efficacy of Trichoderma spp. against P. tuberculosus and which strains of Trichoderma spp. are most effective against P. tuberculosus. Similar tests will be performed on blocks of wood and on young prune trees to evaluate the efficacy and possible applications of Trichoderma spp. as a BCA of P. tuberculosus in prune orchards. If tests yield positive results, Trichoderma spp. could be used to treat pruning wounds and prevent Phellinus spp. infections in prune orchards.

The Aesthetics of Nature and Art in Medieval Literature

Jacqueline Gordon
Sponsor: Sara Petrosillo, Ph.D.
English

Contrary to our current belief that outward appearance is not indicative of interior character, readers in the Middle Ages commonly understood aesthetic beauty of people, objects, and nature as directly linked to internal beauty (Nolan, 224). This idea, critic Maura Nolan remarks, held such importance for medieval readers, that visually pleasing bodies were thought to connect a person to the divine. The medieval-era poem Sir Orfeo, however, approaches this understanding with a unique skepticism. Rather than treating all aesthetics as exterior expressions of interior character, the plot and poetic features of Orfeo complicate the ideal when beauty occurs outside a strictly natural context. Though the poem treats the elegance of the natural world as inherently good and divine, when outside forces in the story add "artifice" – that is, artificial and invented beauty – to nature, Orfeo suggests that the intrinsic qualities of nature become somehow compromised. The result is a dissonance between the interior and exterior as nature's pleasing aesthetic proves untrustworthy. Orfeo, then, challenges medieval aesthetic theory, calling into question the widely-held philosophy of outer beauty reflecting inner beauty and warning against the dangers of trusting the exterior.

Paleodietary Reconstructions Using Stable Isotopes at CA-SCL-330 in Mount Hamilton

Shelly Goswami
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Excavations at CA-SCL-330, a Late Period site situated on the western slope of Mount Hamilton, recovered disassociated human remains. At the request of the Muwekma Ohlone Tribe, stable isotopic analysis has been performed on the human bone and teeth. Collagen in continuously remodeled bone records protein intake of individuals during the last 15-20 years of life. As teeth do not remodel, they can provide information about what individuals were eating during different stages of development. These data coupled with other lines of inquiry can provide insight into the dietary patterns of interior populations in the San Francisco Bay Area. We used mechanical and chemical preparation in order to extract collagen from the bone and teeth. As part of the mechanical procedure, the samples is photographed, drilled, cleaned in deionized water and weighed. In the chemical preparation, the sample goes through a demineralization process and humic removal in order to solubilize the collagen for stable carbon and nitrogen isotopic analysis.

Functional Analysis of Rapidly Evolving *Bremia lactucae* Effector Recognized by Downy Mildew-Resistant Lettuce

Ayumi Gothberg
Sponsor: Richard Michelmore, Ph.D.
Plant Sciences

Downy mildew is an economically important disease caused by the plant pathogen Bremia lactucae. When B. lactucae infects plant cells, it secretes virulence molecules, called effectors that suppress the cell's immune response. However, plants may have resistance genes that recognize effectors and launch an immune response, usually leading to localized cell death and preventing the pathogen's spread. B. lactucae and lettuce are in an evolutionary arms race, where lettuce evolves resistance genes to strains of B. lactucae and in response strains evolve effector genes that plants do not recognize. The effector, SW4, is recognized by lettuce cultivar, Ninja. I cloned 12 different sequence-divergent versions of this rapidly evolving effector from two isolates of B. lactucae. I then used Agrobacterium-mediated transient expression in lettuce leaves to test which versions are recognized by Ninja by screening for the cell death phenotype indicative of recognition. Sequence comparisons revealed mutations unique to the effectors recognized by Ninja. I will narrow down the unique amino acid mutations that the recognized effectors have in common and test mutations at these positions to determine which are critical for recognition by plant resistance proteins. This research will be informative to breeding lettuce cultivars resistant to B. lactucae.

Determination of Variability in the Spines of Amacrine Cells in the Rat Retina

Aaron Gouw
Sponsor: Andrew Ishida, Ph.D.
Neuro Physio & Behavior

Currently, there is limited understanding of the dopamine-releasing amacrine cell (TH cell) in the retina. This can complicate attempts to assess possible anatomical changes caused by retinal diseases or abnormalities. Previous studies found that TH cell structure, such as spines, are better preserved in sucrose-supplemented solutions. While spines are sites of synaptic input to hippocampal and cortical neurons important in memory formation, spine morphology has not been extensively studied in retinal TH cells, thus making it difficult to understand their function. I am interested in how the structure of these spines respond when exposed to light. I hypothesized that illumination of the rat retina causes TH cell spines to increase in spine length and/or density. To test this hypothesis, Long Evans rats were either light stimulated or dark adapted then euthanized. Following enucleation, dissected retinae were flat mounted, immersed in a sucrose-supplemented fixative, immunohistochemically processed, and imaged via confocal microscopy. Images were analyzed using ImageJ and Imaris. Preliminary results suggest that there was no significant difference in spine length or density of the tested retinae. While results suggest a pattern in the data, they do not support my hypothesis. Furher experiments are necessary to confirm the observed patterns.

Methamphetamine Abuse and Emergency Department Utilization: 20 Years Later

Connor Grant
Sponsor: John Richards, M.D.
MED: Emergency Medicine

Methamphetamine (Meth) abuse continues to be a worldwide problem. Abusers present to the ED for myriad reasons, including trauma, chest pain, and psychosis. The study objective: determine how prevalence, demographics, and ED utilization have changed. Data in 2016 of Meth patients presenting to the UCDMC ED were compared to a similar study performed there 20 years prior. There were 638 Meth patients from 3,013 toxicology screens, 20,203 visits over 3-months. This represented a significant increase in prevalence compared to 1996, when there were 461 patients, 3,102 screens, 32,156 visits over 6-months. Meth patients were significantly older compared to past, but there was no gender or racial difference. Mode of arrival was most frequently by ambulance, but at a lower proportion than 1996. Admission rate was significantly lower, as was discharge to jail. The proportion presenting with trauma was significantly lower, but higher for chest pain. In conclusion, a significant increase has occured in the prevalence of Meth patients presenting to the ED. Resource utilization has also changed. The lower proportion of trauma and higher proportion of chest pain may reflect the shifting demographics of Meth abusers, as highlighted by an older patient population relative to the past.

Compounds to Increase Neuroplasticity

Alexandra Greb
Sponsor: David Olson, Ph.D.
Chemistry

Many neuropsychiatric diseases are characterized by deficits in neuroplasticity, and therefore, agents capable of promoting neuroplasticity have enormous therapeutic potential. Neurotrophic factors—a class of biomolecules that are produced naturally in the brain—are one such class of molecules. The goal of my research is to identify medicinal compounds that enhance plasticity by increasing the brain's production of neurotrophic factors. We anticipate that these compounds will play a key role in treating certain neuropsychiatric diseases, such as depression, addiction, and post-traumatic stress disorder. To evaluate the effects of compounds on plasticity, cortical rat neurons were treated, fixed, and stained so that we could visualize changes in dendritic morphology using microscopy. We discovered that classical psychedelics (e.g., LSD, DMT, and DOI) are capable of increasing neuronal branching in vitro through a neurotrophic factor-dependent mechanism. We hypothesize that this increase may be the underlying cause of their clinical effects on neuropsychiatric diseases. Ultimately, we hope to identify better-tolerated compounds capable of promoting plasticity and to elucidate the basic biology responsible for their mechanisms of action.

Synthesis and Investigation of $Yb_{(14-x-y)}Ca_xBa_yMgSb_{11}$ Compounds for Thermoelectric Application

Navtej Grewal
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Thermoelectric materials allow for the production of electricity directly from heat through exploitation of the Seebeck effect, which involves the migration of charge carriers in a material due to a temperature gradient, thereby generating current. The figure of merit, zT, represents a material's thermoelectric efficiency by accounting for its Seebeck coefficient, thermal conductivity, and electrical resistivity. The p-type material $Yb_{14}MnSb_{11}$ was originally investigated for high temperature thermoelectric application in 2006 and exhibited a zT of ~0.7 at 1000°C, but zT values up to 1.3 have been achieved through elemental substitutions of Ytterbium with Calcium and Manganese with Magnesium. To further improve performance, simultaneous substitution of Ytterbium with Calcium and Barium was done to decrease thermal conductivity by increased phonon scattering, which is necessary to maintain the operating temperature gradient. A powder metallurgical synthesis employing mechanical milling of elements into a homogenous powder was performed using a WC ball mill. This powder was then partitioned for a spark plasma sintering based synthesis and a furnace annealing based synthesis to compare product formation between the two techniques. Sample composition, thermal conductivity, and Seebeck coefficient/electrical resistivity measurements were made using powder x-ray diffraction, laser flash analysis, and four-point probe respectively.

The Role of Nucleoporin Nup2 During Prophase I of Meiosis

Tatiana Gromova
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

Meiosis produces haploid gametes by reducing the genome in half through two chromosome segregation events. In Saccharomyces cerevisiae, the telomere-associated protein Ndj1 is required for successful formation of the telomere bouquet; a key chromosome event during prophase I of meiosis. Without Ndj1, the cell experiences a delay in meiosis. Nup2 is a nonessential nucleoporin involved in boundary activity and telomere silencing during mitosis. In meiotic cell extracts, Nup2 co-purified with Ndj1, suggesting that Nup2 also plays a role in meiosis. The yeast nup2 ndj1 double mutant failed to segregate the chromosomes, preventing sporulation. Deletion analysis identified a 125-amino acid region of Nup2, the MAR, required for the completion of meiosis. To characterize the function of Nup2 during meiosis, localization of the MAR region was assessed using immunofluorescence. Nup2 was identified within the meiotic yeast nucleus and localized along the length of the chromosome spreads. Further investigation showed that only a small subset of Nup2 and Ndj1 foci colocalized at the chromosome during meiosis. Characterizing the functional interplay between the two proteins supports our hypothesis that Nup2 and Ndj1 use separate and distinct pathways to organize the chromosomes and help achieve correct segregation into the daughter cells.

The Association of Between Household Water Source and Child Length Among Older Infants in Western Kenya

Jesus Guillen
Sponsor: Christine Stewart, Ph.D.
Nutrition

In developing countries, children are at risk of not growing to their full potential. For this study, we investigated factors that may be associated with child length, as decreased length (height) is indicative of chronic malnutrition. We conducted a substudy of a cluster-randomized, controlled trial conducted in Western Kenya, which investigated the impact of water, sanitation, hygiene, and nutrition interventions on child growth. For this substudy, we investigated the association with reported household water source and child length. Surface water as a primary source was found to have a negative association with child length at two years of age (add in coefficient and p value), controlling for mother's education, and the randomized nature other the trial. None of the other sources of water were found to be statistically significant, including receiving water from an unprotected spring and unprotected dug well. While there are many factors which influence child growth, it appears that household surface water is an important factor.

Rio Grande/Rio Bravo Water Management Atlas and Streamflow Analysis in California

Daisy Guitron
Sponsor: Samuel Sandoval Solis, Ph.D.
Land Air & Water Resources

California and Mexico are faced with water supply and water demand concerns. El Rio Grande/Bravo is one of the longest rivers in North America that supplies numerous amounts of resources and plays a huge role in the environment, communities, and wildlife. The "Instituto Nacional de Estadistica y Geografia" records population data spanning from 1900 to 2010 for five states in Mexico. ArcGIS will be used as a visual mechanism to highlight the potential evolution in flow regime, and freshwater habitats. This data was portrayed temporally which demonstrated that the areas of sheer water volume provided to human populations contained the most clusters, leaving some population areas with water scarcity. River ecosystems worldwide have been degrading due to alterations of the flow regimes. California, in particular, has high alterations because of strong climatic variability. The goal is to integrate hydrologic and geomorphic characteristics with river ecosystem functions to estimate environmental flow targets at the reach scale and planning level, which will ultimately address the need of future effective flow targets. The geospatial dataset includes 15 years of daily data for 92 gauge stations with unimpaired flows, which identifies each one under eight natural flow classes that represent hydraulic characteristics and rainfall-runoff.

Exploring Molecular Targets of Curcumin in Hodgkin's Lymphoma

Jacob Guorgui
Sponsor: Gerardo Mackenzie, Ph.D.
Nutrition

Naturally occurring dietary compounds hold merit for cancer prevention and treatment. Among them, curcumin appears especially promising because of its non-toxic and effective anti-cancer properties. Curcumin has been shown to inhibit Hodgkin's lymphoma (HL) cell growth in vitro, but its poor in vivo bioavailability and unacceptable pharmacokinetics highlight the need for novel in vivo delivery systems. Thus, we explored whether encapsulation of curcumin in solid lipid nanoparticles (SLN-curcumin) and d-a-Tocopheryl polyethylene glycol 1000 succinate (TPGS)-stabilized curcumin nanoparticles (TPGS-curcumin) could enhance its efficacy in vivo. Using a HL heterotopic xenograft model, our laboratory showed that SLN-curcumin, and to a lesser extent TPGS-curcumin, enhanced the tumor growth inhibitory effect in comparison to curcumin alone. Compared to vehicle-treated controls, SLN-curcumin and TPGS-curcumin inhibited tumor growth by 50.3% ($p<0.02$) and 43.0% ($p<0.04$), respectively, while curcumin alone reduced tumor growth by 35.0% ($p<0.05$). Using HL xenograft total tumor extracts, we explored potential molecular targets that could be affected by the various treatments. In particular, we focused on molecular targets that are known to be involved in cell proliferation and the inhibition of apoptosis (e.g. XIAP, Bcl-xL, survivin, among others). Moreover, we aim to explore alternate molecular targets to reveal a complete mechanistic rationale.

Applications of Microphone Array Algorithms and Eyetracking for Enhancing Selective Auditory Attention

Nathaniel-Georg Gutierrez
Sponsor: Lee Miller, Ph.D.
Neuro Physio & Behavior

One of the major problems in day-to-day communication between people is the inability or inefficiency of selectively attending to a particular source of interest among a large group of interfering talkers. This problem is especially worse for those with deteriorated hearing. Many conventional hearing aids nowadays serve to amplify all sources of sound in the environment, but this does not solve the issue, and the fundamental problem of selectively amplifying the sounds the listener wishes to hear remains unsolved. This project serves to provide a solution to selective auditory attention through the utilization of microphone array processing algorithms, known as beamforming. I have developed code in MATLAB to test different beamforming algorithms for both high and low frequency signals. These experiments also utilize a Tobii EyeX eye-tracker to determine in which direction the user is looking, upon which the microphone array performs a beamforming algorithm, enhancing speech in that direction. Preliminary results indicate that these algorithms are performing appropriately with real-time actual speech, over a wide range of frequencies from low to high.

The Asymmetry of Female Meiosis Reduces the Frequency of Inheritance of Unpaired Chromosomes

Saba Haile
Sponsor: Francis McNally, Ph.D.
Molecular & Cellular Bio

The asymmetry of female meiosis reduces the frequency of inheritance of unpaired chromosomes. Trisomy is a third copy of a chromosome and it is damaging and harmful. It can cause inviable and disabled progeny if passed through the germ line. There is also a high frequency of trisomic offspring from a trisomic parent with the random segregation of an extra chromosome. However, Caenorhabditis elegans, with trisomy of the X chromosome, have far fewer trisomic offspring than expected. From previous results, it is known that the extra unpaired chromosome was preferentially lost during anaphase I of female meiosis by extrusion to the polar body. The him-8 mutant has two unpaired X chromosomes and also preferentially places the unpaired X chromosomes in the polar body. Preferential elimination of the unpaired X chromosomes in him-8 mutants is observed as a high incidence of male progeny. Thus the elimination of unpaired X chromosomes in the him-8 mutant is a tractable model for correction of trisomy to diploidy. We are testing whether embryos depleted of ANI-3, a polar body contractile ring component, eliminate unpaired X chromosomes with decreased efficiency.

Simulation for PTCDI Exchange in Nanoparticle Grids

Yaeir Halfon
Sponsor: Roland Faller, Ph.D.
Chemical Engineering

Nanoparticle grids consist of nanoparticles connected with organic molecules between them. They are interesting because they have useful thermoelectric properties, in that a temperature gradient can induce a voltage. In nanoparticle systems, an electron has a probability of hopping or tunneling from one nanoparticle to another, depending exponentially on the interparticle length. In experiment, the conductance of a gold nanoparticle grid was found to increase when the molecules between particles were exchanged from alkanethiols to a conjugated perylene tetracarboxylic diimide, PTCDI. The length of PTCDI is much more rigid than that of the alkanethiols, whose structure allows for a Gaussian distribution of lengths, and therefore it can only exchange for nanoparticles lengths in a particular range. The ratio of conductance of the PTCDI exchanged and the alkanethiol grids were plotted against length of the alkanethiols on a log-y scale and found to follow an S structure. Conductance in these systems can be modeled as the ratio of successful hops and total hop attempts in the grid, in which the probability of hopping between nanoparticles is the tunneling probability. The ratio of hops between PTCDI and the alkanethiols in the simulation was found to be consistent with results from the experiment.

Filial Huddling Test as a Paradigm for Social Behavior in Prairie Voles

Gabriella Hamlett
Sponsor: Karen Bales, Ph.D.
Psychology

The development of an organism can be best understood when both individual and group dynamics are taken into account (Alberts, 2006; Alberts 1997; Stewart, 2012). Huddling is a behavior that is exhibited across mammalian species and serves two functions: thermoregulatory control, which is critical early in life, and social reinforcement, which emerges later in development. To date there is no research on the Filial Huddling behavior of Prairie Voles (Microtus ochrogaster) and no testing paradigm to quantify their group bonding behavior. A Filial Huddling test was developed to quantify preweanling huddling behavior. Ten litters were tested at three developmental timepoints: postnatal day (P)12, P16, and P20. Litters were placed in an Open Field box and behavior was recorded on video for 10 minutes. Videos were scored for how often a huddle formed and reformed. Preliminary results demonstrate that litters will huddle for longer at P12 and decrease with time. The older they get they will break and reform the huddle more often. We expect to see changes in this behavior in high-contact litters compared to low contact litters.

Analyzing Alternative Diet Effects on Chicken Muscle Health

Angela Hampton
Sponsor: Michael Mienaltowski, D.V.M.,Ph.D.
Animal Science

Efforts are underway to design a better diet for broiler chickens that will allow for the replacement of synthetic methionine with all-natural products while maintaining the desired growth rates and improving the quality of the meat. In recent years fast growth and diet have compromised the health and quality of the muscle. One consequence of fast growth is a fibrous white striping present in the muscle, particularly in the pectoralis major muscle. Consumer interest in the quality of diet for chickens is also creating pressure to design a better diet. In this study, we examined one of the alternative diets fed to chicken and compared it to the control standard diet to determine how nutrition affects muscle health. We hypothesize that the experimental alternative diets will produce healthier muscle without compromising consumer and production interests. Differential gene expression regarding inflammation, atrophy, and oxidation were studied to compare resulting muscle health between the diets. The main goal of this study is to determine the safety and efficiency of alternative diets.

Investigating the Effects of Exposure to Father and Romantic Partner Disengagement Cues on Health Attitudes and Risk Taking

Jacob Hansen
Sponsor: Jay Belsky, Ph.D.
Human Ecology

Extensive research indicates that father's disengagement, both physical and emotional, is associated with problematic child development, including sexual and non-sexual risk taking. Because most work is correlational, it remains unclear whether it documents true casual effects of uninvolved fathering. In attempt to advance understanding, a recent experimental study found that presenting young adults with father disengagement cues, as opposed to father engagement cues, increased willingness to engage in risky sexual behavior. We sought to replicate these findings using a more diverse sample, while extending them to determine if results varied as a function of (actual) childhood family structure (i.e., 1 vs. 2 parent) and susceptibility to environmental effects, while also determining effects of romantic-partner disengagement cues. Thus, we exposed 318 undergraduates to one of three conditions, father disengagement, father engagement, or romantic-partner disengagement, by asking participants to describe a time when they experienced these in real life. Afterwards, participants reported their health attitudes, general and sexual risk taking, environmental sensitivity, and childhood family structure. Data are being collected to test the hypotheses that both sets of disengagement cues will promote problematic functioning, especially in the case of highly sensitive individuals and one's from single-parent families.

Heavy Metal Sequestration by Douglas Firs on Serpentine Soil

Emma Hansen-Smith
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Serpentine soils are derived from ultramafic rocks, creating harsh soil environments with heavy metals that are toxic to plants such as Ni, Cr, and Mg. Some evergreens respond to heavy metal toxicity by sequestering heavy metals in their foliage, roots, or bark. Black spruce growing in soils contaminated with heavy metals sequesters Cu and Pb in their needles (Aznar et al., 2009), while Turkish red pine has been found to to sequester heavy metals from the air in its bark (Dogan et al., 2010). Douglas fir (Pseudotsuga menziesii) is an evergreen tree species that is widespread across the Pacific Northwest. It is non-endemic to serpentine environments but is found growing on serpentine soils in the California coast ranges. We examined potential Douglas fir adaptations to heavy metal toxicity in serpentine soils by collecting foliage from Douglas firs located on serpentine and adjacent, non-serpentine soils in the California coast ranges. Preliminary results from elemental analysis of these foliage samples suggest elevated heavy metal accumulation in needles of Douglas firs growing on serpentine soils as compared to Douglas firs growing on adjacent, non-serpentine soils. Our findings have important implications for understanding the ways evergreens adapt to heavy metal toxicity in soils.

Biochemical Regulation of Bim1 Complexes in Response to Replication Stress

Lauren Hargis
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

During mitosis, segregation of replicated sister chromatids during anaphase to daughter cells is essential for genome integrity. One challenge is that sister chromatids become physically linked, or tangled, during replication and these tangles are only fully resolved in anaphase. Our lab has found that tangled sister chromatids modulate the activity of the Aurora B kinase, preventing it from phosphorylating the microtubule plus-ended protein, Bim1. Dephosphorylated Bim1 enriches on the anaphase spindle, but the mechanism that links phosphorylation with increased affinity for the spindle is not clear. Our lab has found that there is a shift from a large Bim1 protein complex to a smaller complex when sister chromatids are tangled. I hypothesize, that phosphorylated Bim1 interacts with a negative regulatory protein complex during anaphase that inhibits its ability to bind spindle microtubules. To test this hypothesis and identify Bim1 binding partners, I aim to purify Bim1 protein complexes using immunoaffinity purification and identify associated proteins using mass spectrometry.

Relationship of Climatic Factors Along a Latitudinal Gradient and the Phenotypic Traits of *Plantago lanceolata*

Simon Harris
Sponsor: Jennifer Gremer, Ph.D.
Evolution & Ecology

This study will explore the relationship of climatic factors due to latitude with the phenotypes and density of the globally-distributed species Plantago lanceolata. We predict a correlation of phenotypic traits with annual precipitation and temperature at three different locations. Primary phenotypic characteristics such as number and size of leaves, inflorescences, max stem height, and number of basal rosettes will be compared from each site. In addition to phenotypic traits, the density of individuals will also be examined within square-meter plots at the different sites. We hypothesize that conspecific proximity is also related to annual precipitation and temperature. Data were collected during the 2015 and 2016 growing seasons in California, Oregon, and British Columbia. Preliminary results indicate differences in the measured traits, suggesting a relationship between phenotypic characters of Plantago lanceolata along the latitudinal gradient. A more detailed statistical analysis of these data will be performed along with the incorporation of future climatic projections for each region. This project examines trends in plant phenotypic traits and conspecific proximity over a latitudinal gradient and will serve as a baseline for future studies that analyze change over time due to climate change.

Evolution of Students' Knowledge Structures Over General Chemistry Courses

Mario Hartanto
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Constructivist theory states that knowledge is a dynamic entity that changes constantly. Experts' ability to effectively solve problems highlight that meaningful learning does not occur unless knowledge is organized. A learner is required to metacognitively revise the interaction between existing and gained knowledge. The organization of these structures is an important predictor for one's success in problem solving. A word association test was developed by selecting major concepts in the first course of Chemistry 2 as stimulus words. This test was modified with concepts from the second and third courses in the series. For each test, students were asked to provide five response words within forty- five seconds of reading each stimulus word. After determining the frequency of the responses, the top twenty-five responses for each stimulus word were used to calculate relatedness coefficients, which measure the relationship between words. Pathfinder and Gephi, network generating programs, were utilized to interpret the data and determine knowledge structures. Depending on the differences in these knowledge structures, methods will be recommended to strengthen students' ability to monitor their knowledge structures. Connections between existing and new concepts from later courses will illuminate how successful a student is at constructing his or her knowledge structure.

Effects of Temperature on Anaerobic Soil Disinfestation

Megan Haugland
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Fusarium wilt, caused by Fusarium oxysporum f. sp. fragariae (FOF), is an important disease affecting strawberries in California. The pathogen infects roots and invades water conducting tissue, which results in stunting and dieback. Previously, Fusarium wilt was managed by pre-plant soil fumigation. However, cost and environmental regulations have made this option less available to growers. An alternative method, anaerobic soil disinfestation (ASD), shows promising results in reducing pathogen levels in soil prior to planting. ASD involves establishing anaerobic conditions, which negatively impacts survival of FOF. Based on results from previous studies, it is hypothesized that ASD will be more effective in reducing FOF levels at higher temperatures. In order to test this hypothesis, I will quantify survival of FOF in soil subjected to ASD at day/night temperatures of 28/20 °C, and 22/15 °C. The results, whether supportive of my hypothesis or not, will be useful in determining the conditions under which ASD is likely to be effective in controlling Fusarium wilt.

Effects of Oxytocin Neurons in Bed Nucleus of the Stria Terminalis on Behavior

Katharine Hedbabny
Sponsor: Brian Trainor, Ph.D.
Psychology

Although oxytocin (OT) is generally considered a prosocial and anxiolytic hormone, current evidence suggests that the effects of OT are context dependent. Previously we found intranasal administration of OT (INOT) increases social anxiety in an unfamiliar environment in female but not male California mice (Peromyscus californicus). This mimics the effects that social defeat stress (SDS). In contrast INOT reduces anxiety behaviors in a familiar environment for both males and females. We also found that SDS results in hyper-activation of OT neurons in the bed nucleus of the stria terminalis (BNST), a brain area associated to social and anxiety behaviors. This investigates the effects of OT neurons in BNST have on behavior in familiar and unfamiliar contexts. The translation of OT in the BNST was inhibited in socially defeated female California mice using infusions of morpholino antisense oligonucleotides. Controls received a missense infusion. Mice were tested in the social interaction (novel environment) and resident intruder (home cage) tests. Our data shows that antisense effectively reduces expression of OT by ~70%, and that inhibition of OT expression in BNST increases social exploration behavior and decreases escaping behavior during resident intruder test. Ongoing experiments are assessing effects on social interaction test.

Neuronal Death & Dysfunction Lead to Altered Oscillations & Impaired Learning & Memory in a Rodent Model of Traumatic Brain Injury

Pedro Hernandez
Sponsor: Gene Gurkoff, Ph.D.
MED: Neurological Surgery

There are as many as 3.2 million traumatic brain injuries (TBI) annually and 5.3 million existing TBI patients with chronic disability in the United States. Currently there are no medical treatment options to improve outcomes in TBI patients with chronic disabilities. Based on anatomy and connectivity, the hippocampus is a structure that is vulnerable to TBI; altered hippocampal function is associated with poor cognitive performance in humans and rats. One measure of hippocampal function is neural oscillations; coordinated ionic movements that can be observed in the electroencephalogram (EEG). We hypothesize that TBI-induced neuronal death in the hippocampus will lead to a change in theta oscillations, and deficits in learning and memory. Using the lateral fluid percussion model, Sprague-Dawley rats received a moderate concussion. EEG was recorded from the hippocampus while animals performed a spatial learning task. Brains were then extracted and histology performed using specific antibodies (neuronal nuclei, parvalbumin and calbindin) to identify and quantify hippocampal interneurons. We anticipate that there will be a relationship between interneuronal number and the quality of oscillation observed in the EEG. Better characterization of the effect of TBI on hippocampal function and cognitive behavior is essential for the development of innovative therapeutic strategies.

Identifying Transit Dependent Populations: A Method for Measure A Neighborhood Shuttle Systems

Veronica Herrera
Sponsor: Susan Handy, Ph.D.
Environmental Science & Policy

Measure A is a one-half percent sales tax that funds transportation improvements in Sacramento County. A portion of these funds are designated for a countywide Neighborhood Shuttle System. Such shuttles systems have quickly become an essential component of larger more regional multimodal transit systems, now seen as the heart of Transit Oriented Development planning. However, current and proposed shuttle routes in the Sacramento region do little to resolve unmet transit needs in disadvantaged communities, and instead reflect long-standing patterns of unequal public investment in Sacramento County. Using data from the U.S. Census and literature on transit dependent populations, this research project proposes a method to identify areas experiencing unmet transit needs. Using such a method can aid in prioritizing neighborhoods where Measure A investments can be most beneficial to locating shuttles where they are most needed. Utilizing such a method could result in a more equal distribution of public infrastructure investment in Sacramento.

Effects of p,p'-DDT and p,p'-DDE on Respiration and Substrate Utilization in Brown Adipocytes

Elise Hickman
Sponsor: Michele La Merrill, Ph.D.
Environmental Toxicology

Dichlorodiphenyltrichloroethylene (DDT) is an insecticide used widely in the United States in the mid-1900s. Although DDT was banned in the United States in 1972, it is still widely used in Asia and Africa for malaria control. DDT and its metabolite dichlorodiphenyldichloroethylene (DDE) are both highly stable and lipophilic, allowing them to persist in the environment and bioaccumulate. Importantly, epidemiological studies show an association between exposure to DDE and risk of both obesity and diabetes. Perinatal exposure to DDT causes impaired thermogenesis, decreased energy expenditure, and increased insulin resistance in mice. We hypothesize that DDT and DDE may interfere with metabolism in brown adipose tissue, a tissue that plays a key role in non-shivering thermogenesis. To test this, brown adipocytes were exposed to DDT and DDE, and mitochondrial function was measured. Preliminary results show significantly decreased basal respiration in brown adipocytes exposed to 1-1000 nM DDT. These results suggest dysfunction of the mitochondria or impairment in the processes delivering substrates to the mitochondria.

The Postmodern Uncanny and Playful Spectre

Dakota Hill
Sponsor: Patrick Lemieux, Ph.D.
Cinema & Digital Media

This thesis is a collection of mediums exploring the postmodern uncanny. My goal is to analyze how artists ironically utilize artifacts from the past, a symbol for abandoned modernism, in order to construct nostalgic attachment and ultimately disturb their audience on a Freudian level. Protagonists in these works often succumb to dark cosmic fates, out of their own control and understanding, and are lured to their demise by spectral commodities of childhood or play. By breaking away from expected media regimes to both comedic and horrific effects, the postmodern creators examined share a similar counterculture ethos with surrealist art movements of the last century; however, while modern thinkers were interested in individual existence within industrial society, contemporary artists are more concerned about cultural existence in late capitalism. Stylistic characteristics considered include anachronistic time periods, eldritch locations, hauntological repetition, and visceral horror. In addition to a written component, this project consists of two creative pieces inspired by the topics discussed, a short narrative film Iguana Girl, and a virtual reality experience From Childhood Memories 1999 (Bootleg).

A Hydrogen Bond Network Promotes Inhibited Filaments in CTPS

Kevin Hinojosa
Sponsor: Enoch Baldwin, Ph.D.
Molecular & Cellular Bio

Cytidine triphosphate synthetases (CTPSs) are conserved, essential metabolic enzymes. CTPSs catalyze the conversion of UTP to CTP and regulate cellular CTP levels by directly sensing nucleotide concentrations. E. coli CTPS (EcCTPS) has been the focus of most biochemical and mechanistic investigations because its 3D structure is known, and it provides a good structural model for other homologs due to high CTPS sequence conservation. We are investigating EcCTPS CTP product feedback regulation, which occurs at two levels: CTP both competes with UTP at the catalytic site, and it induces a conformational change that results in the formation of inactive CTPS filaments. We hypothesize that a hydrogen bond network across the tetramerization interface stabilizes and promotes the filament-forming CTPS conformation. I am characterizing two mutant enzymes with substitutions designed to disrupt this network (E155K and R158M). I measured the enzymes' concentration-dependence of specific activity from 50-500 nM to assess their ability to form active tetramers. As expected, since the mutations are at the tetramerization interface, they require a higher concentration to achieve maximum specific activity. With this data I will establish standardized reaction conditions to assess defects in their ability form filaments.

The Use of CT Scan Imaging Technology to Detect the Prevalence and Progression of Keel Bone Damage in Laying Hens

Karina Hissen
Sponsor: Maja Makagon-Stuart, Ph.D.
Animal Science

Keel bone damage (KBD), caused by fractures and/or deviations of the bone, is associated with reduced egg production and egg quality in laying hens and may have a negative effect on hen welfare. CT scan imaging (CTSI) allows us to visualize keel bones in live birds, thus providing data on the relative incidence of the two types of damage. The objective of this study was to use CTSI to determine the incidence, types, and progression of KBD in laying hens housed in enriched housing systems. 3D models of keels were produced and evaluated from CTSI. Each of the 120 focal birds were scanned at the start and end of each two three-week trial (total 4 scans/bird). Keel bones were scored based on the severity of fractures and deviations, each on a scale 0-2. The results were an increase in the number of bones with damage within each three week period. The CTSI data are being paired with information about the frequency, degree, and behavioral causes of impacts experienced at the keel in a larger study. The long term objective is to identify risk factors that contribute to the development of KBD by hens housed in enriched colony cage systems.

Fineness and Phylogeny in Freshwater and Marine Fishes

Evan Hoeft
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Teleosts, a large vertebrate group that contains most of the world's species of bony fish, have transitioned between marine and freshwater environments several times throughout their evolutionary history. While some research has assessed how these environments generally influence body shape in fishes, we have little understanding of how freshwater and marine environments affect body shape diversity among teleosts, and proposed mechanisms yield conflicting predictions. Additionally, different morphological features may follow different trends in diversity, making it desirable to analyze these features separately. In this study on teleosts, I will examine the effect of habitat type on fineness ratio, a measure of how streamlined an object is and an indicator of a fish's movement efficiency in water. Using habitat data available from FishBase and morphological data collected from up to three specimens each of 810 teleost species, I will search for differences in fineness ratio diversity between freshwater, marine, and brackish teleosts in an evolutionary (phylogenetic) context. A preliminary exercise ignoring phylogeny reveals that freshwater fishes, with higher fineness ratios, are generally more streamline than marine fishes, with comparable amounts of variation between them.

Relationship of Climatic Factors Along a Latitudinal Gradient and the Phenotypic Traits of *Plantago lanceolata*

Asa Holland
Sponsor: Jennifer Gremer, Ph.D.
Evolution & Ecology

This study will explore the relationship of climatic factors due to latitude with the phenotypes and density of the globally-distributed species Plantago lanceolata. We predict a correlation of phenotypic traits with annual precipitation and temperature at three different locations. Primary phenotypic characteristics such as number and size of leaves, inflorescences, max stem height, and number of basal rosettes will be compared from each site. In addition to phenotypic traits, the density of individuals will also be examined within square-meter plots at the different sites. We hypothesize that conspecific proximity is also related to annual precipitation and temperature. Data were collected during the 2015 and 2016 growing seasons in California, Oregon, and British Columbia. Preliminary results indicate differences in the measured traits, suggesting a relationship between phenotypic characters of Plantago lanceolata along the latitudinal gradient. A more detailed statistical analysis of these data will be performed along with the incorporation of future climatic projections for each region. This project examines trends in plant phenotypic traits and conspecific proximity over a latitudinal gradient and will serve as a baseline for future studies that analyze change over time due to climate change.

Bioluminescence Resonance Energy Transfer (BRET)-Based Synthetic Sensor Platform for Drug Discovery

Jason Hong
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Bioluminescence resonance energy transfer (BRET) is a method that analyzes the interactions between proteins. This technique uses Renilla luciferase as the bioluminescent donor and fluorescent protein as the acceptor that are linked to two proteins of interest. Energy transfer is detected when the proteins interact within the Förster radius. BRET is advantageous because it offers real time measurements that can be performed in vivo. Technology of BRET enables the development of diverse synthetic biosensors to easily design high-throughput screening of drug candidates in a variety of disease models. Autophagy is a highly conserved biological process that involves a multi-step formation of autophagosomes that carry cargo to the lysosome or vacuole for degradation and recycling. Membrane phospholipid and cargo selection in autophagy biogenesis are mediated by core components such as ATG4 and ATG8. We developed the BRET-based synthetic biosensor for the ATG4-mediated processing of ATG8. Using the BRET-based synthetic biosensor, we optimized high-throughput screening to identify autophagy modulators. Furthermore, the BRET-based synthetic sensor of ATG8 can be applied to different species for the discovery of drugs for the conserved ATG8 protein.

Preliminary Field School Findings From CA-SCL-330 in Mount Hamilton, San Francisco Bay

Juliet Hook
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

This study focuses on findings from CA-SCL-330, an inland Late Period site that was excavated by the U.C. Davis Archaeological Field School in the summer of 2016. CA-SCL-330 is situated on the west slope of Mount Hamilton, in the U.C. owned Blue Oak Ranch Reserve. Characterized by its rolling hills and sparse oak woodland, this undeveloped 3,280-acre nature reserve has numerous unrecorded and uninvestigated prehistoric archaeological sites within its boundaries. Units and shovel test pits were plotted and excavated based on previous site record data and surface finds to yield a viable, investigatory sample size. Groundstone collected during survey and excavation at the Mount Hamilton site were categorized within an ordinal scale to determine use-wear. Olivella biplicata shell beads found at the site were typed through known comparison, along with radio carbon data, to infer period of occupation. Preliminary analysis of artifacts and faunal remains excavated from CA-SCL-330 provide one of the few insights into the lifeways of prehistoric populations in this region.

Can Biochar Soil Amendments Reduce Nitrate Leaching?

Zaahir Howard
Sponsor: Sanjai Parikh, Ph.D.
Land Air & Water Resources

Nitrate leaching due to excess nitrogen fertilizer applications may lead to ground water contamination. This project evaluates the potential to impact soil available nitrate with biochar - pyrolyzed carbon that has the potential to retain plant nutrients (e.g., nitrate, potassium) in the root zone of plants. Ten bioengineered chars (Cool Terra) were analyzed for pH, electrical conductivity, and nitrate sorption. It was hypothesized that the pH of the chars would influence nitrate sorption. However, since there was so little measurable nitrate sorption, trials with and without adjusting the pH and showed little to no influence on sorption. Sorption of nitrate was not significantly higher, 1.3-3.5 % average increase between multiple biochars, as compared to non-biochar treated experiments. Corresponding column studies revealed physical retardation of nitrate with biochar can occur. Ultimately, bioengineered char may increase nitrate residence time in the root zone. Additional studies to examine nitrate use efficiency for crop production are ongoing. It is anticipated that the results of these experiments will provide important baseline data for determining the efficacy of biochar soil amendments to increase soil available nitrate and to reduce N fertilization inputs, thus reducing nitrate leaching.

Characterizing Gait and Motor Impairments in an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

Caroline Hsieh
Sponsor: Robert Berman, Ph.D.
MED: Neurological Surgery

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a late-onset neurodegenerative disorder caused by a premutation (PM) in the FMR1 gene, which refers to a moderate CGG repeat expansion in the 5' UTR. FXTAS patients typically show signs of kinetic tremor, gait ataxia, and neuropsychiatric changes. PM leads to an increase in FMR1 mRNA, decreased FMRP levels, and repeat-associated non-AUG translation, which produces a toxic peptide, FMRpolyG. The presence of intranuclear inclusions in neurons and astrocytes is considered to be a pathological hallmark of PM/FXTAS, however the contribution of different cell types to disease pathology is still unknown. By using a PM/FXTAS doxycycline-inducible mouse model, we can selectively express a CGG(n) repeat in neurons at different time points during development to investigate FXTAS progression and reversibility. These inducible mice exhibit the hallmark cellular pathology; therefore we wanted to assess FXTAS-related motor phenotypes in the mice using a variety of behavior tests including gait analysis, balance and coordination, motor learning, and forelimb dexterity. Mice expressing CGG90 repeat expansions demonstrated abnormal gait and impaired motor coordination. Collectively, results from this study will provide a deeper understanding of the role of neurons in FXTAS pathogenesis and potentially identify a novel therapeutic target for disease intervention.

Deep Brain Stimulation Does Not Cause Additional Cell Death in Epileptic Rats

Emily Hsu
Sponsor: Gene Gurkoff, Ph.D.
MED: Neurological Surgery

Temporal lobe epilepsy (TLE) is characterized by recurring seizures, hippocampal sclerosis, and cognitive deficits such as difficulty with learning and memory. Anti-epileptic drugs (AED) reduce seizures, but over 30% of TLE patients are refractory to treatment. Furthermore, responsive patients can still experience side effects, further impairing cognition. Therefore, there is a need to develop a treatment strategy in addition to AED that reduces seizures and improves cognitive outcome.

Hippocampal theta oscillations are modulated by direct inputs from the medial septum (MSN). Disruptions of hippocampal theta oscillations impair cognition and lower seizure threshold. Additionally, depressed hippocampal theta has been observed in models of TLE. We previously demonstrated that theta frequency range (7.7 Hz) stimulation of the MSN entrained oscillations, improved cognitive function, and increased seizure threshold in epileptic rats. One additional possible benefit of stimulation is that reducing seizures could improve neuronal viability. Alternately, stimulating a hyperexcitable epileptic brain could lead to excitotoxicity. In this study, we compare the number of neurons in the CA1, stratum radiatum (SR), and hilus in sham, epileptic, and epileptic and stimulated rat brains using systematic and unbiased cell counting. We anticipate that limited stimulation will neither lead to significant protection nor loss of hippocampal neurons.

Effect of meta-Topolin on Shoot Growth in Paradox Walnut Rootstock and Scions

Erin Hsu
Sponsor: Richard Evans, Ph.D.
Plant Sciences

A number of paradox walnut rootstocks and scion varieties are difficult to propagate in vitro. Application of the cytokinin 6-benzylaminopurine (BA) in growth media has had varied effects upon genotypes, promoting shoot development in some and not in others. Usage of the aromatic cytokinin meta-topolin (mT) has been shown to increase shoot multiplication rates in several species of Prunus (Gentile et al. 2014) and Malus (Dobranzki et al. 2002). In this experiment, the effects of BA and mT upon walnut growth and shoot multiplication were examined and compared. Ten walnut shoots of each genotype (VX211 and CR10) were grown in media with 2.2 µM, 4.4 µM, and 8.8 µM of mT without BA, whereas the control was treated with 4.4 µM of BA without mT. Shoots were grown through three subcultures lasting 21 days each and examined for shoot growth and multiplication at the end of each cycle. Preliminary results show no significant differences in shoot multiplication between the control and mT treatments; however, shoots of scion variety Chandler CR10 appear to have greater leaf and petiole development with the application of mT.

To Determine If Zinc Oxide Has an Effect on Decreasing Sperm Counts in Juvenile Boars

Cheryl Hsu
Sponsor: Trish Berger, Ph.D.
Animal Science

Since the 1990s, studies have reported decreases in human sperm count. Sharpe reported 40% of men from 1990-2000 with a sperm count of less than 40 million/mL, a large decrease from 1930s. Possible causes ranging from inherent genetic changes to environmental sources are being evaluated. This objective of this experiment is to determine whether zinc oxide, a component of diaper rash ointments, has an effect on Sertoli cell numbers. Rash ointment contains almost 40% zinc oxide. If applied near the scrotum, the zinc may be absorbed into the testes and affect sperm production by altering Sertoli cell numbers, which regulates sperm number. Five one-week old littermate pairs of boars were selected as subjects. One of each pair was treated with Vaseline containing 40% zinc oxide or Vaseline vehicle as a control. Sertoli cells quantified by immunohistochemistry with GATA-4. The control resulted in 27.8 Sertoli cells per 10^5 μm^2, while zinc oxide subjects produced 28.3 Sertoli cells per 10^5 μm^2. The results show zinc did not have an effect on altering Setroli cell numbers within boars. Using the baby pig as a model, topical zinc oxide ointment during the neonatal interval does not appear to contribute to declining sperm counts.

The Moderating Role of Ethnic Centrality Between Perceived Stigmatization and Anxious Arousal Levels in Latinx Individuals

Alice Hsu
Sponsor: Paul Hastings, Ph.D.
Psychology

Little is known whether perceived racial discrimination impacts mental health above and beyond perceived general stressors in the general Latinx community. Further, less is known whether ethnic centrality, or defining one's self primarily as Latinx, confers risk or resilience. This study examined the associations between perceived stigmatization by others, general perceived stress, and ethnic centrality on psychological distress. We hypothesized that perceived stigmatization would robustly predict anxious arousal when compared to general perceived stress. Further, we hypothesized that stronger ethnic centrality would moderate the associations between perceived stigmatization and anxious arousal such that individuals who reported high ethnic centrality and who perceived more stigmatization would show the highest anxious arousal. Latinx participants completed measures of perceived discrimination and general stress, ethnic centrality, and anxious arousal. Our results suggested that perceived ethnic and general stress predicted symptoms of anxious arousal (R^2=0.33, F(6, 94)=7.81, p<0.01). Also, ethnic centrality moderated the association between perceived stigmatization and anxious arousal. Participants who perceived more stigmatization and were more ethnic centric showed more anxious arousal (b=0.62, t(3, 97)=5.90, p<0.001). These findings suggest that, in the context of perceived stigmatization, ethnic centrality may underscore a person's racial or ethnic identity status and therefore exacerbate anxious arousal.

Corporate Financial Performance and the Link to Sustainability

Albert Huang
Sponsor: Kevin Novan, Ph.D.
Ag & Resource Economics

Today, in the age of information, corporate financial performances have not only been affected by the quality of its operations but also by how media portrays the reputation of the firm. Because of the high level of exposure of corporate activities, the financial performance of a corporation is affected by the implications of environmental impact such as excess waste or the emission of pollutants. This market driven force has helped transition corporations to develop sustainability strategies to increase investor value and decrease costs. As a result, the environment is better off by the market and societal awareness. This study quantifies implications of environmental impact by analyzing corporate financial performance before and after a headline environmental impact. In addition to quantifying the risks, different corporate sustainability strategies that help to mitigate the implications are also analyzed. The data used in this study are the daily closing stock prices of publically traded corporations from Google Finance and Google keyword searches relevant to the events on a five year basis from Google Trends. These findings will help corporations in their decision making process to optimize its financial performance and to protect the environment through sustainability strategies.

Importance of Jasmonaic Acid Pathway Proteins in Plant Immunity

Pin-Jui Huang
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

The rapid increase in world population has put a significant constraint on the demand for crops. A considerable amount of crops are lost due to biotic and abiotic stress to crop plants. Understanding how plants cope up with these stresses in their natural environment could potentially open up new avenues for developing better crops. Various plant hormones mediate a fine balance that help them deal with biotic and abiotic stress. Plant hormones Jasmonates (JA) play an important role in initiating plants' defense signaling pathway against necrotrophic fungal pathogens while also playing a pivotal role in growth. In the absence of pathogens, JA defense response is inhibited by JAZ protein. In contrast, JAZ protein interacts with CORONATINE INSENSITIVE 1 (COI1) and form a JAZ-COI1 complex in the presence of the pathogen. This complex can be recognized by E3 ubiquitin ligase and result in JAZ protein ubiquitination and degradation, so the transcription of JA-responses gene can be activated. To gain a deeper understanding of JA-mediate immune responses, I used yeast two hybrid and plant molecular biology techniques. My project focus on molecular interaction between various proteins that are involved in jasmonic acid mediated defense response.

Molar Attenuation Coefficient of Germanium Nanoparticles

Jorinna Huang
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

The molar attenuation coefficient (ε_0) of a chemical species is an inherent property that describes its light absorption capacity at a wavelength of interest. This study determines the molar attenuation coefficient of germanium nanoparticle (Ge NPs) at wavelengths from 600nm to 800nm. Germanium(II) iodide (GeI_2) was used as the Ge precursor. Oleylamine served as the solvent,capping ligand, and reducing agent in this synthesis. Using a microwave heating method and diluted with toluene, Oleylamine-capped germanium nanoparticles were synthesized and suspended in the solvent. The absorbance (A) is recorded by UV/vis/NIR spectroscopy. Precise concentrations were determined using gravimetric analysis, and the Beer-Lambert Law ($A=\varepsilon_0 cl$) is applied to calculate for the molar attenuation coefficient at different wavelengths. The procedure is repeated several times to minimize experimental uncertainty. We are interested in the molar attenuation coefficient of germanium because it allows us to determine the concentration of similarly synthesized nanoparticle samples.

Effects of Ideal Trait Preferences and Interaction Context on Friendship Formation

Sabrina Huang
Sponsor: Paul Eastwick, Ph.D.
Psychology

Our study examined how interaction context and people's preferred traits in a friend, or their ideal trait preferences, influence the process of friendship formation. Construal level theory suggests that certain interaction contexts (e.g., seeing a person's profile, interacting online) are associated with greater psychological distance compared to other contexts (e.g., interacting in-person), and therefore may induce more abstract mental representations of interaction partners. We hypothesize that, due to these differences in mental representations, participants evaluating a potential friend's written profile will express greater interest in a friend whose traits are manipulated to match (vs. mismatch) their ideal trait preferences. After an online interaction with the potential friend, participants will continue to express greater interest in a friend whose traits match (vs. mismatch) their ideal trait preferences, whereas after an in-person interaction with the potential friend, the match vs. mismatch manipulation will no longer be associated with friendship interest. These results would suggest that mental representations of online interaction partners are more abstract than mental representations of in-person interaction partners, and that ideal trait preferences influence friendship initiation processes in certain interaction contexts, but not in others.

Measuring the Effect of MSC-secreted PGE2 on T and B Cell Activation

Nanxi Huang
Sponsor: David Simpson, Ph.D.
VM: Pathology, Micro, & Immun

Feline chronic gingivostomatitis (FCGS) is a severe inflammatory disease that affects 0.7%-10% of the general cat population. Full mouth tooth extraction is currently the only FDA approved treatment for cats suffering from FCGS. Oral mucosal inflammatory diseases, such as FCGS, are linked to overactive T and B cells that mediate chronic inflammation. Mesenchymal stem cells (MSCs) were shown to have immunomodulatory effects that reduce inflammation and alleviate the clinical symptoms of FCGS. However, because not all MSCs tested were capable of mediating a positive effect, a potency assay was conducted to help predict MSC bioactivity before delivery to FCGS patients. MSCs secrete anti-inflammatory proteins such as Prostaglandin E2 (PGE2) which downregulates the proliferation of cytotoxic T cells and B cells which secrete pro-inflammatory cytokines such as interleukin-2 (IL-2).Thus, we hypothesized that if activated T and B cells were cultured with MSCs, the concentration of IL-2 would decrease due to the immunomodulatory effects of PGE2 from MSCs. PGE2 and IL-2 production was measured using ELISA to determine the effect of MSCs on T and B cells. Potency assays are important in controlling for the consistent quality of a product by identifying the essential parameters that affect its efficacy.

A Taxonomic Investigation of the Species Limits of *Lycianthes inaequilatera* and *Lycianthes amatitlanensis* (Solanaceae)

Mayra Huerta
Sponsor: Daniel Potter, Ph.D.
Plant Sciences

Taxonomy is an essential part of understanding biodiversity. Taxonomists study the evolutionary relationships among organisms and delimit species (including naming new species). I am studying the taxonomy of two species in the genus Lycianthes within the Solanaceae (the tomato family), an economically important plant family with both medicinal and food crops. Lycianthes was first studied as a whole by the German taxonomist Georg Bitter in 1919. He classified 134 species into subgenera, sections, and series, however he did not provide a proper identification key. One of the series Bitter studied was series Strigulosae, a mostly South American group of 23 species. Two of these species, Lycianthes amatitlanensis and L. inaequilatera, are widespread, and there has been confusion as to how to distinguish them. To test whether these taxa should be considered one species or two, I measured leaf, pubescence, floral, and fruit characteristics on specimens from Mexico and Central and South America that had been identified as these two species. I performed a Principal Components Analysis, using the "stats package" in the program R. The preliminary results indicate that the two names should be placed in syonymy, and just the name L. inaequilatera should be used.

General Stressors, Experiences of Discrimination, and Internalized Homonegativity Predict General Distress in LGBTQ Individuals

Alexandria Huerta
Sponsor: Paul Hastings, Ph.D.
Psychology

Ubiquitous hassles and stressors impact the lives of the general population. However, lesbian, gay, bisexual, transgender, and queer (LGBTQ) individuals experience unique stressors associated with heterosexism because of their sexual minority group membership. Experiences of LGBTQ discrimination have been shown to severely impact self-perceptions (i.e., devaluation of the self) and mental health. Our study examined whether experiences of LGBTQ discrimination and negative self-perceptions for being LBGTQ (i.e., internalized homonegativity; IH) would predict psychological distress more robustly than general stressors. Furthermore, we predicted that IH would moderate the associations between LGBTQ discrimination and general distress. Our findings showed that LGBTQ discrimination, IH, and general stressors were positively associated with each other and with general distress. These findings demonstrate that general stress and IH predicted general distress, but IH moderated the links between LGBTQ discrimination and general distress (R^2=0.58, F(6, 95)=7.95, p<0.01). Participants who reported more experiences of LGBTQ discrimination showed more general distress when they also reported having more IH (b=0.35, t(3, 98)=2.17, p<0.05). These findings suggest that experiences of discrimination towards one's sexual orientation are a form of stress that when coupled with high IH yield more negative health outcomes.

Does Our Decision Timing Bias the Perceived Difficulty of the Decision?

Tsz Ho Hui
Sponsor: Eve Isham, Ph.D.
Psychology

Although we often characterize our decisions as easy or difficult, but it is unclear whether our introspection of the difficulty level is accurate. It is possible that the perceived difficulty is influenced by a number of factors including one's perceived time of when the decision was made. In the current study, we asked our subjects to make decisions regarding audio statements that we played to them and give a difficulty rating for each decision. We manipulated the perceived time of decision by providing either no feedback or delayed feedback (auditory tone) at the time of their responses. In the no feedback condition, the decision is presumed to have been reached earlier, whereas in the delayed feedback condition, the decision is presumed to have been reached later. We observed that difficulty ratings varied with the presumed early and late decisions. Our findings suggest that our perception of difficulty is biased by when we think the decision is made.

Effects of Supplemental Milk Fat Globule Membrane (MFGM) on Genes Involved in Memory and Learning in Rat Pups

Anna Hurzhyi
Sponsor: Bo Lonnerdal, Ph.D.
Nutrition

Benefits of breastfeeding are well known; nonetheless, various reasons prevent many infants from being breastfed. Infant formula still does not contain many biological components found within breast milk and there are significant differences in long-term cognitive outcomes between formula-fed and breast-fed infants. To date, MFGM has been absent in infant formula, but bovine MFGM is now commercially available. Recent clinical trials on infants fed MFGM-enriched formula showed improved cognition, but the mechanism is unknown. We examined the effect of supplemental MFGM on cognitive development using normally fed (N) and growth restricted (R) neonatal rats. MFGM was supplemented at 100 mg/kg body weight. Supplementation continued daily until postnatal day (PD) 13 or PD 21. mRNA was isolated with Trizol and converted to cDNA. Q-PCR was performed on PD14 cDNA. At PD14, MFGM increased mRNA expression of genes involved in memory/learning in N and R animals, including BDNF (1.25-fold change (fc) N, 1.48 fc R), St8sia4 (1.67 fc N), Dopamine Receptor (1.69fc N, 0.98fc R), and Glutamate Receptor-1 (1.71 fc N, 1.54 fc R) (P<0.01). Animals also showed improved results in behavioral testing. Our findings suggest that MFGM plays a role in cognitive development by up-regulating proteins involved in brain function.

A Human Milk Oligosaccharide Reduces the Uptake of Pathogenic Bacteria by Mammalian Epithelial Cells

Jenna Huynh
Sponsor: David Mills, Ph.D.
Food Science & Technology

Premature infants in the neonatal ICU are at high risk of infections, and can develop intestinal complications such as Necrotizing Enterocolitis (NEC), a condition that is attributed to proteobacterial blooms. Human milk oligosaccharides (HMOs), which are abundant in milk and can be metabolized by bacteria like Bifidobacterium longum subsp. infantis, aid in deflecting pathogens. Currently, there is little research on the effect of individual purified HMOs on host-microbial interactions. We hypothesized that a synthetic oligosaccharide, HMO 1.1, may function to prevent bacterial translocation across the epithelial barrier of Caco-2 cells. To test this, HMO 1.1 was added to Caco-2 cells, along with pathogenic E. coli, and this clearly reduced the uptake of pathogenic E. coli. Moreover, it also reduced phosphorylation of key Caco-2 proteins in the signaling cascade responsible for the ability to combat infection. These studies support a growing body of evidence suggesting a direct role for HMOs in conditioning the intestine and preventing infection. Further study will define the mechanistic nature of this protection and aid in the development of possible therapeutic treatments aimed at preventing dysbiosis and reducing the risks of NEC in premature infants.

Acceleration of Cardiac Simulations for Cloud Computing Resources

Delvin Huynh
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Computer simulation has greatly facilitated our understanding of the cardiovascular system and is boosting the development of personalized medicine for cardiac diseases. The simulation of the heart is computationally intensive due to the complexity and multi-scale essence of the cardiovascular system. Parallel programming with many central processing units (CPUs) has been one of the commonly used solutions to quickly compute and simulate voltage diffusion of the heart. More recently, rapidly growing cloud computing resources, such as Amazon Elastic Compute Cloud and Google Compute Engine, provide a new infrastructure for parallel computing. They prove to be beneficial as they do not require the user to own physical CPUs. Unfortunately, the high latencies of these resources make parallel computing even slower, thus undermining its use for intensive computations. In this study, we developed a novel algorithm to facilitate the utilization of cloud based computing resources. The larger the latency, the faster our algorithm performs the simulations compared to no algorithm. Overall, this algorithm improves the simulation speed by more than twice as much. Techniques developed here can also be applied for other complex reaction-diffusion systems in other fields.

Site-Specific Gene Expression During Lung Development Informs Respiratory Toxicology

Matthew Hvasta
Sponsor: Laura Van Winkle, Ph.D.
VM: Anat Physio & Cell Biology

The goal of this study is to define the normal pattern of development for key enzymes involved in metabolic activation and detoxification of the air pollutant naphthalene. Typically, toxicologic mechanisms and patterns of enzymatic development have been investigated thoroughly only for adult male rodents. We quantified differences in gene expression in neonatal (7d), juvenile (3w), and adult (8w) male and female mouse lung for three key genes: cytochrome P450 monooxygenase 2F2 (Cyp2f2), Glutamate cysteine ligase (Gclm, the rate limiting enzyme in synthesis of the antioxidant glutathione) and microsomal epoxide hyrolase (Ephx1). Proximal and terminal airways were subsampled by laser capture microdissection and measured using qrtPCR. Adult male terminal bronchiolar epithelium had an average of 2 fold more expression of the three genes compared to all other groups including adult female. Female mice had an atypical maturation of the enzymes compared to males. Due to the later maturation of Gclm, juvenile females may be more susceptible to proximal airway damage. We conclude that expression of key enzyme systems differs greatly by age, sex and location with the lung. These findings have implications for age and sex-specific susceptibility to environmental toxicants that are metabolized by these enzyme systems in the lung.

Flexible Attentional Templates: Shifting in Target Representation

Hyeyeon Hwang
Sponsor: Joy Geng, Ph.D.
Psychology

An attentional template is based on a group of features in working memory that represents a target in visual search. In contrast to previously accepted notions that attentional templates are static, recent research reveals that these templates are flexible and dynamic even with controlled targets and distractors (Navalpakkam and Itti, 2007). The current study further examines the flexibility of template shifting with respect to changes in distractor context. A visual search target was defined by a single color, and subjects were instructed to find and click on the target object within a visual search display containing the target and distractors. Attentional templates were measured periodically by a second colorwheel task for which subjects clicked on the remembered target color. Initial findings indeed revealed shifts in the target representation that updated rapidly when the distractor context changed. A second experiment tested whether a perceptual illusion due to color contrast between the target and distractor colors could account for the results, but found that the effect of the illusion was smaller than that of the template shift. Together, the results indicate that the target representation is actively shifted away from distractor colors in order to facilitate target selection from distractor clutter.

Regulation of Collagen and EGR1 Expression in Skeletal Muscle Following Resistance Exercise in Young and Aged Rats

Amenah Ibraheem
Sponsor: Keith Baar, Ph.D.
Neuro Physio & Behavior

The loss of skeletal muscle (SKM) strength with age independent of muscle mass is termed dynapenia. Dynapenia may be partially attributed to a defect within SKM extracellular matrix (ECM) resulting in impaired transmission of force from the skeletal muscle to the bone. Collagen, the principle component of SKM ECM, expression is regulated by the transcription factor Early Growth Response-1 (EGR1) which increases after exercise. We sought to determine whether aged SKM exhibited a diminished adaptation to resistance exercise within the ECM. Young and old rats underwent an acute bout of unilateral resistance exercise and tibialis anterior (TA) muscles were collected 6, 18, 48 hours post. Another group of young rats were subjected to in-vivo electroporation of the TA muscle with a mouse-specific EGR1 plasmid (20ug) or vector control. RNA was isolated from all muscles and analyzed by qPCR. Western blotting was performed to assess protein content. Aged SKM exhibited an ~50% decrease in expression of EGR1 and collagen isoforms in response to exercise. Further, the overexpression of EGR1 was associated with a dose-dependent increase in collagen expression. These data indicate that aged SKM exhibited an impaired adaptation of the ECM to exercise, which could contribute to dynapenia over time.

Exploring DNA Curvature and Topological Structure of kDNA Minicircle Networks

Lara Ibrahim
Sponsor: Francisco Arsuaga, Ph.D.
Molecular & Cellular Bio

Trypanosomes are parasites that cause lethal diseases such as African trypanosomiasis, a neglected tropical disease as catalogued by the World Health Organization. A key feature of these organisms is the catenated, planar network of DNA minicircles found in the mitochondrion. The purpose of this research is to understand the mechanisms which allow the formation of the network, and its unique topology. Experimental data suggests that each minicircle is singly linked to 3 other minicircles (i.e. valence 3). However, mathematical modeling which factors in minicircle orientation, DNA flexibility and electrostatic repulsions fails to reduce the valence below 11. Conformations of a minicircle sequence were simulated in order to test if sequence dependent bending of the DNA may account for the remaining discrepancy between the experimental (3) and theoretical (11) valence number. By fragmenting the kDNA network and determining the fragmentation pattern as a function of the extent of restriction enzyme digestion, the model that best represents the network can be identified. This comparison of laboratory results with graph theory predictions will allow for the determination of the network topology. Information about sequence dependent curvature and details of network topology could aid in identifying novel drug targets within the parasite's mitochondria.

Heterogeneous Distribution of Action Potential Waveforms Can Promote Initiation of Cardiac Arrhythmias

Hitomi Inoue
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Sudden cardiac death (SCD) is a leading cause of death in the United States. SCD is often caused by ventricular fibrillation. Early afterdepolarization (EAD) is depolarization during the plateau phase of the action potential, which may trigger ventricular tachycardia and fibrillation. In this study, using a physiologically detailed computational model of the ventricular action potential, we investigated how heterogeneous distribution of action potential waveforms promotes EADs, and thus arrhythmias. The ventricular tissue has three layers called epicardium, mid-myocardium, and endocardium. Each layer has significantly different action potential waveforms. Action potentials in epicardium and endocardium are much shorter than that in mid-myocardium. EADs often develop in the mid-myocardial cells. Our results show that existence of the short action potential in epicardium or endocardium and electrotonical coupling between these layers can promote formation of EADs. Understanding the causes and mechanisms of EADs is critical for development of effective drugs and therapies. Our results provide theoretical bases for development of antiarrhythmic drugs.

Who Am I: Understanding How People Develop Racial Identities

Pak See Ip
Sponsor: Nicole Hollis, Ph.D.
Human Ecology

Previous research has shown that context can influence racial identity development (Nishina et al., 2010). Further, the way in which one identifies themselves can have a significant influence on self-esteem and achievement (Worrell, 2007). The current study examines how contextual factors (e.g., cultural events) and family characteristics (e.g., language) influence how individuals identify themselves and think about race. Given the political and social changes in our country, it is important to understand and value ethnic and racial identity. There is an increasing prevalence of cross-racial relationships (Passel et al., 2010; Tuch et al., 1999) as the population diversifies. Thus, it is critical to examine how individuals choose to identify themselves, and what influences positive and negative views of one's race to increase positive self-beliefs. To begin this examination, we used data from the American Identity and Representation Survey (AIRS; Schildkraut, 2012) and the GATE Millennium Scholars Program (GMS) Cohort 2 (Gates Foundation, 2013). First, individuals' racial identity relates more to their behavior when they are in their public sphere than when they are in their private sphere. Second, contextual factors such as opportunities to engage in cultural activities and with same-race members are related to strengthening one's racial identity.

Impact of Cytochrome P450 Polymorphisms on Fentanyl Pharmacokinetics in Burn Patients

Xenia Ivanova
Sponsor: Nam Tran, Ph.D.
MED: Pathology & Lab Medicine

Fentanyl is a potent synthetic opioid with anesthetic and analgesic (pain relieving) properties. It is one of the primary opioids used for pain management in burn patient care. Optimized dosing of opioids for burn patients has been shown to reduce suffering and improve clinical outcomes, but has been difficult to achieve for fentanyl due to large variability in its metabolism. This variability can cause premature elimination before fentanyl has reached its target, or slowed elimination and accumulation of fentanyl with toxic effects. The metabolic disparity is in part due to polymorphisms of the cytochrome P450 (CYP) liver enzymes CYP2D6 and CYP3A4, which are thought to be the main metabolizers of fentanyl. Differing activities among genotypes of CYP2D6 and CYP3A4 can lead to more than a 100-fold difference in metabolism. Additionally, fentanyl metabolism in burn patients can vary due to the altered physiologic state following burn injury. Our study characterizes the pharmacokinetics (PK), or absorption, distribution, metabolism, and excretion of intravenous fentanyl in burn patients, and examines the effect of CYP2D6 and CYP3A4 polymorphisms on fentanyl PK. We hypothesize that genotyping CYP2D6 and CYP3A4 prior to fentanyl administration may give clinicians useful information regarding optimal fentanyl dosing.

Interleaflet Coupling Effects in Supported Lipid Membranes

Daniela Ivey
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering

For the past two decades, there has been considerable interest in the subject of phase-separated, liquid-ordered domains (i.e. lipid rafts) in biological plasma membranes. These domains are believed to play important roles in the lateral organization of membrane proteins and are known to influence properties such as membrane fluidity. Indeed, knowledge of the fundamental biophysical properties of lipid domains informs a greater understanding of the potential functions and properties of lipid rafts in living cells. However, it can be difficult to characterize lipid rafts in vivo due to inherent challenges associated with probing dynamic, living systems. Therefore in this research project, we investigate the properties of phase-separated phospholipid bilayers by using solid-supported lipid bilayers (SLBs) as model systems. When produced in these biomimetic membranes using a variety of lipid compositions, domains are almost exclusively observed as being coupled across the bilayer, suggesting that interleaflet interactions play a notable role in domain formation. To investigate the strength of interleaflet coupling in SLBs, we also aim to develop an electrophoresis-based method to measure the coupling strength between the leaflets. By monitoring the electrophoretic response of domains, we seek to characterize the relative strength of coupling interactions in different SLB systems.

Identifying Knowledge Structures of Introductory Chemistry Students

Kyleigh Jacobs
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Studies have shown that students in general chemistry have difficulty with problem solving, which is influenced by many variables, including how students organize knowledge in their minds. This study explores students' knowledge structures, defined as the network of related concepts in the mind, and how they are related to different factors including gender and prior knowledge in chemistry and math. A word association test was developed by selecting major concepts in general chemistry as stimulus words to which students were asked to provide ten response words that came to mind within ninety seconds of reading each stimulus word. The top twenty-five most frequently used responses for each stimulus word were used to calculate relatedness coefficients, which measure how closely stimulus words are linked in the students' minds. Finally, two network generating programs, Pathfinder and Gephi, were utilized respectively to interpret these relatedness coefficients and determine knowledge structures. Our data indicate structural differences in the organization of concepts in students' knowledge structures based on gender and background in math and chemistry. Our findings will inform changes in curriculum which would place more emphasis on related topics that seem weakly connected in the knowledge structures to promote conceptual understanding.

Energy Expenditure of Stone Tool Knapping Oldowan and Acheulean Technologies

Dana Jacobs
Sponsor: Nicolas Zwyns, Ph.D.
Anthropology

Early humans started to produce stone tools in Africa some 3 million years ago. This major innovation would be linked with the introduction of meat in their diet, a change that would help support the caloric costs of an expanding brain. This model rests on the assumption that since the emergence of tool-making behavior, the energetic rate of return for stone tool production (and use) is such that benefits exceed the cost. Technology may have well helped early humans adapting to environmental constraints, however, little is known about its physiological costs. Here, I designed an experiment to investigate the energy expenditure necessary to produce two of the earliest stone tool technologies: Oldowan and Acheulean. By collecting and analyzing the expired air of participating subjects as they produce stone tools, I am able to determine the physiological cost of producing such tools in comparison with seated metabolism. Using Homo sapiens as a reference, the results will help model the physical exertion contributed to the transition between stone tool technologies for extinct species. This project provides the initial data necessary to launch a deeper investigation into the entire process including raw material collection, stone tool production, butchery, and meat consumption.

Detection of the Vector-Transmitted Bacteria, *Bartonella henselae*, in Small Indian Mongooses (*Herpestes Auropunctatus*) From Grenada Island

David Jaffe
Sponsor: Bruno Chomel, D.V.M.,Ph.D.
VM: Population Hlth & Reprod

Domestic cats (Felis catus) are the natural reservoir of a few Bartonella species, including Bartonella henselae, the agent of cat-scratch disease. Many mammals are established hosts for these bacteria. Indian mongooses (Herpestes auropunctatus), as domestic cats, belong to the Feliformia phylogenetic suborder, and have been reported as a possible host for B. henselae in southern Japan. Confirming the prevalence of Bartonella in mongooses from the Caribbean could identify them as vectors for human transmission, and the risk involved with mongoose-human contact in the New World. No study has looked for Bartonella's presence in mongooses from Grenada Island. We used immunofluorescence, polymerase chain reaction, and sequencing techniques to establish the presence of B. henselae in 171 mongooses from all six parishes in Grenada. Almost a third (32.3%, 54/167) of the mongooses were seropositive for B. henselae, and 13 (36.1%) of the DNA extracted from blood pellets (n=36) were PCR positive for the gltA (citrate synthase) gene, but only one of 136 tissue samples. All sequences were identical to B. henselae genotype I, as previously reported from Japan. This study confirms the role of Indian mongooses as a natural reservoir of B. henselae in the New World.

Joint Attention Through Caregiver's Manual Interactions

Mithya Jayakumar
Sponsor: Lisa Oakes, Ph.D.
Psychology

Joint attention is a key milestone of early development when parents and infants focus on the same object. While such attention is an essential component of early cognition, it is not yet well understood how it develops in infancy. Historically, research has focused on gaze following as the primary pathway to joint looking behavior. Work by Yu and Smith (2013) shows this to be a potential pathway in toddlers. Our project investigates an alternate pathway: joint attention through infants' gaze at caregiver's manual interactions. Parent's active exploration of the objects may provide significant cues to infants on where parents are looking. We used head mounted eye-trackers to measure visual attention during naturalistic parent-infant play and to determine whether this pathway emerges in infancy. We are currently coding for visual and manual behavior of both parents and infants over the course of each hand behavior. Using this data, we will ask whether different parental hand behaviors have different effects on infants' attention. Ultimately, understanding what initiates these explorations will further our knowledge on how to encourage an infant's development.

Investigating the Role of Cdc48 in Meiotic Recombination

Meenakshi Jhalani
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Meiosis is the cell division process in which a diploid cell divides into haploid gametes. Accurate chromosome segregation requires that homologous chromosome pairs associate and become connected by crossing over. These events are mediated by a DNA repair mechanism called homologous recombination. Defects in recombination are associated with cancer, infertility and aneuploid diseases such as Down's syndrome. Consequently, several distinct pathways tightly regulate meiotic recombination. We hypothesize that the conserved AAA+ ATPase Cdc48 protein plays a role in meiotic recombination, because of its essential regulatory functions in a broad array of cellular processes including mitotic chromosome repair by recombination. During mitotic recombination, Cdc48 with its cofactor Ufd1 recognizes and extracts pro-recombination proteins to negatively regulate this process. Given the essential nature of Cdc48, conditional alleles of Cdc48 and/or its cofactors are required to understand its function in a specific process. Here, I am employing the "anchor-away" method to rapidly deplete the nucleus of the Cdc48 cofactor, Ufd1. This approach will maintain the cytoplasmic localization and function of Ufd1, allowing its nuclear function to be elucidated. Moreover, the anchor away system enables "real-time genetics" that will allow us to explore the requirement for Cdc48 at different steps of meiotic recombination.

Investigating the Function of Three Homologous IQD (IQ Domain) Family Proteins During Mitosis in *Arabidopsis*

Xueer Jiang
Sponsor: Bo Liu, Ph.D.
Plant Biology

Eukaryotic cell division depends on the dynamic network of microtubules. During cell division, microtubules undergo rapid reorganization that is often regulated by calcium and calmodulin. Ca^{2+}/calmodulin-binding IQ domain-containing proteins, or IQDs, have been identified in flowering plants and shown to directly interact with microtubules. Among many IQDs in the model organism, Arabidopsis thaliana, closely related IQD6, 7, 8 exhibit a cell cycle-dependent expression pattern. We hypothesize that these IQD proteins regulate microtubule organization during cell division in response to calcium signaling. To test this hypothesis, IQD6-8 were expressed in fusions with green fluorescent proteins (GFP) under native promoters. IQD6 and 8 were detected at the preprophase band (PPB), a microtubule array forecasting the plane of cell division, by confocal and immunofluorescence microscopy. Furthermore, plants harboring T-DNA insertional mutations were isolated by PCR-based genotyping techniques in Arabidopsis. While homozygous single mutants of iqd6, iqd7, and iqd8 did not exhibit noticeable phenotypes, an iqd7; iqd8 double mutant showed a phenotype of seriously retarded growth when compared to wild type controls. Therefore, both lines of evidence supported our hypothesis. This study with ongoing experiments in Arabidopsis will advance our understanding on the regulation of PPB microtubule array organization during cell division.

Confirmation of Methylation Differences in Umbilical Cord Blood From Autism Subjects in the MARBLES Study

Julia Jianu
Sponsor: Janine LaSalle, Ph.D.
MED: Medical Microbiology & Imm

Autism spectrum disorders (ASD) encompass a variety of neurodevelopmental disorders with characteristics of reduced social interactions and communication. MARBLES (Markers of Autism Risk in Babies: Learning Early Signs) is a longitudinal study for pregnant women who have a child with autism with the goal of finding early markers for ASD. Epigenetic mechanisms such as DNA methylation provide a link between genetic and environmental factors, and therefore may offer insight into the complexity of autism genetics. As a part of the MARBLES study, differences in methylation between ASD subjects and controls are being examined through whole-genome bisulfite sequencing (WGBS) in umbilical cord blood. WGBS has identified 7 differentially-methylated regions (DMRs) significant at a genome-wide level. These DMRs are hypermethylated in ASD and methylation at these DMRs is positively associated with ASD severity. While WGBS is well adapted to characterize methylation patterns across the entire genome, it is expensive and requires extensive analysis. Bisulfite pyrosequencing quantitatively assesses methylation in a target region and is also more time- and cost-efficient. Pyrosequencing assays have been developed and tested for specificity. In future work, DMRs identified by WGBS will be confirmed through bisulfite pyrosequencing, which provides technical validation of the WGBS results.

Treg to Th17 Imbalance in Canine Ulcerative Stomatitis

Robert Jimenez
Sponsor: Amir Kol, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Canine ulcerative stomatitis (CUS) is a chronic inflammatory disease that is thought to result from inappropriate response of the patient's immune system against innocuous oral microbiota. Th17 cells are a pro-inflammatory T cell subset that play an important role in recruiting macrophages and neutrophils to inflamed tissues. Conversely, regulatory $CD4^+$ T-cells (Treg) are important modulators of immune response, counteracting the pro-inflammatory response of Th17 cells. It is now recognized that several key immune-mediated diseases are characterized by Th17 to Treg imbalance. I hypothesize that in canine ulcerative stomatitis, T-cell populations in inflamed oral tissues are skewed towards a Th17 phenotype compared to healthy controls. To test my hypothesis, I am examining T cell subset populations within CUS lesions via immunohistofluorescence. Treg cells are identified by co-staining for $CD3^+$ (a T-cell surface marker) and FoxP3; a Treg master transcription factor. Th17 cells are defined by dual positivity for $CD3^+$ and IL17. Images have been acquired using confocal microscopy and will be analyzed using the IMARIS software. Preliminary results indicate that Th17 cells are increased disproportionally to Treg cells with CUS lesions. These data suggest that Th17 to Treg cell imbalance may play a role in the pathogenesis of canine ulcerative stomatitis.

Investigating the Interaction of Molecular Signaling and Neuronal Activity in Retinotopic Map Formation

Yihan Jin
Sponsor: Hwai-Jong Cheng, M.D.,Ph.D.
Neuro Physio & Behavior

To process visual information, the lateral geniculate nucleus (LGN) and the superior colliculus (SC) receive input from the retinal ganglion cells (RGCs) to form a retinotopic map during development that serves as an orderly representation of visual input. This event depends greatly on molecular signaling and neuronal activity, but the interaction of these two mechanisms remains unclear. Graded expression of Eph on RGCs and ephrin in the LGN and SC guide extending RGC axons to appropriate locations to form the map. However, in mutant mice with duplicated EphA3 gradients, RGCs form two maps in SC but only one map within LGN. We hypothesize that competing neuronal activities from both eyes override the duplicated molecular driving force in mutant EphA3 knock-in (EphA3kiki) mice. We eliminated one eye in newborn EphA3 kiki mice, performed focal injections of a fluorescent tracer to label RGC axons, and analyzed tissue sections using fluorescence microscopy. Currently, our preliminary data shows that 20% of postnatal day 15 (P15) enucleated EphA3kiki mice have two maps in LGN. Older mice around P20 all have only one map. Further experiments on younger mice are important to understand if refinement occurs in enucleated EphA3 kiki mice to develop proper visual connectivity.

State of Water Resources Management in the Rio Grande/Rio Bravo Basin

Zaira Joaquin-Morales
Sponsor: Samuel Sandoval Solis, Ph.D.
Land Air & Water Resources

Water resource modeling tools have been developed for many different regions and sub-basins of the Rio Grande/Bravo (RGB). These tools have specific objectives, whether it is to explore drought mitigation alternatives, conflict resolution, climate change evaluation, tradeoff and economic synergies, water allocation, reservoir operations, or collaborative planning. However, there has not been an effort to integrate different available tools, or to link models developed for specific reaches into a more holistic watershed decision-support tool. This project outlines promising next steps to meet long-term goals of improved decision-support tools and modeling. We identify, describe, and synthesize water resource management practices, available models, and decision support tools that represent the RGB basins and the distribution of water for human and environmental uses. The extent body of water resources modeling is examined from a perspective of environmental water needs and resource management and thereby allows subsequent prioritization of future research and monitoring needs for the development of river system modeling tools. This work communicates the state of the RGB science to diverse stakeholders, researchers, and decision-makers. The products of this project represent a planning tool to support an integrated water resources management framework to maximize economic and social welfare without compromising vital ecosystems.

Characterization of Maternal Cytokine Profiles and Pup Ultrasonic Vocalizations in a Rat Maternal Immune Activation Model

Skylar Johnson
Sponsor: Melissa Bauman, Ph.D.
MED: Psychiatry & Behav Sci

Pregnant women who are exposed to viral or bacterial infection during pregnancy have an increased risk of giving birth to children later diagnosed with neurodevelopmental disorders, such as autism or schizophrenia. Preclinical research using rodent models identified maternal immune activation (MIA) as a key link between prenatal immune challenge and altered brain and behavioral development of the offspring. This study will evaluate the specific cytokine profiles generated by various doses of a viral mimic, polyIC, as well as the ultrasonic vocalization (USV) data collected from the offspring. On gestational day 14, the pregnant dams received tail vein injections of polyIC and blood samples were collected and assayed for cytokine responses 4.5 hours later. The preliminary results show that different doses of high molecular weight and low molecular weight polyIC produce very different cytokine responses in the dams. To complement the immune data, the pups born to these dams will undergo various forms of behavioral phenotyping, including the collection of ultrasonic vocalizations. The preliminary data collected from these USV tests will also be presented in this study.

Measuring With Behavior How the Brain Commits to a Choice in a Simple Decision Task

Bridgette Johnson
Sponsor: Timothy Hanks, Ph.D.
MED: Neurology

Have you ever wondered how your brain commits to a decision? The commitment to execute a decision relies on information you have on hand, the current situation and the implications of your decision. In this study, we analyze how humans control the balance between avoiding premature decisions and late decisions, and how the outcome of previous decisions affect the next decision they make. We use an auditory change detection task in which subjects detect a change in a fluctuating auditory stimulus. Each choice is made from the information subjects gather before the choice. This type of task allows us to better understand how sensory information given before a decision affects their commitment. We have a method to measure which parts of the proceeding information had influence for the choice. We found that subjects alter their decision strategies without altering when information influences their choice. We also discovered that subjects change their decision strategies when they make mistakes. This reduces the probability of them consecutively making the same type of mistake. Our study provides the framework for further studies that will strive to understand how the brain exerts flexible control over decision commitment.

Analysis of Peptide Toxin Partitioning Into the Membrane Using Rosetta

Cierra Joseph
Sponsor: Vladimir Yarov-Yarovoy, Ph.D.
MED: Physiology & Membrane Biol

Voltage-gated ion channels play a key role in signal transduction in excitable cells. Understanding ion channel modulation by naturally occurring peptide toxins on molecular level is key for development of novel therapeutics of neurological and cardiovascular disorders. A number of peptide toxins partition to the extracellular side of the membrane to target membrane exposed protein surface on voltage sensors of ion channels. However, molecular determinants of peptide toxin interaction with the membrane environment are not well understood. I used the Rosetta molecular modeling suite with membrane environment specific energy function to embed 12 peptide toxins structures into the membrane environment. I analyzed the peptide toxin embedding predictions to identify peptide toxins that converge on similar position and orientation in the membrane bilayer and evaluated the membrane environment specific energies of all peptide toxin residues. Preliminary results suggest that the peptide toxins prefer a similar orientation and depth in the membrane bilayer. The unique orientation of peptide toxins exposes residues that are critical for protein-protein interaction with the voltage sensors within the lipid environment, suggesting that the toxins may utilize this embedding and orientation to interact favorably with voltage sensors of ion channels.

Topological Signals That Trigger Regulation of the Spindle Associated Protein Bim1

Najah Joseph
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

During DNA replication, physical linkages form between sister chromatids that result in "tangled" sister chromatids that are not fully resolved until anaphase. Conditions that exacerbate these linkages, result in slow to resolve sister chromatids in anaphase. Our lab has found that replication stress activates an Aurora B signaling pathway that alters spindle dynamics and increases spindle forces acting on unresolved sisters in anaphase. We have found that one change in the spindle involves a decrease in the size of the protein complex associated with the microtubule plus-end regulator, Bim1. However, it remains unclear what molecular cues from tangled sisters contribute to Bim1 and spindle changes. We hypothesize that specific topological structures associated with tangled sister chromatids trigger the Aurora B dependent signals that regulate Bim1 and its complex size. To test this hypothesis, we analyzed the size of Bim1 complexes in topoisomerase mutants that result in tangles due to either intertwined or catenated DNA. Both types of linked DNA enrich Bim1 in larger protein complexes, a result that contrasts with the smaller Bim1 complexes in cells exposed to replication stress. This finding suggests that formation of topological linkages may represent one step in a regulatory pathway that controls anaphase progression.

Circadian Rhythm Analysis After Removal of Important Repressors and Activators

Nikhil Kaimal
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

The circadian clock is a biological timekeeping mechanism found in diverse organisms such as cyanobacteria, fungi, plants and animals. The circadian clock times the expression of thousands of genes through a number of core clock gene regulators that either repress or activate their target genes. Functions of circadian rhythm in plants include optimizing photosynthesis and adjusting to changing temperatures over the course of a day. In Arabidopsis thaliana, a model organism for plant research, several clock activators and repressors have been identified. Research has shown that removing repressors of evening genes leads to shorter circadian cycles, and removing activators of evening genes leads to longer cycles. The impact of simultaneously removing both groups on the circadian rhythm is not known, and understanding that impact is the goal of this experiment. Quintuple mutants were identified by genotyping for day-phase repressors and activators to find plants homozygous mutant for all 5 relevant genes. To analyze the circadian rhythms of the quintuple mutants and other genotypes of interest, bioluminescence assays and a gene-expression analysis were used. It was observed that the periods of quintuple mutants is very inconsistent, leading to the conclusion that the clock is arrhythmic in these plants.

Anticipatory Behavior, a Welfare Assessment Tool

Naoki Kanagawa
Sponsor: Jason Watters, Ph.D.
Animal Science

Anticipatory behavior is described as a goal-driven action triggered by certain cues, whereas stereotypic behaviors are repetitive patterns that are not goal orientated. In addition, anticipatory and stereotypic behaviors have both been used to assess animal welfare. Our focus is to help identify indicators of animal welfare. Anticipatory behavior is a real-time indicator of the animal's sensitivity to cues and rewards that occur daily. By focusing this study on anticipatory behavior, changes can be implemented to the animal's environment to modify the expression of these behaviors. Such changes may include varying the cues associated with the behavior. The study entails multiple data collections which include taking the animal's behavior and their location within their enclosure. The two species that we studied were the Canis lupus baileyi and the Ursus arctos. We will be monitoring for differences between behaviors, while the project aims to clarify the discrepancy between the two classical measures of animal welfare. The preliminary results indicate that these species do in fact exhibit goal-driven behavior at certain times during the day. With the validation of anticipatory behavior, changes can be applied to test why these behaviors are occurring so they are beneficial to the wellbeing of the animals.

Tale of the Tail: How Habitats Influence the Shape of the Caudal Peduncle

Jo Hsuan Kao
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

In fish evolution and ecology, the anatomical variance between fresh and marine water fishes is debated. Freshwater Teleost lineages may be more diverse because of greater likelihood for barrier formation, alternatively marine environments may provide more complex habitats and thus enable greater diversification. Because of these conflicting views, this paper will work with a larger dataset to compare the variation between marine and freshwater fish within the same group, producing a more confident resolution to this debate. We will use Ovalentaria, a big Teleost fish group that includes clownfishes,cichlids, etc. measuring the minimum Caudal Peduncle Width and Depth to obtain a Compression Index. The Caudal Peduncle is the area just before the tail fin and is crucial for fish locomotion. The Caudal Peduncle Compression Index reflects how fish swim and maneuver through their environment, with deeper Caudal Peduncles indicating more complex habitats. We will be using a dataset collected at the Smithsonian Museum and running statistical tests compare morphological diversity between habitats, while taking into account evolutionary relationships.

A Novel Statistical Analysis of Prairie Vole Parenting

Anurupa Kar
Sponsor: Karen Bales, Ph.D.
Psychology

Parents have lasting behavioral influences on their children—that is, they play an important role in shaping the social behavior of their offspring. But to what extent is the behavior of children shaped by their parents? To better understand the influence on offspring behavioral development that different parenting styles have, it is convenient to observe a non-human animal model in the laboratory. The prairie vole (Microtus ochrogaster), is a socially monogamous rodent that has become a prominent non-human model for monogamy and biparental care. Here, we observe prairie voles to draw conclusions about (1) if and how parental care changes over time, and (2) if parental care has long-term effects on the offspring's own parenting styles. We first analyze archival behavioral data on how the first generation's parental care changes chronologically throughout consecutive litters. Next, we use the same data to establish the transmission of parental care behaviors across multiple generations. By implementing structural equation modeling (SEM) on this archival data, we statistically define a parsimonious model of the changes and effects in parental behavior over time.

Using Fluorescent Proteins to Study Host-Pathogen Dynamics During Host Cell Killing

Sergio Karageuzian
Sponsor: Katherine Ralston, Ph.D.
Microbiology & Molec Genetics

Entamoeba histolytica is responsible for amoebic dysentery, a disease most commonly found in underdeveloped countries. This organism has appropriately been given its name of histolytica, meaning "tissue destroying," for the damage it inflicts. We recently discovered that E. histolytica attaches to human cells and takes bites from the cell membrane, ultimately leading to human cell death. To aid in further study of this process, termed trogocytosis, I am developing tools to visualize host-pathogen interactions using live microscopy. I aim to use fluorescently-tagged proteins to visualize cell membrane and cytoskeletal dynamics during trogocytosis. I will first use fluorescent proteins targeted at the plasma membranes via lipid anchors. To do this, I am transiently transfecting plasmids for fluorescent protein expression into Jurkat and Caco-2 cells followed by microscopy and image stream for both qualitative and quantitative analyses of protein localization. To apply these fluorescent reporters to amoebae, I am currently using Gibson Cloning to ligate the genes into the Entamoeba expression vector. I will then transfect these plasmids into E. histolytica. Once I have successfully generated human cells and amoebae expressing multiple fluorescent proteins, I will use live microscopy to gain a deeper understanding of membrane and cytoskeleton dynamics during trogocytosis.

Community Development in a São Paulo Favela

Kalen Kasraie
Sponsor: Liliane Larson, M.B.A.
Ag & Resource Economics

The Vila Nova Esperança community in São Paulo, Brazil suffers from lack of government recognition, limited resources, and high rates of poverty. The Centro Inovação (Innovation Center) combats and alleviates these problems by providing a makerspace filled with a variety of tools and equipment and directed by an expert mechanical engineer. Through a fellowship with the UC Davis Blum Center for Developing Economies, I spent one month in Vila Nova Esperança studying and analyzing the effectiveness of community development methods employed at the Innovation Center. Working in the center, I was able to gain a firsthand perspective on the influence that the Center has within the community. My analysis and recommendations have led to practices that more greatly emphasize stakeholder engagement across demographics. My experience and research is relevant to the 11 million-strong population of favela residents in Brazil, as well as international communities that struggle with poverty, limited resources, and lack of government recognition.

Religious Concerns in Abortion Policy

Acacia Keith
Sponsor: Meaghan O'Keefe, Ph.D.
Religious Studies

This paper analyzes changes in religious rhetoric in recent abortion legislation in the United States, focusing on how evangelical Protestant theology has reframed the abortion debate from protecting the life of the fetus to protecting the life of the woman. Prior to the 1970's, the pro-life movement was largely a Catholic phenomenon that made rights-based claims in order to protect what they saw as a defenseless minority, unborn children. By the 1970's, this argument came into conflict with another rights-based argument, women's rights. In 1973, Roe v. Wade reframed abortion as a woman's right to privacy. Currently, evangelical Protestants place abortion in the context of the family and link the pro-life movement to upholding moral order and family values. These evangelical Protestants then argue that abortion is medically and morally dangerous for women. I examine recent rhetoric of protecting women in political statements regarding recent TRAP laws, targeted regulation of abortion providers. These laws target clinic regulation and enforce medically unnecessary restrictions that effectively shut down clinics, all in the name of women's health. I argue that this rhetoric of protecting women's health and safety is part of a larger ideology of paternalist control.

Episodic Memory for Emotion Words With Extended Delays

Olivia Kelly
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

Erik Kennedy-McDonnell
Sponsor: Suad Joseph, Ph.D.
Anthropology

The term "Egypt" was used by the West in reference to both ancient and modern day Egypt. I examined 15,881 articles published from 1930 to 1939, and critically analyzed 213 relevant articles where the term "Egypt" was used by New York Times correspondents. I discovered that the while present day Egypt was represented as ahistorical and inferior to the West, ancient Egypt was depicted as a prosperous and model "civilization." I argue that this depiction of an affluent ancient Egypt was used as a contrast to further the representation of present day Egypt as subordinate, which justified British colonial acts that claimed to "save" the people of modern day Egypt from chaos and disorder. This misrepresentation engraved into American society that the people of the East were backwards and inferior. I suggest that such news media misrepresentation which is persistent in the 21st century, served as an opportunity for the West to portray itself and Christianity as heroic, modern, and advanced in order to depict the East and Islam as backwards. This research is part of an analytical project of the New York Times over 150 years conducted in Dr. Suad Joseph's lab.

Effect of Convolutional Neural Networks on Automating Materials Science Research

Sabuk Ketvirtis
Sponsor: Subhash Mahajan, Ph.D.
Materials Science & Engineering

Google Brain team's open source machine learning library, Tensorflow, was employed to test the viability of using convolutional neural networks in determining the existence of twinning defects in different materials. These materials were analyzed through micrograph images taken from a scanning electron microscope (SEM) at different magnifications. After retraining the Inception v3 network with 44 varying materials' micrographs, with some containing twinning, the trained model had an accuracy of 83.4% at predicting whether a micrograph had twinning or not. A test set of 12 images was used to validate this metric, which resulted in the neural net correctly predicting twinning at 75% accuracy. These results indicate that the neural net is finding the correct parts of the micrographs where twinning is occurring at an accuracy of better than random guessing. Therefore, neural nets provide the potential to automate much of scientific research. Future direction of convolutional neural networks includes automating the determination of grain size.

Variation in Retrotransposon Copy Number in the Wild Ancestor of Maize

Tanmayee Khadilkar
Sponsor: Jeffrey Ross-Ibarra, Ph.D.
Plant Sciences

Maize and wild teosinte differ in their amount of lateral branching, and selection for upright plants as opposed to bushy plants was important for the domestication of maize. Teosinte branched 1 (Tb1) is a gene that controls branching in both teosinte and maize, and higher levels of expression of tb1 leads to apical dominance in maize. This increase in expression is caused by a Hopscotch LTR retrotransposon insertion into regulatory regions near tb1. Retrotransposons are pieces of DNA that can jump to new positions in the genome, and plants can vary in the number and position at which they are found. By using bioinformatics tools such as relocaTE and existing resequenced data, my research project will determine the location and copy number of Hopscotch insertions across a range of inbred teosinte lines, and investigate the impact on gene expression and branching phenotype. Increasing the copy number of Hopscotch could have no effect on branching; however, if there are numerous Hopscotch insertions, the host genome may increase silencing of Hopscotch and this could downregulate tb1. Integrating variation in retrotransposon abundance with plant phenotypes will allow insight into the process of domestication.

Mechanism of Autophagy in Plants

Aliza Khalid
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Autophagy is an intracellular degradation system that delivers cytoplasmic constituents to the lysosome (or vacuole) for recycling of nutrients. When autophagy is induced by starvation, a membrane sac called an isolation membrane appears and expands into a double-membraned autophagosome. 18 Atg proteins in six distinct groups have been identified that help form the autophagosome, including the Atg1 complex, the transmembrane protein Atg9, an autophagy-specific phosphatidylinositol 3-kinase (PI3K) complex, the Atg2-Atg18 complex, and the Atg8 and Atg12 conjugation systems. Specifically, The Atg1 complex plays a vital role in the formation of the autophagosome. The Atg1 complex consists of the protein kinase Atg1, the TORC1 substrate Atg13, and the trimeric Atg17-Atg31-Atg29 scaffolding subcomplex. Autophagy is triggered when Atg1 and Atg13 assemble with the trimeric scaffold. Although an abundance of knowledge has been gained regarding the components involved in autophagy, much remains to be elucidated about the actual mechanism of autophagy. Here, I use biochemistry, plant genetics, and yeast 2-hyrid experiments to gain a deeper molecular understanding of autophagy in plants.

Can Natural *Drosophila melanogaster* Serve as a Model for Type-II Diabetes?

Nossin Khan
Sponsor: Didem Sarikaya, Ph.D.
Evolution & Ecology

The prevalence of type-II diabetes is increasing worldwide. In order to combat it, it is important to study the genetic mechanisms of type-II diabetes. Single nucleotide polymorphisms in insulin and other metabolic genes are linked to type-II diabetes. Interestingly, many of these genes also show population-level genetic differences in the fruit fly Drosophila melanogaster, making natural Drosophila populations a potential model for diabetes research. Here, we characterize whether there are population-level differences in diabetes-related traits in Drosophila populations from Maine (high latitude) and Panama City (low latitude). First, we measured wing size in starved and well-fed conditions, and we observed that while the high latitude populations were larger than the low latitude population when well-fed, we did not observe a significant difference between populations when starved, suggesting that both populations are reaching a similar threshold for a starvation response. Next, we measured whole body triglycerides and glucose levels, and found that high latitude flies had overall higher levels of triglyceride and glucose. These preliminary findings suggest that natural fruit fly populations may serve as a model for understanding metabolic differences that can affect type-II diabetes susceptibility.

The Significance of Russo-Japanese War and the Treaty of Portsmouth

Sung Kim
Sponsor: Shennan Hutton, Ph.D.
Classics

The Russo-Japanese War was fought between Japan and Russia in 1904-1905. Their common goal was to gain the full control over Korea and Manchuria. The Russo-Japanese War was the first major military victory in the modern era of an Asian power over a European State. In fact, Japan had significant advantages over Russia when the war began. First, the Japanese Empire was supported by Britain and US. The American financiers and the British government provided subsidies to Japan. Second, the Japanese soldiers could easily receive the materials from the homeland. However, the Russians had to provide the materials such as uniforms, food, and ammunitions to soldiers by sending them through sailing ships all the way from Baltic Sea via Indian Ocean to Port Arthur, Manchuria. The Trans-Siberian railroad was incomplete, so the Russians had to engage the long voyage in the ocean. Third, the nationalism played a large role in Japan. The Japanese except for the pacifists, supported the war and believed that the Russians were perpetrators, while the Japanese were fighting for their justice, freedom, and securing their national pride. In contrast, Russia suffered from economic hardships and frequent revolts against the government by laborers and peasants.

Blepharoplasty as Domestication of the Asian: Constructing Korean Identities by White Hands

Angela Kim
Sponsor: Javier Arbona, Ph.D.
American Studies

South Korea has a multi-billion-dollar cosmetic surgery industry; one in five Korean women receive procedures. The most popular is blepharoplasty, or "double-eyelid surgery," where surgeons reconstruct the phenotypical trait of the Asian monolid to mimic the crease in the white eyelid. The motives behind this very normalized procedure hold many controversies. Are Koreans attempting to "white-ify" their facial features to conform to Westernized beauty standards or to the Korean tradition of investing in human capital? I trace the historical origins and popularization of blepharoplasty to demonstrate that the procedure is fundamentally rooted in white supremacist ideology since Dr. Millard, a white WWII veteran, originated it in Korea. Motives for undergoing blepharoplasty have changed throughout history since its initial impetus to conform to Western beauty standards to enter America. I argue that in contemporary Korean and K-pop culture, these motives have transformed into a desire for transnational, cosmopolitan whiteness instead, wherein the new beauty aesthetic nods to Western features, but does not replicate them. My research furthers this inquiry into the implications of understanding militarism and racism as intertwined, illustrated by the history of white supremacy and U.S. influence in Korean culture; blepharoplasty will always be racially charged.

Stirring up the Muck: The Systematics of Fionidae (Nudibranchia: Aeolidina) From the Indo-Pacific

Ashley Kim
Sponsor: Arthur Shapiro, Ph.D.
Evolution & Ecology

Tropical Indo-Pacific aeolidid nudibranchs of the family Fionidae are poorly known. Many undescribed species are found throughout the Indian and Pacific Oceans and are concentrated in the "Coral Triangle", which includes the Philippines, Papua New Guinea, Indonesia, and Malaysia. Interestingly, one particular species, Tenellia yamasui Hamatani, 1993, has been repeatedly misidentified. In this project, the phylogenetic placement of Tenellia yamasui, Tenellia n. sp. 1, Tenellia n. sp. 2, Tenellia sp. 3, Abronica sp. 1 and Abronica sp. 2 from the waters inside the Coral Triangle was investigated. Both morphology and molecular data were used to analyze species. SEM photographs of the radula, jaws, and reproductive system were employed to characterize the taxa. DNA was extracted from the foot of the nudibranchs and PCR amplicons were sequenced for mitochondrial 16S, COI and nuclear H3 genes. This analysis corroborates the distinctiveness of Tenellia yamasui from Tenellia sp. 1 and T. sp. 2. This study also confirms that all four species of Abronica are characterized by having an acutely-pointed curved penial stylet, thus confirming a unique morphological synapomorphy for members of this genus. It also confirms that Tenellia sp. 3 is closely related to coral-eating species of Tenellia.

Altruism Project: An Observation of Social Influence on Adolescents' Altruistic Behavior

Elizabeth Kim
Sponsor: Amanda Guyer, Ph.D.
Human Ecology

Adolescence is a developmental period of increased social sensitivity and peer influence on behavior. Most studies of social influence among adolescents have examined antisocial forms of risk-taking with little focus on prosocial behaviors (Steinberg, 2008) like altruism, which emerges in adolescence and develops further into adulthood (Stewart-Williams et al., 2013). The present study examines how viewing others' altruistic behavior influences one's own and how this effect varies across different ages. Adolescents and young adults (N = 60; 55% female; 12-25 years old) performed a computer task in which they viewed photographs depicting altruistic behaviors. Either before or after viewing the images, participants were given the option to donate a portion of their study compensation to a charity. Donation amount was used as an ecologically-valid indicator of altruistic behavior and did not vary significantly based on participant age, sex, or self-reported altruistic tendencies. However, viewing altruistic behaviors before receiving the option to donate significantly increased the amount of donation given compared to being asked to donate prior to viewing the images. This suggests that altruistic behaviors in adolescents and young adults can be influenced by viewing altruistic behaviors, the extent of which does not change by age or self-reported altruistic tendencies.

Culturing of Melainabacteria From the Koala Microbiome

Gregory Kincheloe
Sponsor: David Coil, Ph.D.
UC Davis Genome Center

Since its discovery, the bacterial phylum Melainabacteria has been a curiosity to scientists. Found in aquatic habitats, Antarctic microbial mats, as well as in many mammalian guts, it is closely related to Cyanobacteria, the photosynthetic phylum of bacteria. Attempts have been made to culture members of this group, but only one strain was ever isolated in a co-culture with algae, which was lost in the 1970's. Using new tools and recently available Melainabacteria genomes obtained from single cell sequencing and metagenomics, we are attempting to culture this bacteria from the koala microbiome. Still an anomaly today, many questions have been raised about the function of this group of bacteria within the gut microbiome. A recent survey of the koala gut microbiome in our lab has suggested that Melainabacteria species may be important in promoting gut health after antibiotic treatment in these animals, and a cultured isolate would allow experimentation on this topic.

The Mechanistic Role of Eukaryotic Initiation Factor 4G in Cancer

Anna Kirillova
Sponsor: Christopher Fraser, Ph.D.
Molecular & Cellular Bio

Regulation of translation initiation plays a crucial role in gene expression. Eukaryotic initiation factor (eIF) 4G is a scaffolding protein in the eIF4F complex that helps bridge the mRNA and the ribosome during this first phase of protein synthesis. Overexpression of eIF4G has been shown to cause dysregulation of protein synthesis, malignant transformation in NIH3T3 fibroblast cells and progressive tumorigenisis in mice (Fukuchi-Shimogori et. al, 1997). Although it is evident that upregulation of eIF4G plays a role in cancer, the exact mechanism that causes translation machinery dysregulation remains unknown. To explore this, I have developed NIH3T3 tetracycline-inducible stable cell lines using the Flp-In T-Rex single-site recombination system. Upon treatment with tetracycline, these cells are programmed to overexpress full-length or selected truncations of eIF4G in vivo from a single site in the genome. I will test the tumorigenic potential of transformed cell lines to deduce the minimal truncation construct that causes malignant transformation. In addition, I will use these cell lines to analyze how different truncations of eIF4G affect translation regulation of mRNAs in vivo using RNA-Seq. These findings will elucidate how eIF4G and its various binding partners regulate mRNA translation, which could open pathways to novel therapeutic targets.

Environmental Justice: People, Communities and Water Video Project

Marguerite Kise
Sponsor: Jonathan London, Ph.D.
Human Ecology

What is the human right to water? Despite the passing of California's AB 685, The Human Right to Water Bill, in 2012, clean, accessible, and affordable water is still not a reality for many California communities. Working in tandem with the Environmental Justice Coalition for Water (EJCW), our research uses film, secondary research, and interviews to collect and disperse the stories of people directly impacted by the violation of this human right in the Salton Sea, Delta, and the Northern Tribal (Karuk, Pit River, Yurok, and Winnemem Wintu) regions. The videos will be dispersed through social media as calls to action, informing viewers what they can do to recognize and act upon their stake in the struggle to ensure the human right to water. We strove to capture a plurality of perspectives, from youth to organizers to workers, on how water pollution, diversion, and ecological destitution impacts their ways of life. While policy is necessary for change, this research affirms the importance of centering the voices of those most affected by water exploitation and recognizing the power of the people to demand justice.

The Effects of Behavioral Type on Foraging and Space Use in Australian Sleepy Lizards

Janine Rose Klein
Sponsor: Orr Spiegel, Ph.D.
Environmental Science & Policy

Understanding how animals use space is a key question in animal behavior with implications for conservation and ecological theory. Recent studies suggest that individuals differ consistently in their foraging behavior and space use, but empirical evidence from free-ranging species is rare and observational. To address this gap we studied foraging of the Australian sleepy lizard (Tiliqua rugosa). We combined GPS tracking, repeated bioassays of a lizard's aggression and boldness, and food supplementation in a wild population of lizards. Food supplementation was 120 cages replanted with cherry tomatoes (a desired food items) twice a week in three different treatments. A subset of 27 cages were monitored with camera-traps. We compared a set of generalized linear mixed-models to test the hypothesis that a lizard's behavioral type will affect the time lag between food deployment and cage discovery. Beyond the effect of cage treatments, we found that bolder lizards discovered food faster after deployment, and more aggressive lizards took longer, with a stronger effect size for the latter. This finding is consistent with previous observations that suggest lower responsiveness in more aggressive lizards. These insights from individualized foraging explain social networks structure and disease dynamics in wild populations.

Every Painter Paints Themselves: Abstraction, Technology and the Self

Douglas Kleinsmith
Sponsor: William Pardee, M.F.A.
Art

How can abstract art, void of all representation, be explained? A famous quote emerging from the Renaissance claimed, "Every painter paints himself", an idea repeated in studies such as Sociology and Art History. Examining my own abstract painting process revealed the influence of both past ideologies and present technologies, and their implications on the nature of creativity. Today, mathematics and computers provide artists with tools and visual vocabulary never before available. The aesthetic of my paintings exemplify the influence of technology, however my process and intentions are founded in philosophies from the past. Abstract Expressionists argued that creative authenticity came from the unconscious. I have reached the same conclusion through experimentation with a mark: the scribble. An almost paradoxical act, a scribble is meant to mean nothing, a consciously unconscious mark. No two people would scribble the same, making this process unique for everyone. A scribble provides the keystone for each painting I make, a map from which a visual space is constructed. I then utilize imagery created or inspired by mathematics, resulting in a culmination of both past and present, illuminating not only the subjective and sociological nature of expression, but also the role of synthesis in creative progression.

Statistical and Narrative Medical Analysis of the Success of an Inner-City Clinic

John Klyver
Sponsor: Amy Clarke, Ph.D.
University Writing Program

San Francisco's Tenderloin District is one of the poorest and most crowded districts within the city. Many of its residents live in single-room occupancies, or SROs, and immigrants, the homeless, and the mentally ill make up unusually large proportions of the local population. Accordingly, the Tenderloin presents a remarkable medical challenge, as a wide variety of ailments ranging from mental disorders to traumatic injuries can be found within the district. In response to the these difficulties, City Impact, a local outreach, and its associated medical clinic have begun Home Visit and Patient Advocate Programs to reach out to the residents. This talk addresses a project evaluating the success of these programs from a statistical standpoint, via a patient self-report survey. In addition, it also includes a narrative medical analysis focusing on the patient-provider experiences and interactions. City Impact explicitly states its desire to cultivate successful relationships with the local residents, and this project evaluates its level of success through its medical clinic.

Quantification of Infection of *Fusarium oxysporum* f. sp. *fragariae* on Resistant Strawberry Cultivars

Samuel Koehler
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Fusarium oxysporum f. sp. fragariae is a fungal pathogen of strawberry causing crop loss in the main strawberry producing regions of California. Resistant strawberry cultivars are available and can be employed in infested fields. While these plants do not exhibit symptoms, Fusarium oxysporum f. sp. fragariae is observed to infect them without causing disease. In the field, cultivars with the least amount of infection are the most desirable because they support less propagation of Fusarium oxysporum f. sp. fragariae. I hypothesize that the level of this susceptibility will differ between strawberry cultivars. To test this hypothesis, quantitative PCR will be used to determine Fusarium oxysporum f. sp. fragariae biomass produced on 10 month old crown and petiole tissue from 4 resistant strawberry cultivars (Ventana, Fronteras, San Andreas, and Portola) grown in a naturally infested field. These results will inform us of the differences in the extent of colonization of strawberry cultivars by Fusarium oxysporum f. sp. fragariae. Those supporting the least development of the pathogen should be favored as parents in breeding for new, disease-resistant cultivars.

An Efficient Antibiotic Inducible Gene Therapy System for Huntington's Disease Neurons

Anvita Komarla
Sponsor: Kyle Fink, Ph.D.
MED: Neurology

Huntington's disease is an inherited neurodegenerative disorder caused by accumulation of misfolded mutant protein in the brain. Our current research suggests that transcription activator like effectors (TALEs) and dCas9 can reduce mutant protein by selectively targeting the mutant gene and silencing it, preventing neuronal death. The present study will focus on identifying and developing an efficient inducible expression system for dCas9 partnered with epigenetic modifiers (EM) such as KRAB, FOG and DNMT3A in HD patient-derived fibroblasts (skin cells). This tetracycline inducible system allows for regulated dCas9-EM production which could prevent toxicity. dCas9-EM will be cloned under a tetracycline response element and that will only allow expression of gene therapy following treatment with the antibiotic tetracycline. The fidelity of the inducible gene expression system will be assessed in a fluorescence-activated cell sorting experiment (FACS), where green fluorescent protein will be used as a marker for dCas9 production. These studies will provide important preliminary data for future delivery platforms for gene therapy.

Effect of Convolutional Neural Networks on Automating Materials Science Research

Ryan Kopa
Sponsor: Subhash Mahajan, Ph.D.
Materials Science & Engineering

Google Brain team's open source machine learning library, Tensorflow, was employed to test the viability of using convolutional neural networks in determining the existence of twinning defects in different materials. These materials were analyzed through micrograph images taken from a scanning electron microscope (SEM) at different magnifications. After retraining the Inception v3 network with 44 varying materials' micrographs, with some containing twinning, the trained model had an accuracy of 83.4% at predicting whether a micrograph had twinning or not. A test set of 12 images was used to validate this metric, which resulted in the neural net correctly predicting twinning at 75% accuracy. These results indicate that the neural net is finding the correct parts of the micrographs where twinning is occurring at an accuracy of better than random guessing. Therefore, neural nets provide the potential to automate much of scientific research. Future direction of convolutional neural networks includes automating the determination of grain size.

Evolution of Students' Knowledge Structures Over General Chemistry Courses

Jennifer Kopetzky
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Constructivist theory states that knowledge is a dynamic entity that changes constantly. Experts' ability to effectively solve problems highlight that meaningful learning does not occur unless knowledge is organized. A learner is required to metacognitively revise the interaction between existing and gained knowledge. The organization of these structures is an important predictor for one's success in problem solving. A word association test was developed by selecting major concepts in the first course of Chemistry 2 as stimulus words. This test was modified with concepts from the second and third courses in the series. For each test, students were asked to provide five response words within forty- five seconds of reading each stimulus word. After determining the frequency of the responses, the top twenty-five responses for each stimulus word were used to calculate relatedness coefficients, which measure the relationship between words. Pathfinder and Gephi, network generating programs, were utilized to interpret the data and determine knowledge structures. Depending on the differences in these knowledge structures, methods will be recommended to strengthen students' ability to monitor their knowledge structures. Connections between existing and new concepts from later courses will illuminate how successful a student is at constructing his or her knowledge structure.

Spp1 SUMOylation Modulates Homologous Recombination During Meiosis

Srujan Kopparapu
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Meiosis is the cell division process that halves the genetic material in preparation for fertilization. During meiosis, reciprocal exchange of DNA between homologous chromosomes occurs via the DNA repair process called homologous recombination (HR). The resulting crossovers are required for accurate chromosome segregation, and drive genetic diversity. HR is initiated by the formation of DNA double-stranded breaks (DSBs), mediated by the meiosis-specific protein Spo11. Defects in HR have been linked to birth defects, sterility, and cancers. Accordingly, meiotic recombination is highly regulated via the post-translational modification of proteins; this includes modification by the Small Ubiquitin-like Modifier (SUMO), which covalently attaches to lysines on target proteins and controls their stability and function. We have developed an efficient method for proteome-wide identification of SUMOylation sites. One identified target is Spp1, a subunit of the COMPASS protein complex that promotes Spo11-catalyzed DSB formation. Using site-directed mutagenesis, we generated strains that are unable to SUMOylate Spp1 (SPP1-SNM, SUMO-No-More, mutants). When combined with spo11 hypomorphic mutants that form reduced numbers of DSBs, SPP1-SNM causes defects in meiosis, which are manifested as reduced spore viability. These data suggest that SUMOylation of Spp1 plays an important role in promoting DSB formation and/or downstream steps of meiotic HR.

Importance of Glutamate Oxaloacetate Transminase (GOT-1) Serum Levels in Traumatic Brain Injury (TBI)

Ioannis Kournoutas
Sponsor: Bruce Lyeth, Ph.D.
MED: Neurological Surgery

Traumatic Brain Injury (TBI) affects millions of people annually, and remains a major public health concern due to the resultant death and disability. Many studies have shown that TBI causes excessive release of the excitatory neurotransmitter glutamate, which has been implicated in the accompanying neuronal cell death/damage. Scientists have provided evidence for the "glutamate-scavenging hypothesis", which postulates that reducing blood levels of glutamate facilitates a concentration gradient favorable for the transport of excess brain glutamate into the blood, and thereby reduces damage. This reduction occurs by increasing levels of the blood enzyme GOT-1, which converts Glutamate into a neutral substance. Previous findings show that this increase of blood GOT-1 leads to improved cognitive outcome in laboratory TBI models. The present study proposes the opposite conjecture; reduction of the GOT-1 enzyme (via antibody) will hinder breakdown of blood glutamate, and thus worsen outcome. This study will be crucial in providing additional evidence for the glutamate scavenging hypothesis, which can potentially serve as a therapeutic strategy for combatting excitotoxicity in the acute stage of TBI. Additionally, it may demonstrate how the widespread variation in endogenous GOT-1 enzyme (ranges: 10µ-40µ in humans) can possibly contribute to the variation in outcome of TBI patients.

Sequence Analysis and Cloning of a Protein Kinase Potentially Involved in the Sugar Starvation Response in *Arabidopsis*

Aaron Krelstein
Sponsor: Diane Beckles, Ph.D.
Plant Sciences

The aim of this project is to functionally characterize protein kinase STY46 in Arabidopsis thaliana Col-0. To deal with, and adapt to adverse environmental conditions that lead to sugar starvation, plants have evolved complex mechanisms to ensure sugar availability through regulating the metabolism of storage and structural compounds. This process is called the sugar starvation response (SSR). Gene network analysis suggested that STY46 is co-expressed with most of the genes within the SSR network, and its expression is up-regulated under low carbon conditions, which leads to our hypothesis that STY46 could possibly be a master regulator of the SSR. To test this hypothesis, in silico analyses will be employed, and, transgenic lines (i) constitutively over-expressing, and (ii) expressing STY46 only upon induction, will be created, and their response to short and long term stress-induced sugar starvation will be compared to the Col-0 control. The information from this analysis could provide a better understanding of the events that enable plant survival, and could potentially be used to develop agricultural techniques or new germplasm that strengthen crop yield under stressful environments. In this specific experiment, the results of the sequence analysis and generation of transgenic lines will be presented.

Human Tissue Derived Animal Model for Childhood Vascular Anomalies

Andrea Kulinich
Sponsor: David Sahar, M.D.
MED: Surgery

Vascular anomalies in children are masses of enlarged vessels that are caused by a localized defect in the vessels. They may lead to gross deformity and functional problems when located in head and neck regions. Current treatment methods have unpredictable outcomes and serious side effects. Our group is developing a nanoparticle based, targeted, high-efficacy treatment for vascular anomalies. We previously obtained encouraging results with a mouse model using a hemangioendothelioma cell line. Currently, we are working on an animal model using human vascular anomaly specimens to obtain a more clinically relevant model. We obtained samples from a childhood vascular malformation. Half of the sample was used for explant cultures to obtain a cell line. The other half was cut into 0.5 mm pieces and surgically implanted to the dorsum of immunocompromised mice. We followed tumor growth for seven weeks by digital caliper measurements. Some of the cells in the explant cultures exhibited large cytoplasm and round nuclei resembling vascular endothelial cells. Tumor growth peaked at three weeks after implantation and regressed after the fourth week, resembling the growth pattern of vascular anomalies. Our results suggest that an animal model for vascular anomalies can be established using human specimens.

Investigating Redox Properties of a Bis(imino)pyridine-Ligated Aluminum(III) Complex

Sheila Kulkarni
Sponsor: Louise Berben, Ph.D.
Chemistry

Catalysis, or increasing the rate of a chemical reaction by adding a catalyst, is an important step in large-scale chemical processes. Transition metals are common catalysts because they readily participate in electron transfer, or redox, reactions; however, transition metals are often dangerous and expensive to work with. It is more favorable to use light, abundant metals like aluminum, which can be complexed to redox-active ligands to demonstrate transition metal-like behavior. This project aims to synthesize a type of aluminum(III) complex with a redox-active ligand to investigate its properties as a potential catalyst. The bis(imino)pyridine-aluminum hydride complex $^{Ph}I_2PAlH$ was reacted with $[HNEt_3]^+[BF_4]^-$, breaking the pyridine ring's aromaticity and fluorinating the Al center twice to create the compound $^{Ph}HI_2PAlF_2$. Cyclic voltammetry measurements made with the crude $^{Ph}HI_2PAlF_2$ complex have demonstrated at least one redox event, showing that this compound can participate in desired electron transfer. Through further measurements with a purer sample, we hope to better understand this compound's behavior and eventually test its capability as a redox catalyst.

Detecting Proteolytic Activity in Human Milk to Better Understand Infant Digestion

Nithya Kumar
Sponsor: J German, Ph.D.
Food Science & Technology

Proteases, enzymes that break large proteins into smaller peptide subunits, are prevalent in fresh human milk. Coupled with proteases, however, are protease inhibitors, which prevent complete protein break down and contribute to a complex proteolytic system that yields unique and potentially functional peptide sequences. I am developing a method to simulate infant digestion and measure the effective proteolytic activity in human milk. My method quantifies a universal product of protease digestion, peptides, as an indicator of proteolytic activity. By using a known and active protease, pepsin, as the positive control, and milk treated with protease inhibitor as the negative control, I will resolve the relative protease activity of a given milk sample after simulated digestion. Peptides from these digested milk samples can be identified via mass spectrometry and analyzed in future projects. The developed digestion model coupled with analytical technique will therefore help us better understand the role of proteases in human milk and will contribute to research investigating the role of resulting peptide sequences in the breast-fed infant.

Regulation of Double Strand Break Repair by Various Proteins in *Saccharomyces cerevisiae*

Sreevidya Kurra
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Homologous recombination (HR) is involved in repairing double strand breaks (DSBs) through a series of highly regulated steps. Irregularity in HR can lead to cancer and genomic instability. A key step which we will be focusing on here is the formation of RAD51 nucleoprotein filaments which are involved in homology searching as well as strand exchange in order to repair the DSB. One protein involved in this process, RAD51, is present in both humans as well as Saccharomyces cerevisiae (yeast). Paralogs in humans include RAD51B, RAD51C, RAD51D, XRCC2, and XRCC3 and can lead to breast and ovarian cancer if impaired. The paralogs in yeast include the RAD55-RAD57 heterodimer. In yeast, other proteins involved in the formation of this filament include the SHU complex as well as RAD54, both of which are still unidentified in terms of function and interactions with other proteins and will be further examined here. Additionally, the relationships between the RAD51 paralogs and other proteins involved in the HR pathway will also be discussed. The methods involved in studying this include mutating the genes and observing how yeast cells react once exposed to toxic chemicals such as, methyl-methansulfonate (MMS).

The Collaborative Effect of Scientific Meetings: A Case Study of the International Milk Genomics Consortium

Eric Kwok
Sponsor: Danielle Lemay, Ph.D.
UC Davis Genome Center

Collaboration among scientists has a major influence on scientific progress. Such collaboration often results from scientific meetings, where scientists gather to discuss their research and to meet potential collaborators. Competitive funding, however, imposes a bias that confounds attempts to evaluate the role of scientific inquiry in collaboration decisions and outcomes. To evaluate the collaborative effects of scientific meetings independent of funding bias, we conducted a case study on the annual symposium held by the International Milk Genomics Consortium (IMGC). In our study, we utilized data science tools to analyze the effectiveness of the IMGC in facilitating collaboration and progress in a community of milk scientists. Using the number of co-authorships on published papers as a measure of collaboration, our analysis revealed that scientists in the IMGC were associated with more collaboration than were scientists not in the IMGC. Furthermore, we evaluated the scientific progress of consortium members by analyzing publication rate and article impact. We found that IMGC attendees, in addition to being more collaborative, were also more productive and influential than were scientists not in the consortium. The results of our study exemplify the positive effect of scientific meetings on both collaboration and progress.

Synthesis of Gyramide-Bound Photoaffinity Reagents for DNA Gyrase

Ada Kwong
Sponsor: Jared Shaw, Ph.D.
Chemistry

Antibiotic resistant bacteria are on the rise, and it is imperative that new drugs be developed to fight them. Unexploited targets that cause bacterial death are an important area of study for such development. We are targeting DNA gyrase, a protein that helps uncoil DNA during replication and transcription in bacteria because it can be distinguished from the analogous human protein, Topoisomerase II. Gyramides are small molecules that have been shown to successfully inhibit DNA gyrase. Previously, our group synthesized and screened an initial batch of gyramides that showed good inhibition activity, but they were cytotoxic to human cell lines. In order to tailor the gyramide analogs to target bacterial cells exclusively, we can utilize photoaffinity reagents to gather a better understanding of the approximate location and shape of the binding site. Presented here is our recent progress towards synthesizing and studying the gyramide-bound photoaffinity reagents as well as our work towards various analogs.

Synthesis of Ni-Doped $BaFe_2As_2$ Superconductor via Hydride Route

Ming Yin Kwong
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Superconductors are materials that have zero electrical resistivity when cooled below the critical transition temperature, T_c. Superconductors exclude magnetic fields (the Meissner effect), which result in magnetic levitation. Applications of superconductors include magnetic resonance imaging and frictionless transportation. Superconductors containing iron arsenide were discovered in 2008. They are known to have high T_c and their superconductivity in iron arsenide is not destroyed by application of high magnetic fields. $BaNi_xFe_{2-x}As_2$, where nickel is substituting iron, have been studied extensively. However, there are still synthetic challenges. In our work, we used hydride route, which involves using barium hydride (BaH_2) instead of barium. Because BaH_2 is a fine powder, it provides better mixing of reactants and more surface area for reaction, yielding more rapid preparation. The goal of this project is to optimize the synthesis of $BaNi_xFe_{2-x}As_2$ using this hydride route. Samples with different stoichiometry ranging from x=0.02 to x=0.18 are synthesized and analyzed by x-ray powder diffraction. It is shown that the hydride route can successfully synthesize nearly single phase samples of $BaNi_xFe_{2-x}As_2$. The superconducting properties of the samples will be reported.

Characterization of Embryonic Stem Cell Derived Retinal Ganglion Cells

Stephen Kwong
Sponsor: Anna La TorreVila, Ph.D.
MED: Cell Biology & Human Anat

Glaucoma is a disease that affects 60 million people worldwide and causes Retinal Ganglion Cell (RGC) death, resulting in visual degeneration and eventual blindness. The mammalian retina has no regenerative capacity, and once vision loss has occurred, it cannot be restored with current therapies. Cell replacement therapies are a promising approach to treating glaucoma. Currently, the lack of donor tissue is an obstacle to developing feasible cell replacement therapies. However, RGCs can be generated in vitro from stem cells (SC), and may be used as a source of donor cells. However, before SC-derived RGCs are utilized in therapy, they must be characterized to ensure that all of the different types of RGCs necessary for vision are produced. We generated SC-derived RGCs using a three-dimensional organoid technique. To characterize these SC-derived RGCs, we performed immunocytochemistry against RGC-specific genes, analyzed RGC-specific gene expression using quantitative Reverse Transcriptase Polymerase Chain Reaction (qRT-PCR), and developed a functional assay to analyze RGC growth cone guidance in response to different signaling molecules. Together, these experiments will constitute an important first step in assessing the feasibility of RGC replacement for glaucoma treatment.

Pre-Cleaning of Forehead Skin With Isopropanol Decreases Concentrations of Sebum Lipids and Lipid Mediators in Healthy Human Adults

Man La
Sponsor: John Newman, Ph.D.
Nutrition

Sebum is one of two major cutaneous secretions, and the sebum lipidome has been recently characterized to non-invasively identify biomarkers of skin inflammation. However, the impact of cutaneous pretreatment on the sebum lipidome is unknown. This study aims to identify the impact of cleaning the skin with a 70% isopropanol solution prior to sebum collection on sebum non-esterified fatty acids as well as oxygenated lipids, endocannabinoids, and sphingolipids ("lipid mediators"). Sebum was collected from isopropanol-wiped and unwiped areas of the forehead of healthy male volunteers (n=10) on two separate occasions using Sebutape Adhesive Patches (CuDerm Corporation, Dallas, TX) and sebum fatty acids and lipid mediators were profiled using gas chromatography-mass spectrometry and liquid chromatography-tandem mass spectrometry, respectively. Isopropanol-pretreatment decreased concentrations of all detected fatty acids and 18 out of 85 detected lipid mediators ($p < 0.05$, paired student t-test). Affected lipid mediators were derived from metabolism of C18 and C20 polyunsaturated fatty acids by cyclooxygenase, 12/15-lipoxygenase, cytochrome P450 and N-acyltransferase, collectively the most abundant cutaneous enzymes. Therefore, cutaneous pre-treatment appears to reduce concentrations of sebum fatty acids and lipid mediators, and care must be taken when collecting sebum for metabolomics analysis and when comparing data between different sebum collection techniques.

Experimental Studies of the Psychological Consequences of Childhood Poverty

Jennifer La
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Childhood poverty rates in the United States are one of the highest among developed countries (UNICEF, 2014). Exposure to poverty has been correlated with various negative outcomes for the children experiencing it. However, it is unknown whether these associations are due to causal processes or other confounding factors. The goal of this research was to provide a systematic review of the literature on the causal effects of childhood poverty on psychological outcomes by summarizing studies with experimental or quasi-experimental designs that try to alleviate poverty (e.g. cash transfers, tax benefits, neighborhood relocation). We used the search terms "poverty," "causal," and "child" to retrieve relevant articles published before January 10, 2017 from Web of Science Core. After perusing 165 abstracts, we identified 60 articles that fit our inclusion criteria. Based on these studies, there was evidence that childhood poverty has significant negative and causal effects on child mental health (e.g. depression, anxiety), behavioral health (e.g. substance abuse, antisocial behavior), physical health (e.g. obesity, mortality), and educational attainment (e.g. school failure, non-graduation). These studies suggest that early exposure to poverty poses substantial risks for child development that early interventions may be able to prevent.

Effects of Mesenchymal Stem Cell Secreted Factors on B and T Cell Activation

Jacqueline Labins
Sponsor: Isaac Pessah, Ph.D.
VM: Molecular Bio Sciences

Recent studies found that Feline Chronic Gingivostomatitis (FCGS), an oral inflammatory disease in cats, can be improved through the intravenous application of Mesenchymal stem cells (MSCs). While more research must be done for clinical treatment in felines, it is necessary to first design a potency assay to verify MSC consistency in treatment. It is hypothesized that the severe inflammation observed in FCGS is due to a hyperactive immune response, which is characterized by an increase in T and B cell activation. Consequently, it is shown that MSCs have an immunomodulatory effect when interacting with lymphocytes. Based on the assumption that MSCs will decrease activation of T and B cells, we will determine if MSC secreted factors have an effect on feline T and B cell activation. We will use CD4, CD8, and CD21 to track T and B cell response and will utilize flow cytometry, which will measure T cell activation using the CD4/CD8 ratio and B cell activation using CD21-. In the experimental group, we will expose lymphocytes to MSC conditioned media. This high throughput potency assay will ultimately measure MSCs' ability to effectively act as an immunomodulator in the treatment of FCGS and potentially other autoimmune diseases.

Addressing Postpartum Depression With Preventative and Educational Measures: A Review of Literature

Marrisa Lafreniere
Sponsor: Theresa Walsh, M.S.
University Writing Program

Postpartum depression is an issue of women's health that will be addressed in this review of literature. Specifically, preventative treatments of postpartum depression will be extensively researched as a means for the most efficient way to address this issue. Postpartum depression affects about 20% of all pregnant women, and most treatment plans are administered after symptoms occur. With using data and research from previous studies published in journal articles, information will be gathered on the most efficient way to treat postpartum depression by identifying risk factors and treatments targeted at prevention. While my research is still in progress, I have found some preliminary evidence that there are identifiable risk factors that can predict postpartum depression in pregnant women and that the use of psychological treatment before the onset of symptoms can improve outcomes for those who were at risk. I also hope to identify how improving education and the social stigma behind postpartum depression will decrease the prevalence among those with and without risk factors. By identifying risk factors, finding the most efficient preventative treatment and spreading education on postpartum depression will be the best way of addressing this issue in women's health.

Effects of Inhaled Multi-Walled Carbon Nanotubes on Lung Lavage Cells in Mice and Rats

Emilia Laing
Sponsor: Kent Pinkerton, Ph.D.
MED: General Pediatrics

Multi-walled carbon nanotubes (MWCNT), unique engineered nanomaterials, possess superior conductive and mechanical properties, but due to their size cause concern for occupational exposure. We examined the effects of repeated inhalation of aerosolized MWCNT in the lungs of mice and rats to exposure concentrations of 0.06, 0.2, 0.6 mg/m³ with humidified air for a total of 22 days. The lungs were examined at 1 and 5 weeks post-exposure. In mice, a significant increase in the total number of cells recovered from the lungs by bronchoalveolar lavage (BAL) was found 1 week post-exposure at a concentration of 0.6 mg/m³ MWCNT compared to control. In contrast, rats at 1 week post-exposure demonstrated a highly significant dose response effect of increased neutrophil numbers (markers of acute inflammation) at 0.06, 0.2, and 0.6 mg/m³ concentrations. By 5 weeks post-exposure time, cellular numbers by BAL had returned to control values in both mice and rats, but MWCNT inclusions continued to be observed in BAL macrophages. Mice and rats display a dose-dependent acute inflammatory response to MWCNTs with retention of MWCNT in the lungs and macrophages, thus raising concerns regarding possible lasting effects of MWCNT with repeated exposure by inhalation.

Do Pre-Operative Metabolic, Endocrine and Nutrition Abnormalities Predict Poor Surgical Outcomes in Patients Seeking Bariatric Surgery?

Clinton Lam
Sponsor: Michael Campbell, M.D.
MED: Surgery

Morbidly obese patients seeking bariatric surgery often present with pre-operative metabolic, endocrine and nutrition abnormalities. The purpose of this study is to examine the association between pre-operative metabolic, endocrine and nutrition abnormalities and successful weight loss in patients undergoing bariatric surgery. We conducted a retrospective, cohort-based, chart review of 349 patients who underwent Roux-en-Y gastric bypass surgery at UC Davis Medical Center between January 2008 and December 2011. 321/349 (92.0%) patients had at least one metabolic, endocrine or vitamin abnormality. 215/274 (78.5%) patients were deficient in 25-hydroxy vitamin D and 6/256 (2.33%) were deficient in vitamin B12. 18/188 (9.57%) patients had an abnormal TSH and 82/210 (39.0%) patients had an abnormal PTH. 110/329 (33.4%) patients had increased cholesterol, 128/328 (39.0%) had elevated triglyceride, 94/317 (29.7%) had elevated LDL, and 150/326 (46.0%) had decreased HDL. 121/300 (40.3%) patients had a HbA1C < 5.7, 94/300 (31.3%) had a HbA1C 5.7 – 6.5, and 85/300 (28.3%) had a HbA1C > 6.5. On univariate analysis, 25-hydroxy vitamin D deficiency was associated with unsuccessful weight loss ($p = 0.05266$). Metabolic, endocrine and nutrition abnormalities are common in patients seeking bariatric surgery. Vitamin D deficiency may be associated with poor surgical outcomes.

Direct Versus Conceptual Approaches to Learning

Tricia Lam
Sponsor: Cary Trexler, Ph.D.
Education

Researchers have previously debated the best approach for teaching topics where rote memory is often utilized (e.g., Baroody et al., 2016; Denham, 2015). Direct approaches to presenting information foster rote learning, while conceptual approaches encourage reasoning. Some studies have shown that conceptual approaches lead to more efficient information transfer (Baroody et al., 2016; Caron, 2007). The goal of this study was to build on past results and examine best teaching practices. Method. This study had two parts. Part I compared conceptual and direct approaches in teaching 6th grade math (n = 29). Part II extended this research to examine conceptual and direct approaches in teaching history to young adults (n = 25). Results. In Part I, we found no significant differences between direct and conceptual tutorials for calculating volume. One possible reason for this result was that children reported having previously learned the methods we taught. Part II was designed to address this limitation and extend the research by examining another topic where rote learning is common. Surprisingly, preliminary results show no difference between direct and conceptual approaches; however, 62.5% of participants said they prefer to learn less information, rather than have extra information that provides context.

Examining the Influence of Lunch Duration on Student Fruit Selection

Erica Lardizabal
Sponsor: Lenna Ontai, Ph.D.
Human Ecology

The average U.S. school lunch period of 20 minutes may not be adequate for students to eat their lunches (Cohen, Jahn, Cluggish, Parker, & Rimm, 2012). This specifically affects students' fruit choices as shown by a study in which students did not choose a fruit when they had less than 25 minutes to eat (Cohen et al., 2012). This is important because students' intake of fruit is not meeting current standards. However, since the addition of a new federal policy requiring students to select either a fruit or vegetable with their lunch, there has been no research on whether the relationship between lunch duration and fruit selection still exists. To address this gap, I will examine lunchtime fruit selection of elementary-aged youth in grades 4-6 (N = 146) using digital images documenting a student's lunch tray before and after consumption. I hypothesize that lunch duration (measured as minutes seated at lunch) will still be positively associated with fruit selection (measured in servings) because, while nearly all students may select a fruit at lunch under the new guidelines, the exact quantity they select is expected to depend on lunch duration. I will use linear regression analysis to examine this association.

Effects of Cooking Time on Allergenicity of Peanuts

Raymond Lau
Sponsor: Patrick Leung, Ph.D.
MED: Div Of Internal Med

Different methods of thermal processing impact the allergenicity of peanuts, with roasted peanuts eliciting a greater IgE response than do boiled peanuts (Beyer et al., 2001). However, varying different factors during processing may reduce peanut allergenicity in both roasted and boiled peanuts. In this study, the effects of thermal processing in peanuts will be investigated via boiling and roasting at different times and with or without shell. Raw peanuts of the virginia cultivar were boiled at 100°C or roasted at 177°C with or without shell for 5, 10, 15 or 20 minutes. After cooking, shells were removed. Defatted peanut flour was refined from grinding the peanuts in acetone. Proteins were extracted from the flour in TBS buffer and resolved by SDS-PAGE. Staining of the SDS-PAGE gel showed successful extraction of peanut proteins. The extracts will be examined for IgE reactivity with serum samples from subjects with peanut allergies and controls by immunoblotting.

How to Change Delta Cells Into Beta Cells in Pancreatic Islets

Elaine Lau
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

There are approximately 1.25 million Americans who suffer from Type 1 Diabetes, which is characterized by the absence of insulin as a result of beta cell destruction by the immune system. The regeneration of these cells may provide a way for diabetic patients to maintain lifelong glycemic control. Glucagon-producing alpha cells and somatostatin-producing delta cells also exist in the pancreas alongside beta cells. Previous studies have shown that delta cells under certain circumstances can convert, or transdifferentiate, into insulin-producing beta cells, but the signals that promote this process are unknown. We are currently investigating the effect of Urocortin-3 (Ucn3), a peptide hormone co-secreted with insulin from mature beta cells that specifically activates delta cells to induce the release of somatostatin. This led us to hypothesize that Ucn3 could affect transdifferentiation for delta cells. To test this hypothesis, we are comparing the number of delta cells that transdifferentiated into beta cells in wild type and Ucn3 knockout mice. Our preliminary data suggests a slightly greater ratio of transdifferentiated cells in Ucn3 knockout mice compared to controls. This implies that the absence of activation of delta cells by Ucn3 may induce their reprogramming into beta cells.

Does Pair-Bond Quality or Androgen Level Explain Variation in the Structure of Vocalizations of Duetting Coppery Titi Monkeys *Callicebus cupreus*?

Allison Lau
Sponsor: Margaret Crofoot, Ph.D.
Anthropology

Individuality and stability is well documented in the vocalizations of monogamous primate species that engage in duetting. However, the mechanisms behind this individual level variation in call structure are poorly understood. We investigate if androgen levels and/or pair-bond quality can explain variation in the structure of coppery titi monkeys Callicebus cupreus duet vocalizations. Titi monkey duets were recorded and urine samples were collected from pairs of individuals housed at the California National Primate Research Center (CNPRC). Pair-bond quality was assessed using long-term behavioral data on key activities, including proximity, contact, tail-twining, and duetting. The CNPRC provides an excellent opportunity to learn about this elusive species, and may also provide insight into the duetting behavior of other monogamous duetting primates. This is important because it will provide insights into potential causes of vocalization differences that would be extremely difficult to test in the wild. The results of this study will help us better understand the function of primate vocalizations and may be extended to the development of human language.

Payment Method and Consumption for UC Davis Students

Sophia Law
Sponsor: Kristin Kiesel, Ph.D.
Ag & Resource Economics

There are various payment methods for students to purchase meals and snacks in Universities. My research will address if any relationships exist between consumption and payment methods for student at UC Davis at the Silo dining area and 2 convenience stores located on campus using data from UC Davis Dining Services. Students can pay with cash, credit/debit cards, or Aggie Cash. Aggie Cash is money loaded onto a student's ID card. The time frame evaluated is three months October, February, and April-- one month from each academic quarter period. The data utilized in this research includes summary reports obtained from UC Davis Dining Services. Healthy items compared to unhealthy items were lower in fat, sugar, sodium and caloric content. Healthy items included fruit, breakfast, Asian food, dairy refrigerated, simply to go prepackaged meals, soup, and sandwiches. Unhealthy items included toppings, snacks, chips, ice cream, candy, bakery, frozen food, and pizza. I hypothesize that UC Davis Students significantly spend more using Aggie Cash. By promoting healthier food choices and varieties, Aggie Cash may be beneficial. Students would be able to focus on the benefits by using electronic payment and they would also receive a 10% discount on healthier alternatives.

Nitrogen Footprint Analysis of UC Davis

Ann Le
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Reactive nitrogen is an integral part of human life. An excess of this resource contributes to a wide range of environmental and human health problems. These problems include worldwide declines in biodiversity, climate change, and compromised air and drinking water quality for people. A nitrogen footprint (NF) provides a standardized measure for the amount of reactive nitrogen released by a given institution, thereby guiding opportunities for reductions in excess nitrogen use and enhancement of sustainability. Using the Nitrogen Footprint Tool developed by the University of Virginia (UVA), we present results for UC Davis' NF, including energy, fertilizer, and food sectors. Results point to a relatively low NF for UC Davis' transportation and energy portfolio compared to those of other universities. This quantitative measurement, as well as the predictive scenarios and projections provided by the Nitrogen Footprint Tool, will aid in the formation of future abatement targets and sustainable management actions.

The Effects of Malnutrition and Human Lysozyme on Hepatic Metabolism

Mariana Leal
Sponsor: Carolyn Slupsky, Ph.D.
Nutrition

Childhood malnutrition is frequently observed in developing nations and significantly impacts the developing immune system, thereby increasing morbidity and mortality. Repeated enterotoxigenic E. coli (ETEC) infections can decrease nutrient absorption thereby creating a vicious cycle of malnutrition and illness. Human milk contains high levels of lysozyme—an antimicrobial enzyme that may help protect children from pathogenic infections. This study examines the connection between malnutrition and the presence of antioxidant and pro-oxidant metabolites. Weanling piglets were fed a protein- and energy-restricted diet for 3 weeks, after which the diet continued either without supplement (n=6) or was supplemented twice daily with 250 mL of goat's milk (n=6) or transgenic goat's milk expressing human lysozyme (hLZ; n=6) for 2 weeks. A subset (n=4) from each group was further challenged with ETEC. The liver metabolome was investigated at each time point using ^{1}H-NMR spectroscopy. Piglets supplemented with either milk are expected to have lower levels of oxidative stress associated with malnutrition and be better able to respond to ETEC challenge.

CDK9 Inhibition Prevents Injury-Induced Subchondral Bone Resorption by Targeting Osteoclast Precursors

Jason Leddy
Sponsor: Dominik Haudenschild, Ph.D.
MED: Orthopedic Surgery

Common joint injuries substantially increase the risk of osteoarthritis (OA). Following injury, secondary joint damage results when an inflammatory response degrades cartilage and leads to the breakdown of joint bone – known as subchondral bone resorption. This process is accomplished by bone-resorbing cells called osteoclasts. Subchondral bone resorption increases the likelihood of developing post-traumatic OA (PTOA). Because current clinical joint injury treatments do not address this issue – and cannot curtail PTOA – developing a strategy to limit subchondral bone resorption might help prevent PTOA. Previous experiments, in which mouse anterior cruciate ligaments (ACL) were ruptured, showed that subchondral bone resorption is prevented by inhibiting the activity of CDK9, a kinase that influences inflammatory gene expression. We hypothesize that CDK9 inhibitors target bone resorption pathways by inhibiting osteoclasts. This could happen in three ways: First, preventing osteoclast proliferation – limiting the number of cells capable of bone resorption. Second, reducing osteoclast differentiation – limiting resorption activity per osteoclast. Third, by affecting both proliferation and differentiation. This study examines the effects of CDK9 inhibition on osteoclasts. Our results show that CDK9 inhibitors suppress both proliferation and differentiation of osteoclast precursor cells. These insights may lead to the development of post-injury treatments that prevent osteoarthritis.

Development of Smart Clothing for Visually Detecting People at Night

Sue Bin Lee
Sponsor: Thomas Maiorana, M.F.A.
Design Program

Bicycling and walking, aside from exercising, recreation use, or running errands, are increasing mode of transportation for increasing number of Americans. The U.S. Census Bureau shows that from 2000 to 2012, number of bicyclists increased from 488,000 to about 786,000 [1]. While this environmentally friendly way can offer many benefits such as better health and financial savings, it also brings dangers associated with auto vehicles. 48 % of bicyclist deaths occur between 4 p.m. and midnight when it is dark outside. 24% of fatalities are between the ages 45 and 54 where as 9% make up children under the age 16. Many times, these accidents occur from not abiding by the rules of the road and drivers not being able to detect bicyclists sharing the road [1]. With better detection of pedestrians and bicyclists in the dark hours, risks and fatalities with automobiles will decrease significantly. The purpose of this research is to research and prototype the best safety method for bicyclists and night time athletics to ensure their safety in the dark. The initial prototype will entail light, navigational and accident sensors in a ready to wear weather proof jacket with other multi functioning accessories.

Survival During the Khmer Rouge: Genocide and Labor Market Outcomes in Cambodia

Brian Lee
Sponsor: Katherine Eriksson, Ph.D.
Economics

In 1975, the Khmer Rouge, also known as the Communist Party of Kampuchea took control of Cambodia following years of civil war. In what is now known as the Cambodian Genocide, around 1.7 to 2 million Cambodians were systematically killed by the Khmer Rouge's attempt to reform the country into an agrarian classless society, led by Pol Pot. This research examines some of the long-run effects of the Khmer Rouge through the perspective of economics. Specifically, I will be examining how genocide instigated by the Khmer Rouge impacted labor markets outcomes in post-conflict Cambodia. The data used in this research includes a unique dataset constructed from the 1962 Cambodian Census, which has been obtained from the Royal University of Phnom Penh. Because the Khmer Rouge specifically targeted educated individuals and those with non-agrarian occupations as enemies of the state, I expect to find a negative causal relationship when comparing labor market outcomes in 1962 to 1996. Even though authoritarian regimes often meticulously document their crimes, little to no research has been done quantifying the impact of genocide in post-conflict states due to lack of data before episodes of genocide.

Testing Genetic Interactions in the OOC-5 Pathway During Asymmetric Division

Nancy Lee
Sponsor: Lesilee Rose, Ph.D.
Molecular & Cellular Bio

Asymmetric cell division is an important developmental process that creates daughter cells with different fates. During asymmetric divisions, the mitotic spindle must be aligned with the axis of cell polarity to ensure that the daughter cells inherit different fate determining molecules. In C. elegans, the conserved PAR polarity proteins regulate polarity and spindle position during the first divisions of the embryo. In ooc-5 mutant embryos, the first asymmetric division is normal, but then PAR protein localization is abnormal and polarity reestablishment fails at the two-cell stage, causing the embryo to die. To identify other genes involved in the pathway for polarity reestablishment, we carried out a genetic enhancement screen. We tested whether disrupting the function of candidate genes enhanced the defects of a weak ooc-5 mutant. We performed hatch counts and calculated embryo lethality to detect enhancement. We also filmed the embryos to observe and analyze spindle orientation to establish if enhancement of lethality is due to defects in polarity. We have identified two genetic enhancers that may act in the OOC-5 pathway required for polarity reestablishment.

UC Davis College of Letters and Science Marketing Campaign Survey: Have It All

Dong Hyun Lee
Sponsor: Donna Justice, M.A.
College of Letters and Science

The purpose of this research project is to survey undergraduate students at UC Davis to measure awareness of the College of Letters and Science Have It All Campaign; to measure interest among students in pursuing majors or double majors in the college; and to learn about obstacles to their awareness to the campaign. The campaign was launched to expose students to the variety of majors they can pursue and encourage students in the college and outside the college to consider a major in Letters and Science. The survey is being administered online and in person. The goal of this research is to measure the effectiveness of the campaign advertisements, students' attitudes toward choosing a major in the College of Letters and Science and their attitudes toward double majoring.

Protein Biotinylation Quantification Using Novel Illuminating Peptide-Dye Conjugates

Lynn Leng
Sponsor: Kit Lam, M.D.,Ph.D.
MED: Biochem & Molecular Med

The virtually irreversible binding of biotin to either avidin or streptavidin is used in the biotechnology to develop a wide variety of detection methodologies. While the biotinylation process is well established, estimation of level of biotinylation in proteins remains difficult to determine. The traditional HABA colorimetric assay suffers inaccuracies, while mass spectrometry (MS) is costly and limited to molecules under 60 kDa. Therefore, a new assay that retains the HABA assay's simple process and MS' accuracy is crucial. Malachite Green (MG), a molecular rotor dye with low fluorescence in its free state and fluorescence increase when bound to an engineered macromolecule, is extensively used in live cell imaging. We aim to covalently link MG to a one-bead-one-compound (OBOC) combinatorial peptide library to generate a large number of random illuminating peptides. A sequential confocal fluorescence microscopy screening assay will track peptide-dye pairs which light up when bound to either avidin or streptavidin. Positive ligands exhibiting the highest fluorescence increase will be resynthesized in solution and their ability to evaluate level of protein biotinylation will be investigated. This transformative approach will supplement previous methods as a more accurate and simple colorimetric assay to determine the number of conjugated biotin per protein molecule.

The Impact of Parent Attachment on Self-Esteem and Peer Interactions

Leslie Leon
Sponsor: Kali Trzesniewski, Ph.D.
Human Ecology

Researchers have shown that positive peer relationships during childhood are related to better academic achievement and mental health. Given how important peer relationships are in an individual's life, studies are needed to understand the factors that predict development of positive relationships. One important factor is quality of the parent-child relationship, which has been hypothesized to impact the development of peer relationships because it helps the child form a positive self-view. However, little research has directly tested this hypothesis. The goal of this research is to test this hypothesis in a sample of children aged 5 to 13 (N=80). Children came into a lab at UC Davis and completed a survey. They were then asked whether they wanted to play with some other children and how well they expected the play session to go. Correlational analyses supported the hypothesis, showing that children having positive interactions with parents were more likely to have higher self-esteem, both in general and in social situations. This higher self-esteem was related to children feeling more confident in how well peer interactions would go. In addition, children with higher self-esteem were reported by parents as having fewer problems with peers.

Classification of Digestive Behavior for Canned Black Beans Based on the Food Breakdown Classification System

Aaron Leong
Sponsor: Gail Bornhorst, Ph.D.
Biological & Ag Engineering

The Food Breakdown Classification System (FBCS) categorizes solid foods based on their initial hardness and rate of softening during in vitro gastric digestion. This experiment aims to determine the change in hardness during in vitro gastric digestion of canned black beans. Canned black beans were rinsed with deionized (DI) water, and beans with uncompromised seed coats were selected for testing. To determine softening over time, two digestion conditions were evaluated – incubation in either water (6mL/g) or simulated oral (0.2mL/g) and gastric (6mL/g) fluids. After mixing beans with digestion fluids, samples were incubated in a shaking water bath (37°C at 100 rpm) for up to four hours. Using a TA.XT2 Texture Analyzer, single compression was completed to 50% strain to measure the hardness of each bean before and during digestion. Black bean hardness was significantly different between digestion conditions ($p<0.0001$). The initial hardness was 7.09N. After 180 min of simulated digestion, the hardness for gastric fluid and water digestions were 9.39N and 7.04N, respectively. Production lots may have affected differences in hardness. Under the FBCS, we can classify canned black beans as a Class VI food with low initial hardness (<20N) and a slow rate of softening ($t_{1/2}$>30min).

Students' Goals Moderate the Association Between Poverty and Grades in School

Chelsea Leslie
Sponsor: Kali Trzesniewski, Ph.D.
Human Ecology

Research has shown that living in poverty can put students at risk for low achievement in school. Research has also shown that students' beliefs and attitudes can foster higher achievement in school. The goal of the present research is to test whether positive beliefs and attitudes can help protect students from the negative effects of poverty on achievement. A sample of 788 middle school students attending New York public schools were assessed on their attitudes, beliefs, and achievement in school. The results showed that mastery goals (i.e., a desire to learn, even if performance suffers) of the student moderated the effect of poverty on average grades. Specifically, students not living in poverty had higher grades than students living in poverty, regardless of their mastery goals. In addition, students living in poverty who had higher mastery goals were able to reach a similar level of achievement as students not living in poverty. In contrast, the grades of students with lower mastery goals who were living in poverty were about half a grade-level lower than the other groups. This provides evidence that mastery goals may protect students from the harmful effects of living in poverty.

The Minimization of Ammonia Volatalization in Urine and Ammonia Distillate Samples Using Mineral Oil

Nathan Lester
Sponsor: Harold Leverenz, Ph.D.
Civil & Environmental Engr

Improper fertilizer storage can result in ammonia loss due to volatilization. Physical treatment methods for the long-term storage of urine and ammonia distillate samples taken from urine collection systems designed for nutrient recovery are being assessed for their effectiveness at preventing ammonia loss. A 10 week controlled monitoring program is in progress to characterize the effectiveness of physical barriers by quantifying the rate of ammonia loss in tanks containing urine or ammonia distillate under different storage conditions. A vented incubation chamber was constructed to maintain samples at 20^{o}C while venting ammonia from the headspace. The storage conditions under evaluation are samples (a) open to the atmosphere and (b) under a 10 mm layer of mineral oil. Nitrogen loss is being quantified using colorimetric ammonia and total nitrogen concentration measurements. A preliminary monitoring program supports other scholarly investigations that ammonia loss is not only dependent on parameters such as pH, and alkalinity, but is also affected by physical barriers acting on the samples. In general, the preliminary study revealed that the addition of an oil layer preserves at least 75% of initial ammonium content in both urine and distillate samples, where as a vented tank experienced effective ammonium depletion.

Optimization of Intact Cardiomyocyte Nuclei Isolation From Frozen Heart Tissue

Jessica Li
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

Recent studies show that changes in the physical structure of cardiomyocyte nuclei occur early in the development of heart disease, but it is not yet known what drives these changes. Our aim here is to optimize a procedure for isolating intact nuclei from frozen heart tissue samples in order to facilitate studies examining the molecular mechanisms underlying cardiomyocyte nuclear remodeling. Existing methods use detergent to lyse cells, followed by differential centrifugation to separate organelles and tissue residues. However, extended detergent exposure damages the nuclear envelope, diminishing our ability to study transmembrane protein complexes that regulate nuclear trafficking. By taking advantage of new microfabrication technology and advancements in stem cell purification methods, we have significantly shortened the protocol. We analyzed purity and enrichment of the nuclear fraction by confocal imaging upon staining with DRAQ5 for DNA and mitotracker orange for mitochondria, as well as western blot analysis of organelle markers. Experiments using a cardiac-specific nuclear envelope protein to further purify the cardiac nuclei from this nuclear fraction are ongoing. This more efficient and precise method for intact nuclei isolation should prove very useful in the analysis of changes in nuclear structure, protein expression, and functional activity underlying cardiac remodeling.

BMP Signaling Mechanisms and Potential Clinical Impacts

Serena Libert
Sponsor: Dominik Haudenschild, Ph.D.
MED: Orthopedic Surgery

Bone Morphogenetic Proteins (BMPs) are utilized in medical bone growth procedures. These treatments are effective, but limited because they require millions of times higher BMP concentrations than what is found in the body. High BMP concentrations can result in adverse side effects, limiting conditions BMPs can treat. BMPs are growth factors that turn on the mRNA expression of bone functioning genes. They bind to cell-surface receptors and signal through SMAD proteins to activate bone related genes. By studying BMP signaling dynamics and bone formation activation, we hope to fine-tune BMP and various co-factors to get optimum bone growth using lower BMP concentrations. To study BMP signaling mechanisms, we are creating cells that express fluorescent SMAD proteins. SMAD proteins remain in the cytosol and move to the nucleus when BMP signaling is activated. We are transfecting C2C12 cells with different SMAD proteins containing genes for green fluorescence and antibiotic resistance. Treatment with antibiotics selects for transfected cells, which we check under the microscope for signal signifying fluorescence. Successful isolation of transfected cells will allow us to closely study BMP signaling mechanisms. Through this study, we hope to better understand BMP signaling and activation so that we can improve bone treatments.

The Minimization of Ammonia Volatalization in Urine and Ammonia Distillate Samples Using Mineral Oil

Kahui Lim
Sponsor: Harold Leverenz, Ph.D.
Civil & Environmental Engr

Improper fertilizer storage can result in ammonia loss due to volatilization. Physical treatment methods for the long-term storage of urine and ammonia distillate samples taken from urine collection systems designed for nutrient recovery are being assessed for their effectiveness at preventing ammonia loss. A 10 week controlled monitoring program is in progress to characterize the effectiveness of physical barriers by quantifying the rate of ammonia loss in tanks containing urine or ammonia distillate under different storage conditions. A vented incubation chamber was constructed to maintain samples at 20^{o}C while venting ammonia from the headspace. The storage conditions under evaluation are samples (a) open to the atmosphere and (b) under a 10 mm layer of mineral oil. Nitrogen loss is being quantified using colorimetric ammonia and total nitrogen concentration measurements. A preliminary monitoring program supports other scholarly investigations that ammonia loss is not only dependent on parameters such as pH, and alkalinity, but is also affected by physical barriers acting on the samples. In general, the preliminary study revealed that the addition of an oil layer preserves at least 75% of initial ammonium content in both urine and distillate samples, where as a vented tank experienced effective ammonium depletion.

Quantification of Oleuropein in Olive Leaf Supplements and Purification of Its Derivatives

Alicia Lim
Sponsor: Selina Wang, Ph.D.
Food Science & Technology

Oleuropein aglycone is a derivative of the bitter polyphenolic compound oleuropein, and is produced by the hydrolysis of oleuropein during olive fruit maturation and olive oil processing. There is interest in determining the amount of oleuropein aglycone present in olive oils, as it is an antioxidant, has possible therapeutic effects for various diseases, and contributes to the oxidative stability of olive oil. However, oleuropein aglycone standards are not currently commercially available. This project aims to produce pure oleuropein aglycone from ten olive leaf supplement samples, which all claimed to contain at least 20% of oleuropein on the label. Oleuropein will be extracted and purified from the olive leaf supplements using column chromatography. The pure oleuropein will then be enzymatically hydrolyzed to oleuropein aglycone. In addition, high performance liquid chromatography (HPLC) will be used to determine the concentration of oleuropein in each olive leaf supplement sample, and the experimentally determined concentrations will be compared to the labelled concentrations.

Designing an Anti-Memorial to Land Lost

Kristi Lin
Sponsor: N. Claire Napawan, M.L.A.
Landscape Architecture & Sustainable Design

Traditionally, memorial designers have sought to use permanent materials such as stone to preserve moral lessons for society. However, traditional memorials do not reflect the regenerative process in which individuals remember, heal, and transform. Landscapes offer living materials that change over time. Thus, landscape designers are equipped to facilitate the renewal of memories as they evolve and become relevant at different moments. In contrast with traditional memorials, anti-memorials incorporate landscape processes such as tides, wind, growth, and decay. Through formalizing impermanence, anti-memorials recognize the significance of on-going marginalized issues and their absence in societal memory. Although the emerging field of anti-memorials is focused on human loss, this project looks at how one would design an anti-memorial to land loss. In some places in California, land is subsiding at a rate of one foot per year due to groundwater over-pumping. This project compares the landscape materials, longevity, interactivity, and outcomes of contemporary anti-memorials in order to develop a set of guidelines for their use as landscape design activism. Using the guidelines, this project will propose a design for an anti-memorial to land lost and critique society's tendency to forget about the environment until after it is too late.

Phenotypic Screening for Fructokinase Gene Family 1-7 in *Arabidopsis thaliana*

Frank Lin
Sponsor: Judy Callis, Ph.D.
Molecular & Cellular Bio

Plants are photoautotrophs that self-supply glucose through photosynthesis. However, glucose is not a constant energy source because synthesis occurs only in the light. Thus, plants synthesize starch and sucrose for storage and easy access, respectively. Sucrose is a disaccharide of glucose and fructose transferred throughout the plant. At distant sites, sucrose is cleaved and individual sugars converted into Glu-6-P and Fru-6-P by hexokinases and fructokinases, respectively. Losing either enzymatic activity could result a significant energy deficiency per sucrose molecule catabolized. We are studying the fructokinase gene family in the model plant Arabidopsis thaliana that consists of seven active genes coined FRK1-7. Our lab is interested in identifying the biological role for each FRK. We are using a reverse genetics approach to create single and double loss-of-function (LOF) mutants and analyzing these plants for phenotypic differences from wild type. We identified LOF mutants from T-DNA insertional libraries in 5: FRK1, FRK2, FRK3, FRK5 and FRK7 and conventional crossing is being used to generate double mutants. Growth of single mutants appears normal. We report our progress in isolating and characterizing double mutants. We plan to use CRISPR-Cas9 system to generate LOF mutants in FRK4, FRK6 and other higher mutants for future experiments.

Morphological Consequences of Habitat Transitions in Teleost Fish

Monica Linares
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

A wide variety of teleost fish inhabit marine habitats, freshwater habitats, and even intermittently both environments. This transition from freshwater to marine habitats poses an interesting question: how is the morphological diversity of fishes affected by the change in environment? As marine habitats are generally more complex, they support more niches. Consequently, fishes in these habitats should have a higher degree of diversity when compared to their freshwater counterparts. This morphological diversification in relation to habitat transitions has never been understood on such a large scale. Using both traditional and geometric measurements on a set of over 1000 teleost specimens from the Smithsonian, we will compare standard length and other morphological traits, such as body depth and width, between the freshwater and marine habitats. We predict a positive correlation between standard length and the other measurements. However, following the trend of more diversity in marine habitats as a result of more available niches, we hypothesize that the variation of body measurements (range) when compared to standard length is greater in marine teleosts. Overall, this will be an important step in discovering what particular habitats contribute most to body shape evolution and understanding the relationships between ecological opportunity and morphological diversification.

Patronage Trends of the Mogao Grottoes During the Northern Liang, Western Wei, and Tang Dynasties

Emma Lingel-Gary
Sponsor: Katharine Burnett, Ph.D.
Art

This paper explores the Mogao complex of temple-caves in Dunhuang, Gansu province. By examining Caves 275 (Northern Liang Dynasty), 285 (Western Wei Dynasty), and 320 (Tang Dynasty), I analyze trends in patronage at the time of creation and the nature of conservation today, as the sites are so representative of their respective periods that they have often been the subject of exhibitions. In connection to this rich history of patronage, the monuments saw the development of an unique sect, Liangzhou Buddhism, which helped establish the patron as a powerful player in the communities that shaped the temple-caves and their visual programs. This tradition was instrumental in connecting one's social and religious status on earth to the elevation of one's Buddhist merit. The temple-caves and their paintings are extremely valuable sites of cultural heritage, both to the groups and belief-systems under which they were first built and to later observers, devotees, and conservators. By examining patronage traditions then and today, one observes the deep connections between power, ideology, and art.

Optimization of Acid-Hydrolysis Conditions for the Monosaccharide Composition of Carrots

Yiyun Liu
Sponsor: Carlito Lebrilla, Ph.D.
Chemistry

The food we eat holds a significant role in our health, especially the immune and digestive systems due to unique interactions with the gut microbiome. While the analysis of vitamins and minerals in foods is omnipresent, our understanding of their sugar profiles is understudied due to the difficulty of their analysis. Hydrolyzing polysaccharides into monosaccharides prior to analysis is one such difficulty. This project aims to optimize and understand the competing reactions of polysaccharide depolymerization and monosaccharide decomposition under high acid conditions. Carrot was chosen for method optimization and underwent acid hydrolysis with different acid concentrations, reaction times, and temperature conditions. Free monosaccharides, released from polysaccharides, were then labeled with 3-methy-1-phenly-2-pyrazolin-5-one (PMP) and isolated through chloroform extraction. Samples were subsequently analyzed using an ultra-high performance liquid chromatograph paired with a triple quadruple mass spectrometer (UHPLC/QqQ-MS). The monosaccharides were quantified using a standard curve and the optimum hydrolysis conditions were determined. These results will be used to determine the monosaccharide compositions in a variety of foods which will provide a different approach to understanding nutrition and aid in the fields of food science and health.

A Novel Device and Method to Sample Insects in Strawberries Using CO2 Gas

Jessie Liu
Sponsor: Christian Nansen, Ph.D.
Entomology/Nematology

Effective insect sampling is crucial in estimating population dynamics, the knowledge of which allows timely and precise treatment interventions for crop production. In this study, we assessed the use of CO2 gas as an alternative method in insect sampling. We examined effect of CO2 fill time and pressure on the quantity and demography of collected insects from strawberry field plants. Our methodology involved using 2-liter plastic bag to envelop the entire strawberry plants, pumping CO2 into the bag with different fill time (2, 8 or 15 seconds) and at different pressures (25 or 50 PSI). The bag was shaken to collect the anesthetized the insects which were then transferred to smaller sampling sealed bag. The samples of collected insects were then identified to taxonomic family level. The analysis of collected data revealed that the method using CO2 gas could minimize mechanical damage on the sampled plants and effectively captured small-body insects such as thrips and whiteflies while excluding the large-body insects such as beneficial wasps and lacewings. Therefore, insect sampling using CO2 gas as anesthetizer provides the discriminatory collection of target insects which can help reduce processing efforts as well as the stress on the populations of non-target insects.

Statistical Learning in Intelligent Supply Chain Management

Yuqing Liu
Sponsor: Hao Chen, Ph.D.
Statistics

The supply chains are experiencing a transformation driven by the application of data. Lam Research Corporation is a leading company in the semiconductor industry and has more than 800 purchase orders created by engineers every day. This project aims to improve the current purchases system by quoting from suppliers ahead of time based on the evaluation of whether a product in the database will be purchased in the future and estimation of the expedite fee. I use the order history data from 2014 to 2016 and build 3 predictive models with machine learning and statistical methods. Each modeling process involves statistical tests for feature selection, variable transformation and cross validation. There are also adjustments to the modeling methods corresponding to different business functions of the models. Two models are implemented and based on a 2-month pilot run, they save the work of 4 employees and expedite 3 days of delivery time for 40% orders at the company.

Performances Characterization of Substituted Spiropyrans as Novel GSH Sensors Using Ultraviolet-Visible Spectrophotometry

Stephen Liu
Sponsor: Angelique Louie, Ph.D.
Biomedical Engineering

Oxidative stress is strongly correlated to numerous chronical pathologies. The overproduction of oxidative radicals in arterial endothelium, for example, can promote cellular damages and atherosclerosis that ultimately facilitate ischemic stroke development. However, there is currently no excellent diagnostics for strokes at early-stages. A previous population study has shown that plasma concentrations of a biologically active antioxidant called glutathione (GSH) are 17.4% ± 4.6% lower among 143 stroke patients than the control group. This result indicates that GSH level is significantly decreased in stroke. A GSH sensor could then allow identifications of strokes or stroke-risks. Spiropyrans (SPs) were recently reported to undergo a structural isomerization with GSH present. Performance of this GSH-induced switching, meanwhile, might be optimized by certain electronic profiles of structural substituents. In my work, reversibility, selectivity, rate constant, and association constant with GSH present were characterized for each of nine uniquely dual-substituted SPs using ultraviolet-visible spectrophotometry. Absorbance data showed that the incorporation and position differences of electron-donating methoxy drastically influence SPs' sensitivities towards GSH. Understanding performance of substituted SPs is essential towards their future clinical applications as in vivo diagnostics for strokes.

The Relationship Between Hmong Fashion and Hmong Women in the Central Valley

Ia Lo
Sponsor: Susan Avila, M.F.A.
Design Program

This research project examines the relationship between Hmong fashion and Hmong women in the Central Valley. Hmong women have assimilated into the American culture yet they continue to negotiate their identities through the commercialization and consumption of Hmong fashion. Through this cultural authentication framework, Hmong women are agents of change by selecting, characterizing, incorporating, and transforming Hmong fashion trends and techniques. Social media and Hmong media have become major sites for transmitting trends. Increase in personal capital of Hmong women fosters the growth of the Hmong fashion industry. This qualitative research examines personal experiences and observations of Hmong women who identify as entrepreneurs, producers, consumers, and self-designers in the Hmong fashion industry. The analysis of historical data and artifact collection constructs a timeline of fashion trends suggesting three time periods: Wrap Turban Era (Early 20th Century-1975), French Coin Era (1975-2000), and Eclectic Fusion (2000-present). While there are published works about Hmong culture in the early California settlement, there is a lack of studies on current Hmong fashion and Hmong women. For this reason, this research will expand on the existing academic works and gallery archives of Hmong fashion.

The Effects of Milk Osteopontin on Intestinal Development in Early Infancy

Jamie Lo
Sponsor: Bo Lonnerdal, Ph.D.
Nutrition

Osteopontin (OPN) is a highly phosphorylated glycoprotein synthesized in the mammary gland and gut, being abundantly present in milk of some species, such as human and mice. It is involved in a wide range of biological processes, including cellular proliferation and differentiation, and immune modulatory functions. OPN exerts its multiple functions by binding to its integrin or CD44 receptors on the surface of target cells, and subsequently initiates various signaling pathways. OPN and its fragments may play important roles in intestinal development in infancy. To investigate functions of milk OPN, an established mouse model by our group was used. In this model, wild-type (WT) mouse pups were either fed by WT or OPN knock-out (KO) dams, receiving milk with or without OPN. Milk OPN was resistant to in vivo digestion indicated by immunoblotting using intestinal contents. Pups fed by WT dams (OPN+ group) showed similar length of the intestine as pups fed by OPN KO dams (OPN- group), yet OPN+ pups had larger inner surface than OPN- pups at postnatal D10 and D20, as revealed by histological analysis of the ratio of villus height/crypt depth. Put together, milk OPN plays a role in promoting intestinal growth in early life.

Analysis of *Myxococcus xanthus* 5889: A Developmentally Essential Response Regulator

Matthew Long
Sponsor: Mitchell Singer, Ph.D.
Microbiology & Molec Genetics

Myxococcus xanthus is a species of soil based myxobacteria. In times of low nutrients, these social Gram-negative bacteria congregate and form multicellular fruiting bodies, which house myxospores. Myxospores are the bacteria's dormant state and represent a novel terminal cell type. One goal of our lab is to define the regulatory networks that control this developmental process. We identified the MXAN_5889 gene as a potentially important developmental response regulator by RNAseq analysis. After a deletion in the MXAN_5889 gene, M. xanthus cells developed significantly slower than wild type cells, demonstrating the importance of this gene. During my analysis, MXAN_5889, M. xanthus cells showed varying developmental speeds; developing at the speed of the control wild type when grown in submerged cultures, but developing slower than control wild type when grown on CTTYE agar plates. Complete fruiting body formation was also unsuccessful when MXAN_5889 was plated on CTTYE agar plates. In this presentation, I report my ongoing research to further characterize spore and developmental variations caused by the deletion of the 5889 gene as well as by the media used for development. This will help characterize the gene's impact in development and sporulation.

The Relationship Between Microbial Activity and Efficacy of Anaerobic Soil Disinfestation

Lia Lopez
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Anaerobic soil disinfestation (ASD) is a procedure used to reduce plant pathogen populations in soil, as a sustainable alternative to chemical fumigation. This pre-plant technique is achieved by incorporating a carbon source into soil, which is covered with a plastic tarp and irrigated. This process stimulates growth of microorganisms that consume available oxygen and undertake anaerobic metabolism, resulting in the accumulation of by-products that are toxic to fungi. In field trials, ASD treatments have resulted in little to no reduction in the disease known as Fusarium wilt. However, a controlled environment study conducted in Fall of 2016 showed that in soil subjected to ASD+rice bran (RB), the population of the pathogen causing Fusarium wilt was reduced by 99%. We hypothesize that microbial activity is critical for success of ASD and further, that ASD+RB treatments will have higher microbial activity than RB controls under both warm and cool conditions. To test this hypothesis, we will quantify microbial activity in soil subjected to ASD+RB or amended with RB without ASD, under both warm and cool conditions. The results should provide a better understanding of how ASD works, which may facilitate more effective application to disease control under field conditions.

Zero Tolerance Policies and School-To-Prison Pipeline: Exploring Alternatives to Exclusionary Policies

Adriana Lopez Torres
Sponsor: Gloria Rodriguez, Ph.D.
Education

Zero tolerance policies stemmed from federal drug enforcement policies in the 1980's that punished all types of offenses no matter how big or small. In 1994, President Clinton and the federal government signed the Gun-Free Schools Act; which punished students in possession of either weapons or drugs on school property. This drew to the use of zero tolerance policies to discipline these students. Throughout the years these policies evolved and now not only punished those in possession of weapons or drugs, but also for class disruption, or any minor act inside the classroom. Through an extensive literature review it has been noted that with the implementation of zero tolerance policies the path for schools to track students of color has eased, specifically black and brown youth, into the school to prison pipeline. Taking that into consideration the aim of this research is to show how the use of zero tolerance policies led to higher rates of suspension/expulsion pushing students out of the schools and into the prison system. The goal is to find alternative ways to the exclusionary policies to retain students of color and break away from the school-to-prison pipeline.

Optimizing Sample Preparation for Milk Analysis

Yi Lor
Sponsor: J German, Ph.D.
Food Science & Technology

Human milk consists of macronutrients lipids, carbohydrates, and proteins in variable ratios along with other micronutrients present. These macronutrients are important for infant growth and development. Samples obtained from human subject is often in small quantities. Fourier Transform Infrared analysis measures milk sample composition rapidly and accurately. However, this analysis requires sample amounts that are often more than given by the human subject. In this project, I am investigating the optimal sample preparation and conditions to obtain accurate and precise results, and then using the results to compare with human milk references. Optimizing the preparation of milk sample for analysis establishes a standard to obtain consistent results using any samples. I will also test the differences in composition of macronutrients across multiple milk samples in a human subject. This allows for cost effective use of equipment and materials in future projects. Determining the use of the most favorable composition of macronutrients in human milk is important for personalized nutrition and ensuring beneficial infant development and growth.

Evaluating Parking Demand and Elasticity Functions for Permits A and C at the University of California, Davis

Yu Lu
Sponsor: Kristin Kiesel, Ph.D.
Ag & Resource Economics

Parking at UC Davis has been a concern to students and faculty especially regarding insufficient parking spaces, high parking prices, and parking traffic congestion. In order to analyze whether current UC Davis' parking prices play a large factor in meeting utilization rates due to high parking prices and unequal allocation of staff and student parking, my research will analyze and measure UC Davis' parking demand and elasticity. The study focuses on regressing variables responsible for explaining the price elasticity as well as factors affecting the utilization. By working with UC Davis' Transportation and Parking Services to gather data from the last 15 years on the number of permits sold, change in parking prices and utilization rates of parking structures, these regressions can inform TAPS pricing decisions and its effects on utilization rates and ultimately also revenue. Our study will also analyze whether alternative transportation forms affect the parking demand. This study can serve as a tool for TAPS in their consideration of setting future parking prices to increase revenue while considering utilization rates and traffic.

Multi-Modal Sensation From *Culex quinquefasciatus*

WeiYu Lu
Sponsor: Walter Leal, Ph.D.
Molecular & Cellular Bio

Mosquitoes are vectors of diseases such as malaria, dengue, chikungunya, Zika and many types of encephalitis. In California, the southern house mosquito, Culex quinquefasciatus is a vector of the West Nile virus. Mosquitoes use their olfactory system to sense and approach human and other host animals as a potential source of a bloodmeal. Odorant molecules can bind to mosquitoes' odorant receptors in their antennae to trigger an electric signal which is transmitted to the brain, allowing the mosquitoes to locate their host, but also to avoid danger. To prevent mosquito bites, people use mosquitoes' olfactory system to repel them, through mosquito repellents. One such repellent is DEET, the "golden standard" repellent used worldwide to protect host from bites. In our lab, we use DEET and other commercially available repellents such as IR3535, picaridin and PMD to conduct bioassays. Our lab previously demonstrated that odorant receptor 136 (CquiOR136) is the DEET receptor in Culex quinquefasciatus. In this study, the expression pattern of CquiOR136 was examined in all olfactory tissues by qPCR. Additionally, newly designed behavior experiments, coupled with gene silencing strategy, were used to determine whether mosquitoes detect DEET with other olfactory structures rather than the antenna.

A Human Milk Oligosaccharide Reduces the Uptake of Pathogenic Bacteria by Mammalian Epithelial Cells

Henderson Lu
Sponsor: David Mills, Ph.D.
Food Science & Technology

Premature infants in the neonatal ICU are at high risk of infections, and can develop intestinal complications such as Necrotizing Enterocolitis (NEC), a condition that is attributed to proteobacterial blooms. Human milk oligosaccharides (HMOs), which are abundant in milk and can be metabolized by bacteria like Bifidobacterium longum subsp. infantis, aid in deflecting pathogens. Currently, there is little research on the effect of individual purified HMOs on host-microbial interactions. We hypothesized that a synthetic oligosaccharide, HMO 1.1, may function to prevent bacterial translocation across the epithelial barrier of Caco-2 cells. To test this, HMO 1.1 was added to Caco-2 cells, along with pathogenic E. coli, and this clearly reduced the uptake of pathogenic E. coli. Moreover, it also reduced phosphorylation of key Caco-2 proteins in the signaling cascade responsible for the ability to combat infection. These studies support a growing body of evidence suggesting a direct role for HMOs in conditioning the intestine and preventing infection. Further study will define the mechanistic nature of this protection and aid in the development of possible therapeutic treatments aimed at preventing dysbiosis and reducing the risks of NEC in premature infants.

A Diffusion Tensor Imaging Study on the Efficacy of Allopregnanolone in Improving the Corpus Callosum Microstructure of Carriers of Fragile X Premutation

Eileen Lu
Sponsor: Susan Rivera, Ph.D.
Psychology

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a late-onset neurodegenerative disorder that is seen in older individuals who are premutation carriers of the fragile X mental retardation 1 (FMR1) gene . Approximately 40% of males aged 50 years and older who carry the premutation alleles will develop FXTAS. The corpus callosum is a white matter structure severely affected in FXTAS. Allopregnanolone, an endogenous neurosteroid that stimulates neurogenesis and oligodendrogenesis, serves as a potential treatment for FXTAS. However, no research has been done in studying its efficacy in treating FXTAS. In the current study, we investigate the efficacy of allopregnanolone in improving the connectivity and integrity of corpus callosum microstructure in patients with FXTAS who have undergone allopregnanolone intervention treatment for three months. We are conducting diffusion tensor tractography to manually reconstruct the corpus callosum from diffusion tensor imaging scans of patients with FXTAS using a multiple regions of interest (ROI) approach. It is expected that patients with FXTAS who have undergone the allopregnanolone intervention treatment will show an increase in the reconstructed fiber tract volume and a decrease in mean diffusivity and isotropic diffusion (increase fractional anisotropy). The improvements will show promise in the use of allopregnanolone as an effective treatment of FXTAS.

Elucidating Cell Surface N-Glycosylation in Metabolically Active Tissues

Jonathan Luke
Sponsor: Helen Raybould, Ph.D.
VM: Anat Physio & Cell Biology

N-glycosylation is one of the most important posttranslational modifications in proteins that directly affect structure, stability, and function. Aberrant glycosylation is a hallmark in cancer and other diseases. The cell surface protein N-glycosylation of metabolically active tissue such as liver and muscle is largely unknown. In this study a nano-liquid chromatography electro spray ionization quadropole time of flight mass spectrometry (LC/ESI QTOF MS) platform was used to identify and profile cell surface N-glycans in mouse metabolically active tissue. Select tissues were collected from C57BL/6J mice at day 30-post birth including liver, adipose, muscle, spleen, and brain. All extracted tissues were homogenized and membrane fractions containing cell surface proteins were obtained through differential centrifugation. N-glycans were released enzymatically using protein-N-glycanase, and purified by solid phase extraction before MS analysis. N-glycome profiles were obtained from all tissues and more than 1000 glycans were identified. Brain tissues showed the highest diversity, and a differential distribution of glycan species was seen among cortex, hippocampus, and cerebellum. Defining the N-glycome in healthy tissues is the first step in understanding the role of glycan biomarkers in different diseases. This platform will be a valuable tool for future studies of the N-glycome in metabolic disorders like diabetes.

Time-Of-Day Effect on Academic Performance of Adolescents

Phuc Luong
Sponsor: Giovanni Peri, Ph.D.
Economics

Research on sleep patterns of adolescents shows that they are more likely to experience sleep deprivation and sleepiness early in the morning. Moreover, sleep deprivation is associated with a lower cognitive performance that impairs learning ability. Studies on the circadian rhythm, a biological clock that regulates one's sleep-wake cycles, also reveal that adolescents tend to be more active and alert in later time of day. Motivated by these findings, my research examines the relationship between time of day and academic performance of adolescent students. I use students' academic grades of their courses to measure their learning and performance. Other factors influencing academic achievement such as students' individual characteristics, teacher's quality, and classroom size are also included in my analysis. Applying econometric methods to a data set of over 6800 Vietnamese first-year college students over a period of five years, I find that given a school start time, students who take courses in later time perform better than in the early morning. The results of my research are relevant to policies aiming to improve school efficiency and the productivity of students regarding course scheduling.

Assessing Viability of Tissue Constructs Using Fluorescence Lifetime Imaging

Su Hyun Lyu
Sponsor: Laura Marcu, Ph.D.
Biomedical Engineering

In tissue engineering, sample assessment is vital to ensure the development of viable tissue constructs. Current methods to assess sample viability have proven laborious and destructive, causing need for non-destructive optical techniques. Fluorescence lifetime imaging (FLIM) is an optical technique that maps the lifetime of a fluorescence molecule's excited state. One challenge within FLIM is distinguishing the source of fluorescence, which is often necessary with strongly auto-fluorescing scaffold components such as collagen. To address this issue, we measure steady-state fluorescence at a wavelength that predominantly excites the fluorescent dye but not the collagen molecules, e.g. 440 nm. In this project, we aim to to develop a bandwidth amplifier with variable gain to be used in steady-state fluorescence measurements of a single layer of dye-labelled cells sitting atop a collagen-based scaffold. Given the broad absorption and emission of collagen molecules, we still expect substantial fluorescence using 440 nm excitation. However, since this wavelength is close to the maximum absorption of dye, we expect that collagen scaffolds with dye-labelled cells on top will exhibit considerably more fluorescence signal than acellular collagen scaffolds. These measurements will provide insight into the efficacy of FLIM as a method for assessing viable tissue constructs.

The Effects of Varying Precipitation and Seed Size on Seed Carryover in Five Native Californian Forb Species

Xinyu Ma
Sponsor: Andrew Latimer, Ph.D.
Plant Sciences

As climate becomes more variable, with a higher frequency of drought, the persistence of native annual forbs will increasingly depend on seed banks to buffer their populations from declining. Among species that use seed banking, those with smaller seeds are thought to retain larger seed banks through higher seed carryover between years. However, it is not well understood how climate variability affects seed carryover in seed banks. Our research investigates this relationship by manipulating rainfall on five native forb species at an annual grassland site. Bags with seeds were buried in September 2015 for each species and treatment, and retrieved in July 2016. Then, seed mass was measured for each species, and seed carryover was determined by counting the number of viable seeds via inspection of the embryo under a dissecting scope. We hypothesize that species with larger seeds will exhibit a low seed carryover in both precipitation and drought conditions, while species with smaller seeds will exhibit a low seed carryover in precipitation, but a higher carryover in drought due to stronger seed banking tendencies. Samples are currently being processed, but preliminary results show strong variation in seed carryover between species.

Fish Heads and Habitats: Diversity Within Teleost Head Morphology and the Trends Seen in Relation to Habitat

Lauren Maas
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Freshwater and marine environments, while both aquatic, may exert different selection pressures on the organisms living within them. Because marine habitats are generally more varied and complex, they have more available niches, and we therefore hypothesize this will allow for a greater diversity of morphologies. The purpose of this study is to examine the relationship between head shape diversity and habitat in teleost fish. Using morphological data on approximately 800 preserved species collected from the Smithsonian, we will look at head depth, lower jaw length, and mouth width as fundamental measures of head shape and compare them to habitat data to determine if there are any overarching trends. There may be a connection between these traits and diet, adding another dimension to our research and plausible findings. We intend to use a phylogeny to compare different lineages of freshwater and marine fish, giving evolutionary context to any statistical trends we may find. Preliminary results have already shown a greater variation in head shape among marine species, including a greater array of extreme outliers. Finding clear trends in head shape diversity between freshwater and marine lineages would illuminate the differences in selection pressures, demonstrating broader evolutionary trends between these two habitats.

Cell Plate Formation and Mutant Plant Resistance to the Inhibitory Effects of ES7

Emily Mabry
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

Cytokinesis in terrestrial plants involves the formation of a cell plate at the equator of dividing cells. The incipient cell plate expands and ultimately matures into a cross wall that separates daughter cells at the end of cell division. Cell plate formation is a complex process, characterized by fusion of Golgi-derived vesicles and timely deposition of polysaccharides such as callose and cellulose. Disruption to the cell plate formation can lead to lethal mutations. Therefore, our lab has characterized ES7, a small molecule that specifically inhibits callose deposition at the cell plate in a non-lethal manner. We are presenting our work on the identification of several gene mutations that confer resistance to the inhibitory effect of ES7. One of these mutants, es7-40-3, shows that elongation and organization of root cell files were significantly unaffected by ES7, in comparison with its parental (control) line. Identification of the gene that confers resistance to ES7 can provide insights in plant cytokinesis.

Interface of English Language Games for the Practice and Improvement of Multilinguals in the US

Danielle Macedo
Sponsor: Glenda Drew, M.A.
Design Program

A research University such as UC Davis is filled with diverse individuals with multicultural backgrounds, and many of them speak two languages or more. An article in the journal of Bilingualism: Language and Cognition involved a study that showed if bilinguals are not exposed to their second language, such as English, early in life, they will struggle to be fully proficient in adulthood. According to the US Consensus Bureau, at least half the non-native English speaking population claim they speak it less than "very well." English is a complex language full of quirks and exceptions; by collecting anecdotes about personal struggles in being multilingual, prototyping and performing user testing, a refined interface that addresses and remedies these struggles may come to fruition. The range of categories covered will include speech comprehension and production, vocabulary, sentence structure, cultural concepts and idioms. The purpose of this project is to encourage multi-lingual individuals to acquire a better grasp of English as their non-native language and help them to connect more with an English speaking environment. In the end, the project is a fun, educational, convenient and interactive experience that will encourage multilinguals nationwide to practice and improve their English skills.

Voluntary Action in Groundwater Management in California

Clara Macleod
Sponsor: Mark Lubell, Ph.D.
Environmental Science & Policy

In California, 40% of water supply comes from groundwater in average years and up to 60% or more in drought years. Some communities rely entirely on groundwater as their drinking water source. Until 2014, voluntary groundwater management plans existed as a governance option for groundwater management. However, little is known about the compliance, timing, and impact of these previous efforts to manage groundwater. This thesis aims to fill that knowledge gap. Understanding the timing of institutional change provides a deeper understanding of the dynamics involved with the current development of new local groundwater institutions. This thesis will first compare the geographical and institutional differences between the northern and southern Central Valley in terms of access to water and institutional management resources. Applying an event history model, I will analyze water agencies' action to implement groundwater management plans (GMPs) and the external impact on shallow domestic wells. I will estimate the model using physical variables such as groundwater basin size, groundwater dependency, and a capacity variable such as the size and budget of agencies. The results of this analysis could inform current processes of institutional development under the Sustainable Groundwater Management Act to successfully manage groundwater resources in California.

Photochemistry of Impurities in Nature-Identical Snow Crystals

Danielle Magadia
Sponsor: Cort Anastasio, Ph.D.
Land Air & Water Resources

Snow acts as an important reaction matrix for photochemical reactions, particularly in polar regions. In snow, there are two major locations of interest in which these reactions take place: the quasi-liquid layer (QLL) and the internal liquid-like regions (LLRs). Significant research has been conducted on snow photochemistry, but the methods used to prepare frozen samples in the laboratory resulted in materials that do not accurately represent characteristics of nature-made snow, potentially giving data unrepresentative of natural conditions. This research intends to compare photolysis rates of chemicals in snow in nature-identical snow versus aqueous solutions. The nature-identical snow is made with a snow-making machine that mimics the process of snow formation in nature. Chemicals are incorporated into the snow either by surface deposition or introduction of chemicals during snow crystal growth. Photolysis rates are measured by illuminating the snow under simulated sunlight and measuring concentrations using high performance liquid chromatography (HPLC). Past research has shown increased photolysis rates in the snow matrix, and this research will attempt to prove and to interpret this phenomena.

Preliminary Field School Findings From CA-SOL-346 in Suisun Marsh, San Francisco Bay

Danica Magana
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

In the summer of 2016, archaeology students from the U.C. Davis Field School completed excavations at CA-SOL-346 in the Suisun Marsh of the San Francisco Bay. CA-SOL-346 is situated within the Solano Land Trust owned Rush Ranch Open Space just north of Grizzly Bay along the marsh-terrestrial ecotone zone. Characterized by its large bedrock mortar complex which lies adjacent to a small, shallow midden deposit, this Late Period site was probably a seasonal camp or part of a larger logistically organized settlement strategy geared toward the exploitation of waterfowl and other brackish water resources. This study examines faunal remains recovered from the site and explores a methodology applicable to a heavily fragmented assemblage. Through the systematized collection of burning and size data we successfully infer site usage, refuse management, and dietary patterns. The analysis of this data set also allows us to draw conclusions applicable not only to faunal harvesting throughout California but also to other areas with similar levels of preservation.

Models for Vibration Induced Patterns in Carbopol Gel

David Maginnis
Sponsor: Ronald Phillips, Ph.D.
Chemical Engineering

The behavior of polymers when driven by an oscillating force is not currently well understood. We believe that mathematical models like Faraday waves, which are generally applied to Newtonian fluids, can be used to predict behaviors of Non-Newtonian polymers such as Carbopol gel. By observing formation of ridges formed on the surface of a Carbopol polymer and measuring the period of oscillation and the acceleration of the fluid we hope to establish a model that can relate non-Newtonian fluids to conventional equations of motion. By varying the Strouhal number of our system we will search for correlations between Newtonian fluid models and other non-Newtonian models. This research has applications in multiple fields because fluids of this type appear in applications like cement, food processing, and inkjet printing and by being able to better describe these equations engineers and scientists may be able to correct problem behaviors associated with these fluids.

Generation and Phenotypic Analyses of PCNT Null Cell Lines

Karan Mahe
Sponsor: Li-En Jao, Ph.D.
MED: Cell Biology & Human Anat

The centrosome is the major microtubule organizing center in animal cells and is crucial for cell division, migration, and signaling. It consists of a pair of centrioles surrounded by a protein-dense matrix, pericentriolar material (PCM). The PCM nucleates and anchors microtubules, and thus dictates the microtubule-organizing activity of the centrosome. An integral component of the PCM is pericentrin (PCNT), which recruits other proteins to the centrosome during PCM expansion at the onset of mitosis. Mutations in PCNT have been causally linked to microcephalic osteodysplastic primordial dwarfism type II (MOPDII), a condition characterized by skeletal abnormalities, dwarfism, and microcephaly. Using the CRISPR/Cas9 gene editing system and flow cytometry, we have generated several PCNT null cultured retinal pigment epithelium (RPE1) cell lines. Preliminary studies using antibody staining have shown that loss of PCNT resulted in reduced growth rates and defects in microtubule nucleation. We are currently assessing what other cellular functions in these PCNT knockout cells are also affected, including the ability of these cells to generate cilia and to faithfully segregate chromosomes. These cell lines are the first established PCNT null stable cell lines and will serve a valuable tool to study the cellular function upon the loss of PCNT activities.

Empathy, Anxiety, Sensitivity to Context, and Quality of Friendships

Tiffany Mak
Sponsor: Nicole Hollis, Ph.D.
Human Ecology

Research has shown that empathy is associated with higher levels of conflict management, closeness and intimacy in friendships (Chow et al., 2013; Wied et al., 2007). However, higher anxiety has been associated with having fewer friendships, less intimacy, and less support (La Greca & Lopez, 1997). Given research showing that empathizing with others is related to distress and worry (e.g., Negd et al., 2011), we wanted to understand the relation between empathy, anxiety, and friendships. We used data from the Swedish Adoption/Twin Study on Aging (SATSA) through ICPSR (Pederson, 2015) which includes 2,018 adults. Our results showed that levels of anxiety, sensitivity to context, and empathy all significantly predicted whether or not participants had best friendships and participants' number of close friends. When tested together in a multiple regression, higher levels of empathy and lower levels of anxiety significantly predicted more best friendships and the number of close friends, but sensitivity did not. Instead, we found a mediation between sensitivity and close friendships such that higher sensitivity predicted higher anxiety, which in turn predicted fewer close friendships. These results help us understand what experiences individuals who are high in empathy, sensitivity, and anxiety may have in their friendships.

Successful Caregiver Strategies to Engage Preschool Children With Autism

Caroline Makepeace
Sponsor: L Harper, Ph.D.
Human Ecology

To date, research regarding preschool children with autism has focused mostly on techniques to foster peer-to-peer social interactions. In this study, we investigate the approaches used by adult caregivers to engage children with autism and the context in which the social interaction occurs. Subjects (2 boys and 2 girls, aged 35-58 months, all nonverbal) were drawn from a larger study conducted in a University preschool setting. Children were videotaped in 20 minute blocks during free play periods through the academic year (9-10 videotapes per child, 37 total). Observations were coded in real time for each bout of interaction with an adult. Coding indicates the activity, if any, the child was engaged in, who initiated the interaction, and the response to the bid for interaction. It is hypothesized that children with autism will engage in longer bouts of interaction with adults when they are engaged in activities that have a gross motor component and/or when the adult uses physical or tactile elements to engage the child.

Understanding Epistemic Modality in Mammography Testing and Their Guidelines

Upekshila Mallawa Arachchige
Sponsor: Sarah Perrault, Ph.D.
University Writing Program

Mammography guidelines are widespread and easily attainable by the public through a simple search online or a visit to their doctors. The guidelines are filled with rhetoric features illustrating confidence in their guidelines. However, the research behind these guidelines are not as transparent. There is a significant overstating in confidence in the guidelines, which is not reflected in the research articles behind these guidelines. In order to understand this difference, I have conducted an analysis on guidelines from the American Cancer Society and a review article that led to these guidelines. The guidelines and the article were analyzed for hedges and boosters, and afterwards the sentences containing hedges and boosters were analyzed for their level of certainty. Initial findings from this research identified discrepancies in the level of certainty between the guidelines and the review article. The review article has less epistemic modality which leads to question the guidelines and their higher level of modality. These results highlight the necessity to restructure guidelines to represent the scientific research that they stem from.

Mechanism of Signal Transduction During Plant Immunity

Gita Mallya
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

The world population is expected to reach 9.7 billion by the year 2050. In order to feed this growing population, we will need to increase crop production by 70%. Crops lost to disease alone can vary from 10-16% each year. Making crops more disease resistant could potentially alleviate some of these losses. Plants have evolved sophisticated defense mechanisms against invading pathogens, however our understanding of how plants defend themselves in nature is not clearly known. Plants use extracellular pattern recognition receptors (PRRs) to identify unique structures on a pathogen called pathogen-associated molecular patterns (PAMPs). Once a PAMP is recognized, a signal transduction pathway occurs within the cell to initiate an immune response. One important event that occurs during signal transduction is the release of reactive oxygen species (ROS), however the mechanism for this is not yet known. The goal of my project was to identify novel proteins involved in regulation of ROS during PRR signaling. Over the past few months I have used yeast two hybrid, molecular biological and biochemical approaches to enhance our understanding of the PRR pathway in detail.

The Role of Endogenous Human Breast Milk Enzymes in Infant Digestion and Potential Bioactive Function of Digested Peptides In Vivo

Courtney Manning
Sponsor: J German, Ph.D.
Food Science & Technology

Human breast milk is a universal source of sustenance for infants, yet very little is known about how breast milk proteins are digested and how the digested peptides function in the infant body. This project seeks to identify the endogenous milk enzymes that are responsible for the primary peptide cleavages that produce protein segments necessary for optimal infant digestion. Mass spectrometry was used to analyze the peptide composition of breast milk digested in vitro. Resulting peptide segments for alpha-lactalbumin were compared to the theoretical enzyme cleavage sites identified by SitePrediction for cathepsin D, plasmin, trypsin, pepsin, chymosin, and lysosomal Pro-Xaa carboxypeptidase. Insight into the function of these key enzymes will provide a foundation for selective enzyme isolation. Such a project has the potential to make significant contributions to research on enhancing digestion and nutrient absorption in infants. Ongoing research into the identification of peptide function within infants will further elucidate essential peptide cleavages and aid in the identification of the enzymes responsible.

The Impact of Lipid Composition on Artificial Cell Functions

Michelle Mao
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Artificial cells are biomimetic systems consisting of biological membranes encapsulating translation/transcription machinery and genetic information. The membranes impact transport of chemicals between artificial cells and the environment, and modulate stability of artificial cells. The transport of chemicals is particularly important because certain chemicals need to be maintained inside artificial cells for their proper function, yet signaling molecules need to be transported into artificial cells for their response to environmental stimuli. To this end, we construct artificial cells using the water-in-oil emulsion method by varying compositions of phospholipids and cholesterol. We also measure gene expression activities of artificial cells using fluorescence microscopy. Our results show that certain lipids and membrane composition produce the largest quantity of artificial cells that can carry out gene expression in diverse environments. We further correlate the observation to biophysical properties of the membranes, including transition temperature, charge, and degree of unsaturation. Controlling the membrane interface may enable artificial cells to function robustly in the human body.

Designing Confidence: Targeting Math Anxiety in Early-Elementary Age Students

Sophie Maquiling
Sponsor: James Housefield, Ph.D.
Design Program

My research develops tools to combat math anxiety among early-elementary age students in grades 1 - 3. Math anxiety, the negative emotional response to doing math, produces severe consequences to personal achievement. By avoiding math-related courses and career options, math anxiety limits otherwise capable students from educational and career-related opportunities. As a fundamentally interdisciplinary practice, design projects combine knowledge, methods, and inspiration drawn from other areas of study to target to social issues. Using ethnographic research practices to gain qualitative and empathic insight about early-elementary math education, my goal is to apply my findings to a design project that involves developing, prototyping, and testing a possible solution in the form of tools that attempt to alleviate math anxiety and improve confidence in early-elementary age students. I aim to explore the ways in which design responds to social issues and interacts with other disciplines while contributing to a productive conversation about math anxiety in the education community.

Misnomers and Malpractice: Preserving Ancestry and Eliminating Biological Race from Medicine

Gabrielle Mark-Bachoua
Sponsor: Christina Rulli, Ph.D.
Philosophy

The concept of discrete biological human races persists despite overwhelming scientific evidence opposing such a concept. Sociologist and Law Professor Dorothy Roberts, has extensively analyzed the harms and injustices proliferated by treating race as a biological category in medicine, and she warns these wrongs will continue until we recognize race is a political category. I use her work as a foundation to claim we should eliminate use of race in medicine as a biological category. Though race is biologically uninformative, I argue broad ancestral categories and narrowly defined ethnic groupings have some biological relevance in medicine. I claim we should use ancestral and ethnic groupings to increase genetic sampling data, and in some circumstances ethnic groups can be used as a risk factor for certain heritable genetic diseases. However, it is crucial for clinicians and researchers to recognize these groupings have an extremely limited biological scope of operation in medicine. I define this scope to establish a framework for responsible and ethical practice, in the hope that progress in gene mapping and genotyping will eliminate use of such uncertain proxies, and instead focus on unique genetic makeups of individuals.

Sodium Butyrate's Effect on Depressive Behavior Within Rhesus Macaques

Steten Martinez
Sponsor: Erin Kinnally, Ph.D.
Psychology

Depression is a widespread problem in American society without an effective pharmaceutical treatment. However, epigenetic mechanisms (changes in gene expression without alteration of DNA sequence) may play a role in reducing depression. Studies show that an increase of histone acetylation, a mechanism allowing DNA to become more accessible, reduces depressive behavior in rats. Since histone deacetylase inhibitors like sodium butyrate (SB) ultimately facilitate HA, we hypothesize that SB reduces depressive behavior. Twenty-five rhesus macaques (Macaca mulatta) were relocated indoors for two consecutive trials to induce temporary depressive behavior. Fifteen received a vehicle control, while 10 orally received 500 mg/kg SB during the second trial. Blood was collected on the 1st, 8th, and 15th day of the second trial to quantify HA levels via ELISA. A standard monkey ethogram and five hours of video documentation was used to code the monkeys' behavior, including activity and depressive responses. While data are still being analyzed, current results show an increase in depressive behavior for monkeys treated with SB in comparison to controls. This evidence contradicts our initial hypothesis. These results, if confirmed, may suggest that re-organizing HA during stress may potentiate, rather than attenuate, the effects of stress in adolescent monkeys.

Bounds for the Minimum Step Number for Two-Component Links in the Simple Cubic Lattice

Ernie Martinez
Sponsor: Francisco Arsuaga, Ph.D.
Molecular & Cellular Bio

The structural analysis of DNA molecules in spatial confinement has long been a topic of interest. Recently mathematicians have begun analyzing the natural linking in DNA to better understand its biological structure and function as well as its applications to nanotechnology. An important open question is to determine the minimal number of nucleotides necessary to build a DNA molecule with a pre-specified topology. Our research determines the minimum step number needed to form prime two-component links in the simple cubic lattice. Links are naturally found in mitochondrial DNA and also form during bacterial DNA replication. To accomplish this we are employing a Monte-Carlo algorithm known as the BFACF, which generates a Markov chain that samples the set of all polygonal conformations of a given link type in the simple cubic lattice. We examine all of the sampled polygons and select the one with the fewest edges. Our results include numerical bounds for the minimum step number for prime two-component links up to 9 crossings as well as their coordinate representations. These numerical bounds can be used to further the understanding of DNA in confinement and may be applied in the design of nanotechnological systems.

Mother-Scholar Dichotomies: Examining the Trajectories of Mexican-Origin Postdoctoral Fellows Navigating Academia and Motherhood in STEM Fields

Jeannette Martinez
Sponsor: Mary Lou de Leon Siantz, Ph.D.
Betty I Moore Nursing School

Various studies have documented that women of color in science, technology, engineering and mathematics (STEM) are highly underrepresented (NSF, 2015). Women and minorities in STEM fields often experience unwelcome climates. This study examines the trajectories of Mexican-origin women in academia in STEM fields who became mothers during or before their postdoctoral fellowship. Highlighted tension arises at various points of their education and career: finishing their degree, applying to postdoctoral fellowships, seeking academic appointments, finding a balance between being a mother, scholar and mentor for other minority students. Interviews were conducted with postdoctoral fellows in STEM fields. Initial findings point to the climates in STEM fields that have created an environment for mothers to have to feel the need to work harder than others to maintain their position and advance in academia. More policy action is needed in university, state, and federal level to create equality and retention in these demanding fields.

Effects of Turbidity on Coloration and Mating Strategies of Trinidadian Guppies (*Poecilia reticulata*)

Daniel Martinez
Sponsor: Andrew Sih, Ph.D.
Environmental Science & Policy

Human-induced rapid environmental change (HIREC) affects virtually all ecosystems across the globe. One particularly global source of HIREC in aquatic environments is the sedimentation of water bodies and associated increases in turbidity, reducing water clarity. Turbidity can impair visually-based mating systems in aquatic species, influencing sexual selection. One system that is particularly affected by turbidity is the Trinidadian guppy, which relies on conspicuous coloration and displays in mating interactions between males and females. However, male guppies may also utilize sneak mating attempts to inseminate females. To observe the effects that turbidity has on this visually based mating system, we collected coloration and mating behavior data and compared them across populations. Preliminary data on coloration indicate a decrease in orange and black pigmentation as a function of total body size in populations that originated from chronically turbid streams. To test if this shift in coloration is also paired with changes in mating behavior, guppies from each population will be assayed in both clear and turbid conditions and the frequency of displaying and sneak mating measured. Achieving this will help shed light on the role that HIREC plays in altering the behavior of afflicted populations.

Hall Effect Characterization of Gallium Nitride (GaN) High Electron Mobility Transistors (HEMTs)

Daniel Mascareno
Sponsor: Srabanti Chowdhury, Ph.D.
Elect & Comp Engr

Silicon has been the leading semiconductor in transistors for the past 70 years. Transistors made with Silicon are in any possible electronic device you can think of. However, today there is a semiconductor that can possibly be the future in high power applications like electric vehicles or power converters in the next years and that is Gallium Nitride (GaN). Silicon is very abundant and cheap and that is why it is the most used semiconductor in transistors today. However, Silicon based technology has slowed down and any advancement is now incremental. The purpose of this research is to investigate the growth of GaN using the Metalorganic Chemical Vapor Deposition (MOCVD) method. MOCVD is a tool with which thermodynamics and reactant chemistry may be precisely controlled. After the growth process is done, I will measure the electrical characteristics of my wafer using the Hall effect tool, to test the specifications I am expecting like the electron and hole concentration. The final product will be a HEMT (High Electron Mobility Transistor) using my GaN wafer to understand and to find ways to get as close as possible to the ideal HEMT.

Shadow Pan

Bayan Mashat
Sponsor: Patrick Lemieux, Ph.D.
Cinema & Digital Media

Shadow Pan is an expressive video game where the player solves mini mental health problems (specifically depression) through having interactive conversations with animation characters. Each level the player will get to meet a different character, listen to their problems, interact with them, and give (write) them solutions or suggestions on how to fix it or how to move on. After the game is done, the results can be shared with other players to learn about different approaches on how to deal with their mental health problems. The purpose of this game is to express feelings and emotions through animation characters and get mental health coaching and advice indirectly from anyone who can use a computer without having to go through direct interaction. The target can be divided into two groups: first, those who have mental health problems, and those who can provide mental health help. This game can be particularly helpful for shy people who find it hard to express themselves explicitly or those who are hesitant to ask for help.

Effects of Diet and Chronic Oxytocin on the Oxytocin Receptors in Rat Forebrains

Megan Masnaghetti
Sponsor: Karen Bales, Ph.D.
Psychology

Recently, the hormone oxytocin has made quite a name for itself. From ties to pair bonding, child birth, and even petting dogs, oxytocin has gone mainstream. However, many mechanisms of oxytocin and how it's processed in the brain are unknown. In previous studies, researchers demonstrated a distinct change in rodent feeding behavior with chronic subcutaneous oxytocin treatment. Our research aims to understand the effects of chronic oxytocin administration on oxytocin receptor density in key areas of the rat forebrain, providing a possible physical explanation for the observed behavior changes. Rats were given either a high fat or chow diet and chronically dosed with either a vehicle or oxytocin treatment. Brains were extracted, sliced, and analyzed using receptor autoradiography. Oxytocin receptor density was then quantified in the ventromedial hypothalamus and arcuate nucleus, which regulate feeding behavior, and in the central amygdala and subiculum, which are two areas outside of the feeding circuitry known to have dense oxytocin receptor expression. We hypothesize that oxytocin receptor density will be higher in areas of the brain that regulate feeding behavior and unchanged in the others. Considering previous research, we believe this effect will be more pronounced in the rats given a high fat diet.

Evaluation of Dielectric Materials for Their Radiation Hardness

Rogelio Mata
Sponsor: Sudhindra Tripathi, Ph.D.
Physics

The Compact Muon Solenoid (CMS) detector at the Large Hadron Collider (LHC), located in Geneva, Switzerland, is about to see a greatly enhanced intensity of particle interactions. The silicon based detectors at CMS have to with stand this increased luminosity delivered by the LHC. Our goal is to find a convenient dielectric to provide isolation for traces and interconnects in the next generation of trackers. The dielectric should have: excellent radiation hardness, high resistivity, high dielectric strength (breakdown voltage), low dielectric constant (capacitance), and easy processing (be spin-coatable). We plan to test various materials for this purpose. The project involves the use of parallel capacitor structures, used in testing for resistivity, dielectric strength and dielectric constant at different exposures to radiation including neutron and proton and both together. My contribution is in the field of simulating electro-magnetic response of materials to radiation damage. Preliminary results from this study will be also presented.

Plantaricin-Mediated Fitness of *L. plantarum*

Patricia Matus
Sponsor: Maria Marco, Ph.D.
Food Science & Technology

Lactobacillus plantarum (Lp) is a lactic acid bacteria (LAB) common to the microbiomes of plants, humans and animals. It is essential for most food fermentations and is also recognized for its production of plantaricins. Plantaricins are ribosomally produced secreted small peptides with bactericidal activity. The production of plantaricins by food-associated Lp is a desirable trait because plantaricins might inhibit the growth of spoilage bacteria populations. Plantaricins might also inactivate pathogens in the mammalian intestine as well as improve the persistence of ingested strains. In this study, the capacity of 23 L. plantarum (and highly related L. pentosus) strains to produce functional plantaricins was analyzed by amplifying and sequencing genes in the plantaricin locus. Concurrently, a phenotypic assay was conducted to assess bacteriocin production and sensitivity among the strains. Results from the tested isolates indicate that BGM40, 1B1, BGM37, and AJ11 contain all tested plantaricin genes, while B1.3 and W1.1 lack all the tested plantaricin genes. Isolates that are highly inhibitory will have an intact plantaricin locus and are also highly resistant to other plantaricin producers. The plantaricin locus has undergone considerable divergence and the presence of intact plantaricin loci is an important determinant of competition amongst related Lp strains.

Synthesis, Crystal Structure, and Thermoelectric Properties of the Quaternary Phosphide $Ba_4Mg_{2.8}Cu_{11.2}P_{10}$

Joseph Mazzetti
Sponsor: Kyrylo Kovnir, Ph.D.
Chemistry

Thermoelectric materials play a pivotal role in society's expanding demand for renewable energy alternatives, since these materials can convert heat into electrical power and vice versa. The performance of a thermoelectric material is determined by its figure of merit, zT, defined by the equation: where = the Seebeck coefficient, = electrical conductivity, = absolute temperature and K = thermal conductivity of the material. Exploring the construction of new high efficiency thermoelectric materials out of cheap elements prompted us to focus our eyes on the Ba-Mg-Cu-P quaternary system, which resulted in the discovery of $Ba_4Mg_{2.8}Cu_{11.2}P_{10}$. Here we report the synthesis, crystal structure, and thermoelectric properties of the new compound $Ba_4Mg_{2.8}Cu_{11.2}P_{10}$, which has a layered two-dimensional crystal structure. Both CuP_4 tetrahedra and CuP_3 triangles act as basic building units in $Ba_4Mg_{2.8}Cu_{11.2}P_{10}$, and the structure is composed of large two-dimensional $Ba_2Mg_{2.8}Cu_{11.2}P_{10}$ blocks extending along the [001] direction, separated by a layer of Ba cations. The metallic-type performance of $Ba_2Mg_{2.8}Cu_{11.2}P_{10}$ was confirmed by theory calculation and resistivity measurement. $Ba_4Mg_{2.8}Cu_{11.2}P_{10}$ shows a moderate thermal conductivity of 13.4 W m^{-1} K^{-1}, and a resistivity of $3x10^{-6}$ O m at 400 K.

Intentional Absurdities: Understanding Gertrude Stein's Nonrepresentational Literary Portraits of Picasso

Madeline McCluskey
Sponsor: Margaret Ronda, Ph.D.
English

While art and literary historians examine Gertrude Stein's cultural and historical importance as a central figure around which many of the greatest minds of the early 20th century congregated, literary critics of her writing often limit their interpretation of Stein by examining how her work relates to other writers and disregarding the potential for an interdisciplinary approach to understanding her poetry. My project aims to bridge that gap, using a historical lens alongside the poststructural while I juxtapose Stein's two literary portraits of Picasso, "Picasso" and "If I Told Him--A Completed Portrait of Picasso." Using previous literary analyses of these poems, art historical literature on Cubism, and Stein's essays and letters about Picasso's cubism, I examine how Stein's literary portraits interpret Picasso's cubism by paralleling his ideas into poetics. Stein is not simply copying Picasso's ideas into words, for there are inherent differences between visual and textual portrayals of ideas that are brought to light through comparing the differing methods Picasso and Stein used within their mediums to convey similar ideas. I aim to use these differences to better comprehend Stein's purpose in writing these nonrepresentational literary portraits.

CRISPR-dCas9 Expands Dynamic Range of Gene Expression From T7 RNAP Promoters

Sean McCutcheon
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Catalytically inactive Cas9 (dCas9) has been used extensively to explore functional genomics by modulating gene expression at the transcriptional level. However, alternative applications of CRISPR-dCas9 in genetic engineering may help improving the control on recombinant gene expression. Here, we investigate the efficacy of dCas9 to increase the dynamic range of expression systems by repressing leaky expression. We use mathematical models based on experimental data to establish the mechanism by which dCas9 increases the dynamic range of our expression system. We discover that dCas9 is significantly more effective than several conventional methods for increasing the dynamic range of the T7 RNAP promoter without affecting the maximum gene expression level. We also enhance the maximal expression levels of our system by introducing mutations in the T7 promoter sequence. These findings demonstrate that CRISPR-dCas9 can serve as a useful and novel tool to expand the dynamic range of gene expression. This application of dCas9 could improve the performance of expression systems that suffer from the leaky expression of toxic proteins. Furthermore, this system offers versatility as it could be extended to other promoters by simply changing the sequence of single guide RNA.

Developing a Rapid Screen to Modify Starch Structure in Potatoes

Gakpe Mckenzie
Sponsor: Diane Beckles, Ph.D.
Plant Sciences

Starch provides most of the calories for humans and is an important biopolymer and biofuel. Engineering starch biosynthesis to ensure high yield and specificity for each downstream use is desirable for food security and environmental sustainability. Starch is found in high amounts in storage organs such as tubers, or in smaller amounts in potato leaves. We aim to develop a rapid in vitro screen to modify starch, by treating potato leaf discs with oligodeoxynucleotides (ODN), designed to attack different starch metabolic and regulatory genes. The ODN will bind to a complementary strand of mRNA triggering the cells' Ribonuclease H, which will prevent mRNA translation to protein. This treatment will alter the expression of the targeted proteins, which may change starch physico-chemical properties. We will analyze the starch in the leaf discs to verify this. By modifying the expression of these individual proteins, we may understand their role in determining starch amount, composition and structure in potato. ODN is the first step; we aim to use the results of these experiments to help us implement CRISPR-Cas9 in the potato to rationally modify starch for commercial application.

Identifying Knowledge Structures of Introductory Chemistry Students

Spivey McLane
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Studies have shown that students in general chemistry have difficulty with problem solving, which is influenced by many variables, including how students organize knowledge in their minds. This study explores students' knowledge structures, defined as the network of related concepts in the mind, and how they are related to different factors including gender and prior knowledge in chemistry and math. A word association test was developed by selecting major concepts in general chemistry as stimulus words to which students were asked to provide ten response words that came to mind within ninety seconds of reading each stimulus word. The top twenty-five most frequently used responses for each stimulus word were used to calculate relatedness coefficients, which measure how closely stimulus words are linked in the students' minds. Finally, two network generating programs, Pathfinder and Gephi, were utilized respectively to interpret these relatedness coefficients and determine knowledge structures. Our data indicate structural differences in the organization of concepts in students' knowledge structures based on gender and background in math and chemistry. Our findings will inform changes in curriculum which would place more emphasis on related topics that seem weakly connected in the knowledge structures to promote conceptual understanding.

In Vitro & In Vivo Digestion of Bovine Milk Fat Globule Membranes

Shasta McMillen
Sponsor: Bo Lonnerdal, Ph.D.
Nutrition

Milk fat globule membranes (MFGM) cover lipid droplets secreted by mammary gland secretory cells, and consist of proteins, glycoproteins, & membrane lipids. In a recent clinical trial, MFGM was added to infant formula, resulting in significantly lessened differences in cognitive development between breast-fed and formula-fed infants, and decreased infections. Several of these observations, particularly the anti-infectious effects, may be explained by the presence of bioactive proteins in MFGM. Several milk proteins are known to be resistant against proteolysis. With these findings in mind, this study used mass spectrometry (MS) to identify and quantify MFGM proteins, and Western blots to observe the protein at various stages of in vitro, and in vivo digestion. Several bioactive proteins were shown to be at least partially resistant to digestion, whose identities were consistent with findings of similar studies. Our results also strongly suggest a remarkably high resistance to proteolysis by alpha-lactalbumin, which was shown by Western blot to be present even after gastric and intestinal digestion in both models. These findings could help to provide insight into the mechanisms underlying the beneficial effects of MFGM supplementation.

Site Formation Processes and Human Use Analysis at Varsche Rivier 003, Western Cape, South Africa

Patricia McNeil
Sponsor: Teresa Stelle, Ph.D.
Anthropology

The archaeological site of Varsche Rivier 003, Namaqualand, SouthAfrica has produced a sequence of material culture spanning the Middle and Later Stone Age (MSA and LSA). Radiocarbon and optically stimulated luminescence dating of deposits produced dates from two periods of occupation (MSA: >46,000 years; LSA: <2,000 years), but the contact levels of the deposit are heterogenous in nature. We propose that human reuse and occupation of this site has had significant effect on the integrity of the contact deposits. Factors such as sleeping/bedding hollows, rock clearing, and hearth clean-up are activities that would significantly disturb the substrate, obscuring earlier deposits. Using spatial analysis to decipher human impacts, we show how human behavior in the LSA obstructed upper deposits left by occupants from the MSA, accounting for the uneven stratigraphy. 3-D modeling and GIS software allow for visualization of deposits, including the spatial distribution of land-snail, charcoal, and rocks, and allow for the development of scenarios of how site formation processes and human impact affected the stratigraphy over the millennia. These methods allow us to distinguish intact from disturbed deposits, facilitating a better reconstruction of site use, which will contribute to our understanding of early modern and hunter-gatherer behavior.

Oligosaccharide Composition of Tergal Glands in dsTra Mutant Female *Blattella germanica*

Megan Meany
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

Sexual dimorphism occurs when the two sexes of a species are visibly differentiated by physical characteristics. These differences are pertinent to species specific courtship rituals and mating. In Blattella germanica, males differ from females in shape, color and the presence of a tergal gland. This gland, found on the dorsal side of males, secretes a pheromonal phagostimulant composed of previously identified oligosaccharides and phospholipids. The tergal gland elicits a female feeding response who climb onto males to feed before copulation. Previous work has shown that interference of the gene Transformer, responsible for female sex determination, gives genetic females a morphological tergal gland. This project aims to determine if morphologically similar glands are chemically like wildtype(WT) male glands. Third instar female nymphs were injected three times throughout development with dsRNA to knockout Transformer. Mutant adult females display "male-like" phenotypes including tergal gland development. With the combined efforts of an evolution lab and a chemistry lab, I am analyzing oligosaccharide composition of mutant glands using LCMS. LCMS determines if dsTra creates a chemically similar and functional gland in mutants compared to WT male glands. Strong quantitative differences have already been found in the chemical composition of WT male and female mutant glands.

The Cascading Effects of the Seed Environment on the Functional Traits of a Mature Native California Wildflower

Joaquin Meckler
Sponsor: Jennifer Gremer, Ph.D.
Evolution & Ecology

The various environmental cues that determine when a seed transitions to a seedling are critical for timing growth with favorable conditions, allowing a plant to maximize fitness in the face of changing climate conditions. As temperatures continue to rise due to climate change, regions of California are expected to experience increased environmental variability, altering the environmental cues that plants rely on for germination. This study examines the traits related to plant performance through measuring morphological and physiological differences in Streptanthus tortuosus across elevations in a common garden experiment. Preliminary results suggest that relative growth rates of height and canopy size is higher in the low elevation plants, which may relate to the elongated growing season they experience in the field. I will test the prediction that relative growth rate and water use efficiency are higher in low elevation plants while photosynthetic rate is higher in high elevation plants. This will be done by measuring photosynthetic rate and water use efficiency and comparing the results in plants from the two elevational extremes of the range of S. tortuosus. The results of this study pertain to understanding whether plants are locally adapted and how that may affect responses to climate variabilty.

Asylum Acceptance: Do Political Ideologies of Ruling Parties in Destination Countries Affect Asylum Acceptance?

Jose Medina
Sponsor: Jeannette Money, Ph.D.
Political Science

Eric Neumayer studied asylum recognition rates and found that political conditions and economic conditions of an asylum seeker's country of origin had a significant effect on whether or not an asylum applicant was granted asylum by the country of destination. In response to Neumayer research, I shall be studying the political conditions of the destination countries that asylum-seekers apply to. Through a comparative analysis of both a country that accepted the most asylum applicants and a country that accepted the least asylum applicants from 2010 through 2014, I found that the political ideology of the political party in power within a destination country affected asylum-seekers accepted. The quantitative analysis of 44 industrialized countries would then find that the political ideology of a ruling party in a destination country will have an effect on the acceptance of asylum-seekers. The political ideology of a destination country's ruling party, not just the political conditions and economic conditions of the origin country, has some type of influence over the acceptance of asylum-seekers. The initial findings suggest that an ideologically left ruling party would accept more asylum seekers while an ideologically right ruling party would accept least asylum seekers.

Anticipatory Behavior, a Welfare Assessment Tool

Tarun Mehta
Sponsor: Jason Watters, Ph.D.
Animal Science

Anticipatory behavior is described as a goal-driven action triggered by certain cues, whereas stereotypic behaviors are repetitive patterns that are not goal orientated. In addition, anticipatory and stereotypic behaviors have both been used to assess animal welfare. Our focus is to help identify indicators of animal welfare. Anticipatory behavior is a real-time indicator of the animal's sensitivity to cues and rewards that occur daily. By focusing this study on anticipatory behavior, changes can be implemented to the animal's environment to modify the expression of these behaviors. Such changes may include varying the cues associated with the behavior. The study entails multiple data collections which include taking the animal's behavior and their location within their enclosure. The two species that we studied were the Canis lupus baileyi and the Ursus arctos. We will be monitoring for differences between behaviors, while the project aims to clarify the discrepancy between the two classical measures of animal welfare. The preliminary results indicate that these species do in fact exhibit goal-driven behavior at certain times during the day. With the validation of anticipatory behavior, changes can be applied to test why these behaviors are occurring so they are beneficial to the wellbeing of the animals.

Microbial Relations: A Closer Look at the Interactions Between Apoidea Species, Microbes and Different *Epilobium canum* Cultivars

Wendy Melendez
Sponsor: Rachel Vannette, Ph.D.
Entomology/Nematology

Microbes are known to play an integral role in the vast majority of biological systems. Knowledge of what microbes provide to the floral community are novel and are in need of expansion. My research examines the intimate symbiosis that exist between microbial communities, carpenter and honey bees, and the native California flower, Epilobium canum. Specifically, the research focuses on a comparison between the microbial communities of flowers that have been visited by these various insects. Comparing these different cultivars with varying traits by extracting their nectar, diluting and plating it on R2A and YM media we are able to observe if flower traits could possibly predict the microbial communities structure and insect visitation such as these bees. The findings of the research could aid in our understanding of why the microbes found have a relationship within the flora community. This research allows for expansions after its conclusion, we could possible directly correlate floral traits with certain microbes which can aid in improving agricultural techniques.

Evolution of Students' Knowledge Structures Over General Chemistry Courses

Alexandra Milkey
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Constructivist theory states that knowledge is a dynamic entity that changes constantly. Experts' ability to effectively solve problems highlight that meaningful learning does not occur unless knowledge is organized. A learner is required to metacognitively revise the interaction between existing and gained knowledge. The organization of these structures is an important predictor for one's success in problem solving. A word association test was developed by selecting major concepts in the first course of Chemistry 2 as stimulus words. This test was modified with concepts from the second and third courses in the series. For each test, students were asked to provide five response words within forty- five seconds of reading each stimulus word. After determining the frequency of the responses, the top twenty-five responses for each stimulus word were used to calculate relatedness coefficients, which measure the relationship between words. Pathfinder and Gephi, network generating programs, were utilized to interpret the data and determine knowledge structures. Depending on the differences in these knowledge structures, methods will be recommended to strengthen students' ability to monitor their knowledge structures. Connections between existing and new concepts from later courses will illuminate how successful a student is at constructing his or her knowledge structure.

Gender, Cosmology and Mythology in John Milton's Paradise Lost

Kristina Miller
Sponsor: Margaret Ferguson, Ph.D.
English

There are passages within John Milton's epic poem, Paradise Lost (1667) in which characters display fluid signs of gender; in some cases, the character's identifying pronoun changes from one gender to the other, or individuals possess characteristics of the opposite gender, making them neither strictly male nor female. The sun, moon, angels and occasionally even Adam and Eve demonstrate this fluidity across both genders at one point or another in the poem. For example, in Book 7 Milton describes the sun's creation via the penetration of the female light into an awaiting orb. The feminine light, not the sun, is given the reproductive capabilities that are usually assigned to a male entity. In this pre-lapsarian and Edenic universe, I believe that the presence of light and the manner in which it is segregated from God, who is considered the original source of light itself, during the account of creation may play a significant role in these characters' fluid gender identity. This research, in conversation with work by feminist critics and students of Milton's materialism, aims to discover how light itself, and also the light manifested in the soul of an individual, can contribute to the Miltonic character's gender fluidity.

Genome Wide Association Study of Juvenile Idiopathic Epilepsy (JIE) in Egyptian Arabian Foals

Brittni Ming-Whitfield
Sponsor: Carrie Finno, D.V.M.,Ph.D.
VM: Population Hlth & Reprod

Juvenile Idiopathic epilepsy (JIE) is a disorder in Egyptian Arabian foals that causes seizures during the first year of life. Potential life-threatening complications include head injury and aspiration pneumonia. The disorder is heritable but the mutation is unknown. The aim of this study was to identify single nucleotide polymorphisms (SNP), significantly associated with the JIE phenotype. A genome wide association study using the Axiom®Equine genotyping array with 670,000 SNP markers was performed on 48 Egyptian Arabian foal samples. JIE-affected foals (n=9) included foals with electroencephalographic (EEG) evidence of seizure activity, JIE-suspect foals (n=6) included foals with owner reported seizure activity not confirmed by EEG and unaffected horses (n=33) included Egyptian Arabian horses over the age of 1 year with no history of juvenile seizures. Genome-wide significance was determined with Bonferroni correction on the 445,843 SNPs passing quality control. Population stratification was minimized using a genome-wide efficient mixed model program (GEMMA) analysis (λ=1.04). Two SNPs on chromosome 1 (p=2.383932 and p=5.908369) were significantly associated with JIE. This region was evaluated using whole genome sequencing to identify putative mutations in two JIE-affected foals. A list of 27 possible variants was identified and are undergoing genotyping in the original 48 horses.

MTAP Dysregulation: A Potential Novel Biomarker for Kidney Cancer

Matthew Miyazaki
Sponsor: Ching-Hsien Chen, Ph.D.
MED: Div Of Internal Med

Kidney cancer (or renal cell carcinoma, RCC) is one of the few malignancies increasing in incidence in the US. Given that patients with metastatic RCC have an unusually poor prognosis, there is an urgent need to discover potential molecules for predicting malignant changes which lead to RCC. Here, we have identified dysregulation of S-methyl-5'-thioadenosine phosphorylase (MTAP) as a possible biomarker for early detection of RCC. cBioPortal analysis of The Cancer Genome Atlas (TCGA) dataset for RCC (n=538) showed that MTAP gene deletion was associated with a significant decrease in survival. Immunohistochemistry confirmed an increase of MTAP protein expression in adjacent normal as compared to RCC tissues. Through Western blot analysis, we found low MTAP expression in numerous RCC cell lines. Surprisingly, an accumulation of the metabolite S-methyl-5'-thioadenosine (MTA), a major substrate of MTAP, was observed in high grade tumors showing high malignant potential. Functionally, genetic suppression of MTAP in high grade RCC cell lines led to an increase in cell proliferation and motility in MTT and wound-healing migration assays respectively. Overall our data indicates MTAP loss as a major contributor to kidney cancer cell malignancy and provides a viable biomarker for tumor detection.

Activation of PPARgamma Receptors Decrease Depressive-Like Behavior in Mice

Niloufar Mohajerani
Sponsor: Karen Ryan, Ph.D.
Neuro Physio & Behavior

"Prolonged and/or frequent exposure to psychological stress responses may lead to deterioration of organs and tissues, and is associated with increased incidence of both cardiometabolic disease and psychological disorders like anxiety and depression. Chronic psychological stress increases blood corticosterone levels through hypothalamo-pituitary-adrenal (HPA) axis. Previous studies have shown that the activation of nuclear receptor peroxisome proliferator-activated receptor gamma (PPARγ) blunts the HPA axis response to acute stress in rats, and is associated with improvements of depressive-like symptoms in human subjects. In this study, we investigated the role of hypothalamic PPARγ receptors in regulating the response to chronic stress. We first created two groups of neuronal PPARγ knocked-out (KO) and wild-type (WT) gene in the experimental mice, and placed both groups in daily chronic variable stressors for six weeks. The mobility of animals was measured in a Forced Swim Test (FST) at the end of week six. The tail bleeding experiment showed that loss of neural PPARγ does not significantly alter the basal corticosterone levels. However, we did see that KO mice showed more floating or immobility in the FST, which indicates depressive-like behavior in these group of animal".

Structural-Functional Analysis of a Diterpene Synthase From Golden Larch Toward Manufacture of Biopharmaceuticals

Iris Mollhoff
Sponsor: Philipp Zerbe, Ph.D.
Plant Biology

The diversity of plant diterpene metabolites offers a rich source of known and potentially new biopharmaceuticals. Among these, the microtubule-destabilizing activity of pseudolaric acid B (PAB) holds promise for new anticancer treatments. Availability of PAB is limited to low-yielding isolation from the coniferous tree golden larch (Pseudolarix amabilis, Pxa) or multi-step chemical synthesis. This presentation will discuss the discovery and mechanistic analysis of golden larch terpene synthase 8 (PxaTPS8) and subsequent cytochromes-P450-mediated steps in the pathway. PxaTPS8 is an unusual diterpene synthase (diTPS) that catalyzes the first committed step in PAB biosynthesis by converting geranylgeranyl diphosphate into a previously unknown 5,7-fused bicyclic diterpene, coined "pseudolaratriene." Combined NMR and quantum chemical analysis verified the structure of pseudolaratriene, and co-occurrence with PxaTPS8 and PAB in P. amabilis tissues supports the intermediacy of pseudolaratriene in PAB metabolism. Homology modeling combined with site-directed mutagenesis of PxaTPS8 revealed several catalytic residues that suggested a substantial divergence of PxaTPS8 from other TPSs, leading to a distinct carbocation-driven reaction mechanism. Ongoing research includes the elucidation of the downstream PAB pathway via the analysis of candidate genes, including several cytochromes P450 monooxygenases.

Through the Lens of the Fisher King: Hemingway's "Out of Season"

Michael Montgomery
Sponsor: Peter Hays, Ph.D.
English

With "Out of Season," Ernest Hemingway has given us more than just a short story about a fishing excursion. Not only is it Hemingway's first foray into his famed technique of omission, but its deft allusions to the Arthurian legend of the Fisher King have often been overlooked, despite clear thematic influence on the collection that followed it. When read in context of the legend, there is one allusion in particular, a subtle pun on the word "geld," that I argue reveals much about the story's underlying meaning. Scholars such as Joe DeFalco have noted the importance of this pun, but few have connected it directly back to the Fisher King. Fewer still have noted its significance in setting the tone for the story's ensuing allusions. It is therefore the goal of my research to analyze this relationship at a deeper level through a close reading of the text itself and the literature surrounding it. Because "Out of Season" is best appreciated within the lens of the Fisher King legend, my study is primarily concerned with the complex parallels to the legend, and my findings reveal the special significance of the "geld" pun in contributing to these parallels.

UC Davis as an Emerging Hispanic Serving Institution: The Tokenization of Brown Bodies

Alondra Morales
Sponsor: Ofelia Cuevas, Ph.D.
Chicano Studies

Through my research, I present the University of California, Davis as an emerging Hispanic Serving Institution. I analyze the definition of retention on an institutional and personal (student) level through the conduction of interviews. My research presents common themes in which students touched upon in terms of resources needed on campus within Chicanx and Latinx communities. The tokenization of students of color on the UC Davis campus is prevalent through the lack of transparency and resources offered to the large number of Chi/Lat folx on the UC Davis campus. I then analyze the retention data of UC Davis and what it means for the data to not accurately represent of what is occurring on the ground - who does this benefit? This research is vital in recognizing the educational attainment gap between Chi/Lat folx and their white counterparts on the UC Davis campus, and can also provide a foundation for administration to begin acknowledging the needs of this community as we seek to reach the Hispanic Serving Institution label by 2018.

The Effectiveness of Exposing Prospective Transfer Students to University Life: A Pre-Post Test for the Discover UC Davis and Discover Weekend Events

Anthony Morales
Sponsor: Ross Thompson, Ph.D.
Psychology

Discover UC Davis is an annual higher-education planning experience available to community college students from Transfer Opportunity Program (TOP) schools. The purpose of the event is to expose prospective transfers to various activities, majors, and services available on-campus. UC Davis TOP has planned this event multiple times for several years. However, 2017's was the first to feature a "Discover Weekend" event as a part of TOP's agenda. Per the program, 40 San Joaquin Delta College (SJDC) attendees stayed at the Hyatt Place, an on-campus hotel, Friday through Sunday for an extended campus visit. The present study employs a quasi-experimental design and a one-way ANOVA to test the differences in college knowledge and transfer readiness between students who only attended Discover UC Davis and students who attended both Discover UC Davis and Discover Weekend. Results indicated that SJDC students who attended both events had significantly greater understanding of university life over their peers who only attended Discover UC Davis. This not only demonstrates that TOP's efforts to support students are successful, but also suggests that the University of California should continue to host events such as Discover Weekend to better prepare prospective transfer students for the transition to university.

Testing Pathways of Virus Induced Cannibalism Expression in *Geocoris pallens*

Tobias Mueller
Sponsor: Jay Rosenheim, Ph.D.
Entomology/Nematology

Geocoris pallens is a generalist insect predator found throughout California's major crop systems. Through predation, it helps control populations of countless pests found on a variety of crops. However, over the past decade a population collapse has been observed in Geocoris populations found in California. Research indicates the collapse was caused by a previously uncharacterized viral pathogen that induces high rates of cannibalistic behavior in its infected hosts. Little is known about this viral pathogen, as its existence has only recently been discovered. I created an experiment to test the traits of healthy and cannibalistic (infected) field-caught Geocoris, measuring lipid content, body weight, linear body dimensions, fecundity, and cannibalism to test the idea that nutrient stress (reduction in lipid storage) might be correlated with infection and in turn an increase in cannibalism expression. Experimental results with field collected Geocoris however revealed no correlation between cannibalism expression and lipid content of adult female Geocoris. This suggests that the expressed cannibalism is not caused by a shortage of lipid reserves, but perhaps some other metabolic deficiency or neurological pathway.

Breaking Down the Wall: Evolution of the Cell Wall From Algae to Land Plants

Neije Mukherjee-Roy
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

The plant cell wall and its network of polysaccharides and glycoproteins is one of the major evolutionarily conserved structures of terrestrial plants. De novo formation of the new cell wall occurs during cytokinesis as the cell plate grows radially to partition the cytoplasm of the dividing cell. As a fundamental developmental process cytokinesis is very sensitive to classical genetic perturbations, hindering traditional molecular studies. We have characterized a pharmacological cytokinesis inhibitor that specifically targets callose deposition during cell division called, Endosidin 7 (ES7). This small molecule arrests cell plate maturation by disrupting callose deposition during the late stages of cytokinesis. Interestingly, ES7 also inhibits cell division of Penium margaritaceum, a single-celled alga with similar cell wall characteristics as land plants. By using ES7 as a probe to investigate the cell wall formation strategies and subsequent inhibition by ES7 in both species, I could gain a deeper understanding of the evolution of the cell wall. Immunohistochemistry and fluorometric dye labeling help accomplish the identification and analysis of cell wall components. With ES7 I hope to tease apart the deposition of cell wall components between the two species and add a piece to the evolutionary puzzle of the cell wall.

Investigation on Contaminant Issues in the San Joaquin Central Valley Using Fish Model Medaka, *Oryzias latipes*

Allyson Mulcahy
Sponsor: Swee Teh, Ph.D.
VM: Anat Physio & Cell Biology

The California Central Valley provides eight percent of the agricultural production of the nation. In the area, various health issues have been reported among the local residents, including higher ADHD, cancer, diabetes, and autism rates. Although there are a number of factors that are possibly affecting the health of local people, one of the major concerns is water quality, particularly contaminants in the ground water. In the area, over 36,000 metric tons of pesticides and fertilizers are applied for crop management every year, and those chemicals can now be detected in well water through infiltration of contaminants through the soil. Due to the lack of sufficient infrastructure for providing safe drinking water, local people are utilizing well water for direct consumption (e.g. drinking and cooking). Our preliminary results indicate that the juvenile fish cultured in the well water showed erratic swimming behavior. The basic water quality parameters were within the tolerance range for the fish species, and therefore we suspect involvement of contaminants, particularly pesticides. To test the hypothesis, we are running fish toxicity testing using pesticides commonly sprayed in the area. We will present our findings and discuss health related issues in the area at the conference.

Defining the Structure of a Major Groove Nucleobase Click Modification in RNA

Madeline Mumbleau
Sponsor: Peter Beal, Ph.D.
Chemistry

Copper-catalyzed azide/alkyne cycloaddition (CuAAC), or 'click' reactions on terminal alkynes allow for a variety of modifications of ethynyl containing RNAs. Previously in our group, an N-ethylpiperidine substituent was incorporated via a click reaction with 7-ethynyl-8-aza-7-deazaadenosine (7-EAA) to better understand the impact of this unique ribonucleoside modification in the major groove of an RNA duplex. The crystal structure of the double stranded RNA was solved, however a well-defined electron density for the triazole substituent was inconclusive. To obtain a better defined crystal structure, new rigid modifications were introduced via click reactions involving 7-EAA with either 4-azidoaniline or 1-azido-4-bromobenzene. Successful results were obtained with the bromobenzene modification yielding a 1.6Å resolution crystal structure. This work also comments on the optimized approach for clicking 1-azido-4-bromobenzene, which offers unexpected byproducts in reducing conditions. Nucleic acid thermodynamic (Tm) studies are planned to test the stability and denaturation of the 1-azido-4-bromobenzene modification using complementary and mismatched RNA duplex strands.

CDK9 Inhibitor Shown to Down Regulate HIV Latency Reactivation

Biftu Mume
Sponsor: Guochun Jiang, Ph.D.
MED: Medical Microbiology & Imm

The Human Immunodeficiency Virus (HIV) is a retrovirus that over a million people in the U.S. suffers from. Early in the course of infection, HIV establishes latent reservoirs in CD4 T-cells. These reservoirs can then be reactivated when P-TEFbs (CDK9 and cyclin T1) binds to the RNA stem loop structure, promoting transcription of viral genes. I hypothesize that a CDK9 inhibitor, "compound X", can shut off HIV latency reactivation, which may be developed as a novel strategy to suppress latent HIV expression into permanent latency. To test this in vitro, I utilized J Lat cells, which are HIV latently infected cells with low HIV gene expression. I treated the cells with a) compound X alone; b) JQ1, a CDK9 activator, alone; and c) JQ1 and compound X, together. Through PCR analysis, JQ1 was shown to up-regulate the relative HIV reactivation 14 fold, while cell samples co-treated with compound X and JQ1 had reduced HIV gene expression more than 50% when compared to those treated with only JQ1. Cells treated with compound X alone had decreased relative HIV reactivation. This data supports our idea that further suppressing latent HIV is achievable, which could be a new tool to fight HIV latency.

Defining PIWI-Positive Ribonucleoprotein (RNP) Granules in *Hydra* Stem Cells

Nitika Mummidivarapu
Sponsor: Celina Juliano, Ph.D.
Molecular & Cellular Bio

Hydra is a small freshwater animal that maintains healthy stem cell populations over its entire lifetime, which is estimated to be hundreds of years. Furthermore, these stem cells allow Hydra to regenerate its entire body from a small piece of tissue. Our lab discovered that the PIWI-piRNA pathway is expressed in all Hydra stem cells and is essential for survival. The PIWI-piRNA pathway is a small RNA pathway that plays a conserved role in animal germ cells where it represses the expression of transposons. However, PIWI proteins are also expressed in the somatic stem cells of highly regenerative animals and function in this context is not well understood. PIWI proteins localize to perinuclear ribonucleoprotein (RNP) granules, where PIWI proteins target RNAs for degradation. The protein components of these RNP granules are poorly defined. We aim to characterize the protein components of PIWI-positive RNP granules in Hydra and test for differences in composition between somatic and germline RNP granules. This will allow us to better understand how the PIWI-piRNA pathway contributes to Hydra's remarkable stem-cell longevity and somatic regenerative abilities.

Effects of Terragen Microbial Inoculants and Mustard Seed Meal on the Efficacy of Anaerobic Soil Disinfestation in Combating *Fusarium oxysporum* f. sp. *fragariae* Infection of Strawberry

Mariel Munji
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Anaerobic Soil Disinfestation (ASD) is a method of reducing or eliminating plant pathogens from soil before planting. With ASD, a carbon source is incorporated into the soil, which is then saturated and covered by a clear tarp. The carbon source stimulates growth of microorganisms to deplete the soil of oxygen. In the absence of oxygen, fermentative growth of microbes results in the accumulation of organic acids, volatile organic compounds and reduced metal ions, which can be inhibitory to pathogenic fungi. ASD has become a method of growing interest for farmers in California as a promising treatment against Fusarium wilt, a serious disease of strawberry caused by Fusarium oxysporum f. sp. fragariae. Although optimal treatment conditions are unknown, previous studies indicate that higher temperatures are critical for suppression of Fusarium but are not always feasible in cool climates where strawberries are grown. The purpose of my research is to determine if the efficacy of ASD can be enhanced by adding microbial inoculants, such as the Terragen company's product "TgF," for production of organic acids which may be toxic to Fusarium oxysporum. I am also testing mustard seed meal as an amendment to enhance the efficacy of ASD in cool temperatures.

A Role for Iron Acquisition During Extracellular Growth of *Brucella abortus*

Ariel Munoz
Sponsor: Renee Tsolis, Ph.D.
MED: Medical Microbiology & Imm

Brucellosis is a zoonotic infection caused by gram-negative bacterial genus Brucella that primarily causes infertility and abortion in the natural host (cattle, swine, etc.) and a chronic debilitating illness or an "undulant" fever in dead-end hosts (such as humans). The immuno-evasive nature of this persistent intracellular pathogen is highlighted by its ability to avoid innate immune recognition; yet, Brucella infection of the placenta in pregnant cows results in a strong host inflammatory response termed placentitis. Most studies on Brucella growth have looked at intracellular growth within macrophages, however, preliminary evidence in the Tsolis Lab suggests that extracellular growth during infection of the placenta allows Brucella to reach high numbers in the host which can promote horizontal and zoonotic transmission of this pathogen. Past experimental findings demonstrate that heme is a vital source of iron for B. abortus colonization and growth in trophoblasts of the mammalian host. We are utilizing Brucella iron uptake mutants to test the hypothesis that iron acquisition promote extracellular growth of B. abortus in a mouse model of placentitis. Findings within this study may be applied towards targeting growth mechanisms in order to reduce B. abortus survival in animals.

Multilingual Parsing From Raw Text to Universal Dependencies

Kalani Murakami
Sponsor: Kenji Sagae, Ph.D.
Linguistics

In natural language processing (NLP), parsing research is done to examine the sentences structure and grammar to find relationships between words called dependencies. Multilingual speech parsing is being researched to find context effects in a language by seeing examples in another. The goal of this research is to learning syntactic dependencies parsers that can work in a real-world setting of raw text that can work with known or unknown languages by exploiting a common syntactic standard using low-resource speech processing due to the mass amount of data needed to create such a parser. Using Stanfords Universal Dependencies initiative datasets of over 40 languages we can create a system to learn this relation for the parser. I plan to use deep neural nets to train data using the language sets to find all the dependencies as well as to fine tune the efficiency of this. We will then test the model using unknown language sets and see if the training model is correct.

Assessing the Incidence of Work Place Injuries and Mitigating Risk for Staff and Faculty at UC Davis

Mahitha Murali
Sponsor: Stacey Brezing, M.S.
Occupational Health Services

My research focuses on workplace injuries and associated risks that have occurred across UC Davis. I aim to find which departments have the highest reported injury rates and I will map out the occurrence of these injuries, noticing their frequency, and incidence among staff and faculty. A cross-sectional study of the types of injuries faced, and the services used to recover will be analyzed. My objective is to understand what kinds of workplace hazards staff and faculty are faced with and what strategies are currently being used to mitigate risk and minimize injury. As Occupational Health Services focuses on providing better facilities and services for staff members, I will also be analyzing demographics, socio-economic status, recovery periods, and treatment plans, while following Health Insurance Portability and Accountability Act (HIPAA) guidelines. With an ultimate goal of promoting improved mental and physical health of staff and faculty, the research will focus on understanding the incidence of injuries as well as ways to mitigate risk management across the UC Davis campus.

Self Versus Host Recognition in the Parasitic Plant Genus *Triphysaria*

Maylin Murdock
Sponsor: John Yoder, Ph.D.
Plant Sciences

Parasitic weeds are significant to agriculture because they can be detrimental to a wide range of crop species. They are heterotrophic, meaning they acquire some if not all of their nutrients from host plants, yet they rarely invade closely related parasites. I am investigating how the parasite Triphysaria is able to distinguish host plants from itself. One hypothesis is that Triphysaria releases less haustorium inducing factors (HIFs) than the host plants, which allows it to distinguish between self and host. Given that most of HIFs are phenolic compounds, I tested if there is a correlation between HIFs and total phenolic content released by host and parasitic plants. To do this, I utilized two growth methods in which I studied three parasitic plant species, and three host plant species. After the growth period, I extracted phenolic compounds from both root and shoot tissues of the plants and performed a Folin-Denis Assay to calculate total phenolic concentrations. The data from both growth methods showed a large variation of total phenolics across the species tested. Taken together, the results show that phenolic content alone cannot be used as a proxy for the level of HIFs.

Postnatal Development of Mediastinal Lymph Nodes Can Affect Long-Term Immune Function

Kaitlin Murray
Sponsor: Colin Reardon, Ph.D.
VM: Anat Physio & Cell Biology

Allergic asthma has become increasingly prevalent over the past decade, especially in children. Though there are many contributing factors governing this escalation, new evidence suggests that stressors inflicted during pre- or early post-natal periods can increase susceptibility to this disease. The lymph nodes are specialized tissues that are responsible for integrating these signals. While lymph nodes are fully developed in utero, these tissues may continue developing through early life in humans and non-human primates. We hypothesize that bronchial associated mediastinal lymph nodes (MSLN) serve as a critical assimilation point, and that early-life exposure to environmental factors can change MSLN architecture, increasing susceptibility to allergic immune responses in the future. To assess this phenomenon, MSLN's from Rhesus Macaques were obtained at 1, 3, 6, and 12 months for analysis. Tissues were subjected to immunohistochemistry to identify B-cells (CD20+), T-cells (CD3), and uncoupling protein-1 (UCP1), followed by confocal microscopy. Our results showed UCP1 present in non B- and T-cells, in addition to a decrease in UCP1+ expression by 12 months. This suggests that the MSLN's are still developing in early post-natal life, and that environmental stressors could contribute to shaping its architecture.

Just Keep Swimming: Caudal Peduncle Diversity in Marine and Freshwater Fishes

Maya Nagaraj
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

A fish's caudal peduncle, the attachment point of the tail fin, can affect its maneuverability, speed, and swimming style. We are studying the depth and width of the caudal peduncle in marine and freshwater fishes to find differences in average shape and to analyze whether shape diversity is more varied in freshwater or marine habitats. By comparing caudal peduncle shapes of related species in different environments, we hope to discover if increases in body shape variance are more connected to the greater space and niche availability in oceans, or to the potential for population-splitting events in rivers and lakes. Transitions between freshwater and saltwater habitats in the past could have encouraged changes in body shape to fit new lifestyles. For this study, we took linear body measurements of specimens in the Smithsonian Museum of Natural History's collections. Previous studies on body shape variance in different habitats have focused on smaller groups of species; ours includes over 800 species and multiple habitat transitions. Using R, a programming language for statistical computing, we are looking for evolutionary trends in relative caudal peduncle depth and width, depth to width ratios, and variance from the average size.

Common Themes in Animal and Plant Immunity

Alexander Nagourney
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Plant and human immunity, although different, share many similarities. It is now recognized that human innate immunity overlaps very closely with plant immunity. Thus, advances in our understanding of plant immunity could provide insights into human immunity. The immune systems of both kingdoms utilize specialized trans-membrane proteins known as pattern recognition receptors or PRRs. The extracellular domain of these PRRs is composed of Leucine-rich-repeats (LRRs), which allow them to recognize pathogen-associated molecular patterns (PAMPS). These PAMPS are molecules associated with specific groups of pathogens. One common example being the proteins found in bacterial flagella. Once a PRR binds to a PAMP, a signal transduction pathway is activated that drives the immune response. The goal of my project is to interrogate the proteins related to various PRR mediated signal transduction pathways using Arabidopsis as a model system. We examined two PRRs involved in bacterial immunity using a combination of plant genetics, biochemical and molecular biology techniques. We found that some of the proteins tested play pivotal roles in PRR mediated signal transduction. We are currently investigating the mechanism of how these proteins influence PRR pathways.

Influence of Pinewood and Walnut Shell Biochar on the Dissolution of Copper Oxide Nanoparticle

Yuhei Nakayama
Sponsor: Sanjai Parikh, Ph.D.
Land Air & Water Resources

The widespread use of metal nanoparticles (NP) raises the concern of its impact on both human health and natural environments. For copper NPs, the release of copper ions (Cu^{2+}) via NP dissolution into water systems can negatively impact aquatic organisms. Prior data demonstrate that some biochars (soil amendment produced through thermal treatment of biomass) can reduce bioavailability of heavy metals. The primary objective of this study is to evaluate the influence of biochar (walnut shell, pine wood) on the dissolution of copper NPs. Preliminary results suggest that the walnut shell biochar binds more copper ions compared to the pinewood biochar. The difference in their sorption capacity is attributed to the difference in their physical and chemical properties. Generally, no difference between the concentration of dissolved copper ion in the treatment with and without biochar was observed. In order to further understand the interactions, NP concentrations will be varied and additional studies will be conducted to examine the effect of water-extracted biochar dissolved organic carbon (BDOC) on the dissolution. Results of this research will help elucidate the dynamics of nanoparticles released to the environment when they are exposed to biochar and help predict the toxicity caused by the nanoparticle dissolution.

Where Is the Honor: Why Was 2016 the Year Pakistan Finally Decided to Act on Honor Killings?

Misbah Naseer
Sponsor: Sudipta Sen, Ph.D.
History

Gender-based violence remains a pervasive issue across Pakistan. Mainly committed by men against women, these violent acts include domestic violence, sexual violence, human trafficking and honor killings. It is approximated that each year 1,000 Pakistani women are killed in the name of honor. With the aim of providing insight on what factors led to policy reform regarding honor killings in 2016, this study consisted of a contextual analysis of three different years: 1999, 2015 and 2016. In this context, four variables were examined: prominent honor killings, public opinion, Pakistan's government and social media attention. This paper argues that three of these factors (a prominent honor killing, women in parliament and social media attention) contributed to successful policy reform. Nonetheless, while legislation aimed at combatting honor killings did pass, an alarming rate of violence against women in Pakistan continues to persist, highlighting the amount of progress which remains to be made.

Expanding Genetic Tools and Improving Tractability of the Parasite *Entamoeba histolytica*

Monica Lyn Natividad
Sponsor: Katherine Ralston, Ph.D.
Microbiology & Molec Genetics

The microbial eukaryote Entamoeba histolytica is a parasite that predominantly affects human hosts by driving destruction of its host's tissues. It is responsible for liver abscesses and the diarrheal disease amoebiasis, a fatal disease in developing countries. E. histolytica has a novel mechanism for human cell killing, termed trogocytosis (trogo-: nibble), where amoebae kill human cells by physically extracting and ingesting numerous host cell fragments. This is contrary to phagocytosis where the entire cell is consumed. In order to study the mechanism of this intriguing process and to characterize its role in pathogenesis, I am expanding the repertoire of available genetic tools in E. histolytica. In doing so, this expands the palette of available selectable marker genes in E. histolytica by selecting for resistance to antibiotics blasticidin, puromycin, and zeocin. This is done by determining whether the corresponding drugs kill all wild-type amoebae and at what concentrations. Once candidate drugs have shown to kill amoebae and its concentrations are known, next steps would be to clone the corresponding resistance genes into E. histolytica's expression plasmid pEhEx. Establishment of these selectable marker genes will complement current research on characterizing mutant amoebae.

Prolactin Receptor Expression and Its Relationship With Lactation in Male and Female Rock Doves

Brandon Nava Ultreras
Sponsor: Rebecca Calisi, Ph.D.
Neuro Physio & Behavior

Like humans and other mammals, rock doves (Columbia livia) "lactate" to feed their young. Both male and female rock doves produce "crop milk", an essential substance for the squab growth development. Crop milk production begins when epithelial cells in the crop grow and develop by stimulation of the pituitary hormone, prolactin (PRL). However, for a hormone to take action, it must have a receptor on which to act. Little is known of how prolactin receptor (PRL-R) expression changes over the course of parental care in doves. I will validate primers specific to PRL-R in rock dove crop sac. Then, I will begin to measure changes in PRL-R expression in the crop of reproductively active male and female rock doves using quantitative polymerase chain reaction (qPCR). I expect to find expression levels of PRL-R to be the highest after hatching and lowest during the early incubation periods. Alternatively, the PRL-R expression levels may not change throughout the incubation and hatching periods. My results will expand our insight into how PRL regulates crop milk production in both male and female doves.

Numerical Simulation of Supersonic and Transonic Two-Dimensional Flows

Jacob Needels
Sponsor: Mohamed Hafez, Ph.D.
Mechanical & Aerospace Engr

Supersonic flows over thin, pointed airfoils are simulated based on linear and nonlinear small disturbance potential equation and linearized boundary conditions using a second order finite difference explicit scheme marching with the flow. Compression and expansion waves are calculated over different airfoils. The results are compared with literature. For transonic flows over blunt bodies, the pseudo-unsteady, full nonlinear potential equation is solved using a second order finite difference scheme, marching in time to reach a steady state solution. The scheme is augmented by artificial viscosity for numerical stability and shock waves are captured for both subsonic and supersonic free stream conditions. For the latter, a bow shock is formed and the detachment distance agrees with reported results. These codes can be used for airfoil design in supersonic and transonic aerodynamics research. The present calculations will be used to verify water table experiments at UC Davis, based on the theory of Hydraulic Analogy between shallow water surface waves and compressible fluid flow patterns.

Moon Blindness: Immune Cells in Equine Recurrent Uveitis and Stem Cells' Possible Suppressive Effects

Seldy Nelson
Sponsor: Dori Borjesson, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Moon blindness, or equine recurrent uveitis (ERU), is an autoimmune disease of horses' eyes causing inflammation, recurrent flares, and blindness. Although ERU is the most common cause of blindness in horses, there is no cure and treatments are ineffective long term. Mesenchymal stem cell (MSC) therapy has seen success in other autoimmune diseases and has been proposed as a therapy for ERU. Our research focuses on MSCs' interaction with immune cells to alter the outcome of autoimmune disease. The experiment aims are: 1) to determine the type and function of immune cells in horses with ERU and 2) to assess if MSCs can suppress T lymphocyte activation and revert them to a regulatory healthy state. We compared blood cells from normal horses, horses at risk for ERU, and horses with active disease. Our results have 1) delineated the T lymphocyte subsets in these horses including activated and regulatory T cells and 2) demonstrated how MSCs can influence these subsets. Results could reveal MSCs as a therapy for ERU and potentially recurrent uveitis in human medicine. Research into MSC therapy for ERU could expand MSC therapies for similar autoimmune diseases in animals and humans.

Comparing Testing Schedules for the Morris Water Maze to Measure Cognitive Deficits in TBI Rats

Raumin Neuville
Sponsor: Bruce Lyeth, Ph.D.
MED: Neurological Surgery

Traumatic Brain Injury (TBI) affects 1.7 million people in the United States annually, contributing to an array of cognitive problems. Laboratory rat models of TBI are widely utilized to study these problems. This study compared the efficacy of the Morris water maze (MWM), a cognitive behavioral test, in two testing strategies. We compared the results of the standard 5-day post-TBI consecutive-day test to a 3-day alternate-day test. The rationale for performing the 3 day-alternating schedule was to increase the sensitivity of the test to detect MWM performance deficits, given that it should pose an inherently higher difficulty level due to a longer delay between testing periods. We directly measured latency to platform and distance traveled. We then calculated the path efficiency and swim speed. Our results showed that the 3-day alternate-day test does not increase the sensitivity to cognitive deficits, indicated by the similarity between the path efficiency from TBI groups of both testing strategy cohorts. Overall, we conclude that the 5-day post-TBI consecutive-day and 3-day alternate-day test show similar results in all testing groups, except for the Sham group. Researchers can opt for the alternating testing schedule, which would conserve resources and time.

Cellular Pathology and Behavioral Characterization of an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

Ekaterina Neverova
Sponsor: Robert Berman, Ph.D.
MED: Neurological Surgery

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a neurodegenerative movement disorder resulting from an expansion of a CGG trinucleotide sequence (55-200 repeats) in the 5'-UTR of the FMR1 gene. This expansion undergoes repeat-associated non-AUG translation and produces a toxic peptide (FMRpolyG) that is thought to contribute to the formation of ubiquitin-positive intranuclear inclusions in both neurons and astrocytes, which are considered a hallmark pathology of FXTAS. Over time the inclusion size and number increases, which correlates with the worsening of symptoms in patients. To examine the role of cell-type specific contributions of FXTAS pathology, we have developed a mouse model that ectopically expresses a CGG(90) repeat selectively in neurons, induced by doxycycline. A minimum of 8wks on dox was sufficient to produce intranuclear inclusions in the mice. In this study, we characterize disease progression and the potential for reversibility by quantifying the size and number of inclusions in the hippocampus of mice using immunohistochemical and stereological techniques. We also assessed hippocampal-dependent learning and memory in the mice using Morris Water Maze testing. Results from this study will shed light on progression, reversibility, and the underlying neuronal-specific role of CGG repeat expansions in the pathogenesis of FXTAS.

Measuring the Effect of MSC-secreted PGE2 on T and B Cell Activation

Ralph Ng
Sponsor: David Simpson, Ph.D.
VM: Pathology, Micro, & Immun

Feline chronic gingivostomatitis (FCGS) is a severe inflammatory disease that affects 0.7%-10% of the general cat population. Full mouth tooth extraction is currently the only FDA approved treatment for cats suffering from FCGS. Oral mucosal inflammatory diseases, such as FCGS, are linked to overactive T and B cells that mediate chronic inflammation. Mesenchymal stem cells (MSCs) were shown to have immunomodulatory effects that reduce inflammation and alleviate the clinical symptoms of FCGS. However, because not all MSCs tested were capable of mediating a positive effect, a potency assay was conducted to help predict MSC bioactivity before delivery to FCGS patients. MSCs secrete anti-inflammatory proteins such as Prostaglandin E2 (PGE2) which downregulates the proliferation of cytotoxic T cells and B cells which secrete pro-inflammatory cytokines such as interleukin-2 (IL-2).Thus, we hypothesized that if activated T and B cells were cultured with MSCs, the concentration of IL-2 would decrease due to the immunomodulatory effects of PGE2 from MSCs. PGE2 and IL-2 production was measured using ELISA to determine the effect of MSCs on T and B cells. Potency assays are important in controlling for the consistent quality of a product by identifying the essential parameters that affect its efficacy.

Poverty and Physiological Reactivity to Future Stressors in Adolescents

Megan Ng
Sponsor: Amanda Guyer, Ph.D.
Human Ecology

The effects of early exposure to adversity on physiological vulnerability to subsequent experiences of stress in adolescence are not well understood. In the present study, we tested whether adolescents (N=122; ages=18-20) raised below or above the poverty level differed in their physiological reactivity to a stressor. (Subjects at ages 16-18 with an income-to-needs ratio less than one were categorized as being raised in poverty.) To calculate physiological reactivity, subjects' respiratory sinus arrhythmia (RSA) was measured under a low stress situation (resting) and then a higher stress situation of being placed in a magnetic resonance imaging scanner. RSA is an index of parasympathetic nervous system (PNS) activity, where higher values indicate more PNS reactivity, less physiological arousal, and a better ability to adapt to environmental challenges. Adolescents above and below the poverty line did not differ significantly in their RSA reactivity. However, adolescents raised in poverty showed an average increase in RSA reactivity under the stressful experience while adolescents raised above the poverty level showed less increase in RSA reactivity to the stressor. These results suggest that adolescents from a low socioeconomic standing are less susceptible to physiological arousal and may adapt to future stressful stimuli by efficiently restoring autonomic homeostasis.

The Role of Helianthus Annuus Circadian Clock in Solar Tracking

Dana Ngo
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Orienting its apex and leaves in the direction of the sun as it moves from East to West, sunflower (Helianthus annuus) moves according to the hours of daylight, and reorients towards East during the night. This process is known as heliotropism, or solar tracking, and is the result of different growth rates on opposite sides of the stem at a given time. Previously, heliotropism has been indirectly shown to be regulated by the plant circadian clock, a 24-hour biological timekeeper that controls many plant physiological and developmental processes. Here, we are directly studying the effect of the circadian clock on sunflower heliotropism by disrupting the sunflower clock through mutating the genes that control it (such as LUX, ELF3, and ELF4). To identify homozygous mutations, we are genotyping the sunflower clock genes for single nucleotide polymorphisms (SNPs), which are differences in single base pairs as compared to the original sequence. Based on our current results, we have identified some mutant plants where a clock gene is likely disrupted. We will then phenotype these plants in the field in order to observe whether the disruption of the clock will have a profound impact on the heliotropism in sunflowers.

Automation of PacBio SMRTbell NGS Library Preparation for Bacterial Genome Sequencing

Phong Nguy
Sponsor: Bart Weimer, Ph.D.
VM: Population Hlth & Reprod

The PacBio RS II provides for single molecule, real-time (SMRT) DNA technology to sequence genomes and detect DNA modifications. The starting point for high-quality sequence production is high molecular weight genomic DNA. To automate the library preparation process, there must be high-throughput methods in place to assess genomic DNA and to ensure the size and amounts of the sheared DNA fragments and final library. The library construction automation was accomplished using the Agilent NGS workstation with Bravo. Automated protocols of PacBio 10 kb library preparation produced libraries with similar technical performance to those generated manually. The TapeStation System proved to be a reliable method that could be used in a 96-well plate format to QC the DNA equivalent to the standard Bioanalyzer System results. The DNA Integrity Number that is calculated in the TapeStation System software upon analysis of genomic DNA is quite helpful to assure that the starting genomic DNA is not degraded. In this respect the gDNA assay on the TapeStation System is preferable to the DNA 12000 assay on the Bioanalyzer System, which cannot run genomic DNA, nor can the Bioanalyzer work directly from the 96-well plates.

The Vietnam War Newspapers: The Press, the People, and the President

Hedda Hieu Nguyen
Sponsor: Sudipta Sen, Ph.D.
History

With greater spotlight on the news media in recent months, it is more important than ever to understand how the news impacts our understanding of international conflict. Given the average American's reliance on the press for reliable and accurate information, I aim to recognize its influence on mass-level public opinion. This study examines newspaper coverage of the Vietnam War during crucial phases—initial American involvement, escalation, and the turning point, known as the Tet Offensive—to demonstrate how public opinion of the president changed with the type of coverage the Wall Street Journal writers and editors decided to publish. After performing content analysis, I compare these results to a previous study of New York Times articles to determine the whether liberal and conservative news outlets cover the same stories and have a different effect from one another on public approval of the president.

A Novel Device and Method to Sample Insects in Strawberries Using CO2 Gas

Hoang Danh Nguyen
Sponsor: Christian Nansen, Ph.D.
Entomology/Nematology

Effective insect sampling is crucial in estimating population dynamics, the knowledge of which allows timely and precise treatment interventions for crop production. In this study, we assessed the use of CO2 gas as an alternative method in insect sampling. We examined effect of CO2 fill time and pressure on the quantity and demography of collected insects from strawberry field plants. Our methodology involved using 2-liter plastic bag to envelop the entire strawberry plants, pumping CO2 into the bag with different fill time (2, 8 or 15 seconds) and at different pressures (25 or 50 PSI). The bag was shaken to collect the anesthetized the insects which were then transferred to smaller sampling sealed bag. The samples of collected insects were then identified to taxonomic family level. The analysis of collected data revealed that the method using CO2 gas could minimize mechanical damage on the sampled plants and effectively captured small-body insects such as thrips and whiteflies while excluding the large-body insects such as beneficial wasps and lacewings. Therefore, insect sampling using CO2 gas as anesthetizer provides the discriminatory collection of target insects which can help reduce processing efforts as well as the stress on the populations of non-target insects.

The Influence of Social Dominance on Parental Care in *Columba livia*

Thien-Y Nguyen
Sponsor: Rebecca Calisi, Ph.D.
Neuro Physio & Behavior

In social groups, dominant animals benefit from increased access to resources and mating opportunities. However, maintaining dominance sometimes requires individuals to decrease other activities, including parental care. This raises the question of whether or not offspring benefit from dominant parents because they may get high quality food, but infrequent care. In this study, I examined the impacts of social dominance on parental care in pigeons (Columba livia). I hypothesized that higher ranking animals will have lower-quality offspring because they allocate more time to maintaining dominance. I conducted daily observations of two pigeon colonies in person and by camera to determine social hierarchies. To evaluate parental investment, I video recorded parents at the nest to measure the amount of time spent there during incubation and nestling stage. I measured nestling mass and tarsus length to determine growth rate, which can serves as a determinant of offspring quality. My behavioral data support the presence of social hierarchies within each colony. I will present my research thus far on the relationship between dominant and subordinate parents and chick offspring quality. These results can improve understanding of social hierarchy-parental investment trade-offs, lending more insight into parental care strategies in birds.

Expression of Polyphenol Oxidases in *Juglans regia* and Resistance to Walnut Blight

Diana Nguyen
Sponsor: Abhaya Dandekar, Ph.D.
Plant Sciences

Xanthomonas arboricola pv. juglandis (Xaj), walnut blight's causative agent is regarded as the most serious bacterial pathogen of walnuts in California. Appearing as dark lesions on green tissue, this disease spreads irreversibly under moist conditions and kills walnut plants. Infected buds are dormant during winter until it blooms and rainwater spreads Xaj to infect green matter. Activity of Polyphenol Oxidases (PPO) enzymes are known for their ability to provide plant disease resistance from the synthesis of quinones and melanin with antimicrobial activity. PPO convert available phenolic substrates via cresolase and/or catecholase activity into highly reactive quinones. Quinones react with proteins and organic matter to generate dark-colored melanins. We hypothesize that overexpression of PPO would increase walnut blight resistance. By overexpressing JrPPO1 and JrPPO2 using CAMV 35S promoter sequences in seedlings, we aim to establish the role of PPO in plant defense. To establish this relationship, we will measure JrPPO expression prior and after inoculation with Xaj using qPCR and cresolase activity assay. Low colony forming unit counts (CFUs) signify higher correlation of overexpressed PPO and its products provide resistance to Xaj. The decrease in Xaj growth could inform further research leading to development of a blight resistant walnut rootstock cultivars.

The Environmental Robustness of a Point-Of-Care WBC-Differential Instrument Used to Screen for Highly Infectious Diseases

Kelly Nguyen
Sponsor: Gerald Kost, M.D.,Ph.D.
MED: Pathology & Lab Medicine

Point-of-care (POC) instruments perform rapid diagnoses at or near patient sites, useful in regions of high risk diseases. Changes in WBC and lymphocyte counts determined by optical scanning can help identify communicable infections, such as Ebola virus disease, and stop spread. We evaluated the environmental robustness of a POC WBC-Differential instrument under high and low temperatures encountered during field use. POC instruments must withstand environmental stresses in order to achieve high impact and help prevent outbreaks through early detection where cases first appear. Human whole-blood measurements were obtained in simulated hot and cold, and static and dynamic conditions versus room temperature control. Humidity was held constant to eliminate that confounding variable. We used Student's t-test for paired differences. Findings indicate that dynamic high temperature (> 30°C) impairs WBC-Diff measurements. Additionally, the time spent between microcuvette filling and instrument loading can produce inaccurate readings. Month-long storage of reagents at static high temperatures (~50°C) did not affect paired differences significantly ($P>0.05$). We conclude that the WBC-Diff instrument and future POC devices: a) must be evaluated for environmental limits, b) can perform well within objectively defined temperature brackets, and c) should be robust enough to withstand environmental stresses in limited-resource epidemic settings.

Synthesis of Malonamides With Allylsilanes and Comparison of Different Nucleophiles Effect on Fluorescence

Alayna Nguyen
Sponsor: Annaliese Franz, Ph.D.
Chemistry

Malonamides are known to have applications in industrial chemistry, as they bind to copper and lanthanides, and medicinal compounds, as opiod κ agonists for treatment of moderate to severe pain. They also have applications in nuclear waste removal. Furthermore, the fluorescence of the molecule can further expand the utility of these compounds through potential applications in biochemical imaging, material science, and medicinal purposes. Fluorescent malonamides can be synthesized through a lanthanum(III)-catalyzed reaction by combining coumarin-3-carboxylates, nucleophile (allylsilane, and indole), and amines. The goal of this research is to investigate different nucleophiles (focusing on allylsilane) in the synthesis of malonamides to help determine which component contributes to the fluorescence of the molecule. Because indoles and their derivatives have long been studied for their fluorescence properties, we hypothesize that the indole as the nucleophile is the major contributor of such properties to the malonamide. My goal is to incorporate allylsilane as a nucleophile, in lieu of the indole, in order to study the effect of this component on the fluorescence of the malonamide.

RNF212 Regulates DNA Damage Induced Apoptosis of Postpartum Oocytes

Michael Nguyen
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Over the course of meiosis, there are many regulations and checkpoints that ensure the quality of newly formed gametes. In females, oocytes (eggs) with DNA damage undergo apoptosis, dictating the size of the oocyte reserve that diminishes with age. Our lab has recently shown that RNF212, a SUMO ligase, is a novel component of the checkpoint pathway that is responsible for oocyte apoptosis. To better understand the role of RNF212 in response to oocytes with DNA damage, newborn mice were subject to low doses of radiation and oocyte apoptosis was quantified. Our initial findings show that the Rnf212 mutation confers resistance to radiation-induced apoptosis, in a dosage-dependent manner, and within a narrow time frame after birth. We also quantified the levels of DNA-damage markers γH2AX and RPA in the oocytes of neonatal mice. The Msh4 mutation causes defects in meiosis, resulting in massive amounts of DNA damage. Remarkably, Rnf212 diminishes the damage seen in Msh4 oocytes, resulting in lower levels of γH2AX and RPA foci, thus preventing apoptosis. Our discoveries have impact for understanding the processes that regulate the response of oocytes to DNA damage, modulate the size of the oocyte reserve, and regulate female reproductive lifespan.

Sleep Deprivation in Hospitalized Patients Over the Age of 60: Methods of Recruitment and Data Collection in a Pilot Study

Kimsa Nguyen
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Chronic sleep deprivation in older adults contributes to dementia, cardiovascular disease, and mortality, but has not been studied in a hospital setting. We conducted a pilot study in an 81-bed community acute-care hospital in Tracy, California to evaluate the quantity and quality of sleep among inpatients age 60 and older. The study goal was to evaluate the association between sleep and hospital outcomes such as length of stay, delirium and re-admissions with hopes to develop a pilot study to address findings with an evidence based approach. Outside of being at least 60 years of age, eligibility criteria includes: an expected length of stay of at least one night, no cognitive impairments, and fluency in English or Spanish. We measured sleep with 24-hour wrist actigraphy and sleep diaries, and collected patient reported outcomes through in-person questionnaires. There are several important elements to successful recruitment and participant retention for research in a hospital setting. Having assistance from the Chief Medical Executive, 25 highly-trained college-aged volunteers, and nursing staff proved to be essential to this type of study.

Newly Isolated Rubella Virus May Be Resistant to Current Vaccine-Derived Antibodies

Don Nguyen
Sponsor: Connie Champagne, Ph.D.
Educational Enrichment & Outre

Rubella Virus (RV) is the causative agent of Rubella which causes congenital birth defects. The use of a live-attenuated RV vaccine has reduced the number of incidents. In 2014, a patient suffering from chronic uveitis with unknown etiology was seen at the UC San Francisco Proctor clinic. Deep sequencing of vitreous fluid from the patient's eye revealed an RV genome. It was estimated that the virus had been replicating in the patient's eye for over 20 years. I hypothesized that this rubella strain (RVp) evolved mutations that affect vaccine-derived antibody recognition. I investigated this by analyzing deep sequencing data to determine if there was a difference between RVp and GUZ GER92, the patient's original infection strain. Deep sequencing analysis from the patient's RV strain revealed an accumulation of mutations in the E and E2 glycoproteins and capsid protein. I then compared differences in these structural proteins with epitope regions recognized by antibodies of rubella-vaccinated individuals. Lastly, I obtained a rubella replicon system from the Centers for Disease Control to be used in neutralization studies for strain-vaccine comparison.

A Mass Spectrometry-Based Method for Characterizing Cell Surface Glycolipids

Minh Nguyen
Sponsor: Carlito Lebrilla, Ph.D.
Chemistry

Our cells are known to be coated with short sugar chains, or glycans, through which they recognize and interact with each other. Some of these sugars are anchored to a lipid (glycolipid) or a protein (glycoprotein) on cell membranes. Glycans are important because changes in their structures will affect the way cells interact with their environment, and can potentially be a marker for cancer or other diseases. Past efforts at profiling these glycolipids have proven to be challenging due to their structural complexity. Therefore, we developed a robust, semi-quantitative method for the analysis of glycolipids via Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS). This method allows us to profile the structure of glycolipids from cell membranes of different animal tissues, such as brain tissue from rats and mice, and cell cultures of colorectal cancer. We hope to shed light on glycolipid structural features that are present in human and animal cells with this ongoing research.

Non-Destructive Classification of Bitter and Sweet Almonds (*Prunus amygdalus*) Using Near-Infrared Spectroscopy and Chemometrics

Kara Nguyen
Sponsor: Alyson Mitchell, Ph.D.
Food Science & Technology

Bitterness in almond (Prunus amygdalus) is the result of cyanogenic glucosides, such as amygdalin, presented in the almond kernels. There is no visible difference between sweet and bitter almonds Therefore, Near-infrared spectroscopy (NIR) and Chemometrics are used in this study as a method to classify sweet and bitter almonds. The demonstrated method is simple, time-efficient, reproducible, and non-destructive to the almond samples. The surface of raw and untreated almond kernels is NIR screened and collected measurements are then analyzed. Two classifications of almonds were developed using Partial least square discriminant analysis (PLS-DA) model and selection of specific wavelength from 1352 to 2153 nanometer. High level of sensitivity and specificity are obtained, while false-positive and false-negative error rates are low. Moreover, the resulted sweet and bitter almond classes were validated with their predetermined amygdalin concentration. The study shows that the NIR method is an effective and robust model to predict and classify sweet and bitter almonds.

The Effect of 21 Days (-)-Epicatechin Treatment on Cytoskeleton Proteins, Mitochondrial Biogenesis and Protein Synthesis in Aged Skeletal Muscle

Jennifer Nguyen
Sponsor: David Hughes, Ph.D.
Neuro Physio & Behavior

Epicatechin, an antioxidant flavonoid compound present in green tea, cacao and grapes may have effects in skeletal muscle maintenance in relation to aging. Recent research has shown that consuming small doses of dark chocolate containing cacao may enhance the effects of endurance exercise and promote oxidative phosphorylation, angiogenesis, and mitochondrial biogenesis. Therefore, we examined the effect of (-)-epicatechin on hallmarks of mitochondrial biogenesis, protein synthesis regulation, cytoskeleton proteins and NF-kB signaling in the tibialis anterior muscle of 30-month old male rats. Rats were administered 1 mg/kg of body mass of (-)-epicatechin or saline solution via oral gavage (twice a day) for 21 days. Increases in citrate synthase, cytochrome C, dystrophin, and a-sarcoglycan expression were observed in treated verses control animals. Further, significant increases were observed in protein synthesis and mTORC1 signaling with treatment. Lastly a significant reduction in NF-kB p65 nuclear localization was found in (-)-epicatechin treated muscle. Our findings suggest that acute epicatechin administration may have applications as a nutritional intervention for aging skeletal muscle and/or the treatment of genetic disorders such as muscular dystrophies.

An LC-MS/MS Based Method for the Analysis of the Linkage Composition of Food Polysaccharides

Lanchi Nguyen
Sponsor: Carlito Lebrilla, Ph.D.
Chemistry

Structural elucidation of carbohydrates can aid in revealing their properties and potential nutritional and health benefits. Little is known about the structures of food polysaccharides. Complexities in polysaccharide structures such as their large size and intricate branching can cause difficulties during linkage analysis. The traditional method of using gas chromatography mass spectrometry (GC-MS) is less sensitive, rendering an incomplete linkage profile of polysaccharides. Thus, a high-throughput liquid chromatography-tandem mass spectrometry (LC-MS/MS) method was developed to perform linkage analysis on carbohydrates in different samples. This novel LC-MS/MS based technique is more sensitive and rapid than GC-MS, yielding vastly improved results. Commercially available oligosaccharide standards were used to create a library and monitor 22 glycosidic linkages. Theoretical ion masses were monitored for linkages that were not present in the standard library. This rapid, sensitive, and high-throughput LC-MS/MS approach allows for an improved method for the structural elucidation of polysaccharides in food samples.

The Role of Oxytocin in a Rodent Model of Diet-Induced Obesity

Ngan Kim Nguyen
Sponsor: Karen Bales, Ph.D.
Psychology

Obesity, an increasingly widespread problem in the US, is associated with many health complications, including heart disease and type II diabetes. Previous studies have indicated that treatments using oxytocin, a neuropeptide involved in energy balance and social bonding, are effective in reducing food intake and weight gain in a number of species, including humans. In this study, we will be examining the effect of oxytocin on food intake and weight change in prairie voles, a monogamous species of rodent. Their social nature allows us to examine the possibility of social effects on feeding behaviors. The voles will be paired up and assigned to one of three different dietary conditions: both animals on a special high-fat diet (HFD), both animals on a regular diet, or one partner on each. The voles' food intake and weight will be measured weekly for four months before beginning a 15-day treatment period. During the treatment period, they will be subjected to daily intranasal oxytocin or saline treatments. Based on previous studies, we expect the oxytocin treatments to result in weight loss and the reduction of caloric intake; social effects will be assessed by comparing results across conditions.

Influence of Demand and Supply on Labor Force Participation Rate

Van Nguyen
Sponsor: Bagher Modjtahedi, Ph.D.
Economics

Labor force participation rate—the percentage of population willing and able to work—has been declining for prime-age American men (25 to 54 years old) over the last sixty years. There is no agreement among economists as to the reasons for this decline. Some argue that the decline is the result of reductions in demand for labor that is due to labor-saving technological progress and globalization that have eliminated many manufacturing jobs. Others argue that the decline is because of reductions in the supply of labor that have been caused by such factors as generous government subsidies such as unemployment benefits, health issues, family conditions, and the rise of the services sector. These competing explanations have opposite effects on the real wage. This research utilizes the labor market and other economic data on such variables as participation rates, real wages, and industrial production to shed light on the issue. We will investigate the correlations between the participation rates and other economic variables to understand possible causes of the decline in the prime-age male labor-force participation rate.

Episodic Memory for Emotion Words With Extended Delays

Truc-Quan Nguyen
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

Rescuing Expression of an Epilepsy Gene: Activating SCN1A Expression in Human Cells Using dCas9-p300

Anh Nguyen
Sponsor: Alexander Nord, Ph.D.
Neuro Physio & Behavior

Epilepsy is a neurological disorder that results from abnormal electrical activity within the brain. Severe genetic forms of epilepsy are associated with mutations in the SCN1A gene, which result in a loss of production of the alpha subunit of sodium channels. A possible gene therapy pathway involves the use of synthetic transcriptional activators to increase expression of the remaining functional SCN1A allele. Derived CRISPR/Cas9 chimeric protein constructs can target specific regulatory DNA sequences and activate gene expression. This study purpose is to increase SCN1A gene expression in the human HEK 293 kidney and SHSY-5Y neuroblastoma cell lines as a proof-of-principle for rescuing expression via targeting a brain-specific SCN1A promoter. To test this hypothesis, synthesized guide RNA and dCas9 p300 were cloned in bacterial cells. After preparation, both vectors were transfected into human HEK 293 and SHSY-5Y cell lines. Quantitative (q)PCR was used to measure levels of SCN1A expression in both cell lines. Preliminary data suggested an increase in SCN1A transcription and success using a validated targeting construct for globin genes. The long-term goal is to develop this method as a treatment for SCN1A-associated disorders.

Use of Mass Balance in Determining Plant Water Status of Individual Grape Vines

Shayla Nikzad
Sponsor: David Block, Ph.D.
Viticulture & Enology

Bulk irrigation is the status quo in vineyards. However, even when comparing vines planted side by side, irrigation needs may vary dramatically. In conjunction with the increasing scarcity of water resources in California grape-growing regions, there is a need to increase the resolution of vineyard irrigation. However, traditional methods of measuring plant water stress (i.e. pressure bomb, porometry, and soil moisture sensing) pose major complications when applied to vines on the individual scale. Our work focuses on detecting the evapotranspiration rate of individual grape vines using a mass balance approach. An individually potted grape, outfitted with five humidity sensors and a single anemometer, was placed on a load cell. Humidity, wind speed through the canopy, and the mass of the potted vine were recorded continuously. Estimated values of evapotranspiration were calculated from a mass balance using the vine canopy as a control volume. These estimated values were compared to the absolute measurement of lost water mass recorded by the load cell. Rates calculated via mass balance showed agreement with the evapotranspiration rates from the load cell. A continuation of this work is being conducted on four potted vines exposed to variable water stress conditions by unequal watering of the vines.

Waterproofing Root Systems: Responses to Drought and Flooding in Tomato

Niba Nirmal
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

Due to the large global increase in human population and additional stresses of climate change, crop production will need to double by 2050 in a sustainable fashion. Climate change causes divergent water levels that dramatically influence plant growth and development, especially for the root system. To understand plant response, this project examines the model crop species tomato (Solanum lycopersicum) and its wild drought- tolerant relative (Solanum pennellii). The exodermis is vital to plant survival in these conditions, as it protects against water loss to the soil. Confocal microscopy and image analysis are used to quantify the exodermal composition under normal, drought, and flooded conditions in the cultivated tomato and its wild drought tolerant relative. Lignin is a vital component of the Casparian strip, the paracellular barrier responsible for selective nutrient uptake, while suberin blocks water and solute movement. Findings show a higher suberin content in plants subject to drought and in Solanum pennellii. Additionally, putative suberin biosynthesis genes are being functionally tested for using the CRISPR/Cas9 system in conjunction with hairy root. Knocking out the correct suberin biosynthetic genes will result in a loss of suberin in hairy roots. Determination of these genes is essential for directed breeding programs to create crops more tolerant to water stresses.

Evaluating Social Preference in a Novel Female Mouse Model of Rett Syndrome

Adriana Noronha
Sponsor: Janine LaSalle, Ph.D.
MED: Medical Microbiology & Imm

Rett syndrome (RTT) is a human neurodevelopmental disorder found in 1:10,000 live female births. The major cause of RTT is mutations in MECP2, the methyl CpG binding protein 2 (MeCP2) located on the X-chromosome. MECP2 has two isoforms, MECP2-e1 and –e2 which are characterized by alterative inclusion of exon 1. MECP2-e1 is the dominant isoform in brain and we hypothesize that mutations in MECP2-e1 are sufficient to cause RTT. To address this question we examined female mice heterozygous for MeCP2-e1 expression ($MeCP2^{-e1/+}$). These mice express MeCP2-e2, but fail to make MeCP2-e1 due to the insertion of a point mutation in exon 1. Given the prevalence of social impairments in other neurodevelopmental disorders, we utilized the Three Chamber Social Approach task to assess social preference for a novel mouse.We found that $MeCP2^{-e1/+}$ and wildtype littermates both showed significant sociability as defined by a significant preference for the chamber housing a novel mouse compared to a novel object. Our findings indicate that sociability remained intact in $MeCP2^{-e1/+}$ mice, which is important information for prospective translational studies with this mouse model. Future work could employ more sensitive measures to directly evaluate the type and quality of social interactions across development.

Episodic Memory for Emotion Words With Extended Delays

Daisy Ochoa
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

Public Perception of Dog Behavior

Allison O'Donnell
Sponsor: Melissa Bain, D.V.M.
VM: Medicine & Epidemiology

People often make assumptions about a dog and its owner based on appearances alone (Mills et al., 2016). These inherent biases among the general public may affect how we interact in a public setting with dogs and their owners. I would like to evaluate the general public's impressions of dog-owner pairs based on the dog's breed and the owner's ethnicity. A survey will be sent out to the UC Davis community, from which I hope to get feedback on different dog-owner combinations involving a Caucasian male or a Hispanic male and a Pit Bull Terrier or a Boston Terrier. The participant in the study will rate their perceived aggressiveness of the pictured dog. I hypothesize that the presence of a Pit Bull Terrier will have the greatest effect on the public's opinion of a dog-owner pair due to current negative rhetoric and safety laws regarding Pit Bulls. Reinforcing the existence of these biases is important so that individuals in society can identify their own inherent biases. This can aid in making a more educated assumption of a dog's behavior.

Wearable Technologies: Quantifying Running Mechanics

Laura Oelsner
Sponsor: David Hawkins, Ph.D.
Neuro Physio & Behavior

Up to 92% of runners are injured annually. Previous laboratory-based research suggests these injuries are associated with changes in running mechanics (running form and forces). Moving beyond the lab, injury prevention research and interventions will benefit from wearable technologies that quantify mechanics and provide real-time feedback to help mitigate injury. In this study, nine NCAA runners wore acceleration monitors on their right hip during ~1.5 hours training runs over a 70-day period. Hip acceleration data and custom analysis software were used to estimate (1) right foot peak vertical contact forces, and (2) time between foot-strikes. Magnitudes during the first and last 20% of each run were compared. Peak forces increased significantly from the start to the end of the run ($p = 0.04$), and there was a trend toward longer times between foot-strikes ($p = 0.10$). Results suggest that accelerometer data from wearable devices can be used to detect changes in running mechanics providing an opportunity to improve (1) our understanding of the association between injury and running mechanics, and (2) intervention strategies to reduce injury risk.

Competition of *Phytophthora ramorum* and *Phytophthora gonapodyides* at Different Inoculation Ratios

Rino Oguchi
Sponsor: David Rizzo, Ph.D.
Plant Pathology

Sudden Oak Death (SOD) is an important tree disease that can cause devastating mortality on several oak tree species in coastal forests of California and Oregon. In addition to causing tree death in terrestrial ecosystems, the causal agent of SOD, Phytophthora ramorum (Pr) also coexists in streams with other Phytophthora species. One such species is P. gonapodyides (Pg), a primarily aquatic species found on decaying organic matter. A previous study found that Pr was effective at infecting green leaves in an aquatic environment with no competition, but was suppressed in the presence of Pg. The original experiment was conducted at a 1:1 ratio of Pr:Pg. I am conducting an experiment to find if there is a threshold at which Pr can overcome Pg suppression. This experiment has five treatments representing different Pr to Pg inoculation ratios to test the infection of Rhododendron leaves in water. In each treatment, I will culture the infected Rhododendron leaves in Phytophthora-selective media to find the resulting infection proportions. Results from this experiment will provide a better understanding of the results of stream monitoring, a method widely used to detect and monitor for P. ramorum in streams in high-risk forests.

Post-Fire Regeneration of Coastal Redwoods, the World's Tallest Trees

Catherine Ohlin
Sponsor: Andrew Latimer, Ph.D.
Plant Sciences

This study takes a closer look at the understudied response to fire severity by coastal redwoods (Sequoia sempervirens) in the southernmost part of their range. Specifically, we studied how basal sprouting as a post-fire response correlates to fire severity. Along the Big Sur Coast, on trails spanning a diverse range of burn severity and time since last burn, we measured the size of 'parent' trees, classified burn damage, and counted the number of basal sprouts. From this information, we found that clonal response does, in fact, increase as burn severity increases. However, clonal response is also positively correlated to tree size. When tree size covariation is taken into account, we find that clonal reproduction mainly increases in correlation with increasing burn severity. This has important implications for fire management; research has not only demonstrated that redwoods can tolerate fire, but that they can directly benefit from fire exposure. A better understanding of how this evocative tree species responds to harsh environmental effects, like fire damage, will enhance our ability to allow populations of coastal redwoods to flourish in an uncertain future climate.

Mutation Prevalence of ESR2 c.948delT in Medullary Thyroid Cancer Cases and Risk Factor Association of Five Non-Medullary Thyroid Cancer SNPs in Medullary Thyroid Cancer Cases

Ivan Olaya
Sponsor: Luis Carvajal-Carmona, Ph.D.
MED: Biochem & Molecular Med

Thyroid cancer (TC) is the most common endocrine malignancy and the fifth most common cancer in U.S. women. The two types of TC are medullary (MTC) and non-medullary (NMTC). MTC is a rarer and more fatal type of TC with genetic causes that are not fully understood. Recently, Smith et al. discovered a novel germline ESR2 mutation (c.948delT) in MTC among Caucasian patients. Five additional SNPs have been associated with NMTC risk, however, their role in MTC has not been studied yet. My first objective is to assess the mutation prevalence of ESR2 c.948delT in 35 MTC Caucasian cases. My second objective is to determine whether the five SNPs are also risk factors for MTC. To accomplish my first objective, I amplified the ESR2 gene by PCR and sequenced the amplicon in DNA samples from the 35 Caucasian patients; ESR2 c.948delT was not detected in any of these individuals. To achieve my second objective, I genotyped the same 35 MTC cases for each of the five SNPs, assessed the frequency of the risk allele for each SNP, and performed statistical analyses on each SNP. My preliminary analyses found that one of these SNPs (rs944289) was associated with MTC risk (p=0.000763).

Redlining: The Effects on Educational Attainment Within Los Angeles

Jessica Orozco
Sponsor: Gloria Rodriguez, Ph.D.
Education

Residential segregation, also known as Redlining, was the act of lawfully segregating people within cities. This practice was done by the National Housing Act of 1934, which created the Federal Housing Administration (FHA) and affected 239 cities throughout the United States. The after effects are still very present even though the practice is currently deemed unlawful. The effects can be seen in several areas of social conditions, such as education. The quality of schools varies depending on the city. In order to see drastic differences between schools all someone has to do is drive around a major metropolitan city, like the city of Los Angeles. The comparison of schools that have different ranges of income, but belong to the same county are obvious. In the course of this paper, I will assess the educational attainment of three communities and analyze their similarities and differences. The purpose of this research is to asses the long term effects redlining has had on communities. The goal of this research is to identify any links between redlining and higher educational attainment.

Evaluation of a Dry Powder Insufflation Device for Avian Intratracheal Delivery

Stephanie Ortega
Sponsor: Jean-Pierre Delplanque, Ph.D.
Mechanical & Aerospace Engr

During animal wildlife rehabilitation efforts, mallard ducks (Anas platyrhynchos) undergoing rescue after an oil spill will be treated with Amphotericin B, an antifungal medication. Experimental evaluation using a liquid commercial atomizer for drug efficacy found doses delivered to be highly asymmetric reaching only one lung lobe. The spray generated by the commercial atomizer coalesces when delivered to a model of the avian trachea. The Delplanque Research Group has developed a dry powder insufflator (DPI) device in order to (1) address the asymmetry in delivery and (2) use dry powder as opposed to a liquid drug formulation. Currently, tests are being conducted using hydrophilic powder which is comparable to the liposomal formulation (AmBiosome) used during in-vivo experiments. Concurrently, design and development of a loading mechanism for the DPI device is being conducted. The DPI device has shown to recover symmetric delivery of Amphotericin B doses. We expect to quantify the symmetric drug delivery by testing hydrophilic powder and using the loading mechanism to systematically load the hydrophilic drug. By using the loading device, we can ensure that each dose is a controlled parameter of drug delivery which will help ensure symmetric distribution throughout the mallards lung lobes.

Selection on a Transposable Element During Maize Domestication

Ellen Osborn
Sponsor: Jeffrey Ross-Ibarra, Ph.D.
Plant Sciences

Transposable elements (TEs) are moveable gene sequences that are universally present in plant genomes and can greatly affect the expression of genes linked to the plant's evolutionary history. While TEs are known to be a force in genomic evolution and plant domestication, little is known about the fine scale dynamics of evolution and selection on these elements. In maize, a prominent hopscotch TE insertion 80 kb upstream of the tb1 gene controls branching, a phenotype important for the domestication of maize. To better understand the phylogeny and speciation of hopscotch, we mined genomic sequences of maize and closely related species, identifying TE protein coding domains, looking for signatures of adaptive evolution on these domains. Using TE-specific evolutionary models for phylogenetic reconstruction, we infer speciation and extinction rates of this TE family and reconstruct its activity through time. Application of population genetic methods allow us to measure the extent of purifying and positive selection action on hopscotch copies. Through these investigations, we will identify whether, relative to other grasses, selection on branching during maize domestication constrained the ability of hopscotch to move to new positions in the genome, providing insight into the coexistence of predominantly selfish TEs with their host genomes.

Understanding *Wolbachia* Infections in Natural *Drosophila* Populations: Reproductive Manipulation and Maternal Transmission

Jasmine Osei-Enin
Sponsor: Michael Turelli, Ph.D.
Evolution & Ecology

Over 50% of insects are infected with Wolbachia, intracellular, maternally transmitted bacteria. What contributes to the pervasiveness of this bacterium? Wolbachia ensure their presence by maternal transmission and manipulation of host reproduction which favors infected mothers. Currently, the effects of Wolbachia have been researched in very few species. Luckily for scientists, Wolbachia occurs in the well-researched model organism, Drosophila melanogaster, as well other Drosophila species (fruit flies). This study focuses on the species D. bakoue, D. curta, and D. suzukii for fecundity effects and reproductive manipulation. In D. suzukii only, we will look at maternal transmission. With this information, we hope to gain a greater understanding of what Wolbachia do in natural populations. To obtain the data concerning the three species, we performed molecular analyses (PCR) to determine infection status, and studied hatch rates from matings between infected and uninfected flies to investigate reproductive manipulation. So far, we have found the unexpected result of perfect maternal transmission, infected mothers had all infected offspring, in D. suzukii. Once we've finished these assays, we will have a clearer understanding of Wolbachia in natural populations.

Differentially Expressed Genes Involved in Leaf Shade Response in *Brassica rapa*

Lakshmidevi Pabbisetty
Sponsor: Julin Maloof, Ph.D.
Plant Biology

Brassica rapa is an important crop plant and can serve as a model organism because of its close relationship to other Brassica crops and it has a sequenced genome. Based on prior experiments, it is known that B. rapa alters its growth in response to shade, or a low red/far red ratio. Growth differences between light treatments include taller plants, larger leaves, and longer internodes. However, we do not know when or how these changes occur across development. To understand how B. rapa changes growth in response to shade, we conducted an experiment to profile gene expression in two leaf ages. B. rapa plants were grown in a growth chamber and measurements of parameters such as height, leaf length, and petiole length were taken in addition to leaf tissue for RNA profiling. During initial plant development, half of the plants were in shade conditions and half were in sun. After three weeks, half of the plants in each treatment were switched to the opposite treatment to decouple the developmental effect. Differential gene expression analysis between treatments will provide gene targets related to phenotypic changes. Ultimately, these candidate genes may be used to breed crop plants that are more crowding tolerant.

Factors Related to Retention in a Longitudinal Study of Infants at Risk for Autism Spectrum Disorder (ASD)

Madelena Pabon
Sponsor: Sally Ozonoff, Ph.D.
MED: Psychiatry & Behav Sci

External validity can be threatened when a sample is unrepresentative of the population, while internal validity is threatened by divergent drop out between groups. In this study, we will examine factors that relate to retention in a longitudinal investigation of high-risk infants, taking place across five visits, from 6 to 36 months. Analyses will be conducted to examine relationships between retention and the following: family income level, travel distance, recruitment group, pre-existing parental concerns about development, the number of ASD siblings in the household, single parent vs. co-parent household, parental education level, the sex of the child, and parental age. We hypothesize that the factors most associated with long-term maintenance in the study will be sex of the child, number of ASD children in the home, parental education level and pre-existing parent concerns, while we hypothesize the other factors will not be predictive of retention. This study will have two important contributions and analyses are ongoing. Understanding the factors that improve retention will be useful to future researchers engaging in longitudinal studies. In addition, understanding whether the sample is representative of the larger population indicates whether the findings are likely to generalize to other samples.

The Screening and Optimization of a Split Glutamate Sensor to Identify Functional Relationships Between Neural Populations

Leon Palao III
Sponsor: Lin Tian, Ph.D.
MED: Biochem & Molecular Med

The nervous system lays out initial connectivity based on the genetics of different neural populations and between these connections neurotransmitters like glutamate are exchanged. However, an inability to make functional recordings from such synapses remains a challenge to modern neuroscience. We have developed a sensor for in vivo studies designed to allow us to "eavesdrop" on these specific connections. The sensor is composed of green fluorescent protein and a glutamate binding domain which drives an increased fluorescence output in high glutamate concentrations. It is designed in two parts so no individual part fluoresces on its own and each part is expressed in different neural populations. The sensor only combines and functions at synaptic contacts made between the two populations. Currently, we have a functional sensor in Human Embryonic Kidney cells 293. Optimization will occur through directed evolution towards the mutant with the greatest dF/F and most complete complementation. Screening of most variants will occur in E. Coli, but validation will take place in HEK293 cells, neurons, and observations in vivo. The accuracy and specificity of this sensor will allow us to identify relationships between neural populations and uncover their contribution to the functional wiring diagram of the brain.

Validating the Methylation Status of Grb10 in the Augmented Maternal Care Paradigm

Rebecca Palmer
Sponsor: Janine LaSalle, Ph.D.
MED: Medical Microbiology & Imm

Attenuated stress responses in human adults correlates with increased maternal care during early childhood. My research project defining the molecular mechanisms of stress tolerance uses a rat model, comparing rat pups that received augmented maternal care (AMC) and control pups that received normal levels of maternal care. It has been shown that the pups that received AMC have a much higher tolerance to stress as adults than do the control animals. By using the whole genome bisulfite sequencing method, it was found that there is a significant difference in methylation genome wide. Further analysis revealed that specific CpG island gene promoters had reduced methylation. The pups that received AMC had a significantly lower level of promoter methylation in the majority of the genes than did the control pups, suggesting a higher level of transcription in these genes. One of the genes of interest was Grb10, a gene that is involved in growth and insulin receptor signaling. Thus, modifications in the expression of Grb10 in early development could potentially influence the animal's behavior. My task for this project was to verify Grb10 methylation levels using the pyrosequencing technique.

Modelling Interactions of Urokinase Plasminogen Activator With Amiloride and Its Derivatives

Peggy Palsgaard
Sponsor: Igor Vorobyov, Ph.D.
MED: Pharmacology

Increased expression of urokinase plasminogen activator (uPA) and plasminogen activator inhibitor-1 (PAI-1) is predictive of many metastatic cancers. When uPA is expressed, plasminogen is converted to plasmin, and the extracellular matrix is broken down, harming the body. The binding of uPA and PAI-1 is via a hydrogen bond between an aspartic acid on uPA and an arginine on PAI-1. Our studies focus on a class of chemicals that are able to cleave this hydrogen bond, displacing the PAI-1 from the complex and binding to uPA itself. Amiloride and its derivatives, compounds that have a guanidine group and a ring structure, are potentially able to bind to the active site of uPA and inhibit its activity. Moreover, some amiloride derivatives were shown to cause endosomal mistrafficking of uPA and associated protein complexes, leading to cancer cell demise. Using molecular docking computer simulations, we are modelling the binding of these compounds to the protein, uPA. We hope to understand the molecular determinants of these interactions and will use this knowledge to find novel drug candidates for effective cancer treatment therapies.

Dual Labeling of RecBCD Enzyme by Site Specific Incorporation of Unusual Aminoacids for Single Molecule Förster Resonance Energy Transfer Analysis

Xuankang Pan
Sponsor: Theetha Pavankumar, Ph.D.
Microbiology & Molec Genetics

RecBCD is nuclease and helicase enzyme that partakes in the homologous recombination of DNA to repair double strand breaks in E.coli. Initially the RecBCD enzyme degrades the 3' end of DNA at a more rapid rate than the 5' end, but after reaching series of nucleotides called the Chi sequence (5'-GCTGGTGG-3'), the RecBCD enzyme undergoes a structural reconfiguration and begins degrading the 5' end more rapidly than the 3' end. After recognizing the Chi sequence, RecBCD also assists in loading RecA onto the 3' ssDNA, eventually leading to homologous recombination. Although RecBCD is known to undergo structural changes, the exact mechanism of this change remains unknown. To understand the phenomenon, we plan to incorporate unique amino acids on certain key positions of the RecBCD enzyme complex with fluorescent tags, and analyze the Förster Resonance Energy Transfer (FRET) that occurs during the structural change. The mutations created to introduce the special amino acids are $RecB^{Q985}$, $RecB^{Q1011}$, $RecB^{Q1096}$ and $RecB^{L1167}$, allowing the RecB subunit to be fluorescently labeled with Alexa 488. The Rec D subunit will have the $RecD^{K383}$ mutation to be labeled with Alexa 555. The fluorescently labeled RecBCD will then be studied with TIRF microscopy.

Immune Recognition and Suppression of Downy Mildew Effectors on the Plant Immune System

Archana Pandya
Sponsor: Richard Michelmore, Ph.D.
Plant Sciences

Downy mildews are plant pathogens that infect many agriculturally important plants such as lettuce. Downy mildews use effector proteins that negatively affect the plant's cell processes for their benefit. Effectors are known to weaken the plant immune system, making plants more susceptible to bacterial or fungal infections. Identifying various downy mildew effectors and their interaction with plant receptors encoded by resistance genes present in lettuce can help elucidate the mechanism of pathogenicity in this plant-microbe interaction. My goal is to characterize effectors predicted in genome of Bremia lactucae by expressing them in lettuce plants and testing for immune recognition and immune suppression activities. I am using PCR to amplify effector genes from genomic DNA and to confirm their identity in plasmids after bacterial transformation. I utilized Gateway Cloning to generate expression vectors carrying these effector genes that were then transformed into Agrobacterium tumefaciens. Agroinfiltration was used to infiltrate lettuce plants with expression vectors contained in A. tumefaciens to observe the effects on lettuce plants. Three of the seven effectors tested so far elicited a recognition reaction. These experiments will not only help to understand plant-microbe interactions, but will also contribute to breeding lettuce resistant to B. lactucae.

Nucleosome Sequence Affinity and Its Influence on Codon Bias

Gokul Parakulam
Sponsor: Charles Langley, Ph.D.
Evolution & Ecology

This report aims to connect the ideas of codon bias and nucleosome periodicity. Codon bias is the tendency of a species to favor the usage of a particular set of codons over the others available to them for producing the same amino acid. While evidence of selection for translation efficiency and fidelity have been found in microbes and Drosophila, other mechanisms such as mutation bias and gene conversion remain plausible. Recent analyses of non-coding divergence and polymorphism in the Drosophila populations support that hypothesis that well studied structural interactions between the core histones of nucleosomes and the DNA sequences they package drive natural selection leading to the ubiquitous ~10 base pair periodicities observed in the genomes of all eukaryotes. The most obvious periodicities being the periodic occurrences of the AA, TT, and GC dinucleotides. Here we report results of our attempt to ask whether nucleosome interactions in coding sequence contribute to the observed codon biases across the genome of Drosophila Melanogaster. This is done by building a regression model that seeks to predict the particular codon used to encode each amino acid and comparing it to actual codons being used.

Time-Relative Interests and Infanticide

Wesley J. Park
Sponsor: Christina Rulli, Ph.D.
Philosophy

At the margins of human life, there are noteworthy cases of killing and death that cause one to pause (e.g., abortion and euthanasia). The Ethics of Killing by Jeff McMahan is widely regarded as the most comprehensive discussion on the topic. McMahan proposes, at length, an account of the wrongness of killing concerned with what he calls 'time-relative interests', which have been used to justify abortion. S. Matthew Liao responds that if the concept of time-relative interest permits abortion, however, then it also permits infanticide. Some, including McMahan and Peter Singer, have therefore suggested a radical revision of the commonsense morality of infanticide. Instead, I take Liao's arguments even further. In this paper, I argue that the Time-Relative Interest Account is committed to mass infanticide in novel cases of the trolley problem, requiring the sacrifice of many newborn human infants for the sake of one adult person, and even one adult chicken. Therefore, I recommend an alternative to the Time-Relative Interest Account.

Reactivation of Latent HIV by Targeting Multiple Signaling Pathways

Caroline Park
Sponsor: Guochun Jiang, Ph.D.
MED: Medical Microbiology & Imm

The Human Immunodeficiency Virus-1 (HIV) is a retrovirus that attacks the CD4 T-cells of the body's immune system. Once the virus infects a human, the integrated viral DNA will enter the host cell where it can then hide in the body's reservoirs and become latent. In its latent stage, the provirus avoids detection by the immune system. Because the establishment of HIV latency involves multiple molecular mechanisms, I hypothesize that treating the cells with a combination of drugs will synergistically reactivate the latent virus into its active stage, where the activated viruses will be detected and killed by a host immune response. To test this, I used J-Lat cell lines, which are a cell model of HIV latency. I found that the treatment of the cells with a combination of three different drugs better reactivated latent HIV as opposed to a combination of two compounds, thus indicating that a multiple signaling pathway is needed in order to efficiently disrupt latent HIV.

Concentrated Solar Thermal Power Generation

Walter Parker
Sponsor: Vinod Narayanan, Ph.D.
Mechanical & Aerospace Engr

Concentrated solar thermal is a renewable method of electric power generation in which a traditional thermodynamic cycle is driven by solar heat. Solar energy is concentrated by a dish, and the high density thermal input is incident on a receiver. A receiver takes concentrated sun energy and transfers it to a working fluid. The hot working fluid is then routed for power generation. The performance of a novel microchannel solar thermal receiver will be characterized. The fluid being used through the receiver is high temperature super critical carbon dioxide (sCO2). A 7m parabolic solar dish is being used to concentrate solar energy incident on the receiver. The objective of the project is to characterize the concentration provided by the dish and to model the microchannel receiver efficiency with sCO2. To test the dish concentration, a separate loop will be created with propylene glycol (50/50) solution. A MATLAB model of this loop's components and their performance is created using thermodynamics and fluid mechanic calculation to size the pumps and heat exchangers. Components of the glycol-water loop are being assembled and the sCO2 loop will be developed to characterize efficiency of the microchannel receiver using data from the solar dish.

Relationship of Climatic Factors Along a Latitudinal Gradient and the Phenotypic Traits of *Plantago lanceolata*

Andy Parks
Sponsor: Jennifer Gremer, Ph.D.
Evolution & Ecology

This study will explore the relationship of climatic factors due to latitude with the phenotypes and density of the globally-distributed species Plantago lanceolata. We predict a correlation of phenotypic traits with annual precipitation and temperature at three different locations. Primary phenotypic characteristics such as number and size of leaves, inflorescences, max stem height, and number of basal rosettes will be compared from each site. In addition to phenotypic traits, the density of individuals will also be examined within square-meter plots at the different sites. We hypothesize that conspecific proximity is also related to annual precipitation and temperature. Data were collected during the 2015 and 2016 growing seasons in California, Oregon, and British Columbia. Preliminary results indicate differences in the measured traits, suggesting a relationship between phenotypic characters of Plantago lanceolata along the latitudinal gradient. A more detailed statistical analysis of these data will be performed along with the incorporation of future climatic projections for each region. This project examines trends in plant phenotypic traits and conspecific proximity over a latitudinal gradient and will serve as a baseline for future studies that analyze change over time due to climate change.

Miscommunication Between Regulators and Local Communities During the Aliso Canyon Methane Blowout

Angela Parnay
Sponsor: Suzana Sawyer, Ph.D.
Anthropology

On October 23, 2015 a steady release of natural gas was discovered around a well in the Aliso Canyon storage facility in Los Angeles, California. During the four months it took to seal the well, the released gases caused many health problems for those living nearby, such as bloody noses and nausea. These health concerns led to the relocation of thousands of families and spurred community activism. Though many government agencies worked to seal the well and determine the short- and long-term health impacts, communication failures between regulators and the community produced distrust and panic. Expressions of scientific uncertainty, misinformation, and lack of direct communication exacerbated the fear already present in the community. Also, the context and environment of meetings between regulators, engineers, and community members influenced the language used when exchanging information, as well as the thoroughness of the knowledge provided. This study analyzes the relationship between information expression and the activism of the public by examining interviews with community members and regulators, podcasted community meetings, hearings, news publications, and online government resources. Understanding the role communication plays during times of environmental disasters can help regulators better manage future relationships with communities in crisis.

Environmental Justice: People, Communities and Water Video Project

Viva Parsa
Sponsor: Jonathan London, Ph.D.
Human Ecology

What is the human right to water? Despite the passing of California's AB 685, The Human Right to Water Bill, in 2012, clean, accessible, and affordable water is still not a reality for many California communities. Working in tandem with the Environmental Justice Coalition for Water (EJCW), our research uses film, secondary research, and interviews to collect and disperse the stories of people directly impacted by the violation of this human right in the Salton Sea, Delta, and the Northern Tribal (Karuk, Pit River, Yurok, and Winnemem Wintu) regions. The videos will be dispersed through social media as calls to action, informing viewers what they can do to recognize and act upon their stake in the struggle to ensure the human right to water. We strove to capture a plurality of perspectives, from youth to organizers to workers, on how water pollution, diversion, and ecological destitution impacts their ways of life. While policy is necessary for change, this research affirms the importance of centering the voices of those most affected by water exploitation and recognizing the power of the people to demand justice.

Testing Technology Breaks: A Novel Solution to Decrease the Impacts of Cell Phone Distractions on Academic Performance

Ilse Pastor
Sponsor: Andrew Yonelinas, Ph.D.
Psychology

The ubiquity of cell phones in the classroom can harm academic performance[1]. Technology breaks have been proposed to alleviate the distraction of cell phones by allowing students to take a designated break to use personal technology[2]. Some faculty have already begun employing tech breaks in classrooms, but, to date there have been no empirical studies testing their efficacy. UCD undergraduates were randomly assigned to an experimental condition (tech break, n = 39) or a control condition (non-tech break, n = 43). Participants watched two 15-minute lectures, receiving 4 text-messages during each lecture. Each lecture was followed by a short break before a multiple-choice test on the lecture material. Our results show that the average test scores for students in the tech break condition (M = 76.67%) was higher than the control (M = 69.09%). Measures of cognitive control and individual differences with respect to cell phone habits were also collected, but we have not found any significant correlations with test performance. This study suggests that technology breaks are an effective solution to minimize cell phone distractions in class and improve academic performance. Future studies will examine optimal conditions for tech breaks, such as frequency and duration of the breaks.

Effect of Circadian Cycle on Antiobesity and Anti-Diabetic Properties of *Moringa oleifera*

Kerul Patel
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Moringa oleifera (drumstick or horseradish tree) is known for its bioactive compounds, and has been extensively used as a preventive and curative drug for about 300 diseases. It has antiobesity, antidiabetic, anticancer, and antioxidant properties. Our project focuses on the hypolipidemic and hypoglycemic properties of M. oleifera. Several research groups demonstrated the effectiveness of M. Oleifera leaf aqueous extracts in decreasing blood glucose, LDL-cholesterol, and triglyceride levels. Circadian clock plays a crucial role in many plants and human physiological processes by integrating and coordinating environmental signals with internal biological events. We hypothesize that the circadian clock will also affect the concentrations of the bioactive compounds. Our goal is to identify the time of the day when these compounds are at their highest concentrations and are most effective. M. oleifera leaves were collected every four hours and freeze dried to preserve the concentrations of compounds. The aqueous extract of these dried leaves will be fed to control, hyperlipidemic and hyperglycemic rats and blood glucose, LDL-cholesterol and triglycerides levels will be recorded. We will accept our hypothesis if the rats show decrease in blood glucose, LDL-cholesterol, and triglyceride levels at a specific time of the day or night.

Effect of Circadian Cycle on Antiobesity and Anti-Diabetic Properties of *Moringa oleifera*

Miti Patel
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Moringa oleifera (drumstick or horseradish tree) is known for its bioactive compounds, and has been extensively used as a preventive and curative drug for about 300 diseases. It has antiobesity, antidiabetic, anticancer, and antioxidant properties. Our project focuses on the hypolipidemic and hypoglycemic properties of M. oleifera. Several research groups demonstrated the effectiveness of M. Oleifera leaf aqueous extracts in decreasing blood glucose, LDL-cholesterol, and triglyceride levels. Circadian clock plays a crucial role in many plants and human physiological processes by integrating and coordinating environmental signals with internal biological events. We hypothesize that the circadian clock will also affect the concentrations of the bioactive compounds. Our goal is to identify the time of the day when these compounds are at their highest concentrations and are most effective. M. oleifera leaves were collected every four hours and freeze dried to preserve the concentrations of compounds. The aqueous extract of these dried leaves will be fed to control, hyperlipidemic and hyperglycemic rats and blood glucose, LDL-cholesterol and triglycerides levels will be recorded. We will accept our hypothesis if the rats show decrease in blood glucose, LDL-cholesterol, and triglyceride levels at a specific time of the day or night.

The Roles of apo(a) Sizes and Phenotypes in Lp(a) Reductions With PCSK9 Inhibition

Kishan Patel
Sponsor: Enkhmaa Byambaa, M.D.,Ph.D.
MED: Div Of Internal Med

In the United States one in four adults dies from cardiovascular disease (CVD). Risk factors such as hypertension, hypercholesterolemia, and obesity increase the chances of getting CVD. An increased level of plasma lipoprotein(a), Lp(a), has recently emerged as an independent causal risk factor for CVD. Unlike many other CVD risk factors which can be prevented or improved through lifestyle or drug interventions, Lp(a) levels are genetically determined and thus remain stable over an entire lifespan. A size polymorphism in the apolipoprotein(a), apo(a), gene plays a major role in Lp(a) regulation. Statins, the preferred drug class used to lower cholesterol, do not impact plasma Lp(a) levels; however, a new class of lipid-lowering drugs, called proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors, have been shown to lower Lp(a) levels. The objective of this study was to investigate whether apo(a) size polymorphism modulates Lp(a) reductions with Alirocumab, a fully human monoclonal antibody directed against PCSK9. Using Western blotting, apo(a) isoform sizes were determined in 155 patients with hypercholesterolemia. Alirocumab-induced reductions in Lp(a) levels did not differ significantly by apo(a) phenotypes or presence or absence of a small size apo(a). These findings suggest that Alirocumab reduced Lp(a) levels independently of apo(a) size polymorphism.

Effect of Dopant on Mechanical Properties of MgAl2O4

Christian Patino
Sponsor: Ricardo Castro, Ph.D.
Materials Science & Engineering

The microstructure of $MgAl_2O_4$ is doped with a 1-mol% addition of Ca^{2+}, Zr^{4+}, Er^{3+}, and Yb^{3+}. A control sample of $MgAl_2O_4$ without a dopant and the samples of $MgAl_2O_4$ with a 1-mol% along the grain boundaries have their mechanical properties and grain structure compared. The hardness is tested using a Macromet 1 Buehler Hardness tester. The grain structure images taken with the Nikon Optical Microscope are expected to show the doped samples to have a shorter length at the edges of the grains compared to the control sample. The hardness values of the doped and control samples are plotted against the inverse of the length of the grains. The plot is expected to show a correlation between an increase, decrease, or no change in hardness due to a 1-mol% addition of Ca^{2+}, Zr^{4+}, Er^{3+}, and Yb^{3+} at the grain boundaries. The toughness of the $MgAl_2O_4$ doped samples is also expected to increase.

Effects of Sialic Acid on Inflammation

Rasika Patkar
Sponsor: Emanual Maverakis, M.D.,Ph.D.
MED: Dermatology

Common foods such as dairy products, red meat, and hen eggs contain the monosaccharide sialic acid. Studies have shown that sialic acid levels are significantly different in patients with various immunological ailments such as cancer, rheumatoid arthritis, and allergies, suggesting that it plays a role as an immune moderator. The goal of this study is to examine the effects of different sialic acid treatments on inflammatory response based on changes in glycosylation on an immune cell. Monocytes, a type of white blood cell, will be treated with different concentrations of two types of sialic acid, NeuAC and NeuGC. Some of the cells will be treated with lipopolysaccharide, an inflammatory agent. Changes in glycosylation will be determined by lectin binding using flow cytometry. For the treatments that give interesting results, qPCR will be used to examine changes in gene expression of glycosylation enzymes. Conclusions from this study can eventually lead to suggestions for changes in diet or sialic acid supplements that can help reduce chronic inflammation.

The Effects of Copper Nanomaterials on the Embryonic Development and Multidrug Resistance of *Patiria miniata*

Christine Patten
Sponsor: Gary Cherr, Ph.D.
Environmental Toxicology

The industrial application of nanomaterials exponentially rises, while research of their effect on marine organisms lags behind. Patiria miniata are a keystone species found in anthropogenically stressed marine communities. This study focuses on the impact of nano-CuO on the embryonic development, the phenomenon of Multidrug Resistance, and the potential to protect against mixed chemical pollution in bat star embryos. A dose-response in the lab quantified the effects of nano-CuO and copper sulfate (CuSO4) throughout early development. Secondly, a dye accumulation assay examined the effects of nano-CuO on embryonic defense at the blastula and gastrula stages of development. Finally, fertilized eggs were exposed to various nontoxic concentrations of vinblastine in the presence and absence of nano-CuO to determine if nano-CuO has the potential to act as a chemosensitizer. Results found that nano-CuO significantly impacts embryonic development at concentrations as low as 0.25ppm but does not significantly inhibit the transporter proteins. Furthermore, significantly normal cleavage within the vinblastine assay support that nano-CuO does not act as a chemosensitizer. Though it is clear that nano-CuO induces abnormalities within marine organisms, this study suggests differential effects between different species and exemplified the importance of further investigation in the role of nanoparticles within marine environments.

Pathogen Recognition by Plant Immune Receptors

Dean Paz
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Vertebrates contain a highly evolved immune system. Their immune system consists of specific cells that have the ability to attack pathogenic microbes and also possesses a well-developed circulatory system capable of transporting these immune cells at the site of infection. While vertebrates are equipped with such widespread specialized immune cells and a durable circulatory system, plants lack both, making it more difficult for them to protect against microbial pathogens. However, plants have evolved sophisticated molecular mechanisms to defend themselves against invading pathogens. One of the most well studied plant defense systems involves PRR (pattern-recognition receptors), on the cell surface. These receptors detect conserved molecules called PAMP (pathogen associated molecular patterns), as a sign of a pathogen and initiate a signal transduction events that ultimately culminate in robust defense responses against invading pathogens. The defense responses triggered in response to PAMPs include hormonal regulation, transcriptional reprogramming, stomatal opening and the release of reactive oxygen species. Using molecular biology techniques such as Yeast-2-Hybrid along with plant genetics, I worked on PRR receptors EFR and FLS2. My project involved understanding how PAMP recognition by these receptors initiate the defense responses.

The Red Rose and the Dragon: Henry VII and the Struggle for Legitimacy and the Uses of the Welsh Red Dragon

Margaret Paz
Sponsor: Sally Mckee, Ph.D.
History

Many scholars believe the adoption of the red dragon was politically motivated and that Henry was thought to have used it to align himself with the Tudor family and his paternal uncle Owen. One account by Sydney Anglo entitled, “The British History in early Tudor Propaganda”, had considered the idea of the red dragon being a prophetic icon tying Henry to King Arthur; however, this author still affirms that Henry used his family name to rally support and not prophecy. I believe in reexamining the legends and myths of the prophecy that promises that King Arthur would return to release Britain from Saxon rule. Hence, while Henry is not saying he is descended from King Arthur, he presented himself as the valiant, prophetical return of King Arthur, almost as if he is a messianic figure. This paper's intention is to expand upon Anglo’s line of thought and further explore the red dragon as being both a prophetic and political icon. The intent is to show new perspectives on common thoughts on symbolism and royal lineages and create a conversation that genealogy is not the only evidence a monarch used to solidify his rule.

Noise Pollution and Interspecies Interactions

Kira Pearson
Sponsor: Gail Patricelli, M.S.
Evolution & Ecology

Anthropogenic noise may significantly impact wildlife, and in particular birds, on both small scales (parents and offspring communication), and broader scales (reproductive success and species interactions). These disruptions may negatively impact local population sizes over time, yet to date no experimental field study has studied the effects of noise pollution at the community level. I will experimentally test the potential impacts of noise pollution on tree swallow (Tachycineta bicolor) nestling condition and fledging success through monitoring adult foraging behavior and insect composition. If the presence of noise decreases insect abundance, adult tree swallows will have reduced foraging efficiency. I predict their nestlings will have decreased condition and an overall decreased fledging success rate. The study will take place in two breeding sites in Davis, California where nest boxes are randomly assigned to either traffic noise playback or control conditions (no noise playback). I will net insects and collect insect boluses from adult tree swallows from both treatment groups. Nestling growth will be measured weekly and the number of successful fledgings will be recorded. If my hypothesis is correct, anthropogenic noise has the potential to harm multiple species indirectly by disrupting food chain dynamics.

Functional Analysis of the Tetratricopeptide Repeat Protein TONSOKU in Plant Cell Division

Felicia Peng
Sponsor: Bo Liu, Ph.D.
Plant Biology

In seed plants, root and shoot apical meristems give rise to new cells and ultimately entire plants through oriented cell divisions. To execute cell division, plant cells organize mitotic microtubule arrays in response to spatial or positional signals. In Arabidopsis thaliana, the Tetratricopeptide Repeat Protein TONSOKU (TSK) plays a critical role in meristem organization, as tsk mutant plants have disorganized apical meristems due to abnormal cell division plane orientation. Additionally, recent studies have shown that TSK interacts with TSK-associating protein 1 (TSA1), which interacts with mitotic-spindle organizing protein 1 (MZT1) in the γ-tubulin complex. Thus we hypothesize that TSK has an important function in mitosis and plays a role in cell division orientation. To investigate its underlying mechanism, we isolated tsk mutants by screening T-DNA insertion lines. These mutants were then transformed with a TSK-GFP (green fluorescent protein) construct. Transformants displayed a complemented tsk phenotype, suggesting they produced a functional TSK-GFP fusion protein. Currently, these plants are being used in immunofluorescence microscopy and immunoaffinity purification experiments to localize TSK and identify proteins associated with TSK. Findings of this study are expected to advance our knowledge on spatial regulation of plant cell division.

The Stereoselective Synthesis of Indolines via C-H Bond Insertion

Corinne Penrod
Sponsor: Jared Shaw, Ph.D.
Chemistry

Developing new reaction methods to assemble densely functionalized heterocyclic cores is critical to increasing the accessibility of pharmacophores. The ability to functionalize carbon-hydrogen bonds allows for the synthesis of such cores in a relatively inexpensive and efficient manner. Furthermore, excellent control over regio-, diastereo-, and enantioselectivity proves to be an important aspect in the synthesis of compounds. A three-step synthesis was developed to produce molecules containing an indoline core through intramolecular C–H bond insertion with high stereoselectivity. This method first involves the substitution of an amine for fluorine on 2-fluorobenzophenone in a nucleophilic aromatic substitution reaction. The ketone of benzophenone is reacted with hydrazine to form hydrazone in the second step. In situ oxidation of hydrazone to diazo and subsequent catalyst addition creates a rhodium carbenoid which can insert intramolecularly into an N-substituted aniline. Herein I present the results of the scope study used to determine which types of N-substituents yield indolines with high stereoselectivity.

The Influence of Size, Sex and Claw Condition on Autotomy in Porcelain Crabs, *Petrolisthes cinctipes*

Monica Perez
Sponsor: Eric Sanford, Ph.D.
Evolution & Ecology

One of the various defense tactics that many organisms employ in order to escape predation is autotomy: the dislodgement of an appendage when in danger of predation. My research explored whether the different variables of size, sex, and previous autotomy had any effects on the time it took for the porcelain crab, Petrolisthes cinctipes, to employ this defense mechanism. We tested these constraints in crabs of both sexes, different sizes, and claw conditions (one or two claws present). In order to stimulate the response of autotomy to a predator, porcelain crabs were gripped by a Cancer crab claw. A maximum time limit of 90 seconds was imposed to allow for autotomy to occur. We concluded that P. cinctipes were more likely to autotomize when they only had one claw present, and did so more quickly. There was also a strong correlation between the increase in size of crabs and a decrease in frequency of autotomy. Results also indicated that the frequency of female porcelain crabs utilizing autotomy was greater than that of male porcelain crabs. Studying these different variables and their influence on autotomy will help us understand the factors that have favored the evolution of this defensive strategy.

Characterizing Transgenic Silencing in Lettuce Using DsRed

Paola Perez
Sponsor: Richard Michelmore, Ph.D.
Plant Sciences

Regulatory DNA mechanisms can silence transgenes after a few generations of breeding. With increasing use of genetically modified crops it is desirable that useful transgenes are reliably expressed and silencing mechanisms are repressed. Our experiment uses a DsRed transgene stably transformed into lettuce cv. Cobham Green to assess silencing phenomena. DsRed codes for a red fluorescent protein that is easily visualized under a fluorescent stereomicroscope in lettuce seedlings. Crosses between transgenic lettuce that had been generated through tissue culture and its wild type were made to study the influence of epigenetic patterns from the wild type. Progeny were compared to those from selfed generations of the same transgenic plants. After microscopic evaluation, non-fluorescent plants were screened via PCR to evidence either absence or silencing of the transgene. The experiment is in its fourth generation of screening looking at T4 lines (selfed), F3 lines (Wt cross, then selfed), and BC1 F1 lines (Wt cross, Wt cross, then selfed). T4 families were all fluorescent, while F3 and BC1F1 lines have not deviated significantly from expected segregation ratios. This provides no evidence of silencing in this generation. We are continuing the experiment for a fifth generation to further assess stability of the transgene.

Impact of High PCO2 and Hypoxia on California Juvenile Rockfish

Emily Perry
Sponsor: Anne Todgham, Ph.D.
Animal Science

California coastal ecosystems experience dynamic changes in environmental conditions. Currents and tides create high pCO_2 (low pH) conditions that wash up on shorelines. Coupled with high pCO_2, decreases in dissolved oxygen (i.e. hypoxia) occur during upwelling conditions. Juvenile rockfish (genus Sebastes) recruit to shallow seagrass beds and coves during upwelling and can encounter high pCO_2 and hypoxic conditions concurrently. Studies have shown that high pCO_2 may increase anxiety and activity behaviors in juvenile rockfish; however, how hypoxia combines with high pCO_2 to impact behavior is unknown. We assessed the effect of high pCO_2 and hypoxia (fully factorial design) on activity, exploratory, and anti-predator behavior in juvenile rockfish over a 3-week period. Individual fish were recorded in an isolated arena after 1 and 3 weeks. Novel area explored and total activity before and after the introduction of a predation cue was analyzed. Understanding the impacts of high pCO_2 and hypoxia on rockfish movement and anti-predator behavior provides better insight into fish-environment interactions, as well as potential indirect effects of ocean change on community dynamics such as alterations in predator-prey relationships.

The Role of Septins in Autophagy During Nutrient Starvation

Luis Perucho Jaimes
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Autophagy is a global cellular response to cell stresses, such as nutrient depravation, that targets organelles and proteins for transport into lysosomes/vacuoles where they are degraded, and importantly contribute to long-term survival of cells under stress. The transfer of proteins and cellular organelles to lysosomes involves a complex series of protein and membrane transport steps that are highly regulated and specific. Several reports have led to the hypothesis that septins, a class of cytoskeleton proteins involved in membrane organization, are also important for autophagy, though their precise role is unclear (Barve et al., 2016). To test this hypothesis, we used the budding yeast, Saccharomyces cerevisiae, to ask whether septins are important for autophagy dependent cell survival under nitrogen starvation conditions. Wild type or septin mutant cells were grown under limiting nitrogen conditions for 72h; septin mutants showed only 40-50% the viability of wild type cells grown under the same conditions. Importantly, septin mutants grown in the presence of nitrogen had no impact on viability, arguing that septins are specifically required for cell viability under nutrient starvation conditions. We are now examining how septins might contribute to autophagy, and whether the role of septins in autophagy is limited to starvation conditions.

Mortality in British Romantic Poetry

Loretta Pesola
Sponsor: David Simpson, Ph.D.
English

Many British Romantic poets explore how the individual struggles with living in an imperfect world that ultimately leads to death. This process is often articulated in response to John Milton's Paradise Lost, which illustrates the Christian view that man's Original Sin was punished by death, a punishment which has perpetuated itself in all aspects of life by making the process of living itself painful. Instead of assuming the more traditional perspective in which the heavenly afterlife is a way of overcoming this punishment, the Romantics present the ways in which one struggles through life's painfulness as a means of confronting death. They often raise questions about how connections between the individual and others, and between the individual and nature, either contribute to the rupture caused by the Fall, or may offer solace in the life and death cycle. I will consult critical literature as I study such works as William Blake's Book of Thel and Songs of Innocence and of Experience, William Wordsworth's The Prelude and "Ode: Intimations of Immortality," and Samuel Coleridge's "Frost at Midnight" and "This Lime Tree Bower My Prison," in order to understand how these poets represent attempts to come to terms with mortality.

Sex-Specific Effects of Oxytocin Receptor Antagonist on Cognitive Flexibility in a Novel Social Context

Mary Pham
Sponsor: Brian Trainor, Ph.D.
Psychology

Abstract: Oxytocin (OT) has sparked interest as a therapeutic agent for stress-induced pathologies, but the behavioral effects of OT are context- and sex-specific. Using the California mouse (Peromyscus californicus) we found that in males, administration of intranasal OT increases social interaction (SI) behavior and systemically blocking the receptors for OT decreases it. Interestingly, the opposite effects are observed in females. Intranasal OT decreases SI, similar to the effects that social defeat stress (SDS) has on female social behavior, while blocking OT receptors reverses the effects of SDS. Although SDS does not reduce SI in males, it reduces behavioral flexibility, which does not happen in females. Current studies are re-assessing previous interpretations by more closely examining how females behave in novel social contexts. With video tracking software we will test the hypothesis that stressed females do not avoid social contexts but evaluate them at a distance. We will also test whether OT receptors affect this behavior. If our hypothesis is supported, it will suggest that sex differences in behavioral flexibility may have important effects on social behavior.

Comparative Analysis of Full-Electric Vehicle Specifications in the US Market and Effects on Performance

Dahlia Pham
Sponsor: Thomas Turrentine, Ph.D.
Inst Of Transportation Studies

As the adoption of electric vehicles rises and the electric vehicle (EV) market share grows in the United States, there is an increased need for qualitative and quantitative comparisons between the few models available for purchase within the United States in order for consumers to make a more informed decision. This study uses comparative analysis on US available EV models with the all-electric classification (zero CO_2 emissions and only run on electric power.) The models chosen in this study were selected due to their full-electric status, Li-ion battery in order to share a common factor, and readily available data and will be evaluated based on battery capacity, price, mileage longevity, base MSRP, and charging time; specifications that contribute greatly to car performance and when evaluated, serve as a marker for cost-efficiency. EV data compiled at the UC Davis Plug-In Hybrid and Electric Vehicle Center will be used to quantitatively rank the cars' specifications based on charge-time efficiency and cost-efficiency in terms of mileage and battery performance.

Inhibition of PDE5 by Sildenafil in Diabetic Cardiomyopathy

Jason Phan
Sponsor: Yang Xiang, Ph.D.
MED: Pharmacology

The administration of sildenafil to diabetic cardiomyopathy patients has been shown to inhibit phosphodiesterase 5 (PDE5), an enzyme responsible for sequestering and degrading cyclic guanosine monophosphate (cGMP), and ultimately leads to improved diastolic cardiac function. Preliminary data demonstrates that PDE5 is relatively more highly expressed in high-fat-diet (HFD) mice, which correlates with lowered contractile function. Upon treatment with sildenafil, cardiac myocyte contractility is rescued. We used Western blots to confirm expression levels of PDE5 alongside phosphorylation levels of integral proteins responsible in cardiac excitation-contraction (E-C) coupling. We hypothesized that phosphorylation levels in E-C coupling proteins would be elevated in HFD sildenafil-treated (HFD-Sild) mice as compared to those in HFD vehicle-treated (HFD-Vehicle) control mice and similar to basal levels in normal chow (NC) diet control mice. Heart disease is among one of the major annual leading causes of death in the U.S. Research regarding a sildenafil-treatment approach towards cardiomyopathies specifically for patients with a comorbidity of diabetes will have major implications towards health in diabetic heart failure patients.

Impaired Thermogenesis Accompanied by Sex-Specific Changes in the Brown Adipose Transcriptome and Methylome Exposed to the Pesticide DDT

Lilian Polsky
Sponsor: Michele La Merrill, Ph.D.
Environmental Toxicology

People are exposed to the pesticide dichlorodiphenyltrichloroethane (DDT) and its metabolite dichlorodiphenyldichloroethylene (DDE). While DDT has a strong affinity for the estrogen receptor, DDE is well-characterized as a potent anti-androgen. Studies in rodent models have demonstrated that DDT impairs thermogenesis. We hypothesize that developmental exposure to DDT induces changes in the transcription and methylation of genes that regulate brown adipose tissue (BAT) thermogenesis with an a priori interest in androgen and estrogen receptor signaling. To investigate this in vitro and in vivo, we dosed BAT with DDT and DDE for 8 days and administered DDT to C57BL/6J mice from gestational day 11.5 to postnatal day 5, respectively. Once fully differentiated, cells were extracted and nuclear receptors were analyzed using qPCR. The transcriptome and DNA methylome were interrogated using RNA-Seq and reduced representation bisulfite-converted DNA sequencing (RRBSeq), which revealed differentially expressed and methylated genes in the BAT of DDT-exposed mice. These results were analyzed using Ingenuity Pathway Analysis and inhibition of the androgen receptor in three top causal pathways was predicted. In vitro genetic analyses are ongoing to determine the strength of effect of exposure on nuclear receptors. Overall, this data suggests a genome-mediated, sex-specific role for DDT-impaired thermogenesis in BAT.

Characterization of P3HT Films Using Atomic Force Microscopy

Alexia Portillo Rivera
Sponsor: Adam Moule, Ph.D.
Chemical Engineering

P3HT polymer is commonly used in the area of organic photovoltaic devices due to its conductivity properties. In present work three different P3HT films were spin coated and analyzed using atomic force microscopy. The roughness of the surface of a P3HT-as cast film and P3HT sequentially doped with F4TCNQ (P3HT/F4TCNQ) film were compared. Also, a P3HT/F4TCNQ film was patterned with wires using a confocal microscope by exposing the film to 405 nm light while it was in a good solvent for neutral polymers and dopants, such as THF. The diameter and depth profile of the wires patterned were determined by atomic force microscopy. All the atomic force microscopy images were processed by Matlab to develop three dimensional images. The morphology of the P3HT-as cast and P3HT sequentially doped with F4TCNQ films were similar, while for the patterned film the depth profile of the wires is clearly observed. These results show that we are able to pattern P3HT sequentially doped F4TCNQ film with light.

A Habituative Stepwise Approach to Diminishing Cybersickness in Virtual Reality

Cristian Preciado
Sponsor: Arne Ekstrom, Ph.D.
Psychology

With an increasing affordability of virtual reality (VR) devices and their subsequent accessibility to the public, VR induced motion sickness ("cybersickness") has developed into a prevalent obstacle. Although a multitude of hypotheses have been proposed, the exact mechanism underlying this phenomenon remains largely unresolved. In this study, to better understand, and to minimize the effects of cybersickness, an adaptive approach was implemented. We proposed the unfamiliar virtual environment would produce poor image eye tracking that induces cybersickness. For this reason, we predicted a stepwise exposure with gradually increasing visual complexity would habituate the individual to the VR environment. Consequently, this would diminish the effects of cybersickness. Previous research has shown an increased heart rate is associated with its symptoms. Therefore, a pulse oximeter was used to predict and prevent individuals from experiencing discomfort. The implications of the experiment indicate such a habituative approach could be implemented into VR device tutorials. In which case a client could be subtly trained for a VR environment while learning how to operate their VR device.

The Benefits of Learning a Foreign Language at the Middle School Level

Danielle Preston
Sponsor: Sarah Faye, M.A.
University Writing Program

Middle Schools in the U.S. are experiencing a shortage of foreign language (FL) learning opportunities for their students even though research has demonstrated that there are many benefits of learning another language at a young age. Although studies have proven that learning another language enhances cognitive development, encourages cultural awareness, increase the possibilities of college acceptance and allows for many career opportunities, FL is still considered an unnecessary subject in many middle school curriculums. The lack of value that policymakers see in middle school foreign language programs translates into a lack of funding, and consequently, language programs are scarce in many U.S. middle schools. I will be presenting multiple studies that have been conducted on the differences between other countries and the U.S. pertaining to school policies and curriculums as well as a collection of solutions that discuss raising awareness to stakeholders of the importance of FL learning. In summary, it is shown that the U.S. is falling behind many other countries in preparation towards making its students into global citizens who are capable of communicating with other cultures.

Surveying Size: Body Size Transitions Between Freshwater and Saltwater Fishes

Allison Proffitt
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Evolutionary transitions between marine and freshwater habitats are found in many animal groups, including fishes. As a broad group of over 400 families of fish, the group Ovalentaria provides a unique opportunity for studying body size diversity across the marine-freshwater transition. This transition is distinguished by different lifestyle adaptations, including distinct feeding strategies. Moreover, a historical trend towards decreasing body size has been documented in freshwater fishes. A new study of body size could help establish whether marine or freshwater habitats have greater body size diversity. While marine environments may encourage greater diversity via greater variety of local habitats, e.g. coral reefs, freshwater environments could provide greater opportunities for diversity because of body shape changes that occur when filling new niches. One way to measure body size is standard length. Using standard length data collected from fish specimens at the Smithsonian, I will investigate trends in standard length between and among freshwater and marine fishes. A more comprehensive picture of current body size variations in marine and freshwater fishes could improve existing ideas about feeding strategies and historical shifts, and also show whether the marine or freshwater environments hold greater body size diversity.

Improved Mixing of Hydroxypropyl Methylcellulose (HPMC) for Faster Soil Saturation in Centrifuge Modeling

Amber Pulido
Sponsor: Ross Boulanger, Ph.D.
Civil & Environmental Engr

In geotechnical centrifuge modeling, high viscosity pore fluid, such as hydroxypropyl methylcellulose (HPMC), is required when investigating soil liquefaction to properly satisfy scaling laws. Geotechnical centrifuges use scale models to represent nonlinear, stress-dependent responses of soil masses. At the University of California, Davis, a 9-m centrifuge is used to study soil and soil-structure systems affected by cyclic forces. Soil liquefaction is the process in which saturated soil experiences a loss of strength in response to an applied cyclic force. For centrifuge tests studying liquefaction is critical to ensure that the soil specimens are completely saturated. At the UC Davis Centrifuge for Geotechnical Modeling, problems of not having fully saturated soil specimens in a short period of time, typically two days, for centrifuge modeling have arisen. Incomplete mixing can cause the long-chains within the HPMC mixture to clog the soil pores, increasing the time required to execute the saturation process. In the laboratory, the effect of mixing the HPMC at a constant energy and using boiling water to breakdown the long-chains in the mixture is currently being investigated. These experimental processes are being applied to the HPMC mixing procedure in order to improve mixing and decrease the time required for saturation.

Abstract and Representational Views of Nature: Water Ripples and Reflections

Shuyi Qi
Sponsor: William Pardee, M.F.A.
Art

The focus of my independent work has been venturing into abstract realms and their relationship to representational art. My interest first began when I began studying and painting water over the summer of 2016. In my observations, I noticed a tessellation of parallelogram-style shapes in the rippling of water. By seeing abstract shapes, I was reminded of how Plato's Republic defined the Good and the Forms, the abstract, metaphysical ideas that provide the basis of its representation in the material world. Thus, my work began as an academic, philosophic exercise to understand the structures that underpin water, a shapeless matter. After experimenting with the shapes, I introduced a figure to create a visual dynamic between the abstract and the representational. This was an experiment to try to understand and represent what this relationship means to me: a greater understanding or perhaps just a different perspective of the world. This then leads to question about science and spirituality: if the spiritual informs the abstract that informs the material. My final piece, which I named "Discovery," queries this possible connection by juxtaposing the representational and abstract.

Understanding Academic Advising Communication

Yijuan Qiu
Sponsor: Bo Feng, Ph.D.
Communication

Advice seeking and giving is a very common component of interactions between college students and their professors, academic counselors, and university staff members. It is important to understand what are some factors that influence the advisers' willingness to give advice to their students, as well as the quality and content of their advice. With the number of international students studying at institutions in the United States increasing every year, it is crucial to understand how students and professors' cultural background might influence the effectiveness and quality of their advising interactions. To investigate this topic, a survey was designed and distributed to a total of 2,400 professors from a random sample of 20 institutions of higher education in the U.S. The survey assessed factors that may influence the content and quality of advice (as well as intention to provide further advice) that advisors give to students. Those factors include students' solicitation of advice, perceptions of their responsibility for the problem, their cultural background, and gender. Open ended responses from professors regarding a recent instance of academic advising were also collected and analyzed.

A Companion for Traveling Alone

Linh Quan
Sponsor: Glenda Drew, M.A.
Design Program

Whether traveling across the world to explore new places or across town to get to work, humans have a need for travel. While some travel in groups, many travelers go by themselves. By traveling alone, individuals rely on themselves and do things at their own pace. No matter the distance, traveling alone can be terrifying. On one's own, she/he/they becomes an instant target for robbery, scams, harassment, and violence. Currently, the world is missing a universal companion app for traveling. Rather, solo travelers are currently using barely functioning smartphone applications or just going by without one. The purpose of my research is to find a safer and smarter way to travel alone; that is also quick and intuitive to use. I plan to further my research by developing prototypes and conducting user testing. By the end of my research, I hope to create an app that will make traveling alone safer for everyone.

Investigation of the Anatomical and Functional Connectivity Between the Cerebellum and the Olfactory Bulb

Claudia Quarshie
Sponsor: Diasynou Fioravante, Ph.D.
Neuro Physio & Behavior

Cerebellar mutations that are associated with autistic disorders also impair olfactory responses, and impaired performance in olfactory tasks is thought to be a marker for autism. However, how the cerebellum connects to the olfactory system in health and how this connection is altered in autism remains unclear. Our preliminary studies using anterograde and retrograde tracers suggested the existence of an anatomical connection between the output nuclei of the cerebellum and the olfactory bulb in mice. We hypothesize that the previously reported functional connectivity between the cerebellum and the olfactory bulb is mediated by a direct monosynaptic connection between the cerebellar output nuclei and the olfactory bulb, and that the projections between the two brain areas form a closed loop. This presentation will report my performance of stereotactic intracranial surgeries in mice in order to inject anatomical tracers and fluorescently labeled viruses into the cerebellum. We expect to identify a direct anatomical connection between the output nuclei of the cerebellum and the olfactory bulb. A successful outcome will provide the first insights into the anatomical wiring between the cerebellum and the olfactory bulb and establish the necessary basis for the future investigation of this network in models of autism.

The Limited Availability of Healthcare Access in Rural Communities

Juanita Quino
Sponsor: Mary Lou de Leon Siantz, Ph.D.
Betty I Moore Nursing School

In the United States Hispanics make up the largest percentage of uninsured individuals in the nation (CDC, 2016). Despite the efforts to offer affordable and quality healthcare, marginalized groups such as Latinos living in rural communities, often have higher rates of uninsured individuals than other racial groups and communities. The purpose of this mixed methodology study was to explore the access to healthcare in a predominant Latina/o, agricultural, migrant community in California's Central Valley. The sample consisted of Latina adolescents between the ages 14-17. Focus groups were conducted to gather information regarding migration, teen pregnancy, and depression and surveys were used to gather quantitative information such as social demographics and access to healthcare. A central theme of the study was the the lack of access to physical and mental care as well as quality healthcare facilities offering physicals, services to family planning, sexually transmitted disease and infection screenings, and birth control services. The findings from this study support the notion that there is a demand for culturally sensitive providers and health educators in rural communities. Governmental policies regarding healthcare also need to include individuals regardless of socio-economic status or citizenship status.

Interrogating Clinical Samples for Drug-Resistant Malaria Parasites With Targeted Deep Sequencing

Leslie Quintanilla-Zarinan
Sponsor: Shirley Luckhart, Ph.D.
MED: Medical Microbiology & Imm

Previous studies have shown that a co-infection of malaria and HIV can amplify the transmission of both diseases. However, few studies have examined the contribution of HIV on malaria transmission, during a co-infection, to its disease vector, the Anopheline mosquito. Our study proposes that key drugs used prophylactically to prevent opportunistic infections in HIV patients, such as trimethoprim-sulfadoxine, drive selection for parasite resistance to the antimalarial drug sulfadoxine-pyramethamine, which also targets the parasite's folate metabolism. We aim to perform targeted deep sequencing using a simple, scalable 2-step PCR library prep to quantify shifts in resistance genotypes between patient and vector hosts. However, the ratio of parasite to background contaminant DNA inhibits the efficiency of the PCR primers used in the initial amplification, which increases stochastic variation and unequal sampling of alleles. For my specific aim, I developed control libraries to ensure that rare alleles are represented in each sequencing run.

Affective Air Pollution

Rouzbeh Rahai
Sponsor: Jonathan London, Ph.D.
Human Ecology

Air Pollution has often been reduced to its biological effects. Contemporary views of air pollution as merely containing health effects defined by scientization are inherently limiting. What is lost are the multiple ways people perceive and feel air pollution. This study aims to qualify the contemporary experience of air pollution as one that contains an inherently affective quality. When moving from historical views of air pollution to examining the nature of atmosphere, air pollution proves to carry expansive affects. One of the important emotive effects experienced by communities is a constant state of anxiety. The article examines case studies of community responses to air pollution through this framework of anxiety, and finds that while this anxiety exists on an individual level, it is also shared among various communities across geography, suggesting indeterminate boundaries. The work ends by questioning concepts of space in air pollution, such that, the acceptance of affects directly results in the expansion of defined space. Air pollution thus exceeds boundaries in space through a connection of air, where realized is a singular atmosphere with collective affects.

Analysis of Stomatal & Pavement Cell Densities in Tomato Introgression Lines Reveals Parental Traits Governed by Specific Regions of the Genome

Eduardo Ramirez
Sponsor: Neelima Sinha, Ph.D.
Plant Biology

Global climate change along with an ever-increasing population mandate improvement in agriculture, prompting development of stress-tolerant crops. Solanum habrochaites is a drought-tolerant wild tomato species while domesticated tomato (Solanum lycopersicum) remains drought-sensitive. Additionally, these two species are the progenitors of a homozygous introgression population making them excellent candidates for anatomical, physiological, and genetic inquiries. The goal of my project is to discover epidermal patterning differences and to evaluate correlation of these patterns with drought-tolerance in the two species. To address this, I made epidermal impressions and counted stomata (guard-cell structures controlling gas exchange and water loss) and pavement cells (the protective outer layer of the epidermis) to determine their respective densities on the abaxial and adaxial leaf surfaces. I analyzed epidermal patterning in these two species under normal-watering and no-watering conditions and found that species exhibit different cellular patterns and are plastic with regards to stress. To further characterize the genetic loci involved, I selected 38 of the introgression lines (ILs) for evaluation. ILs with significantly different profiles than the domesticated parent were discovered using pairwise, false discovery adjusted analyses. Taken together, these experiments show that epidermal patterning is governed by multiple regions on the genome and may affect drought-tolerance.

Episodic Memory for Emotion Words With Extended Delays

Anacary Ramirez
Sponsor: Beth Ober, Ph.D.
Human Ecology

Studies have shown that there is a processing advantage for positive (versus negative) emotion-laden words for both native (E1) and non-native English speakers (E2), with a larger effect in E1s (e.g., Kazanas & Altarriba, 2015). In our previous study (EMFEW), the advantage for positive emotion-laden words was replicated; however, the difference was now larger for E2. The purpose of this study is to examine the effect of verbal recall and identify whether E1 remembers more positive versus negative English words compared to E2. In addition, this study (EMFEWX) added two extended delays (45 minutes and 2 week) to see whether the processing advantage for positive words would be amplified compared to EMFEW. A list of 12 positive and 12 negative emotion words was read to participants who were then asked to recall the list, for three presentation-recall sequences. After each of the following delays, participants were again asked to recall as many words as possible: 1 minute, 15 minutes, 45 minutes, and 2 weeks. Our preliminary results showed that there is an overall higher recall for positive words compared to negative words for all subjects. Differences in recall for positive versus negative valence words were greater for E2 participants.

Convection Optimization in Consecutive Variable Cross-Sectional Cooling Channel for Thermal Management in Electronics

Susana Ramirez Perez
Sponsor: Kambiz Vafai, Ph.D.
Mechanical Engineering

Technological advancement emerges in hand with the miniaturization of semiconductor devices, and heat dissipation is critical. Temperature increases affect the behavior of electronics and is most critical in relatively small-cross-sectional areas. In the study, a heat management device is modeled as a combination of converging, uniform, and diverging sections. This channel is made of porous media and dissipates heat by convection. From previous investigations the mathematical expression for the Nusselt number were obtained analytically for adiabatic and constant temperature conditions, and the optimal configuration for the device is a converging-uniform-diverging. This was used to find the optimal angle to achieve the highest Nusselt number. The Nusselt number indicates efficiency for the rate of convection. The derivative of the physical mathematical expression was found, but due to the nature of the expression an explicit solution for the extrema of the complete equation was not found. The local thermal equilibrium assumption led to a simplified equation. Then a graphical approach was used to verify the solution from zero to ninety for a set of input parameters. The study shows that, for the simplified solution, the angle alpha of 60 is ideal for maximum heat dissipation by the mode of convection.

The Impact of Sports and Parent Involvement on Academic Achievement

Sara Ramos
Sponsor: Alvin Mendle, M.A.
Education

Research has also shown the importance of sports. Specifically, physical activity in the school curriculum enhances grades and improves health (Trudeau & Shepard, 2008). Research has shown group memberships (Wentzel & Caldwell, 1997), parent involvement (Fan & Chen, 2001), and friendships (Schaefer et al., 2011) promote achievement. To further investigate the role of parent involvement, sports, and individual characteristics (i.e., age, gender), this study examines moderators of the relation between sports and grades. We used the National Longitudinal Study of Adolescent to Adult Health (ADD Health; Harris & Udry, 2014). Results showed higher parent involvement is associated with grades (ß = .12, $p < .05$). When testing both parent involvement and sports predicting grades, both remained significant. Specifically, parent involvement predicted higher grades (ß = .11, $p < .05$), and participation in sports predicted higher grades (ß = .07, $p < .05$). Surprisingly, the interaction between sports and parent involvement was not significant (ß = -.02, $p = .46$), nor was the interaction between sports and gender (ß = -.03, $p = .24$) predicting grades. These results and further moderators will be presented. This study provides further evidence of the importance of sports activities and parents in fostering achievement.

Children's Problematic Eating Behaviors as a Mediator of the Relationship Between Controlling Feeding Practices of Caregivers and Children's Body Mass Index (BMI)

Perla Ramos Carranza
Sponsor: Lenna Ontai, Ph.D.
Human Ecology

Controlling feeding practices, which are strategies that caregivers use to manage their child's eating, are associated with lower Body Mass Index (BMI) in children (Farrow & Blisset, 2008). A potential mediating factor for this relationship is children's problematic eating behavior. Specifically, a recent study found that higher parent reports of controlling feeding practices were associated with children's avoidant eating behaviors, like pickiness (Powell, Farrow, & Meyer, 2011). The purpose of this study is to replicate and extend this finding with a sample of 60 caregiver-child dyads (preschool age children and one caregiver) from the UC Davis Healthy Kids study, while additionally considering the child's BMI. Caregiver control is measured through the My Child at Mealtime questionnaire (Ontai, Sitnick, Shilts, & Townsend, 2016), while the child's avoidant eating behavior is measured by the frequency of distracted behaviors during a videotaped mealtime. BMI is calculated from the child's height and weight. Given the previously mentioned findings, the expectation is that there will only be a relationship between higher caregiver control and lower BMI for children who show more avoidant eating behaviors. Thus, future research should consider a bi-directional relationship between caregiver practices and the child's eating behavior.

Social Support Buffers Against the Effects of LGBTQ-Related Peer Victimization on Depression Symptoms

Navaneethasri Ratnavelsamy
Sponsor: Paul Hastings, Ph.D.
Psychology

Lesbian, gay, bisexual, transgender, and queer (LGBTQ) individuals face victimization from peers and the general population because of their divergence from heterosexual norms. These sources of stress can lead to poor mental health outcomes. However, social support from friends may protect against LGBTQ-related victimization. This study tested whether social support from friends would buffer against symptoms of depression when participants reported more stress and more LGBTQ discrimination by peers. We predicted that perceived and experiences of general and LGBTQ-related stress would be positively associated with depression; and that social support would be negatively associated with depression. Further, we predicted that social support would moderate the links between LGBTQ-related victimization and depression symptoms. Our findings showed that perceived stress, general stressors, social support predicted depression symptoms (R^2=0.75, F(6, 95)=20.81, p<0.01). Our results also showed that participants reported more depression symptoms when they also reported more LGBTQ-related victimization and less social support (b=-0.64, t(3, 98)=-5.56, p<0.001). The link between LGTBQ-related victimization and depression symptoms did not exist for participants who reported more social support from friends (b=-0.25, t(3, 98)=-1.94, p>0.05). The moderating effects suggest that having supportive friends may protect against mental health problems for LGBTQ individuals.

Evaluation of Cross-Feeding During Bifidobacterial Growth on Milk Oligosaccharides

Pavitra Ravishankar
Sponsor: David Mills, Ph.D.
Food Science & Technology

Bacterial cross-talk plays an important role in the healthy development of the human gastrointestinal tract. Specifically, members of the genus Bifidobacterium dominate the infant gut via their ability to metabolize human milk oligosaccharides (HMOs), a significant component of breast milk. Some bifidobacteria have been shown to cross-feed other bifidobacterial strains during glycan metabolism. B. bifidum, a common probiotic, consumes HMOs using extracellular glycosyl hydrolyses, releasing monomers like fucose in the extracellular milieu. In this work, cell-free spent media (CFSM) from B. bifidum grown on specific, purified HMOs was examined for its ability to cross-feed pathogens. In vitro growth studies show that CFSM isolated from B. bifidum, but not B. longum subsp. infantis, supports the growth of specific proteobacteria. Unlike B. bifidum, B. longum subsp. infantis wholly transports the HMOs to the inside of the cell for metabolism resulting in limited availability of sugars in the CFSM. Current experiments are focused on the analysis of specific purified HMOs in combination with different bifidobacterial strains to understand the outcome on pathogen growth and to evaluate the contents in the CFSM. These analyses can enable the rational design of probiotic treatments to reduce possible enrichment of pathogenic bacteria in the infant gut.

Ionic Mechanisms of Atrial Fibrillation

Kalsha Reddy
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Atrial fibrillation is one of the most common arrhythmias. However, mechanisms that lead to the instability of the atrial action potential are still not well understood. In this study, using a physiologically detailed computational model of the human atrial tissue, we investigated how altered ion channels in the atrial myocyte affect atrial fibrillation. Atrial fibrillation is attributed to breakup of electrical spiral waves in the atrium. We varied conductance and recovery time constants of sodium, calcium, and potassium ion channels and investigated the robustness and breakup of spiral wave in 2D tissue. We found that larger inward currents (or smaller outward currents) and longer recovery constants destabilize rotors in general. However, there are many exceptions to it. These behaviors can be partially explained by action potential duration restitution. The theoretical advancement in this study will provide novel insights into the mechanisms of atrial fibrillation and predictions for experimental and clinical studies.

Analysis of Hippo Milk From Mother After Premature Birth

Camerin Rencken
Sponsor: Maria Marco, Ph.D.
Food Science & Technology

A premature hippo born at the Cincinnati Zoo was required to be hand-reared. To devise a nutritionally appropriate formula, milk samples were acquired from it's mother, days 1, 3, 8, and 9 postpartum, and were assayed for sugar, protein, fat, mineral, and water content, using standard methods validated for multiple species of mammals at the National Zoo's Nutrition Laboratory. The sugar content remained steady (mean = 4.5%; range of 4.3-4.7%). The fat consistently increased from 0.48% to 4.24% (mean = 2%). The protein content gradually decreased from 9.56% to 6.39% (mean = 8%) until day 8, and elevated on day 9. The dry matter (DM) ranged from 14.38%-16.72%, meaning water content was 85.62%-83.28%. The sum of the solids (sugar, protein, fat, and ash) averaged 98.5% of measured DM. Fat content was lower than expected, but within the range of other artiodactyls. Between days 1 and 8, the trend of decreasing protein and increasing fat was consistent with a change from colostrum to mature milk. The increase in fat and protein on day 9 likely was due to involution of the mammary gland and the cessation of lactation. This information was used by the Cincinnati Zoo to formulate a milk replacer.

The Association Between Migration and Depression Among Adolescent Latinas

Juan Reyes
Sponsor: Mary Lou de Leon Siantz, Ph.D.
Betty I Moore Nursing School

Latina adolescents report higher depression rates compared to any other group in the United States (Twenge & Nolen-Hoeksema, 2002). Depression is the most prevalent mental health condition affecting Latina adolescents. This may be attributed to the lack of discrepancy in acculturation between parents and adolescent teens. This study examined the effect of migration and the psychological well-being of first-generation Latina adolescents in the Central Valley of California. This study used both qualitative (focus groups) and quantitative (surveys/questionnaires) methodology measures to get a full insight of the association between migration and depression. All participants had a history of close ties to migration from Mexico. Experienced primarily by their parents, 89% reported being born to immigrant parents. Data was associated with participants own migration experience or through their parents migration experience. The findings from this study shed light for the need educational programs aimed at depression prevention and availability of treatment for Latina girls coping with depression.

Identifying Health Concerns Among the Latino/a Population in Davis

Rosa Reyes
Sponsor: Brian Trainor, Ph.D.
Psychology

There are many factors that contribute to the health disparities that the Latino/a population faces in the United States. These include cultural, social, environmental and economic factors. There is research devoted to increasing our knowledge on these factors and recent studies have found that accessibility to health resources is a significant factor that influences these health disparities. The systematic variation of accessibility in combination with cultural factors, particularly in Latino/a populations, should be considered when developing health resources that cater to this population. To be able to create culturally relevant health resources, we are identifying health concerns via self-assessment among the adult Latino/a population who has visited The Davis Community Clinic. To identify these health concerns, we are using the Adult Staying Healthy Assessment questionnaire created by the California Department of Health Care Services. The questionnaire's 27 questions range in categories such as nutrition, sexual issues and mental health. Our goal is to identify health concerns to improve support resources in The Davis Community Clinic and make the resources more accessible to the Latino/a population. Subsequently, this improvement could be expanded to other clinics to create more culturally competent health assessments more broadly.

Comparison of Ectoparasites in Urban and Exurban Populations of the San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Jane Riner
Sponsor: Janet Foley, D.V.M.,Ph.D.
VM: Medicine & Epidemiology

The San Joaquin kit fox is a small carnivore endemic to the San Joaquin Valley. Habitat loss and degradation resulting from urbanization and agricultural development have led to the species decline, and a recent sarcoptic mange epizootic threatens survival of an important urban population. Additionally, land conversion has promoted the invasion of more cosmopolitan species including domestic cats and dogs, raccoons, skunks, coyotes, and non-native red foxes. Fleas are common ectoparasites and vectors for various pathogens that affect wildlife, domestic animals, and humans. Given the status of the kit fox and the generalist predators by which it has been recently surrounded, we describe and compare flea fauna on remnant kit fox populations from urban and exurban areas. Of 270 fleas collected, 269 fleas from 49 foxes were identified to species. We will determine if flea load (number of fleas per host individual) is a risk factor associated with urbanization, presence of sarcoptic mange, age, sex, body condition, and season. Further research regarding fleas of San Joaquin kit foxes may serve to assess potential disease risks, as the introduction of vector-borne disease in conjunction with habitat loss and other stressors may pose threats to viability in this vulnerable population.

Uncovering the Role of PLK-1 During *C. elegans* Spermatogenesis

Cassandra Rios
Sponsor: Joanne Engebrecht, Ph.D.
Molecular & Cellular Bio

During meiosis, proper chromosomal alignment is necessary to produce viable, haploid gametes. This project aims to determine how the conserved Polo-like Kinase-1 (PLK-1) regulates spindle attachments and chromosome segregation during Caenorhabditis elegans male meiosis. The working hypothesis is PLK-1 senses chromosome alignment and when this is achieved, PLK-1 trans-locates from kinetochores to the mid-bivalent region to promote chromosome segregation. To experimentally test this, I am using three approaches. First, I am using syp-1 and zim-2 worms to determine if chromosome alignment is sensed on a chromosome-by-chromosome basis or if all chromosomes must be aligned before PLK-1 translocates. syp-1 worms have univalent chromosomes and zim-2 worms have unpaired chromosomes. Second, I am using the drug colchicine to destabilize microtubules; it is expected PLK-1 is required for proper microtubule attachments. Third, I am generating a PLK-1::GFP tagged worm using the CRIPSR/Cas9 system to monitor the localization of PLK-1 in live cells. This will be critical to determine whether PLK-1 translocates once proper chromosome alignment has been achieved. Together these results will provide further insights into the function of PLK-1 during spermatogenesis and ultimately male infertility.

The Yugoslav Crisis: Applicable Lessons on Nationalism

Hugo Rios
Sponsor: Michael Collins, Ph.D.
History

Ethnic conflict in Yugoslavia illustrates how modern nationalists use manipulation to generate public support and classify specific political, ethnic, or religious groups as threats to acquire political power. The Yugoslav Wars of the 1990s, a prime example of ethnic conflict, resulted from the failure to resolve such tensions. Yugoslav leader Marshal Tito pursued policies of "Brotherhood and Unity" in his Communist country, rejecting the exploitative relationship between the Soviet Union and other Communist states. While I believe he had good intentions, Tito's plan to grant more autonomy to nationalities under the Constitution of 1974 ignored Serbs outside of Serbia and underestimated Serbian nationalism. Due to these changes, Serbs remembered historical victimization inflicted by non-Serbs and feared more persecution if Yugoslavia collapsed; protecting Serbs outside Serbia eventually became a justification for military intervention. Serbian nationalist Slobodan Milosevic, believing that Kosovo's Serbs were oppressed by an ethnic Albanian majority, seized this opportunity to gain political power in the 1980s. Focusing on minority rights and recognizing sources of ethnic conflict will be important in preventing such future struggles. Moreover, the Russian government's claim to protect ethnic Russian minorities in Ukraine resembles the Yugoslavian crisis, and similar lessons could be applied to that disagreement.

Self-Regulation in Buddhism and Christianity: An Investigation of Hypo-Egoic Phenomena

George Rivera
Sponsor: Naomi Janowitz, Ph.D.
Religious Studies

Self-regulation has received a great deal of attention from researchers in cognitive science, psychology, and religious studies over the past few decades. This highly adaptive ability corresponds to an individual's capacity to inhibit first responses, resist interference from irrelevant stimulation, and persist with relevant tasks even when they are unpleasant. Researchers have shown that religion promotes the ability to self-regulate, however, the relationships between specific religions and specific modes of self-regulation have yet to be investigated. A hypo-egoic approach to self-regulation involves relinquishing deliberate, conscious, control over behavior so that one is able to respond more naturally, spontaneously, or automatically. Conversely, a hyper-egoic approach could be said to involve high levels of self-reflection and effortful self-control. I hypothesized that Buddhism endorses hypo-egoic regulation more and hyper-egoic regulation less than Christianity. I tested my hypothesis by designing and administering a survey to self-identified Buddhists and Christians here at UC Davis. It appears that hypo-egoic regulation is promoted equally by Buddhism and Christianity. However, the survey results also indicated that Christian thought is indeed correlated more strongly with hyper-egoicism than Buddhist thought. In the present work, I discuss these matters more fully and indicate the most promising directions for future research.

A Kinesin-Ii Complex Interacts With LINC Complex to Promote DNA Repair in *Caenorhabditis elegans*

Foxy Robinson
Sponsor: Joanne Engebrecht, Ph.D.
Molecular & Cellular Bio

The Linker of Nucleoskeleton and Cytoskeleton (LINC) Complex is essential for conserved cellular and developmental processes, including nuclear migration, anchorage, and mechanotransduction. LINC spans the nuclear envelope, linking microtubules and nuclear lamin through motor proteins. Studies have shown LINC participates in DNA repair to promote Homologous Recombination by inhibiting Non-Homologous End Joining. However, the motor proteins involved in this process have not been identified. Kinesin-II, a motor protein complex, functions in intraflagellar transport, cilia assembly, and axonal transport. Further, a screen found cells depleted of Kinesin-II components are hypersensitive to irradiation. I hypothesize that components of Kinesin-II function alongside LINC in the cytoplasm to promote Homologous Recombination in the nucleus. To identify the kinesin(s) responsible, I used the roundworm model organism Caenorhabditis elegans to conduct a progeny inviability assay. I treated worms depleted of Kinesin-II components, klp-11, klp-20, kap-1, with the DNA crosslinking agent cisplatin, and compared their progeny viabilities. My results show KLP-11 and KAP-1 are required for efficient DNA damage repair, suggesting they form a heterodimer protein to interact with LINC in the cytoplasm. Further analysis is needed to confirm kap-1 DNA crosslink sensitivity, and the interaction between KLP-11, KAP-1, LINC, and error-free repair.

The Role of Yolk in Sperm Positioning in *C. elegans*

Azucena Rocha
Sponsor: Francis McNally, Ph.D.
Molecular & Cellular Bio

During female meiosis the diploid number of chromosomes is reduced and then restored after fertilization. Fertilization occurs during female meiosis in animals, which suggests that there is a mechanism that prevents interaction between the meiotic spindle and sperm DNA. After fertilization in C. elegans, the sperm DNA is positioned on the opposite end of the embryo from the meiotic spindle. Depletion of profilin, a protein required for polymerization of F-actin, in C. elegans meiotic embryos results in the sperm DNA being closer to the meiotic spindle, but the distance the sperm DNA from the cortex remains unchanged. This shifted the focus onto the yolk and its role in sperm positioning in an embryo. Yolk is packed in the middle of the embryo in between the meiotic spindle and sperm DNA. Vitellogenin receptor, rme-2, was depleted using RNAi. In separate experiments, rab-7 was depleted by RNAi. rab-7(RNAi) embryos have yolk that is more tightly packed in the middle of the embryo. Four measurements were taken; sperm to spindle, sperm to cortex, yolk to cortex and embryo length. No significant differences were found between control, rme-2(RNAi) and rab-7(RNAi). These results suggest that yolk may not contribute to sperm positioning.

DNA Library for Transgenic Marker Lines of *Solanum lycopersicum* and *Solanum pennellii*

Alan Rodriguez
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

With increasing evidence of global climate change, researchers are putting efforts toward understanding how stresses like flooding and drought affect agricultural production. In order to better understand how plants respond to these stresses the Brady lab has created a cell type atlas in both the domesticated Solanum lycopersicum and drought-tolerant S. pennellii. In these marker lines, a root cell type-specific promoter is used to drive expression of a nuclear envelope or a ribosomal tag. These marker lines are used to characterize cell type-specific gene expression patterns in response to stress. These markers were inserted in the respective genomes using Agrobacterium tumefaciens-mediated transformation. In my project, I am identifying insertion sites and copy number of marker genes in 135 lines. I have characterized expression patterns of cell type-specific promoters in our marker lines and created a T-DNA insert sequencing library. The final step in this project is to use bioinformatics to extract insertion site locations from our sequencing libraries. With the insertion site locations, PCR primers can be made for each marker line allowing for selection of individual plants within a line that are homozygous.

General Stressors, Experiences of Discrimination, and Internalized Homonegativity Predict General Distress in LGBTQ Individuals

Marissa Rodriguez
Sponsor: Paul Hastings, Ph.D.
Psychology

Ubiquitous hassles and stressors impact the lives of the general population. However, lesbian, gay, bisexual, transgender, and queer (LGBTQ) individuals experience unique stressors associated with heterosexism because of their sexual minority group membership. Experiences of LGBTQ discrimination have been shown to severely impact self-perceptions (i.e., devaluation of the self) and mental health. Our study examined whether experiences of LGBTQ discrimination and negative self-perceptions for being LBGTQ (i.e., internalized homonegativity; IH) would predict psychological distress more robustly than general stressors. Furthermore, we predicted that IH would moderate the associations between LGBTQ discrimination and general distress. Our findings showed that LGBTQ discrimination, IH, and general stressors were positively associated with each other and with general distress. These findings demonstrate that general stress and IH predicted general distress, but IH moderated the links between LGBTQ discrimination and general distress (R^2=0.58, F(6, 95)=7.95, p<0.01). Participants who reported more experiences of LGBTQ discrimination showed more general distress when they also reported having more IH (b=0.35, t(3, 98)=2.17, p<0.05). These findings suggest that experiences of discrimination towards one's sexual orientation are a form of stress that when coupled with high IH yield more negative health outcomes.

Fortune 500 Companies in Social Media: Communication Patterns

Andres Rodriguez Lombeida
Sponsor: Jorge Pena, Ph.D.
Communication

This study examined the communication style of Fortune 500 companies in the primary (e.g., raw materials), secondary (e.g., manufacturing), and tertiary (e.g., services) economic sectors that communicate through social media. An automated analysis of Facebook and Twitter entries of the companies reveals that primary sector companies use more words, more positive emotion words (e.g., thanks, honored, support), and more work-related words (e.g., CEO, office, company), but fewer second personal pronouns (e.g., you, your) in their posts in comparison to secondary and tertiary sector companies. In addition, companies used more words and more second person pronouns on Facebook but more negative emotion words on Twitter (e.g., pain, problem). On Facebook, primary sector companies posted longer updates and tertiary companies used more second person pronouns. On Twitter, primary sector companies used more work-related words. The study illustrates how companies from different economic sectors tailor their communication with their audience on social media.

Generating Photo-Induced Self-Cleaning Functions on Treated Cellulose

Carmen Romo Duardo
Sponsor: Gang Sun, Ph.D.
Textiles & Clothing

In recent years, photo-induced textile dyes and colorants have attracted attention due their oxidative functions under fluorescent or UVA light irritation. The photopolymerization functions of these dyes create oxidative functions to form singlet oxygen, superoxide and hydroxyl radicals also known as reactive oxygen species (ROS). When exposing the ROS to water, one can create hydrogen peroxide molecules as a mild self-cleaning reagent, which I try to attempt in my research. I used photosensitive 2-anthraquinone carboxylic acid (2-AQC) in the presence of N,N-carbonyldiimidazole (CDI) in dimethylformamide (DMF) solvent. The 2-AQC reacts with the hydroxyl groups in cellulose via esterification in the creation of the hydrogen peroxide used for anti-bacterial properties. In my research, I tested reaction times a 1:3:7 AQC-CNC-CDI ratio to achieve the optimum production of hydrogen peroxide molecules. Lastly, I analyze the esterification and grafting ratio of AQC on cellulose, and amounts of hydroxyl radical and hydrogen peroxide generated by AQC-Cellulose by using FT-IR and UV-Vis.

Phonological Features of Jewish American English

Ingrid Rosenthal
Sponsor: Georgia Zellou, Ph.D.
Linguistics

Jewish identity in America is complex and can be reflected through one's religious, cultural, or linguistic behavior. One marker of Jewish American identity is a distinct pronunciation style. For example, prior work has shown that Orthodox Jewish American English speakers are more likely to pronounce an unflapped medial /t/ (e.g., enunciated "t" in words like "butter") and a released final /t/ (e.g., enunciated "t" in words like "coat") than non-Jewish speakers. However, it has not been studied whether the same pronunciation patterns are exhibited in the speech of non-Orthodox American Jews, a more diverse population. The current study investigates /t/-variation in Jewish American English. Speakers who identify as ethnically, but not religiously, Jewish will be interviewed using traditional sociolinguistic methods designed to elicit a range of speaking styles: word list reading, passage reading, and spontaneous speech from interview questions. The data collected will be compared to previous linguistic studies on speech patterns of religious Jews as well as non-Jewish speakers. Preliminary results from one speaker reveal a high rate of final released /t/ pronunciation. Results from this study will be discussed in terms of use of phonological variation as a sociolinguistic marker of Jewish identity in America.

When Yawning Occurs in Elephants

Zoë Rossman
Sponsor: Lynette Hart, Ph.D.
VM: Population Hlth & Reprod

This study aimed to describe yawning in elephants, a previously unreported behavior. Considering the widespread occurrence of yawning among mammals, one would expect that elephants should also yawn. Following preliminary data collection that confirmed the presence of yawning in Asian elephants in a zoo setting, this study was carried out with 9 captive African elephants (Loxodonta africana) at a private reserve in South Africa. Observations were conducted daily on 7 of the elephants that were managed for interactions with tourists. At night, all 9 elephants were maintained in an enclosure where they were illuminated with infrared lights, and continuously recorded by video cameras. Yawning occurred regularly when elephants awakened from recumbent sleeping/resting bouts (recumbencies), especially following the final recumbency before morning. All observed elephants exhibited yawning, and yawning occurred significantly more frequently in some individuals. Yawning was rare during the daytime and during nighttime periods was only associated with arousal from recumbency. There were also 6 occurrences of potential contagious yawning observed. This study is, to our knowledge, the first to describe yawning patterns in elephants. These findings contribute to the knowledge about elephant behavior and provide a useful comparison for factors influencing yawning and contagious yawning across different species.

Impacts of Maternal Behavior on Juvenile Play

Delaney Roth
Sponsor: Erin Kinnally, Ph.D.
Psychology

The function of play in primates is not well understood, but previous studies suggest that play in adolescence may impact life-long social skills. The early factors that contribute to juvenile play behavior may be significant as well. Mother-infant interactions are formative and the quality of care can be critical in development. This study intends to understand the relationship between mother-infant relationships and juvenile play behavior. Twenty-five juvenile rhesus macaques will be observed twice a week for four months. Mother-infant behavioral observations were previously recorded for our juveniles. Juvenile social interactions are recorded using a transactional coding scheme and juvenile play behavior with focal scans based on an ethogram that was previously developed for other projects. We aimed to test the hypothesis that infants with mothers that displayed poorer care (aggression or rejection) would be more likely to initiate play and respond with play as juveniles. Also, we will determine if sex differences play a role in the impact maternal behavior has on juvenile play. A significant relationship between maternal behaviors and juvenile play behavior would highlight the importance of mother-infant relationships and demonstrate how early maternal behavior impacts juvenile play, which can then impact skills and behaviors in adult life.

Assessing the Effect of Justice Violations on Spontaneous Perspective-Taking

Julianna Roy
Sponsor: Jeffrey Sherman, Ph.D.
Psychology

Gollwitzer and Rothmund's (2009) 'SeMI' model proposes that people high in victim-sensitivity tend to react strongly to perceived injustice. As they seek to restore justice they do so with an egocentric bias, failing to account for the perspectives of others around them. Previous research has investigated the effect of justice violations on deliberate perspective-taking. In contrast, no research to date has investigated its effect on spontaneous perspective-taking. The present study investigates the extent to which victim-sensitive participants are able to spontaneously assess visual information from others' perspectives when they perceive injustice. We manipulated perceived injustice by having participants complete either fair or unfair variant of the Ultimatum Game. Following this, we measured spontaneous perspective-taking with the Level-1 Visual Perspective-taking task (Todd, Cameron, & Simpson, 2016). We predicted that individuals who are high in victim-sensitivity will make more egocentric errors in the perspective-taking task when exposed to unfairness in the Ultimatum Game. This work adds to our understanding of early cognitive processes that relate to egocentric perspective taking in the face of injustice.

Truth or Dolos: The Disconnect Between Language, Suffering, and Experience in Frankenstein and the Philoctetes

Lauren Rudewicz
Sponsor: Seeta Chaganti, Ph.D.
English

My project will read an ancient Greek and a British Romantic text together in order to identify across them languages for expressing the unique suffering and isolation caused by chronic illness. In Sophocles' Philoctetes, verbal communication between characters is so often complicated by the lies, pain, and confusion that arise in attempting to convey one's individual suffering to an other. Over two millennia later, Mary Shelley's Frankenstein invokes those same concerns, although more often through the performative utterances of confessions and admissions of guilt. I hope to discover through the understanding of verbal communications the ways in which Frankenstein both imitates and differs from the Philoctetes. From here my project attempts to define in what ways tragic resonances appear in Shelley's gothic novel, and determine how generic difference might differently shape the vocabularies to articulate suffering and to incite a listener to action. I posit, ultimately, that language is insufficient to provide a vocabulary with which an afflicted subject might connect with a community unfamiliar with their condition. The categories of language which arise in response to this insufficiency allow an articulator to connect with their listener, but at the expense of the articulator's ability to represent their suffering accurately.

Necessary Criteria for Bullying: What They Are and How They Matter

Emma Rudolph
Sponsor: Nicholas Palomares, M.D.,Ph.D.
Communication

Bullying constitutes any behavior by individuals or a group that repeatedly communicates inappropriate levels of aggression or hostility intended to inflict harm on others. There exist instances where people receive hurtful messages that are not considered bullying because they do not meet all the criteria of bullying. The main question for my research is: How does prototypical bullying differ from other instances of receiving hurtful messages? The survey examines the circumstances surrounding instances of receiving these hurtful messages, the content of the messages, and the reactions of the victims to these messages. Three different categories of receiving hurtful messages are examined: prototypical bullying, receiving hurtful messages that meet some but not all qualifications of bullying, and receiving hurtful messages that is not traditionally considered bullying. Comparing across these three categories, I seek to understand the level of hurtfulness of the message and the means of bullying to investigate an important, yet understudied, aspect of communication and social interaction—bullying. This study will contribute to research to bullying by taking steps toward understanding hurtful messages and their consequences across instances when they are considered prototypical bullying or not.

Piezoelectricity of Beta Solenoid Proteins

Noe Ruiz
Sponsor: Daniel Cox, Ph.D.
Physics

Piezoelectricity is a relatively new topic as an application in the field of biological physics, discovered in 1880, there are many applications yet to be accessed. Piezoelectricity is a property of a material to be able to produce an electric field due to the accumulation of charge as a result of the mechanical stress applied to it. Materials exhibiting this property are also reversible, such that they are able to produce a mechanical stress with an applied electric field. These materials have already been used in scientific instrumental techniques serving as the basis for scanning probe microscopy. The application of interest is in the self-assembly of bioengineered amyloid protein aggregates for biotechnology and nanomaterials specifically beta solenoid proteins arranged in a 3-fold symmetry. Various properties of these beta solenoid proteins have already been analyzed such as their stability, tensile strength and ability to form amyloid fibrils. It is also hypothesized that they will exhibit piezoelectric properties due to their geometric structure. This will be verified by producing an array of beta solenoid proteins on the molecular dynamics simulator Groningen Machine for Chemical Simulations (GROMACS) and analyzing its effect on the dipole moments due to the mechanical stresses applied.

The Evolution of Female-Limited Color Dimorphism in *Drosophila montium* Subgroup

Gayane Saakyan
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

Female-limited color dimorphism (FLCD) is a phenomenon in the Drosophila montium subgroup where females have two abdominal color morphs, while males have only one color morph. Some species in this subgroup lack FLCD, making it possible to compare regulatory regions causing color in only one sex. Current research from the Kopp lab shows that FLCD in D. serrata is controlled by a non-coding region of pdm3, a transcription factor that represses dark abdominal pigmentation. To determine how the equivalent non-coding region functions in species without FLCD, I investigate its function in a closely-related species, D. birchii. I cloned the fragment from the first intron of pdm3 into two separate vectors: pBPGUW and pGreenFriend to compare GFP expression driven directly or indirectly by GAL4 and injected them into D. melanogaster embryos. I am crossing the transformed embryos and comparing the GFP expression patterns of the progeny. I hypothesize that the GFP expression pattern in D. birchii will be greater than that of D. serrata. This will allow us to investigate how non-coding pdm3 regions are different between species with and without two female abdominal colors and if they play a significant role in the absence or presence of FLCD in Drosophila.

Does What the Chickens Eat Affect the Chicken We Eat?

Natalia Sachs
Sponsor: Michael Mienaltowski, D.V.M.,Ph.D.
Animal Science

As the poultry industry is breeding larger and faster-growing chickens to meet consumer demand, meat quality is being compromised by the increased incidence of myopathies. This study seeks to determine if the essential amino acid methionine in by-products is a suitable substitute for synthetic methionine and has a sufficient bioavailability to promote optimal growth and development in broiler chicks. Fifteen broiler chickens that were fed a traditional 100% corn/soy diet are being compared to fifteen fed an alternative diet containing by-products comprised of 60% corn/soy, 20% sunflower seed meal, and 20% roasted cowpea for six weeks. Gross visual analyses and gene expression analyses using qPCR are to be completed on the pectoralis major and pectoralis minor muscles, and a hydroxyproline assay to determine collagen content will be performed on the pectoralis major muscles. These approaches will be used to determine the differentiation of cell types in pectoralis major muscles and the incidence of inflammation in pectoralis minor muscles. It is hypothesized that diets with by-products providing methionine allow for growth similar to diets containing artificial methionine, and white striping will be decreased in birds with slower growth rates.

Age Influences Relationships Between Tests of Working Memory, Verbal Fluency, and Language Experience

Emma Sadlowski
Sponsor: Tamara Swaab, Ph.D.
Psychology

Psychologists typically treat working memory, verbal production capacity, and language experience as dissociable cognitive constructs. However, recent evidence indicates that the tests typically used to assess these abilities may not be as dissociable. Two tests typically used to measure working memory are a math-based operations task and a general-knowledge-based listening task; while these measures may have a common memory component, they may also uniquely be affected by task-specific skills. Additionally, two tests used to measure production capacity – verbal fluency for letters and categories – may differently correlate to vocabulary. In order to investigate this possibility, and see if age influences the relationships between these measures, we tested 40 younger and 40 older adults on a battery of cognitive tasks and performed factor analyses to construct latent variables. While working memory tests are highly associated with each other, listening span shares more with vocabulary knowledge than operations span. Meanwhile, while letter fluency is related to vocabulary, category fluency is only correlated with vocabulary in older adults. These findings suggest that the tests used to measure cognitive abilities may underlie multiple constructs, and the relationships between abilities and tests may be affected by age.

The Effects of Sunflower Bloom Orientation on Seed Yield and Germination Rates

Sana Saeed
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Sunflower is an important crop species for oil production and is known for its ability to follow the sun. Heliotropism is the mechanism where by juvenile sunflower buds track the sun across the sky from east to west, through asymmetric stem growth, before reorienting at night to face east in preparation for the next day. As the plants mature, their movement decreases and eventually stops with the blooms uniformly facing an easterly direction. Almost all organisms have an internal circadian clock that synchronises their biological processes to daily changes in the environment and a previous study showed that sunflower heliotropism and flower orientation is regulated by the clock. In this study we aimed to investigate what effect an easterly orientation has on the flower size, seed yield and germination rates. Seeds were collected from two independent trials of east and west-facing sunflower heads grown in mid and late summer. Our preliminary results indicate that east facing plants produce a greater number of heavier seeds, however west facing flowers appear to have a higher germination rate (9.88%). These results suggest that sunflower head orientation affects flower and seed properties and could have important implications for the plants' reproductive ability.

Sleep Deprivation in Hospitalized Patients Over the Age of 60: Methods of Recruitment and Data Collection in a Pilot Study

Rafal Saeed
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Chronic sleep deprivation in older adults contributes to dementia, cardiovascular disease, and mortality, but has not been studied in a hospital setting. We conducted a pilot study in an 81-bed community acute-care hospital in Tracy, California to evaluate the quantity and quality of sleep among inpatients age 60 and older. The study goal was to evaluate the association between sleep and hospital outcomes such as length of stay, delirium and re-admissions with hopes to develop a pilot study to address findings with an evidence based approach. Outside of being at least 60 years of age, eligibility criteria includes: an expected length of stay of at least one night, no cognitive impairments, and fluency in English or Spanish. We measured sleep with 24-hour wrist actigraphy and sleep diaries, and collected patient reported outcomes through in-person questionnaires. There are several important elements to successful recruitment and participant retention for research in a hospital setting. Having assistance from the Chief Medical Executive, 25 highly-trained college-aged volunteers, and nursing staff proved to be essential to this type of study.

Using CRISPR/Cas9 to Study the Trogocytosis Mechanism in *Entamoeba histolytica*

Natalie Sahabandu
Sponsor: Katherine Ralston, Ph.D.
Microbiology & Molec Genetics

The Ralston lab focuses on studying the molecular mechanism by which Entamoeba histolytica a eukaryotic amoeba and parasitic pathogen, causes disease. Our lab discovered that the pathogen nibbles on the human cell leading to its cell death. This process was named trogocytosis (trogo-: nibble). My research focuses on identifying previously uncharacterized genes in trogocytosis to define its underlying molecular process. To accomplish this, I am using the CRISPR-Cas9 genome editing tool. If successful, this will mark the first known gene-specific knockout in E. histolytica. For this project, I am creating a guide RNA (gRNA) that is specific for green fluorescent protein (GFP) so that we can first verify the CRISPR-Cas9 in E. histolytica will be effective. Once I am able to demonstrate the functionality of CRISPR-Cas9 in the amoeba by interrupting the GFP gene, I will extend this method to characterize putative trogocytosis genes. Since trogocytosis is likely to underlie the tissue damage that occurs during infection in humans, in the long run, my studies will help improve understanding of how E. histolytica causes disease.

Biofilm in Neonatal Feeding Tubes: Bacterial Composition, Relationship to Gut Microbiota, and Potential Clinical Predictors

Lauren Salinero
Sponsor: David Mills, Ph.D.
Food Science & Technology

Tube feeding is a common practice in Neonatal Intensive Care Units (NICUs); however, feeding tubes have been found to harbor large communities of microbes that may put vulnerable infants at risk. In this study, 16S ribosomal DNA sequencing technologies were used to identify the bacteria present in 100 feeding tubes and 92 fecal samples collected from NICU patients. The types of bacteria found in the pharyngeal, esophageal, and gastric sections of the feeding tubes, as well as in residual liquid held in the tubes, will be characterized separately and compared. The relationship between feeding tube biofilm composition and gut microbiota will also be evaluated. Furthermore, clinical data such as the frequency of tube changes, gestational age of the patient, use of probiotics, and type of nutrition (mother's own milk, pasteurized donor milk, or formula) will be used to identify clinical factors associated with particular patterns of biofilm composition. Ultimately, the findings of this study may help inform clinical decisions and guide NICU protocol in order to minimize infants' exposure to harmful microbes.

Parental Alienation: A Comparison of Family Court Professionals' Perceptions

Janelle Sampana
Sponsor: Gail Goodman, Ph.D.
Psychology

Allegations of Parental Alienation ("PA") (systematic disparaging of one parent by the other parent in an attempt to alienate their child's affections) as a basis for child custody decisions is highly controversial: They are even more so when claims of PA are coupled with abuse allegations. Critics argue that legal recognition of PA will increase biases against female parents and discredit reports of maltreatment as de facto alienation. Comparisons between family court professionals' views in Brazil (where PA is statutorily recognized) and the US (where there is no such recognition) permit study of putative outcomes. Brazilian and US professionals (N = 365) read three custody scenarios varying as to whether they included either or neither allegations of parental hostility or allegations of maltreatment. For each scenario, the alienating parent's gender was varied between subjects. Participants rated the likelihood that each case involved PA and the appropriateness of three putative recommendations. Statistical analyses revealed significant differences between Brazilian and US professionals: in the scenarios involving allegations of parental hostility and sexual abuse, Brazilian compared to US professionals rated parents as more alienating. Implications for family court policies will be discussed.

Carbonate Limited Calcite Precipitation for Optimization of Urea Consumption

Alexandra Camille San Pablo
Sponsor: Jason Dejong, Ph.D.
Civil & Environmental Engr

Current ground improvement techniques utilize heavy, energy intensive industry equipment and or energy intensive materials, such as Portland Cement, that have significant environmental impacts. Microbially Induced Calcite Precipitation (MICP) is an environmentally conscious ground improvement technique that utilizes ureolytic bacteria to biologically mediate the cementation process of soils. MICP can effectively increase the strength and stiffness of sandy soils, making it an alternative to conventional ground improvement techniques including permeation grouting and soil mixing. This research project is now focused on optimizing the treatment formulation, specifically urea and calcium chloride, to achieve the required performance while minimizing the carbon footprint and financial cost. Five soil columns will be varied with differences in ratios of urea and calcium chloride for the stimulation and cementation treatment solutions. Calcium chloride concentration will remain constant and urea concentration will vary. Soil columns will be stimulated with the same number of treatments to establish similar native ureolytic microbial populations. The duration of cementation treatments will vary depending on cementation solution. pH, urea degradation, shear wave velocity, calcite content, and unconfined compressive strength will be monitored.

The Role of Lrmp in the Movement of Chromosomes During Telomere Bouquet Formation

Meghal Sancheti
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

Meiosis is a process of cell division important for halving the number of chromosomes during gamete formation. Defects in the pairing of homologous chromosomes during meiosis can result in aneuploidy and developmental disease. During prophase 1 of meiosis, rapid chromosomal movement occurs and a transient telomere bouquet forms wherein the ends of the chromosomes cluster together in a region of the nuclear envelope. To enable this movement, the telomeres are connected to the cytoskeleton via the LINC complex which consists of a SUN protein, located on the inner nuclear membrane, and a KASH protein, located on the outer nuclear membrane. Zebrafish are a useful model to investigate the formation and function of the telomere bouquet because of their transparent gonads and accessible cytology. In zebrafish, lrmp is one of six proteins containing a KASH domain. My hypothesis is that lrmp facilitates the movement of chromosomes towards the telomere bouquet and helps in homolog pairing. To test this, I will conduct telomere staining and chromosomal spreads in lrmp mutant zebrafish. This work will help to identify the components involved in the formation of the telomere bouquet and could be used to test the role of the telomere bouquet in homolog pairing.

Identifying Knowledge Structures of Introductory Chemistry Students

Jose Sandoval
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Studies have shown that students in general chemistry have difficulty with problem solving, which is influenced by many variables, including how students organize knowledge in their minds. This study explores students' knowledge structures, defined as the network of related concepts in the mind, and how they are related to different factors including gender and prior knowledge in chemistry and math. A word association test was developed by selecting major concepts in general chemistry as stimulus words to which students were asked to provide ten response words that came to mind within ninety seconds of reading each stimulus word. The top twenty-five most frequently used responses for each stimulus word were used to calculate relatedness coefficients, which measure how closely stimulus words are linked in the students' minds. Finally, two network generating programs, Pathfinder and Gephi, were utilized respectively to interpret these relatedness coefficients and determine knowledge structures. Our data indicate structural differences in the organization of concepts in students' knowledge structures based on gender and background in math and chemistry. Our findings will inform changes in curriculum which would place more emphasis on related topics that seem weakly connected in the knowledge structures to promote conceptual understanding.

Subunit Exchange Among CaMKIIdelta

Elliot Sandvig
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

CaMKIIdelta is an important regulator of cardiac function and dysfunction in pathological states. Understanding CaMKIIdelta regulation is thus imperative, yet little is known about the spatiotemporal dynamics of CaMKII signaling in cardiomyocytes. Recent studies suggest subunit exchange between CaMKIIalpha holoenzymes contributes to the spread of CaMKIIalpha signaling. Whether this holds true for CaMKIIdelta isoforms is unknown. Here we take a FRET approach using in vitro mixing experiments, to determine if subunit exchange occurs between homo- and hetero-multimers of CaMKIIdB and dC isoforms. First site-directed mutagenesis was used to generate wildtype, T287A, and T287D variants of CFP/YFP-CaMKIId isoforms (dB and dC).We find that after mixing independently expressed CFP-CaMKIIdC and YFP-CaMKIIdC without activation, FRET did not occur. FRET was observed after activation of CaMKII with Ca/CaM and ATP or after mixing with the constitutively active TD mutant. Similar results were obtained after mixing dB/dB and dB/dC. Our results indicate CaMKIIdelta activation initiates subunit exchange. Further experiments are planned to determine if this mechanism governs CaMKIId signaling in cardiomyocytes in vivo.

Is California Stuck in Trafficking?: Utilizing the California Fusion Centers to Combat Human Trafficking

Georgia Savage
Sponsor: Rana Jaleel, J.D.
Gender, Sexuality & Women's Studies

In the summer of 2016, I interned at the Central California Intelligence Center (CCIC), a fusion center funded through the Department of Homeland Security which gathers intelligence in its area of responsibility through Suspicious Activity Reports (SARs) submitted by law enforcement and the public. The fusion centers also provide a variety of free trainings for law enforcement and first responders. My interest was specifically in the human trafficking trainings offered and their effectiveness, measured by the intake of human trafficking SARs submitted following these trainings. I was also able to determine how effective the trainings were over time, the regions which were underreporting SARs, the type of human trafficking reported and statistics regarding the reporting party. While my data analysis indicates effective sex trafficking education, it also highlights the absence of labor trafficking education and consequently lack of labor trafficking SARs. Therefore, the second half of this paper offers a critiques the current state of affairs, which reflects the sentiments of the CCIC in that sex trafficking is prioritized over labor trafficking, both societally and politically. I will continue by offering solutions to this problem in the CCIC as well as diplomatic relations and policies.

Method of CD5 Downregulation on B-1a Cell Lymphocytes Supports Hypothesis That B-1a and B-1b Subsets Are Not Distinct

Sanjam Sawhney
Sponsor: Nicole Baumgarth, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Fundamental questions remain on the characterization of certain immune effector cells, with B-1 cells in particular appreciating renewed interest. Though numerically a small subset of B cell lymphocytes, these cells are responsible for the majority of the body's "natural antibody production," serum IgM antibodies secreted without prior stimulation by foreign antigens. Prevailing literature subdivides B-1 cells into two distinct subpopulations, B-1a and B-1b cells, a distinction made based on the presence or absence of the CD5 surface protein. Conflicting data regarding the role and function of these B-1 cell subsets currently exist in the literature and the developmental pathways of either subset have not been elucidated. Ongoing research in the Baumgarth lab now suggests that CD5-expressing and non-expressing B-1 cells are not in fact distinct populations; rather, B-1a cells downregulate CD5 expression in response to antigen stimulation. My research examines whether the downregulation of CD5 by B-1a cells occurs at the mRNA level or through regulation of surface protein expression, and how quickly this downregulation occurs. Preliminary data suggest that both mRNA expression and surface expression of CD5 are decreased after three days of in vitro stimulation, so I will be focusing on CD5 expression at earlier time points.

The Environmental Robustness of a Point-Of-Care WBC-Differential Instrument Used to Screen for Highly Infectious Diseases

Mykhaylo Sayenko
Sponsor: Gerald Kost, M.D.,Ph.D.
MED: Pathology & Lab Medicine

Point-of-care (POC) instruments perform rapid diagnoses at or near patient sites, useful in regions of high risk diseases. Changes in WBC and lymphocyte counts determined by optical scanning can help identify communicable infections, such as Ebola virus disease, and stop spread. We evaluated the environmental robustness of a POC WBC-Differential instrument under high and low temperatures encountered during field use. POC instruments must withstand environmental stresses in order to achieve high impact and help prevent outbreaks through early detection where cases first appear. Human whole-blood measurements were obtained in simulated hot and cold, and static and dynamic conditions versus room temperature control. Humidity was held constant to eliminate that confounding variable. We used Student's t-test for paired differences. Findings indicate that dynamic high temperature (> 30°C) impairs WBC-Diff measurements. Additionally, the time spent between microcuvette filling and instrument loading can produce inaccurate readings. Month-long storage of reagents at static high temperatures (~50°C) did not affect paired differences significantly (P>0.05). We conclude that the WBC-Diff instrument and future POC devices: a) must be evaluated for environmental limits, b) can perform well within objectively defined temperature brackets, and c) should be robust enough to withstand environmental stresses in limited-resource epidemic settings.

Percy Jackson and the Olympians: Adapting Greek Mythology for a Middle Grade Audience

Breanna Schenkhuizen
Sponsor: Cheryl Ross, Ph.D.
Comparative Literature

Starting in 2005, Rick Riordan began adapting Greek mythology in his middle grade novel series, Percy Jackson and the Olympians. The unique relationship between Riordan as both an educator and parent and the adolescent audience with which he is so familiar drives this adaptation. Riordan pulls much of his story from Greek mythology, but specifically adapts it to be appropriate for a middle grade audience, toning down sexuality and violence. Characters not taken from mythology are a composite of Riordan's own experience with adolescents, created from modern psychological theories of adolescent development to serve as models for adolescent readers. Percy Jackson and the Olympians has become a New York Times bestseller, popular enough among readers to result in two movies, a number of tie-in books, and several follow-up series. Studying the series allows for insight into one way to understand and connect with an adolescent audience. The series also suggests one way that classical mythology can be conserved in modern times.

Case Study Examining the Relation Between Social Communication and Vocabulary Outcomes in Autism Spectrum Disorder

Ciara Schnitzer
Sponsor: Emily Solari, Ph.D.
Education

Researchers have long been interested in understanding the role of social communication in educational learning. Children with autism spectrum disorder (ASD) experience difficulties with social communication, and these difficulties have been shown to contribute to challenges in academic achievement. This study investigates opportunities for social communication within the vocabulary instruction component of a reading comprehension study with school-age children with ASD. Vocabulary development in children with ASD may be impaired due to their difficulties with social communication. Therefore vocabulary attainment and intervention needs to be further understood in children with ASD. The current study examines the degree to which the frequency of social interactions are related to vocabulary learning outcomes. These frequencies will be analyzed using Noldus software, and the communicative behaviors will be dichotomized into frequencies of initiating and responding. Frequencies of these social behaviors will then be compared to the accuracy of defining vocabulary words at intervention post-test.

Uncovering Arcadia: A Re-Examination of William Blake's *Illustrations to the Pastorals of Virgil*

Katharine Schultz
Sponsor: Diana Strazdes, Ph.D.
Art

In nineteenth-century Britain, various landscape painters fashioned images of Arcadia as an expansive, pastoral terrain bathed in golden light, an ideal that had been established by the French painter Claude Lorrain (1604-1682) centuries earlier. These idyllic Arcadian scenes are entirely transformed in the English poet, painter, and printmaker William Blake's (1757-1827) Illustrations to the Pastorals of Virgil. In this series of woodcuts, Blake fashions bleak and melancholic Arcadian images that illustrate the Eclogues, a collection of ten poems by the ancient Roman poet Virgil (70 BC-19 BC). While previous scholarship has characterized Blake's woodcuts as unusual Arcadian scenes due to their dark and visionary portrayal of the pastoral landscape, my research demonstrates that both the desolate and imaginative elements of Blake's illustrations are precisely what make his works Arcadian. In examining both the intricate Arcadian landscape first forged by Virgil and the Arcadia of Blake's illustrations, it is evident that like Virgil, Blake created Arcadian visions permeated by human emotion. Blake's woodcuts, therefore, are significant because they complicate the view of Arcadia as an untroubled pastoral landscape, revealing that Arcadia can be understood as a realm built on the complex realities of human experience.

The Role of Oxytocin in a Rodent Model of Diet-Induced Obesity

Alexandria Scott
Sponsor: Karen Bales, Ph.D.
Psychology

Obesity, an increasingly widespread problem in the US, is associated with many health complications, including heart disease and type II diabetes. Previous studies have indicated that treatments using oxytocin, a neuropeptide involved in energy balance and social bonding, are effective in reducing food intake and weight gain in a number of species, including humans. In this study, we will be examining the effect of oxytocin on food intake and weight change in prairie voles, a monogamous species of rodent. Their social nature allows us to examine the possibility of social effects on feeding behaviors. The voles will be paired up and assigned to one of three different dietary conditions: both animals on a special high-fat diet (HFD), both animals on a regular diet, or one partner on each. The voles' food intake and weight will be measured weekly for four months before beginning a 15-day treatment period. During the treatment period, they will be subjected to daily intranasal oxytocin or saline treatments. Based on previous studies, we expect the oxytocin treatments to result in weight loss and the reduction of caloric intake; social effects will be assessed by comparing results across conditions.

Defective Follicle Formation in Mice Lacking Breast Cancer Associated Gene BRCA2

Amelia Sequeira
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Homologous recombination is an error-free mode of DNA repair where a damaged strand copies the information from the intact chromosome to repair the damage. This mode of DNA repair is essential to maintain the genomic integrity in both somatic and germ cells. In somatic cells, BRCA2 regulates RAD51 loading onto DNA double-strand breaks, which is a crucial step in catalyzing strand exchange between DNA strands undergoing homologous recombination. This study pursues to improve the understanding of Brca2's role in regulating meiotic recombination, specifically in ovarian follicle number and viability. We used mouse model with Brca2's conditional allele, more specifically mice containing a floxed Brca2 allele were crossed with lines expressing Cre recombinase under meiosis-specific promoter Spo11. To understand the role in follicle formation, immune-stained histological sections of ovaries from Brca2 conditional mutants and age-matched controls were analyzed. Brca2 mutants show a significant decrease in follicle number compared to controls. Moreover, the total number of live born pups were significantly less in Brca2 mutant females compared to the control. From these results, we conclude that Brca2 has an essential role in ovarian follicle formation and viability.

Evaluation of Cross-Feeding During Bifidobacterial Growth on Milk Oligosaccharides

Karishma Sethi
Sponsor: David Mills, Ph.D.
Food Science & Technology

Bacterial cross-talk plays an important role in the healthy development of the human gastrointestinal tract. Specifically, members of the genus Bifidobacterium dominate the infant gut via their ability to metabolize human milk oligosaccharides (HMOs), a significant component of breast milk. Some bifidobacteria have been shown to cross-feed other bifidobacterial strains during glycan metabolism. B. bifidum, a common probiotic, consumes HMOs using extracellular glycosyl hydrolyses, releasing monomers like fucose in the extracellular milieu. In this work, cell-free spent media (CFSM) from B. bifidum grown on specific, purified HMOs was examined for its ability to cross-feed pathogens. In vitro growth studies show that CFSM isolated from B. bifidum, but not B. longum subsp. infantis, supports the growth of specific proteobacteria. Unlike B. bifidum, B. longum subsp. infantis wholly transports the HMOs to the inside of the cell for metabolism resulting in limited availability of sugars in the CFSM. Current experiments are focused on the analysis of specific purified HMOs in combination with different bifidobacterial strains to understand the outcome on pathogen growth and to evaluate the contents in the CFSM. These analyses can enable the rational design of probiotic treatments to reduce possible enrichment of pathogenic bacteria in the infant gut.

The Neuromorphological Effects of Chronic Early Exposure to Oxytocin as a Treatment for Autism

Venus Shabgahi
Sponsor: Karen Bales, Ph.D.
Psychology

One of the core indicators of autism spectrum disorders (ASD) is the exhibition of social deficits. Though there are behavioral interventions that help them acquire social skills, there are no FDA-approved drugs for the treatment of autism. Recently oxytocin, the hormone involved in social interactions and bonding, has become a promising treatment option for the social symptoms of autism. However, the developmental side effects of chronic, early-life exposure to oxytocin remain unknown. This project will use monogamous titi monkeys as a useful model to determine whether there are long-term morphological effects on the brain size and volume due to daily doses of intranasal administration of oxytocin or saline during adolescence. Using magnetic resonance imaging, I am going to measure the volume of the ventricles which contain cerebrospinal fluid that oxytocin is found in after intranasal administration. I hope to find no morphological differences between the intranasal saline and oxytocin groups which would confirm the safety of the treatment and rule out a potential neural side effect. This research will directly contribute to the development of a better treatment for the social symptoms of autism.

Characterization of the Dynamic Localization of Human CTP Synthetases

Bita Shahrvini
Sponsor: Enoch Baldwin, Ph.D.
Molecular & Cellular Bio

CTP synthetases (CTPSs) are ubiquitous, conserved enzymes that produce the essential nucleotide CTP from UTP. CTP is a precursor for DNA and RNA, is required for phospholipid and saccharide biosynthesis, and is necessary for cell proliferation. For these reasons, CTPS is a therapeutic target for anticancer, antiparasite, and antiviral drugs. As part of their complex regulation, CTPSs undergo dynamic changes in localization and aggregation. Upon live imaging of fluorescently-tagged CTPSs in MCF10A human breast cells, hCTPS2 aggregates to form filaments, particularly under glutamine deprivation. Under normal growth conditions, however, we observe mobile hCTPS2 puncta localizing at cell-cell contacts at the periphery. To elucidate the function of punctate localization we investigated what cellular elements hCTPS2 puncta are associated with. We stained MCF10A cell lines expressing fluorescent hCTPS2-Venus fusions with fluorescently-labeled antibodies against organelles, specific proteins, and cytoskeletal elements. We will also identify signaling inputs responsible for controlling both punctate and filament localization from the effects of specific inhibitors and stimulators. Demystifying CTPS's localization mechanism contributes to understanding the roles of biosynthetic enzyme localization in cellular homeostasis, and could potentially aid in the design of therapeutic CTPS-targeted agents.

Generation and Phenotypic Analyses of PCNT Null Cell Lines

Hashim Shaikh
Sponsor: Li-en Jao, Ph.D.
MED: Cell Biology & Human Anat

The centrosome is the major microtubule organizing center in animal cells and is crucial for cell division, migration, and signaling. It consists of a pair of centrioles surrounded by a protein-dense matrix, pericentriolar material (PCM). The PCM nucleates and anchors microtubules, and thus dictates the microtubule-organizing activity of the centrosome. An integral component of the PCM is pericentrin (PCNT), which recruits other proteins to the centrosome during PCM expansion at the onset of mitosis. Mutations in PCNT have been causally linked to microcephalic osteodysplastic primordial dwarfism type II (MOPDII), a condition characterized by skeletal abnormalities, dwarfism, and microcephaly. Using the CRISPR/Cas9 gene editing system and flow cytometry, we have generated several PCNT null cultured retinal pigment epithelium (RPE1) cell lines. Preliminary studies using antibody staining have shown that loss of PCNT resulted in reduced growth rates and defects in microtubule nucleation. We are currently assessing what other cellular functions in these PCNT knockout cells are also affected, including the ability of these cells to generate cilia and to faithfully segregate chromosomes. These cell lines are the first established PCNT null stable cell lines and will serve a valuable tool to study the cellular function upon the loss of PCNT activities.

Morphometrics of Angulate Tortoises

James Shamlian
Sponsor: Teresa Steele, Ph.D.
Anthropology

Tortoises are commonly found in archaeological assemblages, and thus appear to have been an important food resource for past human groups. Archaeologists have collected osteometric data (measurements) on recovered tortoise bones. Mostly they have measured the humerus; the medio-lateral breadth of the distal epiphysis and the breadth of the diaphysis have been used and assumed to relate to overall body size. Additionally, ecologists have analyzed full body metrics on the basis of sex and related them to overall body mass. However, a reliable, archaeologically significant osteometric proxy for overall animal size and sex estimation has yet to be established using externally valid and statistically viable methods. There has been only limited research conducted on the allometrical relationships between the skeletal elements of Chersina angulata, or angulate tortoises. This study analyzes measurements taken on the skeletons of 50 angulate tortoises collected after they died from natural brush fires in South Africa. We successfully identify a statistically significant relationship between distal humeral breadth and overall tortoise size. Exploration of sex estimation was limited by small sample size. This work allows for a more reliable inference into harvesting pressure and conversely, human population size, at sites where tortoise remains are present.

Healthy Women, Healthy Lives: Introduction of Women's Health Issues in the Undergraduate Curriculum

Malavika Shankar
Sponsor: J. David Furlow, Ph.D.
Neuro Physio & Behavior

Studies reveal that exposure to undergraduate research is one of the primary ways of engaging students in scientific thinking and practices, but it also plays a role in students' future educational and career trajectories. What resources exist nationally to assist the incoming freshman and transfer students with their access to such experiences, and how might such practices be supported at UC Davis? Data was collected from institutions nationally, including the University of Southern California (USC), and the University of Texas (UT), to evaluate the presence of current freshman year research programs and services. Specific programs to include freshmen in undergraduate research were not universal. Based on studies at Wichita State University, the combination of research in a first year seminar has been shown to increase graduation rates and increase retention in STEM majors for underrepresented minority students. This leads to my proposal for the combination of a hands on first year research seminar, particularly in the field of women's health at UC Davis. A focus on the field of women's health would promote discussion on campus in this vital area, and support interdisciplinary research projects across the social and biological sciences. Additional research is needed to examine the feasibility, impact, and structure of a hands on interdisciplinary research seminar in the field of women's health, with a model proposed here based on our findings.

Degradable Alginate Hydrogels for Controlled Release

Shonit Nair Sharma
Sponsor: Eduardo Silva, Ph.D.
Biomedical Engineering

Ischemic vascular disease remains the leading cause of death worldwide. Gene therapy presents a promising route for treating vascular diseases. However, the delivery of genetic vectors needs to be spatially and temporally controlled to reduce off-target effects and promote site-specific efficiency. Alginate hydrogels have been used to achieve controlled delivery of small molecule drugs and proteins, but the sustained release of large viral vectors has proven difficult. We hypothesize that imparting degradative properties on alginate hydrogels will allow for an increased release rate of sterically hindered cargo. A gelation method was developed to cross-link polymer chains with a divalent cation to produce uniform alginate hydrogel disks. We then created hydrogels that varied in their percentage of hydrolytically labile polymers and studied their capacity to encapsulate and release surrogate lentivector particles. The mechanical and swelling properties of these various alginate hydrogels were then measured and fitted to a nonlinear viscoelastic degradation model. Our results confirmed that degradative properties of alginate hydrogels influence the release kinetics of the large particles. For future application, we can engineer hydrogels composed of different percentages of degradable polymers to achieve a full range of release profiles, thereby providing the needed control to therapeutically administer lentivectors.

Design and Synthesis of Bithiazole Compounds Containing Amides Close to Sulfur, Showcasing the Sulfur-Lone Pair Interaction

Marina Shatskikh
Sponsor: Mark Kurth, Ph.D.
Chemistry

Bithiazoles are used to correct defective cellular processing of the ΔF508 mutant cystic fibrosis transmembrane conductive regulator (CFTR) protein. Misfolding of this protein prevents proper maintenance of chloride and sodium ion gradients, which has adverse effects on osmotic balance. The result of this is increased water retention within cells, dehydration of the extracellular space and onset of cystic fibrosis. Constrained bithiazoles were recently used by our group for correction of ΔF508 CFTR protein function. These bithiazoles have an improved effectiveness compared to non-constrained bithiazoles because they are reported to have more favorable entropy of binding in formation of the corrector-bound-CFTR complex due to the presence of a sulfur-lone pair interaction. Currently, we are investigating the extent of this effect within bithiazoles. Two bithiazole compounds containing amides close to sulfur were designed and synthesized to showcase the sulfur-lone pair interaction. This interaction will be explored further through oxidation reactions, such as those using oxone, bleach, hydrogen peroxide and similar reagents. It is hypothesized that through this lone pair interaction we can modulate sulfur's reactivity. Insights from this work have implications for enzyme structure, design and drug development, especially in small molecule drug libraries generated in silico.

Generation of Human-Induced Pluripotent Stem Cells From CD34+ Cord Blood Cells by a Non-Integrating RNA Sendai Virus Vector Under Xeno-Free Conditions

Ayman Shehadeh
Sponsor: Jan Nolta, Ph.D.
MED: Div Of Internal Med

The use of stem cells in clinical trials is hindered due to the use of animal products in both the generation and culturing of stem cells. Another concern is the limited availability of somatic cells capable of returning to a fully pluripotent state. Cells expressing the marker CD34+ are more stem-like, making it easier to revert them back to a pluripotent state. CD34+ cells can also be easily isolated from blood and expanded under xeno-free conditions. The purpose of this study was to generate a clinically compliant iPSC line using CD34+ cells from cord blood by eliminating all animal based products used in its production and expansion. We successfully transduced and generated several lines of iPSC with a non-integrating viral vector containing OCT4, SOX2, KLF-4, and c-MYC on Corning Synthemax, a xeno-free support system that is used in lieu of mouse embryonic fibroblasts (MEF). All lines stained positive for the pluripotency transcription factors Nanog, SOX2, and OCT4. Overall, the results of this study show that the generation of iPSC from CD34+ cells is possible under xeno-free conditions, making us one-step closer to clinically compliant stem cell treatment.

Fatness and Body Positivity: Beyond a Framework of Whiteness

Sarah Shemery
Sponsor: Ryan Cartwright, Ph.D.
American Studies

Body positivity has been rooted in the notion of loving your body. However, popular BP campaigns and representations have traditionally only included bodies that are conventionally attractive, cis-gendered, white, and able-bodied. There is little inclusion of marginalized bodies, such as disabled bodies, Black and Brown bodies, queer and transgender bodies and fatter bodies. In analyzing popular fat representation, I show how BP culture brings timid inclusion of some fat bodies while excluding others. In comparing popular representations of fat bodies, I show how representation of bodies once deemed "unconventional" are identical and exclude other fat bodies with intersecting identities. Fatness is celebrated and accepted when attached to white female bodies. Famous women who are considered champions of the BP movement have built careers capitalizing on the notion that they are more valuable for living up to Eurocentric beauty standards, whereas women and femmes of color have been excluded and juxtaposed in opposition to a culture that promotes whiteness as a universal goal. These representations do nothing to challenge beauty standards that harm bodies that aren't white, cis-gendered or able-bodied. Fat women and femmes of color have little to no representation in these movements, whereas those who are lighter-skinned are hyper-humanized.

Morphological Consequences of Habitat Transitions in Teleost Fish

Erin Shen
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

A wide variety of teleost fish inhabit marine habitats, freshwater habitats, and even intermittently both environments. This transition from freshwater to marine habitats poses an interesting question: how is the morphological diversity of fishes affected by the change in environment? As marine habitats are generally more complex, they support more niches. Consequently, fishes in these habitats should have a higher degree of diversity when compared to their freshwater counterparts. This morphological diversification in relation to habitat transitions has never been understood on such a large scale. Using both traditional and geometric measurements on a set of over 1000 teleost specimens from the Smithsonian, we will compare standard length and other morphological traits, such as body depth and width, between the freshwater and marine habitats. We predict a positive correlation between standard length and the other measurements. However, following the trend of more diversity in marine habitats as a result of more available niches, we hypothesize that the variation of body measurements (range) when compared to standard length is greater in marine teleosts. Overall, this will be an important step in discovering what particular habitats contribute most to body shape evolution and understanding the relationships between ecological opportunity and morphological diversification.

Spatial and Temporal Considerations When Quantifying Passive Knee Torque

Shyamal Sheth
Sponsor: David Hawkins, Ph.D.
Neuro Physio & Behavior

Over 6 million knee injuries occur in the United States annually. Understanding mechanical properties of the knee is important for developing injury prevention and repair interventions. Many knee studies involve positioning the knee at a specific angle and quantifying the passive knee torque. However, such studies do not typically consider the direction of approach to, or time at, an angle when quantifying passive torque. Due to the viscoelastic properties of knee structures, this omission may confound knee torque measurements. In this study, we tested the hypothesis that passive knee torque at a specific angle is different if that angle is approached from flexion versus extension. The right knee of participants (n=3) was tested using a Biodex Isokinetic Dynamometer. The Biodex moved the knee to 140° either from a more flexed or extended position, and held that angle for 30 seconds. Tests were repeated 5 times and the average torque at 140° was calculated for each direction and compared using a paired t-test. A significantly greater passive knee torque ($p<0.05$) occurred when approaching from a flexed versus extended position (Torque difference=3.38 N-m). Future research should consider the effect knee motion direction has on passive knee torque during testing procedures.

Neural Correlates of Compassion and Empathy

Michelle Shi
Sponsor: Paul Hastings, Ph.D.
Psychology

Morality plays a fundamental role in human social interaction, behavior, and daily decision-making. Compassion and empathy are critical sources of morality, and these "moral emotions" are intrinsically interpersonal, unlike basic emotions. In this project, we will examine the brain bases for individual differences in the tendency to feel and express moral emotions. Participants (N=30) self-reported their proneness for empathy and compassion using the Interpersonal Reactivity Index, Compassionate Love Scale, and Dispositional Positive Emotions Scale. Participants also underwent fMRI during which they were presented with moral, positive, and neutral valenced pictures taken from the International Affective Picture System. We will be examining how the brain responds to the morally challenging and positive/affiliative contexts as compared to the neutral contexts, and whether self-reported compassion and empathy predicts brain activity in response to these different contexts. Compassionate and empathic people are expected to show more activity in regions of the brain associated with emotion (e.g., insula, amygdala) and perspective taking (e.g., medial prefrontal cortex) in response to the moral pictures compared to the neutral pictures, and more activity in regions associated with motivation and value (e.g., striatum) in response to the positive/affiliative compared to neutral pictures.

Functional Characterization of Wild Mice as a Model for Cardiac Aging

Minyoung Shin
Sponsor: Nirmala Hariharan, Ph.D.
MED: Pharmacology

Aging is a risk factor for heart disease, the leading cause of death in the US. Cardiac aging is accompanied by loss of function and by telomere shortening. Telomeres are repetitive nucleotide sequences that protect chromosomes and their length is maintained by telomerase. Cardiac dysfunction and heart failure coincident with telomere shortening are evident in telomerase knockout mice. However, the cardiac phenotype in the knockout mice are evident after several generations of breeding because mice have long hypervariable telomeres. Interestingly, however, Mus musculus castaneus (CAST), a wild mouse strain, have been previously demonstrated to have short telomeres similar in length to humans, making them ideal models to study cardiac aging. The goal of our study is to characterize the cardiac function in the CAST mice as compared to common laboratory mouse strains such as FVB and C57. CAST mice exhibit smaller left ventricular volume and inner diameter as demonstrated by echocardiography based analyses. Additionally, E/A ratio is significantly lower suggesting diastolic dysfunction which is consistent with clinical manifestation of cardiac aging. Further studies will determine the cellular mechanism of how CAST mice undergo diastolic dysfunction.

The Role of Oxytocin in a Rodent Model of Diet-Induced Obesity

Amira Shweyk
Sponsor: Karen Bales, Ph.D.
Psychology

Obesity, an increasingly widespread problem in the US, is associated with many health complications, including heart disease and type II diabetes. Previous studies have indicated that treatments using oxytocin, a neuropeptide involved in energy balance and social bonding, are effective in reducing food intake and weight gain in a number of species, including humans. In this study, we will be examining the effect of oxytocin on food intake and weight change in prairie voles, a monogamous species of rodent. Their social nature allows us to examine the possibility of social effects on feeding behaviors. The voles will be paired up and assigned to one of three different dietary conditions: both animals on a special high-fat diet (HFD), both animals on a regular diet, or one partner on each. The voles' food intake and weight will be measured weekly for four months before beginning a 15-day treatment period. During the treatment period, they will be subjected to daily intranasal oxytocin or saline treatments. Based on previous studies, we expect the oxytocin treatments to result in weight loss and the reduction of caloric intake; social effects will be assessed by comparing results across conditions.

Serving Decolonial Realness: A Visual Praxis in Indigenous Memory, Sovereignty and Survivance

Valentin Sierra
Sponsor: Hulleah Tsinhnahjinnie, M.F.A.
Native American Studies

Arriving at the intersections of art and politics, this projects maps the trajectories of Indigenous memory through sickness, relocation and gender performance. This multipart photography project draws upon the theoretical workings of Queer Indigenous Studies as an intervention into the coloniality of western gender binaries. Drawing upon the work of José Esteban Muñoz, the duality of queer and Indigenous place/space transformation is called into question as a discursive performative act by looking at intergenerational memory. Through the lens of HIV/AIDS, seedy night clubs and gay bath houses are (re)examined as sites of potential trauma and decolonization through their positions as locations facilitating that what is beyond the temporal. Centering the queer, urban and Indian identity, I aim to emphasize the practice of calling into memory ancestral knowledge and survivance through music, dance, and drag gender performance. Each photograph depicts an element of this project in fleshing the theory into a visual praxis.

The Moderating Role of Ethnic Centrality Between Perceived Stigmatization and Anxious Arousal Levels in Latinx Individuals

Andre Sillas
Sponsor: Paul Hastings, Ph.D.
Psychology

Little is known whether perceived racial discrimination impacts mental health above and beyond perceived general stressors in the general Latinx community. Further, less is known whether ethnic centrality, or defining one's self primarily as Latinx, confers risk or resilience. This study examined the associations between perceived stigmatization by others, general perceived stress, and ethnic centrality on psychological distress. We hypothesized that perceived stigmatization would robustly predict anxious arousal when compared to general perceived stress. Further, we hypothesized that stronger ethnic centrality would moderate the associations between perceived stigmatization and anxious arousal such that individuals who reported high ethnic centrality and who perceived more stigmatization would show the highest anxious arousal. Latinx participants completed measures of perceived discrimination and general stress, ethnic centrality, and anxious arousal. Our results suggested that perceived ethnic and general stress predicted symptoms of anxious arousal (R^2=0.33, F(6, 94)=7.81, p<0.01). Also, ethnic centrality moderated the association between perceived stigmatization and anxious arousal. Participants who perceived more stigmatization and were more ethnic centric showed more anxious arousal (b=0.62, t(3, 97)=5.90, p<0.001). These findings suggest that, in the context of perceived stigmatization, ethnic centrality may underscore a person's racial or ethnic identity status and therefore exacerbate anxious arousal.

Value Orientations and Household Chaos in a Sample of Mexican-American Families

Selena Silva
Sponsor: Leah Hibel, Ph.D.
Human Ecology

The interactions a person has with their environment influences their cognitive and emotional development. Household chaos is a long-term living environment characterized by crowding, high noise levels, and a lacking of regular routines (Coldwell et al., 2006, Wachs 2005). Children who experience household chaos display lower academic performance and social competence, and higher levels of behavioral problems, including difficulties in regulating emotion and engaging in riskier health behaviors (Coldwell et al., 2006; Evans 2006). The belief in, and practice of traditional Mexican-American values enhance academic performance and decrease amounts of externalizing behaviors of adolescents by providing strong familial support systems (Gonzales et al., 2008; Coohey 2001). Building off this past research, we will examine individuals' relative application of Mexican-American and Anglo value systems, their assimilation level- the embodiment of Anglo values over traditional values, family support, and how these relate to perception of a chaotic household. Mexican-American families (n=30) with infants (age range=5-19 months) and mothers were assessed. We hypothesize that higher levels of Mexican-American values contribute to lower perceptions of household chaos. Further exploration may explain the importance of cultural ties and possible foundations for combating developmental stunts and issues that arise from chaotic environments.

EEG-Based Brain-Controlled Mobile Robots: Insights and Lessons

Gabe Simmons
Sponsor: Zhaodan Kong, Ph.D.
Mechanical & Aerospace Engr

With the rapid development of brain-computer interface (BCI) technology, researchers are now attempting to put current BCI techniques into practical applications, particularly by combining them with robotics. BCI systems translate signals from the central nervous system to device control signals. The goal of the project is to explore the possibility of controlling a mobile robot to perform simple navigation tasks by using electroencephalography (EEG) signals directly. Machine learning algorithms, such as common spatial patterns (CSP) and linear discriminate analysis (LDA), are used to extract a set of EEG features that are capable of accurately classifying human cognitive states, e.g., left turn intention and right turn intention. These features are then used by an online control algorithm to recognize a human operator's intention in real time and subsequently control the motion of a ground mobile robot. The insights and lessons learned from the project have significant practical implications for future neuroprosthetic devices and robotics.

An Eye Tracking Investigation of Attention Shifting Between Affective Central and Peripheral Faces

Riley Sims
Sponsor: Susan Rivera, Ph.D.
Psychology

Previous research indicates that infants differentially disengage from fearful faces compared to happy faces in the presence of non-face peripheral stimuli (Peltola et al., 2008). The current study uses an overlap eye tracking task to investigate the role of peripheral emotional stimuli in facilitating disengagement from centrally located emotional stimuli. Twenty 7- to 44-month-old children (projected N = 50) were shown trials in which a fearful, happy, or neutral face was displayed in the center of the monitor for 500 ms, followed by a fearful, happy, or neutral face in the periphery for 1500 ms. We conducted a one-way repeated measures ANOVA on average latency to fixate on peripheral fearful, happy, or neutral stimuli. This analysis revealed a main effect of emotion, $F(2, 38) = 6.757$, $p = .003$, $h_r^2 = .262$, such that participants oriented to peripheral fearful faces [M = .392, SE = .013] faster than peripheral happy faces [M = .471, SE = .023, p<.01] or peripheral neutral faces [M = .506, SE = .028, p < .01]. Though data collection is ongoing, these preliminary results support Fox et al.'s (2000) threat hypothesis, suggesting that threatening faces are easier and faster to process than non-threatening faces.

The Long-Term Effects of Intranasal Vasopressin on Social and Aggressive Behaviors in Prairie Voles (*Microtus ochrogaster*)

Alexis Singh
Sponsor: Karen Bales, Ph.D.
Psychology

Arginine vasopressin (AVP) is a neuropeptide known for its role in social behavior and pair bonding. Research indicates that AVP systems play a role in neurodevelopmental disorders like autism spectrum disorder (ASD). Current clinical trials are testing the therapeutic effects of intranasal AVP treatment on children with ASD. The purpose of our study is to determine the effects of this treatment on social and aggressive behaviors throughout development, using prairie voles (Microtus ochrogaster) as our animal model. To investigate the effects, we established four separate treatment groups: saline control, low-dose AVP (0.1 IU/kg), medium-dose AVP (1.0 IU/kg), and high-dose AVP (10 IU/kg). From postnatal day 15 to 21, voles were given intranasal treatment twice a day. To measure the long-term effects of the treatment, all subjects were tested as adults with a variety of behavioral paradigms, including intrasexual aggression and partner preference testing. We hypothesized that the effects of intranasal AVP treatment would differ by sex and would result in increased sociality and aggressiveness. Our findings will help inform clinical trials and will elucidate further the basic biology of the AVP system.

Effect of Oxytocin on the Vasopressin System in Areas of the Brain Associated With Feeding and Appetite

Bhavdeep Singh
Sponsor: Karen Bales, Ph.D.
Psychology

Oxytocin and vasopressin are hormones that regulate a variety of behaviors, including feeding and reproductive behaviors. Previous studies have shown that long-term treatment with oxytocin decreases food intake and weight gain in rodents, making oxytocin a potential therapeutic to target obesity. However, given the similar structure of the vasopressin receptor to that of oxytocin, it is possible that oxytocin affects feeding through the vasopressin system rather than its own receptors. Our experiment featured a 2 by 2 factorial design in which the rats were either treated with oxytocin or saline and given either a high fat diet or regular chow. To establish whether oxytocin treatment had any impact on the vasopressin system in these groups, my research will measure the optical binding density of vasopressin 1a receptors in key areas of the brain which regulate feeding and appetite. Frozen, unfixed rat brains were cryosectioned and processed for receptor autoradiography, and a radioactive ligand that binds to vasopressin 1a receptors was incubated on brain sections for visualization. The goal of this study is to hopefully demonstrate whether the long term treatment of oxytocin on the rodents acted through only the oxytocin receptors in the brain and not that of vasopressin.

Differentiating Non-Viable From Viable Cells in Stone Fruit Washwater Through the Use of Propidium Monoazide (PMA)

Mariya Skots
Sponsor: Trevor Suslow, Ph.D.
Plant Sciences

Correctly quantifying bacterial communities and assessing the microbiome associated with stone fruit washwater systems requires the differentiation of viable from non-viable cells. To accomplish this, quantitative polymerase chain reaction (qPCR) with and without pre-treatment using Propidium Monoazide (PMA) was evaluated. PMA permeates compromised cell membranes, which are considered non-viable, and photo-induction is used to covalently crosslink DNA, thus inhibiting PCR amplification. PMA is unable to permeate intact cell membranes of viable cells. By using qPCR with PMA treatment, the analysis of the bacterial population from fruit surfaces into washwater can theoretically be limited to viable cells. Experiments were conducted to test the effectiveness of PMA on reduction of the non-viable qPCR signal of Salmonella Poona. PMA concentration, temperature, light and darkness incubation time were tested. A set of chlorine disinfection experiments were performed on Listeria and Salmonella inoculated stone fruit washwater with viable and non-viable cells at various time intervals. PMA at 50µM and both light and darkness incubation time at 15 min, demonstrated to be effective for PMA treatment. After 15 seconds and 2 minutes of chlorine disinfection treatment, Salmonella and Listeria cells were non-viable, respectively.

Value Orientations and Household Chaos in a Sample of Mexican-American Families

Erin Smith
Sponsor: Leah Hibel, Ph.D.
Human Ecology

The interactions a person has with their environment influences their cognitive and emotional development. Household chaos is a long-term living environment characterized by crowding, high noise levels, and a lacking of regular routines (Coldwell et al., 2006, Wachs 2005). Children who experience household chaos display lower academic performance and social competence, and higher levels of behavioral problems, including difficulties in regulating emotion and engaging in riskier health behaviors (Coldwell et al., 2006; Evans 2006). The belief in, and practice of traditional Mexican-American values enhance academic performance and decrease amounts of externalizing behaviors of adolescents by providing strong familial support systems (Gonzales et al., 2008; Coohey 2001). Building off this past research, we will examine individuals' relative application of Mexican-American and Anglo value systems, their assimilation level- the embodiment of Anglo values over traditional values, family support, and how these relate to perception of a chaotic household. Mexican-American families (n=30) with infants (age range=5-19 months) and mothers were assessed. We hypothesize that higher levels of Mexican-American values contribute to lower perceptions of household chaos. Further exploration may explain the importance of cultural ties and possible foundations for combating developmental stunts and issues that arise from chaotic environments.

Testing Intron Sequences That Affect Gene Expression

Kevin Smith
Sponsor: Alan Rose, Ph.D.
Molecular & Cellular Bio

Gene expression is the conversion of information in a gene into a functional product. This process is mostly regulated by proteins binding upstream of the gene. However, it is becoming clear that downstream elements may also play an important role in gene regulation. Introns, which are noncoding sequences, are known to affect gene expression by causing an increase in mRNA through an unknown pathway called intron-mediated enhancement. In collaboration with our colleagues, we have identified a candidate intron sequence that may be involved. We are testing the importance of this sequence by placing different numbers of copies of this sequence into an intron that normally has no effect on expression. We have preliminary evidence from two introns that the sequence strongly increases expression in a dose-dependent manner. Using the full set of six introns we created should show whether or not it's a true regulator and as well if there is a limit to how much gene expression can be manipulated. This work could have importance in the biotechnical industry where we specifically manipulate expression of a certain gene to the desired level.

Neocolonialism in Nigeria: Old System of Opression - New Beast

Danielle Soba
Sponsor: Adewale Adebanwi, Ph.D.
African American African Stds

Nigeria, as a country, today should be prospering not only because of its high rate of human capital and rich resources, but also due to its flourishing entertainment industry, Nollywood. Many believe that the country's continual decline after years of colonialism and imperialism explains the reason for the high rate of corruption, violence, and war due to Nigeria's lack to govern properly. However, that is not simply the case. Although Nigeria is no longer under colonial rule, they are affected by a new beast entirely, neocolonialism. This research will focus on the effects of neocolonialism, a more economical power restraint, on Nigeria's bureaucracy. The study will highlight how neocolonialism cripples the civil service from governing successfully and enacting effective policies and laws that will benefit the population as a whole. Neocolonialism, which is taking place in many underdeveloped countries, not only halts national progress and well-being but also creates an environment that fuels on corruption, famine, sickness, war, and chaos.

Neuroprotective Potential of Psychedelics

Sina Soltanzadeh Zarandi
Sponsor: David Olson, Ph.D.
Chemistry

Stroke is the third leading cause of death in the United States and a major cause of disability in adults that may lead to physical impairment or cognitive deficits. During a stroke, the brain degenerates rapidly due to lack of oxygen that ultimately results in cell death. Neuroprotective agents such as brain-derived neurotrophic factor (BDNF) have the capacity to prevent irreversible injury of ischemic neurons. However, BDNF does not readily cross the blood-brain barrier which necessitates elaborate drug delivery methods. My research has focused on studying compounds such as N,N-dimethyltryptamine (DMT), ketamine and lysergic acid diethylamide (LSD) that readily cross the blood-brain barrier to potentially increase the production of BDNF and achieve neuroprotection. To test for this, in vitro cortical neurons were treated with glutamate or hydrogen peroxide to model a stroke. Thereafter, the cell cultures were treated with either DMT, LSD, or Ketamine and the extent of cell survival was quantified by using a colorimetric assay for assessing cell metabolic activity. Thus far, the use of DMT and Ketamine appear promising in achieving neuroprotection. Further work will include testing these compounds at varying concentrations and testing for BDNF-independent mechanisms of neuroprotection.

Sleep Deprivation in Hospitalized Patients Over the Age of 60: Methods of Recruitment and Data Collection in a Pilot Study

Rajbir Sooch
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Chronic sleep deprivation in older adults contributes to dementia, cardiovascular disease, and mortality, but has not been studied in a hospital setting. We conducted a pilot study in an 81-bed community acute-care hospital in Tracy, California to evaluate the quantity and quality of sleep among inpatients age 60 and older. The study goal was to evaluate the association between sleep and hospital outcomes such as length of stay, delirium and re-admissions with hopes to develop a pilot study to address findings with an evidence based approach. Outside of being at least 60 years of age, eligibility criteria includes: an expected length of stay of at least one night, no cognitive impairments, and fluency in English or Spanish. We measured sleep with 24-hour wrist actigraphy and sleep diaries, and collected patient reported outcomes through in-person questionnaires. There are several important elements to successful recruitment and participant retention for research in a hospital setting. Having assistance from the Chief Medical Executive, 25 highly-trained college-aged volunteers, and nursing staff proved to be essential to this type of study.

Bounds for the Minimum Step Number for Two-Component Links in the Simple Cubic Lattice

Melissa Spence
Sponsor: Francisco Arsuaga, Ph.D.
Molecular & Cellular Bio

The structural analysis of DNA molecules in spatial confinement has long been a topic of interest. Recently mathematicians have begun analyzing the natural linking in DNA to better understand its biological structure and function as well as its applications to nanotechnology. An important open question is to determine the minimal number of nucleotides necessary to build a DNA molecule with a pre-specified topology. Our research determines the minimum step number needed to form prime two-component links in the simple cubic lattice. Links are naturally found in mitochondrial DNA and also form during bacterial DNA replication. To accomplish this we are employing a Monte-Carlo algorithm known as the BFACF, which generates a Markov chain that samples the set of all polygonal conformations of a given link type in the simple cubic lattice. We examine all of the sampled polygons and select the one with the fewest edges. Our results include numerical bounds for the minimum step number for prime two-component links up to 9 crossings as well as their coordinate representations. These numerical bounds can be used to further the understanding of DNA in confinement and may be applied in the design of nanotechnological systems.

Capitol Chaos: Public Space, Protests, and Voter Turnout in California

Griffin Sproul
Sponsor: N. Claire Napawan, M.L.A.
Landscape Architecture & Sustainable Design

Public space's mission of being accessible to all has made it a facilitator of democratic action in the form of political protests. Protests drive changes in political agendas, policy, and leadership but is that the extent of their effects? If the effect of civic engagement in public space is not limited to protests but continues to affect voter turnout this finding could be a step toward solving California's low voter turnout problem. To explore tangible effects of the relationship between public space and democratic action this study examines the Sacramento Capitol building and grounds from January 1, 2004 through July 12, 2016. This research is supported by three main data sources: a database created to track political gatherings occurring at the Capitol, Public Policy Institute of California polling data on registered voter's job approval for the California Legislature, and data on voter turnout across all election types from the California Secretary of State. Preliminary research suggests the relationships between protests held in public spaces, public confidence in state government, and voter participation are difficult to definitively isolate because of the presence of intervening variables.

Painting Lions: Female Narratives Through Male Authorship in Chaucer's Wife of Bath

Emily Stack
Sponsor: Sara Petrosillo, Ph.D.
English

In Chaucer's Wife of Bath, a female narrator written by a male author poses persistent problems for feminist scholars. Can we understand Alisoun, the eponymous wife, as an authentic female voice, or is she simply a mouthpiece through which a male author ventriloquizes? I propose that reading Alisoun within her story rather than without—reading her not as a fictional woman in our real world but as a real woman in her fictional world—opens up a broad array of interpretive possibilities and offers a new way of understanding her. Rather than trying to pin down her often contradictory and hypocritical views as pro- or anti-woman by our 21st-century standards, looking instead at how she functions in the story allows us to understand her as a complex woman who defies simple compartmentalization, one who has control and authority over her own narrative and the narratives of women's lives. Reading The Wife of Bath in this way, beyond enriching the text itself, establishes, for any text where the identities of a character and the author are at odds, a new framework through which we can understand authorship, voice, and authority.

Academic Preparation, Cosmopolitanism, and Self-Efficacy of Chinese International Students at UC Davis

Caroline Staudenraus
Sponsor: Eddy U, Ph.D.
Sociology

International students are challenged to adjust rapidly to American culture while managing academic responsibilities. Acculturative stressors can harm students' well-being, academic performance, and self-confidence. American universities have seen an upsurge in the enrollment of international students from Mainland China have since the 1949 Chinese revolution. I hypothesize that these Mainland students have lower self-rated English confidence, lower-self efficacy, and inferior academic performance when compared to Chinese students from Hong Kong, Macau, Malaysia, Singapore, and Taiwan — countries that share cultural and linguistic similarities with China but have uninterrupted traditions of transnational education with American universities. I examine the impact of mental health, economic capital, cosmopolitan exposure, racial discrimination, and English education as dependent variables affecting academic experiences and self-efficacy. These dependent variables were selected based on a review of previous literature on the population of interest and after conducting open-ended pilot interviews with Chinese students at UC Davis. The research is based on survey data collected from Chinese international students at UC Davis. Results will be submitted to the Services for International Services and Scholars, as they have implications for the admission, orientation, and advising of international students from Mainland China.

Monkeying Around: Comparing Play Behavior in Relation to Predation Risk in Sympatric Olive Baboons (*Papio anubis*) and Vervet Monkeys (*Chlorocebus pygerythrus*)

Danielle Steinberg
Sponsor: Lynne Isbell, Ph.D.
Anthropology

Predation has long been considered a strong selective pressure on primate behavior— including tradeoffs with foraging and feeding. However, its effects on play behavior, a crucial aspect of primate life, are unknown. Feeding is necessary for survival, but play is imperative for later reproductive success. Olive baboons (Papio anubis) and vervet monkeys (Chlorocebus pygerythrus) are often sympatric but baboons are larger and more aggressive, suggesting that they may be less vulnerable to predation and thus may have longer or more frequent play bouts. Similarly, within species, male primates, being more aggressive than female primates, may be less vulnerable to predation and so may play more than females. I observed play behavior of baboons and vervets in Nyungwe and Akagera National Parks, Rwanda, to test these predictions. I used all-occurrence sampling to record frequencies and durations of play bouts and analyzed the data with nonparametric statistical tests. There were significant differences in play bout frequencies but not durations both between the species and between males and females within species. Future research should explore whether life history differences also contribute to differences in play behavior.

Neonatal EPEC-Induced Changes in the Microbiota-Gut-Brain Axis

Patricia Stokes
Sponsor: Melanie Gareau, Ph.D.
VM: Anat Physio & Cell Biology

Neonatal establishment of the microbiota-gut-brain axis is important for the development of the intestinal barrier, neurogenesis, and cognitive behavior in later life. Enteropathogenic Escherichia coli (EPEC) is an enteric bacterial pathogen that infects children in the developing world. Multiple pediatric infections are associated with development of cognitive defects in adulthood, however mechanisms through which this occurs remain unknown. We hypothesize that neonatal infection with EPEC will disrupt the development of the microbiota-gut-brain axis in adult mice. Given the critical role of the immune system in responding to enteric bacterial infections, we assessed expression of cytokines (IL-6, IL-10), Nf-kB signaling (IkB), and pattern recognition receptors (NOD1, NOD2) in the gut and brain in mice following infection. Mice were infected with EPEC on post-natal day 7 (P7) and tissues collected at weaning (P21) and adulthood (6-8 weeks). Our preliminary results indicate an increase expression of anti-inflammatory cytokines (IL-10) and intracellular pattern recognition receptors (NOD1, NOD2), and a decrease expression in pro-inflammatory cytokines (IL-6) in the ileum and hippocampus of EPEC-infected p21 mice compared to sham-infected controls. This change in inflammatory response suggests that neonatal infection can both impact locally within the gut and distally in the brain.

Context Fear Conditioned Mice Do Not Reliably Use the Presence of a Specific Odor to Predict the Presentation of a Mild Shock

Sassan Suarez
Sponsor: Brian Wiltgen, Ph.D.
Psychology

The hippocampus is a structure in the brain that is often associated with the formation of context memories. The amygdala is associated with fear and anxiety behaviors related to a specific context. The goal of this experiment was to test if animals could be trained to utilize the presence of a specific odor to predict the presentation of a mild electric shock; in this paradigm freezing behavior was used to determine discrimination between contexts. Animals were trained in a standard context-fear conditioning chamber that was cleaned with either NaOH (n=5) or EtOH (n=5), and freezing levels were measured. One day after training, mice were tested in a novel context with the presence of the odor they were trained with and freezing levels were measured. On the second day after training, mice were tested in the initial training context but with the opposite odor that they were trained with and freezing levels were measured. Results suggested that mice did not reliably use the presence of an odor to predict the presentation of a mild electric shock.

Effects of Parental Scaffolding on Infant Play

Rachel Suk
Sponsor: Lisa Oakes, Ph.D.
Psychology

There is increasing evidence suggesting the crucial role that parents play in their infants' cognitive development. Studies have shown that parental involvement in infant's play is correlated with increased infants' object-related interaction (Landry, Smith & Swank, 2006). Our study examines how particular aspects of parental scaffolding, the process in which infants learn a task under the guidance of an adult, affect infants' object exploration. In the study, six-month-olds participated in two 3-minute sessions in which they played with toys. In the first session, infants played either alone or with their parent. In the subsequent session, all infants played with their parent. The parents' and infants' object-related behaviors in the second sessions are analyzed to see whether parents who've have had more time to "scaffold" their infants by playing in both sessions behave differently from those who have just began playing with their infants. We also code and analyze joint touches to the toy as a measure of collaborative play. We expect that parents and infants who initially play together will show more sophisticated interaction and collaboration during this section session. This study will provide a better understanding of how parents can effectively aid in infants' developing ability to explore objects.

Measuring With Behavior How the Brain Commits to a Choice in a Simple Decision Task

Manying Sun
Sponsor: Timothy Hanks, Ph.D.
MED: Neurology

Have you ever wondered how your brain commits to a decision? The commitment to execute a decision relies on information you have on hand, the current situation and the implications of your decision. In this study, we analyze how humans control the balance between avoiding premature decisions and late decisions, and how the outcome of previous decisions affect the next decision they make. We use an auditory change detection task in which subjects detect a change in a fluctuating auditory stimulus. Each choice is made from the information subjects gather before the choice. This type of task allows us to better understand how sensory information given before a decision affects their commitment. We have a method to measure which parts of the proceeding information had influence for the choice. We found that subjects alter their decision strategies without altering when information influences their choice. We also discovered that subjects change their decision strategies when they make mistakes. This reduces the probability of them consecutively making the same type of mistake. Our study provides the framework for further studies that will strive to understand how the brain exerts flexible control over decision commitment.

The Effects of Kappa Opioid Receptor (KOR) Activation in the Dorsal Raphe Nucleus (DRN) on Social Behavior in *Peromyscus californicus*

Rajesh Supra
Sponsor: Brian Trainor, Ph.D.
Psychology

The kappa opioid receptor (KOR) is activated upon its binding to the endogenous opioid peptide dynorphin and similar ligands. KOR stimulation reduces serotonin release in the dorsal raphe nucleus, an area in the brain that possesses a substantial amount of serotonergic neurons. Prior research displays that the activation of the KOR promotes social avoidance in acute stress situations and low serotonergic neuronal activity. Paradoxically, research from our lab highlights an increase in the activity of serotonergic neurons when mice are exposed to chronic stress. The purpose of this research is to determine if injecting a KOR agonist (U50, 488) directly into the DRN of chronically stressed mice will facilitate a decrease in social avoidance. I will investigate this by exposing male and female mice (Peromyscus californicus) to social defeat, subsequently injecting U50,488 and then measuring for a reduction in avoidance behavior. Findings from this study may offer an effective clinical trial or solution to individuals suffering from social disorders and depression.

Behavioral Study of Attentional Control That Supports Flexible Template Adjustment

Michelle Swarovski
Sponsor: Joy Geng, Ph.D.
Psychology

Everyday tasks such as finding a friend on campus, involve the need to hold goal-relevant information in mind (i.e., the friend) and to selectively locate them amongst distractors (i.e., other people). The task-relevant information about the friend held in the mind is characterized as an "attentional template." Interestingly, the attentional template is known to shift in response distractor context in order to increase the distinctiveness of targets from distractors. The purpose of this study is to examine how information in the template is flexibly adjusted. To accomplish this we present subjects with a visual search task and an identification task in which a target color is identified among distractor colors. We hypothesize that the subjects with better performance in the visual search task will also have target representations that are shifted farther away from distractors and the true target color in the identification task. Therefore, the more distinct the target color template is from the distractor colors, the shorter response time in the visual search task. The current study will be used for a subsequent fMRI to identify the brain regions that encode shifts in target representation as a function of distractor context.

Characterizing the Microbiota-Gut-Brain Axis in a Murine Model of Pediatric Inflammatory Bowel Disease

Michelle Swedek
Sponsor: Melanie Gareau, Ph.D.
VM: Anat Physio & Cell Biology

Inflammatory bowel diseases (IBD) are chronic intestinal diseases affecting over 1.4 million Americans. Children and adolescents have more serious disease and are more likely to display extra-intestinal effects, including psychosocial deficits compared to adult patients. Unfortunately, the mechanism(s) through which these extra-intestinal deficits develop is unknown. Our overall goal was to develop a model of pediatric IBD and assess the microbiota-gut-brain axis in adolescent mice. Colonic inflammation was induced by administration of DSS (dextran sodium sulfate), a chemical known to cause colitis in rodents. Weanling mice (P21) were given DSS (2% w/v) in drinking water for 5 days and then allowed to recover, modeling acute colitis. At adulthood (6-8 weeks of age), behavioral tests for anxiety and cognition were performed, and tissue samples collected. Compared to control mice, DSS-treated mice showed impaired object recognition and increased anxiety-like behaviors. Moreover, we also observed dysbiosis, including decreased Lactobacillus and increased Enterobacteriaceae. Finally, gene expression in the colon and hippocampus showed decreased expression of the pattern recognition receptor nod1 and inflammatory response gene il10 (interleukin 10) in DSS-treated mice compared to controls. Taken together, these results indicate that acute DSS-induced colitis in adolescence can have long-lasting effects on the microbiota-gut-brain axis in adulthood.

Addressing Chronic Absenteeism: Learning From Success in Three Elementary Schools

Vanessa Talavera
Sponsor: Nancy Erbstein, Ph.D.
Human Ecology

Chronic absenteeism occurs when a student is absent at least 10% of school, meaning they are missing approximately 18 days in a 180-day school year. When a child is absent from school, it causes challenges for both the school and the child. When a child misses school, the school loses funding, which is tied to student attendance. Likewise, the child misses key information that could help them improve academically. Regular attendance also plays a crucial part in cognitive and social development. Missing at least 10% of school is associated with a variety of negative outcomes for students. To address this problem, the Center for Regional Change is working with a school district where they study 12 schools with high chronic absence rates. With the hope to improve these schools and others alike, my project focuses on three elementary schools with especially low chronic absence rates serving similar students in the same school district. My project involves the use of interviews and student attendance data. By studying the practices of these three successful schools, it is my hope that we can generate findings to improve the other 12 schools and schools elsewhere.

The Effects of Sunflower Bloom Orientation on Seed Yield and Germination Rates

Mat Talton
Sponsor: Stacey Harmer, Ph.D.
Plant Biology

Sunflower is an important crop species for oil production and is known for its ability to follow the sun. Heliotropism is the mechanism where by juvenile sunflower buds track the sun across the sky from east to west, through asymmetric stem growth, before reorienting at night to face east in preparation for the next day. As the plants mature, their movement decreases and eventually stops with the blooms uniformly facing an easterly direction. Almost all organisms have an internal circadian clock that synchronises their biological processes to daily changes in the environment and a previous study showed that sunflower heliotropism and flower orientation is regulated by the clock. In this study we aimed to investigate what effect an easterly orientation has on the flower size, seed yield and germination rates. Seeds were collected from two independent trials of east and west-facing sunflower heads grown in mid and late summer. Our preliminary results indicate that east facing plants produce a greater number of heavier seeds, however west facing flowers appear to have a higher germination rate (9.88%). These results suggest that sunflower head orientation affects flower and seed properties and could have important implications for the plants' reproductive ability.

Determining the Retention and Survival of *Bifidobacterium longum* subsp. *infantis* on Different Surface Types

Jothika Tamizharasu
Sponsor: David Mills, Ph.D.
Food Science & Technology

Colonization of bifidobacteria in the infant gut provides beneficial effects to the host, including development of the immune system. It is unclear how some species of bifidobacteria are transmitted to the infant and one route might be through the built environment. In fact, preliminary results from our group have shown that Bifodobacterium longum subsp. infantis (B. infantis), a fundamental colonizer, can be isolated from various surfaces in lactation rooms. This study aims to optimize the methods used to isolate bifidobacteria from environmental samples and to determine the magnitude of retention and the extent of survival of B. infantis on various surfaces. To determine these latter parameters, B. infantis was applied to paper, wood, plastic, and fabric surfaces and bacteria was isolated from each surface at multiple time points after exposure. The number of colony-forming units was determined by plating on selective media. Maintaining plates in an anoxic environment for at least 18 hours prior to isolation enabled maximized growth and increased quantification accuracy. Survival of B. infantis was significantly longer on fabric compared to other surfaces. Differences in retention were not statistically significant. This knowledge will advance understanding of the persistence and viability of bifidobacteria in the built environment.

Examining the Association Between Sex and Dietary Diversity in Kenyan Toddlers

Xiuping Tan
Sponsor: Christine Stewart, Ph.D.
Nutrition

Intra-household allocation of food is important in determining resource flows to infants whose growth requires a high concentration of select nutrients. There is some concern that there may be sex differentials in household allocation of food. This study examined the dietary diversity of Kenyan infants who were approximately 24 months of age. We used a generalized linear model to examine the association of sex and dietary diversity, first in an unadjusted model, and then controlling for child age, season, the mother's education and household assets. We found that in the unadjusted model, the girls were more likely to achieve dietary diversity (ß = 1.166, p = 0.013). This relationship was maintained after we controlled for age, season, mother's education and household assets (ß = 1.165, p = 0.014). These data support the hypothesis that toddler girls living in rural Kenya are more likely to achieve minimum required dietary than their male counterparts. Further research on intra-household allocation of food is needed to explain why this association exists.

EEG-Based Brain-Controlled Mobile Robots: Insights and Lessons

Anthony Thai
Sponsor: Zhaodan Kong, Ph.D.
Mechanical & Aerospace Engr

With the rapid development of brain-computer interface (BCI) technology, researchers are now attempting to put current BCI techniques into practical applications, particularly by combining them with robotics. BCI systems translate signals from the central nervous system to device control signals. The goal of the project is to explore the possibility of controlling a mobile robot to perform simple navigation tasks by using electroencephalography (EEG) signals directly. Machine learning algorithms, such as common spatial patterns (CSP) and linear discriminate analysis (LDA), are used to extract a set of EEG features that are capable of accurately classifying human cognitive states, e.g., left turn intention and right turn intention. These features are then used by an online control algorithm to recognize a human operator's intention in real time and subsequently control the motion of a ground mobile robot. The insights and lessons learned from the project have significant practical implications for future neuroprosthetic devices and robotics.

Episodic Future Thinking and Math Achievement

Brynna Thigpen
Sponsor: Simona Ghetti, Ph.D.
Psychology

Episodic future thinking is the mental simulation of first-person future event with rich detail of context (Tulving, 2005). Though knowledge about a possible future event (semantic prospection), or reasoning about alternative outcomes of past events (counterfactual reasoning) may provoke future-oriented behavior, episodic future thinking may do so more strongly because it allows one to experience the thoughts and feelings associated with desired future events before they happen (Tulving, 2005). We test this hypothesis by comparing the effects of episodic future thinking, semantic prospection, and counterfactual reasoning on performance of a challenging math task in 9- to 12-year-olds and college students using a novel paradigm. We also look at the number of process-based versus outcome-based strategies used in each condition. We predict that episodic future thinking will result in greater performance gains and more process oriented strategies compared to the other mentalization conditions (semantic prospection and counterfactual reasoning), oriented but that this may not be true for all age groups given developmental differences in these abilities.

The Effect of Feeder Design and Feed Management on Profitability of Free-Range and Pastured Poultry Farms

Alison Thorngren
Sponsor: Maurice Pitesky, D.V.M.
VM: Population Hlth & Reprod

There is currently no uniform way of feeding chickens in the industry of free-range and pastured poultry. The designs of feeders and the management decisions of when and how to provide feed vary significantly between facilities. This makes it impossible to calculate metrics like a Feed Conversion Ratio (FCR) which diminishes our knowledge of sustainability and profitability. A small-scale experiment was carried out using ~140 hens, two different forms of feed, and two different feeder designs to measure how they affected the economics of the farm, considering the income from selling eggs as well as the money lost to feed wasted due to feeder design. A number of larger poultry farms have been asked various questions about how they fed their chickens and how it affected their profits. Current data suggest that feeders that are more accessible for the chickens cause more feed waste, and that wasted feed can make a dramatic impact on a farm's profits. The aim is to eventually collaborate with engineers to design a possible feeder that would maximize availability while minimizing feed wastage and also take into account common management issues such as size, ease of use, and weight of the feeders.

Gratification Stratification: Are There Social Consequences to Children's Screen Time Through Its Effects on Self-Control?

Thalia Tom
Sponsor: Daniel Choe, Ph.D.
Human Ecology

Thanks to the wonders of modern technology, instant gratification is often a click away. In this sense, delayed gratification seems to be a cruel and unnecessary exercise, a relic of the past that need not be revived. The role of technology use, often operationalized as screen time, in self-control among adolescents and young adults is the subject of intense debate in research and popular culture. In contrast, comparatively little research has been conducted on how technology exposure impacts this facet of self-control among preschoolers growing up in the smartphone and tablet era. Drawing on parent-report and assessment data being gathered through an in-progress study in the Department of Human Ecology, I anticipate that the amount of screen time and child's ability to delay gratification will be inversely related. Preliminary findings indicate the veracity of this assertion. Given that self-control has been empirically linked to a host of significant life outcomes ranging from social competence and mental and physical health to employment and criminality, knowledge about the development of self-control is an increasingly valuable societal tool. The findings of this study will inform future policies and have significant implications for parents, educators, and society at large.

Keel Bone Deviations in Laying Hens: Associations With Duration of Daily Perching Behavior in Enriched Colony Cages

Jordan Tonooka
Sponsor: Maja Makagon-Stuart, Ph.D.
Animal Science

Keel bone fractures or deviations in laying hens are presumably caused by short-term impacts or long-term pressure experienced at the keel, respectively. Pain, decreased egg and carcass quality, and greater mortality rates are associated with keel damage. This project focuses on keel bone deviations and addresses their potential development via prolonged perching with keel contact. Three-hundred-sixty hens were housed in six enriched colony cages (60 individuals per cage). One cage per room was recorded 24 hours each day for three weeks. Two birds per cage were selected based on CT scans 1) development of keel deviations (Focal) 2) no change (Control). Two days per three-week period were observed continuously in three 2-hour time blocks. Birds were monitored for perching behavior (both feet on perch for ≥5 seconds). Perching durations were recorded as either standing (upright), or sitting (squatting with keel contact). Analyses were run to compare overall perching frequencies, durations, and average durations of perching with keel contact between six Focal and six Control hens. Currently there is no significant evidence to suggest that Focal hens perch with overall greater frequency or duration than Control hens. More data is needed to improve statistical power of the analyses.

Role of Cyclic AMP Response Element Binding Protein (CREB) Binding Protein (CBP) in the Induction of Maternal Behavior in Female Mice

Lisette Torres
Sponsor: Danielle Stolzenberg, Ph.D.
Psychology

In mice, circulating pregnancy and postnatal hormones prime the maternal brain to respond to infants. However, in virgin mice lacking hormones, cohabitation with pups also induces maternal behavior. Whether a common underlying mechanism allows the two paradigms to induce a similar maternal response is not yet known. One possibility is that both hormones and experience can activate transcription of the oxytocin gene (Oxt), which is involved in the onset of maternal behavior, via activation of the transcriptional coactivator cyclic AMP response element binding protein (CREB) binding protein (CBP). CBP also acts as a histone acetyltransferase (HAT), adding acetyl groups to histone proteins and exposing DNA for transcription factor binding. We hypothesize that CBP is recruited to the estrogen response element and the CREB response element promoter regions of Oxt leading to transcription in both postpartum and virgin female C57BL/6J mice, respectively. The brains of three different groups of mice including 1) virgin females treated with a histone deacetylase inhibitor (HDACi), 2) virgin females with suboptimal experience, and 3) postpartum females were collected following 2 days of pup experience. A chromatin immunoprecipitation (CHIP) assay will be used to determine if CBP is bound to the oxytocin promoter regions.

Microbiota-Induced Epithelial PPAR-γ-Signaling Thwarts Dysbiotic Pathogen Expansion

Teresa Torres
Sponsor: Andreas Baumler, Ph.D.
MED: Medical Microbiology & Imm

A perturbation of the gut-associated microbial community (dysbiosis) may be at the root of many human illnesses, but the mechanisms that maintain a balanced community structure are poorly understood. A balanced gut microbiota confers benefit by maintaining homeostasis and conferring niche protection against pathogens through unknown mechanisms. Here we show that microbiota-induced epithelial PPAR-γ (peroxisome proliferator-activated receptor gamma)-signaling drives colonization resistance against facultative anaerobic Enterobacteriaceae, including Escherichia coli and Salmonella enterica. Depletion of butyrate-producing microbes by antibiotic treatment reduced epithelial signaling through the intracellular butyrate sensor PPAR-γ, thereby increasing nitrate levels in the colonic lumen by elevating epithelial expression of Nos2, the gene encoding inducible nitric oxide synthase (iNOS). Microbiota-induced PPAR-γ-signaling was also necessary for driving the energy metabolism of colonic epithelial cells (colonocytes) towards ß-oxidation, while metabolic reprogramming of colonocytes after antibiotic treatment increased the luminal bioavailability of oxygen. Collectively, our data identify microbiota-induced PPAR-γ-signaling as a homeostatic pathway that prevents a dysbiotic expansion of E. coli and S. enterica by limiting the bioavailability of respiratory electron acceptors in the lumen of the colon.

Evaporatively-Cooled Condensing Units, The AquaChill, in Hot and Dry Climates

Tomas Torres - Garcia
Sponsor: Mark Modera, Ph.D.
Western Cooling Efficiency Ctr

In hot and dry climates, Evaporatively-cooled condenser units have a potential to reduce peak electricity demand and reduce the usage of energy associated with cooling by up 20%-40%. One of the biggest concerns with evaporative cooling is the consumption of water by the unit needed to cool the condenser coils that contain refrigerant. The second most important concern is whether it can efficiently lower the consumption of electricity. The primary goal is to provide evidence that evaporative cooling can reduce electricity use while keeping the water consumption low, especially in hot and dry environments. An AquaChill, an evaporatively-cooled condensing unit, was installed in Simi Valley. Data was collected to keep track of how much water the unit is bleeding and evaporating. A rain gauge sensor determined that the unit bleeds out approximately 2.3 gallons of water per hour while the unit is on. It was calculated that the AquaChill evaporates approximately 4.16 gallons of water an hour while the unit is on. The AquaChill increases the Energy Efficiency Ratio of 2 air conditioning units as the outside air temperature rises.

Marginalized Communities and Nature: Accessibility, Health, and Adventure

Nanci Torres-Poblano
Sponsor: Andrew Fulks, M.S.
Campus Planning Community Res

The purpose of this project is to determine the factors that prevent or limit marginalized communities from enjoying nature. Even as today's society continues to diversify, the number of individuals visiting public lands from these groups is very low. We hypothesized that some of the factors that prevent outdoor enjoyment include: economic limitations, the lack of knowledge regarding possible destinations, comfort level of being outdoors, and the lack of social support. In order to determine if these factors played a role, survey questionnaires were distributed to organizations dedicated to providing nature experiences to marginalized communities. Based on the findings policy reviews may be requested at different political levels in order to make public locations accessible and inclusive to various communities. Indirect implications of policy changes may result in raising health, physical and mental, as well as environmental awareness. Ultimately, this project aimed to determine the factors that deter members of marginalized communities from having outdoor experiences, actions that can be done to make public spaces more accessible, especially during today's political climate, and address the possible indirect effects of making public lands truly accessible to all.

Mathematical Models to Extract Key Features Determining Superconducting Properties on Iron Arsenic Compounds

Melanie Tran
Sponsor: Yulia Zaikina, Ph.D.
Chemistry

Our research begins by datamining superconductive compounds and performing machine learning analysis to uncover correlation between superconducting properties that can help prediction and classification of materials. These compounds are separated by class demonstrating differences in structure, composition, and symmetry elements that may affect their superconducting properties. Although a single structural parameter that defines the magnitude of critical temperature (Tc) has not been identified for, they all have in common the superconducting iron arsenic layer. Our main task is to uncover which features are important for the compound to exhibit superconducting properties. Hence, this study focuses on different classes of iron arsenic superconductors and implements several analytical techniques to accurately predict superconductivity within iron arsenic superconductors, such as Sparse Logistic Regression, Artificial Neural Network, SVD Decomposition, Support Vector Machine and SPCA. We also created an interactive webpage which allows the user to visualize information about this data in three dimensions. The standard k-means clustering algorithm in Javascript was implemented to help on the task of classifying which compound is a superconductor or not.

Multidrug Resistance and the Effects of Silver Nanoparticles on Zebrafish Development

Franklin Tran
Sponsor: Gary Cherr, Ph.D.
Environmental Toxicology

Silver nanoparticles (Ag-NPs) are 1-100 nanometers (nm) silver particulates that are the most prevalent component in consumer products which utilize nanotechnology for antimicrobial properties. Due to their unique properties, Ag-NP behavior and interactions with the environment and biological systems are not fully understood. Previous research has shown that Ag-NPs cause toxicity in many aquatic organisms during early development. This study aims to investigate the potential impacts of Ag-NPs to aquatic organisms using the zebrafish model. The study investigated multidrug-resistance (MDR) efflux pumps that are the first line of defense for early life stages, as well as cell membrane and Ag-NP interactions. MDR efflux pumps were found not to be inhibited by Ag-NP. An endocytosis inhibitor, chlorpromazine hydrochloride, was used in other experiments to investigate whether Ag-NPs were able to be taken up by cells via endocytosis. Results indicated that there was not a significant role for endocytosis in Ag-NP toxicity in developing zebrafish. While additional experiments would be ideal in order for more conclusive data to be obtained, this study suggests that cellular defenses that involve efflux of metals, as well as endocytosis, are not involved in the overall Ag-NP toxicity.

The Effects of Aging, Stress, and Estrogen on the Heat Shock Response of Human Coronary Artery Endothelial Cells

Darlene Tran
Sponsor: Anne Knowlton, M.D.
MED: Div Of Internal Med

Heat shock response is a biochemical pathway responsible for producing heat shock proteins (HSPs) that mitigate stresses such as heat, radiation, and reactive oxygen species. HSPs are chaperone proteins that help stabilize new proteins and refold proteins damaged by stress exposure. Past studies have shown decreased heat shock response in senescent cells. Our project investigates if senescent human coronary artery endothelial cells have decreased heat shock response compared to younger early passage cells and if treatment with estradiol influences HSP expression. Estradiol, a major component of human estrogen, has been previously shown to influence HSP expression. Using western blots, we are measuring HSP concentrations in coronary artery endothelial cells subjected to the following treatments: control (no stress) vs. heat shock, vehicle (DMSO) vs. estradiol, and early passage vs. senescent. This study could provide insight into how aging, stress, and estrogen can impair or improve the heat shock response in human coronary artery endothelial cells. How well these cells can mitigate protein aggregation can influence the development of cardiovascular disease, including cardiomyopathy.

Effects of Naphthalene Inhalation on "Humanized" Transgenic Mice

Randall Tran
Sponsor: Laura Van Winkle, Ph.D.
VM: Anat Physio & Cell Biology

Exposure to the pollutant naphthalene is common, since it is released from combustion of fossil fuels, tobacco, and wood. Naphthalene is metabolized by cytochrome p450 enzymes in the lungs and liver, producing cytotoxic metabolites and making it a potential carcinogen. To determine a correlation between human P450 gene expression and cytotoxicity, we scored the epithelial cells of trachea, lobar, and terminal bronchiolar airways from groups of transgenic mice exposed to either filtered air or 10 ppm naphthalene vapor: 1) "null" mice without mouse CYP2ABFGS genes and liver P450 capabilities 2) "humanized" mice with the human CYP2A13 and CYP2F1 genes inserted under a lung specific promoter and without liver P450 capabilities 3) wild-type mice. 20 hours after exposure, the tissues were necropsied, fixed, and embedded in araldite plastic. They were sectioned 1µm thick and stained with methylene blue for imaging through high resolution light microscopy and stereology. We did not find differences in cytotoxicity between the null and humanized mice, but did find that naphthalene produces damage in bronchiolar epithelial cells in wild-type mice when compared to the lack of damage from filtered air. We conclude that the "humanized" P450 expression in the lung has little impact on naphthalene toxicity.

Age-Related Differences in Nf-κB Pathway Signaling During Unloading and Reloading

Jacinda Tran
Sponsor: Keith Baar, Ph.D.
Neuro Physio & Behavior

The nuclear factor Kappa B (NF-kB) pathway plays a key role in mediating the effects of inflammation on skeletal muscle. We sought to determine effects of aging on NF-kB signaling following a period of disuse and reloading. Nine-month and twenty-eight-month-old rats were subjected to 14 days of hindlimb unloading (HU) and 1 and 3 days of reloading (REL). The tibialis anterior (TA) muscles were taken after each time point and isolated for cytoplasmic and nuclear fractions. Western blots were performed to determine the NF-kB subunits (p50, p52, and p65), Rel-B and IKKß protein levels. Analysis was performed using a two-way ANOVA to determine the effect of age and time. After 14 days of HU, old rats displayed a 2.5-fold increase of p50 protein levels in the nuclear fraction compared to adult rats. One day of reloading resulted in a 4-fold increase in p52 protein levels within the adult nuclear fraction compared to the old fraction. Differences in NF-kB signaling between the adult and old TA muscles during HU and reloading may contribute toward the impaired muscle regrowth observed in the old rats. Future studies include the manipulation of NF-kB signaling to determine how this pathway impacts muscle function.

User-Friendly Graphical User Interface to Assess the Instability and Sensitivity of Cardiac Electrical Activities

Oanh Tran
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

The heart is a highly complex system. Cardiac arrhythmia, which is a major cause of sudden cardiac death, is due to disordered/chaotic membrane voltage activities in the heart. The membrane voltage dynamics is itself highly nonlinear. Therefore, it is difficult to understand the electrical activities in the heart intuitively. In fact, modifications at the single channel level often cause unpredicted phenomena at the cellular and tissue levels. Understanding the mechanisms of arrhythmias using computational modeling is critical for development of effective therapies and drugs. However, it is not easy for non-programmers to use the computational models. In this study, we developed a user-friendly graphical user interface to assess the instability and sensitivity of the cardiac action potential. Using this interface, we demonstrate how single ion channel properties affect the instability of the cardiac action potential interactively. We show healthy and unhealthy action potentials simulating normal and pathological conditions. This study provides an easy and convenient way to evaluate effects of drugs without knowledge of programming.

User-Friendly Graphical User Interface to Assess the Instability and Sensitivity of Cardiac Electrical Activities

Nhi Tran
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

The heart is a highly complex system. Cardiac arrhythmia, which is a major cause of sudden cardiac death, is due to disordered/chaotic membrane voltage activities in the heart. The membrane voltage dynamics is itself highly nonlinear. Therefore, it is difficult to understand the electrical activities in the heart intuitively. In fact, modifications at the single channel level often cause unpredicted phenomena at the cellular and tissue levels. Understanding the mechanisms of arrhythmias using computational modeling is critical for development of effective therapies and drugs. However, it is not easy for non-programmers to use the computational models. In this study, we developed a user-friendly graphical user interface to assess the instability and sensitivity of the cardiac action potential. Using this interface, we demonstrate how single ion channel properties affect the instability of the cardiac action potential interactively. We show healthy and unhealthy action potentials simulating normal and pathological conditions. This study provides an easy and convenient way to evaluate effects of drugs without knowledge of programming.

Identifying Knowledge Structures of Introductory Chemistry Students

Emma Tribble
Sponsor: Ozcan Gulacar, Ph.D.
Chemistry

Studies have shown that students in general chemistry have difficulty with problem solving, which is influenced by many variables, including how students organize knowledge in their minds. This study explores students' knowledge structures, defined as the network of related concepts in the mind, and how they are related to different factors including gender and prior knowledge in chemistry and math. A word association test was developed by selecting major concepts in general chemistry as stimulus words to which students were asked to provide ten response words that came to mind within ninety seconds of reading each stimulus word. The top twenty-five most frequently used responses for each stimulus word were used to calculate relatedness coefficients, which measure how closely stimulus words are linked in the students' minds. Finally, two network generating programs, Pathfinder and Gephi, were utilized respectively to interpret these relatedness coefficients and determine knowledge structures. Our data indicate structural differences in the organization of concepts in students' knowledge structures based on gender and background in math and chemistry. Our findings will inform changes in curriculum which would place more emphasis on related topics that seem weakly connected in the knowledge structures to promote conceptual understanding.

Inhibitory Control in Internationally Adopted Children

Shannon Trinh
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Orphanage-reared children are deprived of parental attachment during a crucial time of development. Studies suggest that this early deprivation forecasts behavioral deficits in several areas. The present study aimed to examine the effects of orphanage rearing on child and adolescent inhibitory control, defined as the ability to regulate one's behavior, impulses, and motivations. This study included 160 participants (79 internationally adopted from orphanages before age 5 years old and a comparison group of 81 non-adopted youth). The sample was balanced by gender (51.3% female) and included two age groups (79 children aged 9-10, and 81 adolescents aged 15-16). To measure inhibitory control, parents completed the Early Adolescent Temperament Questionnaire (Capaldi & Rothbart, 1992). Statistical analyses suggested that non-adopted children showed better inhibitory control than adopted children [$F(1,155) = 16.562$, $p < 0.001$)]. As expected, adolescents showed better inhibitory control than 9-10-year-old children ($F(1,155) = 8.01$, $p = 0.005$)]. The gap in inhibitory control between non-adopted and adopted children may represent a clinical concern because low inhibitory control can lead to conduct problems and attention difficulties in social and academic settings. These findings call for improved interventions to help post-institutionalized children who are in need of support.

Improving Elderly and Disabled Mobility Through Accessible Transportation

Isaac Tseng
Sponsor: Timothy McNeil, M.F.A.
Design Program

California's aging population is expected to grow twice as fast as the overall population according to the California Department of Aging. Yolo County, CA in particular is experiencing a projected increase of 50-99% growth in elderly people aged 60 and above as the year 2020 nears. Senior life satisfaction has therefore, become a pertinent concern in society. Disabled mobility has been proven to correlate tightly to elderly life-satisfaction according to a study by Cumhuriyet University, Turkey. Age-related illnesses and physical disabilities reduce individual mobility, and therefore, lead to lowered life-satisfaction. Modern transportation is also designed primarily for the working young individual, often inaccessible to elders without the help of caretakers or assistants. This project aims to improve elderly life satisfaction via an accessible transportation device that increases their mobility within the city of Davis. I will employ user-centered and iterative design processes supported by interview-based research with community partners, as well as secondary research. By focusing directly on senior citizen and disabled needs in the design process, this project will help combat the mobility challenges related to an aging population.

The Role of Autophagy in Sister Chromatid Resolution During Anaphase

Lo Tuan
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Successful chromosome maintenance requires accurate and complete replication of each chromosome, and starting in anaphase the segregation and physical resolution of sister chromatids. The Kaplan lab found that the Aurora B kinase responds to topologically linked sisters, which results in a change to its substrate targeting. One potential downstream target of Aurora B are members of a membrane fusion complex known as ESCRT III that is implicated in membrane abscission during cytokinesis as well as the process of autophagy, an evolutionarily conserved pathway in eukaryotes by which cytoplasmic cargo sequestered inside double-membrane vesicles are delivered to the lysosome for degradation. The connection between autophagy and DNA damage led us to hypothesize that tangled sister chromatids trigger a change in autophagy that is important for cell survival when cells divide in the presence of topologically linked sister chromatids. To test this hypothesis, I measured the effect of autophagy mutants on cell viability under conditions where cells have difficulty resolving sister chromatids. Results from preliminary experiments raise the interesting possibility that defects in autophagy actually improve cell viability. Next, I plan to measure the effect of autophagy activation on viability of cells under replication stress, and monitor chromosome damage in autophagy mutants.

Peer Influence of Adolescent Depression

Liann Tucker
Sponsor: Robert Faris, Ph.D.
Sociology

In 2014 about 2.8 million U.S. adolescents from age thirteen to seventeen reported that they had at least one major depressive episode in the last year. Depression can have negative consequences on relationships with family, friends, and academic performance, all of which are important in adolescent development. Previous research has identified peer influence as a significant factor in adolescents' engagement in deviant, aggressive, and other health risk behaviors. Only recently has research looked at peer influence on mental health. This paper seeks to add to the body of research on adolescent depression by examining the peer socialization effects of depressive symptoms of adolescents, proposing that adolescents who have friends who are depressed will lead to an increase in their own level of depression. I test this hypothesis using data from a longitudinal survey of middle and high school students in North Carolina, which includes measures of respondents' depression and friendship networks. Results indicate that having friends who show moderate or significant levels of depression is associated with an increase in respondents' level of depression. This research can help further our understanding of the factors that influence adolescent depression, which is essential for developing methods for intervention and treatment.

The Importance of Recreational Activities on Campus Community Wellbeing

Carlo Tueros
Sponsor: Reed Phinisey, M.S.
Campus Recreation And Unions

Engaging in physical activity is known to provide numerous benefits that can improve an individual's wellbeing. Some of the benefits include: controlling weight, improving mood, and promoting better sleep. Campus Recreations and Unions (CRU) recognizes the important role that physical activity plays in maintaining a healthy lifestyle. CRU provides the campus community with traditional and nontraditional recreation opportunities that make physical activity a reality by providing a fun and social environment. The purpose of this study is to demonstrate the effect of participation in CRU programs on wellness. Traditional users are individuals who partake on programs that are offered by CRU like intramural sports, sport clubs and those offered by the fit well center. Nontraditional users are those who participate in programs like the craft center, equestrian center, outdoor adventures among others. Wellness was measured from survey questionnaires that focused on 3 dimensions of wellness: physical, emotional, and social. The realms chosen coincide with CRU's mission to create an environment where one can easily find wellness and fun. This study hopes to show how important recreation opportunities are to the campus community by impacting a person's wellbeing.

Nitrous Oxide Uptake Mechanism Through Plant Stomata and Endophytes

Carly Tyer
Sponsor: William Horwath, Ph.D.
Land Air & Water Resources

Nitrogen is one of the most essential elements for life on Earth; however, there is a discrepancy in the global nitrous oxide (N_2O) budget where the conservation of nitrogen law seems to be defied. We are interested in understanding these N_2O sinks and sources to close the global N budget by focusing on the mechanisms of N_2O uptake by plant leaves that could act as an N source for the plant, as well as mitigating the environmental harm of N_2O in the atmosphere. Previous studies have indicated that these mechanisms can exist through endophytic microorganisms, but this study will explore the general viability of corn's ability to take up N_2O. Corn will be grown in a sandy soil of no nutrient value and only the plant will be exposed to isotopically enriched N_2O in the surrounding atmosphere. After a 24 hour exposure time, the corn will be collected and separated into leaves, shoots, and roots for isotopic analysis of each isolated region by the Stable Isotope Facility. If the roots are isotopically enriched, N_2O will have shown to be metabolized from the stomata.

Paleotemperatures From Noble Gases in the Speleothem Record

Alec Tyra
Sponsor: Sujoy Mukhopadhyay, Ph.D.
Earth And Planetary Sciences

The western Sierra Nevada experienced dramatic climate changes, between the Last Glacial Maximum, 20,000 years ago, and Younger Dryas, 11,000 years ago. A record of this climate change exists in speleothems in Sierran caves. Speleothems form from calcium carbonate precipitation. As speleothems grow, air and water, containing noble gases, become trapped in inclusions. We developed a technique to extract noble gases from speleothems to estimate paleotemperatures. We crushed billets of a speleothem, releasing air and water into a vacuum line. The gases passed through cold traps, freezing the water, separating it from the noble gases. The noble gases were measures by mass spectrometry, while the water was measured using a manometer. To correct for noble gases present in air inclusions, we preformed successive crushes on each sample. We intend to use software in Matlab to differentiate noble gases in water inclusions from those in air inclusions. Preliminary results show levels of noble gas abundances can be measured precisely. Using Henry's Law, which describes the relationship of dissolved gas concentrations and temperature, we can estimate the paleotemperature based on noble gas abundances in water inclusions. The estimated paleotemperatures provide insight to climate change in the region, past and present

E2Fc Acts as a Potential GAGA Nucleotide Motif-Binding Factor and in the Recruitment of the Polycomb Repressive Complex 2 to Silence Genes

Hannah Vahldick
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

The xylem cell secondary cell wall is an anatomical structure that confers rigidity due to its lignocellulosic composition. The mechanisms of secondary cell wall biosynthesis are highly transcriptionally regulated, and a transcriptional regulatory network has been mapped for its development. By exploring the transcription factors that interacted with multiple genes and inputting the promoter sequences of those genes into a bioinformatic pipeline, a GAGA motif was discovered within the genes bound by E2Fc. E2Fc often functions as a repressor of genetic expression, but the mechanism by which it exerts such regulation is less clear. However, the GAGA motif has also been associated with the Polycomb Repressive Complex 2 (PRC2). The PRC2 regulates the transcription of particular genes by catalyzing the trimethylation of Histone 3 at Lysine 27 (H3K27me3), leading to chromatin compaction and repressed expression of the affected genomic region. Previous research has suggested that polycomb responsive elements (PREs) are present in the nucleotide sequences of genes targeted for regulation by H3K27me3, and one such PRE may be the GAGA motif. Here I suggest that E2Fc works in conjunction with PRC2 to repress the expression of genes that contain the GAGA motif within the nucleotide sequences of their promoter regions.

Evidence for an Imbalance in Brain Excitatory/Inhibitory Activity in a Mouse Model of FXTAS

Kevin Valentine
Sponsor: Robert Berman, Ph.D.
MED: Neurological Surgery

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a late-onset neurodegenerative disorder caused by a CGG trinucleotide repeat expansion (55-200) in the 5'-UTR of the FMR1 gene. Consequently, repeat associated non-AUG translation of the expansion produces a toxic peptide (FMRpolyG) in these fragile X premutation carriers (PM). The hallmark pathology of PM/FXTAS is the presence of intranuclear inclusions in neurons and astrocytes marked with ubiquitin and the FMRpolyG. To understand cell-type specific contributions of disease pathology, we developed a doxycycline-inducible mouse model that ectopically expresses CGG(n) only in neurons. Mice were given doxycycline for different lengths to test disease progression and reversibility. Preliminary data confirmed that inducible transgene expression produces intranuclear inclusions and altered expression levels of proteins associated with both excitatory and inhibitory (E/I) signalling in the brain. Here, we utilized western blot analyses to characterize expression levels of NR2A, an NMDA-receptor subunit, and GAD2, a GABA precursor, in key brain regions of the mice after different treatment lengths. E/I imbalance has been reported in FXTAS patients and animal models, therefore, the results from this study will shed light on the pathological role of CGG expansion on neuronal signaling and FXTAS pathogenesis.

How to Change Delta Cells Into Beta Cells in Pancreatic Islets

Richard Van
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

There are approximately 1.25 million Americans who suffer from Type 1 Diabetes, which is characterized by the absence of insulin as a result of beta cell destruction by the immune system. The regeneration of these cells may provide a way for diabetic patients to maintain lifelong glycemic control. Glucagon-producing alpha cells and somatostatin-producing delta cells also exist in the pancreas alongside beta cells. Previous studies have shown that delta cells under certain circumstances can convert, or transdifferentiate, into insulin-producing beta cells, but the signals that promote this process are unknown. We are currently investigating the effect of Urocortin-3 (Ucn3), a peptide hormone co-secreted with insulin from mature beta cells that specifically activates delta cells to induce the release of somatostatin. This led us to hypothesize that Ucn3 could affect transdifferentiation for delta cells. To test this hypothesis, we are comparing the number of delta cells that transdifferentiated into beta cells in wild type and Ucn3 knockout mice. Our preliminary data suggests a slightly greater ratio of transdifferentiated cells in Ucn3 knockout mice compared to controls. This implies that the absence of activation of delta cells by Ucn3 may induce their reprogramming into beta cells.

The Perception of Pain Associated With Injections in Dairy Cattle

Kyra van der Zalm
Sponsor: Cassandra Tucker, Ph.D.
Animal Science

Injections are a common health care procedure in all species and involve puncturing of the skin. Dairy cattle are one such species that receive various injection types. Studies on infant and adult humans have shown that variables such as speed of injection and needle diameter can contribute to pain associated with injection, however limited research has been done on dairy cattle. It is known that dairy cattle and other animals experience pain and studies in cattle have demonstrated that some injections have long-term effects such as bruising and muscle damage. The purpose of this research study is to investigate the pain in dairy cattle during routine injections. Data collection will include non-invasive dependent variables such as behavioral responses. Previous studies have shown that these can all be indicators of acute pain in dairy cattle. Understanding the perception of pain is important for the welfare of dairy cattle and provides insight into further research on how to minimize pain associated with injections.

Diet of Yellowfin Goby in Artificial and Natural Habitats in Seal Beach National Wildlife Refuge

Chloe Van Grootheest
Sponsor: Peter Moyle, Ph.D.
Wildlife & Fisheries Biology

A stomach content analysis was done on Yellowfin Goby (Acanthogobius flavimanus) at the Seal Beach National Wildlife Refuge in order to compare diets between fish in natural and altered habitats. Because their diets differed so much in previous research, a survey of the invertebrate population was taken via sediment cores to compare the invertebrates they were eating to the resource availability in each habitat. The two habitats of interest were natural estuarine habitat supplied by incoming tidewater, and habitats that are supplied with tidewater via tidal culverts. The fish caught in each sampling event were recorded and stomach contents examined. Results showed that on average, the diets between the two habitat types didn't differ very much. Results also showed a difference in occurrence between the non-native Yellowfin Gobies and the native Longjaw Mudsucker (Gillichthys mirabilis) in the two habitat types. These findings offer further insight on ecological differences between altered and natural habitats in the Seal Beach National Wildlife Refuge.

The Role of Mothers in Shakespeare's Plays

Alyssa Vandenberg
Sponsor: Frances Dolan, Ph.D.
English

Parents have a profound impact on the lives of their children—and in Shakespearean plays, the relationship between parents and their children is often at the forefront of the narrative. Mothers in Shakespeare's plays tend to be absent, as in King Lear, thus creating an ambiguity regarding the role of the mother. In many of the plays, this absence seems particularly noticeable, as the conflicts of these stories revolve around the characters' search for maternal figures in their lives. Additionally, the juxtaposition of the mothers' absence and the characters' desire for a maternal figure highlights an apparent fear surrounding mothers—the fear of the control that mothers are often seen as exercising on children. In my thesis, I will examine the fantasies regarding mothers in Shakespeare's The Taming of the Shrew, Macbeth, and King Lear to discover how parents, particularly mothers, shape the narrative. Building on my research about Shakespeare's plays, I will conclude by considering some of the differences and similarities between views of mothers in Shakespeare's works and Western society's views of motherhood today.

Searching in the Electronic Medical Record for New Identifiers of Heart Recovery After a Myocardial Infarction

Chenoa Vargas
Sponsor: Javier Lopez, M.D.
MED: Div Of Internal Med

Heart Attack patients, who have depressed heart function and do not fully recover despite the use of medical therapies, are at high risk of future morality. Properly identifying high-risk patients who never fully re-gain normal heart function remains a challenge. This begs the question: are there traits already recorded in the patient's electronic medical record (EMR) that can predict a patient's recovery of heart function? We aim to find pre-recorded EMR information during the initial hospital encounter to predict the future recovery of heart function. Reviewing the EMR records of 260 patients treated at UC Davis Medical Center for a heart attack (2001-2011), we identified 129 patients (67% male, 60+/- 14 years of age) that had follow-up echocardiogram and heart function assessments at least 30 days after their heart attack. Patients were divided into two groups, an initial normal function group and a depressed function group. By comparing the changes in left ventricular ejection fraction at initial encounter and follow-up, we evaluated the heart function recovery within the depressed group. In this cohort of heart attack patients, we are continuing to extract EMR information that could correlate with the outcome of heart recovery.

German, Jewish, and Queer: Exclusionary State Policies and Alfons Zinkower's Global Odyssey, 1917-1985

Oswaldo Vargas Diaz
Sponsor: Lorena Oropeza, Ph.D.
History

My research uses the story of Alfons Zinkower, a German Jew born in 1908, to explore the intersection between national sovereignty and immigration policy. A Hamburg native who specialized in Jazz-style piano, Zinkower fled Germany in 1939 and joined some 20,000 Jewish refugees at Shanghai, one of the few places in the world where one could enter without a visa. In 1947, Zinkower applied for a visa to the United States but an unnamed informant raised concerns about Zinkower's alleged homosexuality to the American Consulate staff. If proven to be a "Constitutional Psychopathic Inferior" as outlined in the 1917 Immigration Act, Zinkower could be denied entry to the United States. Using documents from the National Archives, the United States Holocaust Memorial Museum, and the Yad Vashem archives, I trace how Zinkower's journey from Germany to China to the United States show the State excluding based on inherent traits like Jewishness and queerness. The research thus asks questions such as where does a nation's right to determine who lives within its borders end and where does human rights for refugees begin? And how can we better understand national and world history through the story of just one extremely vulnerable man?

A Study of Body Diversity in Teleost Fishes as It Relates to Marine and Freshwater Environments

Laura Vary
Sponsor: Samantha Price, Ph.D.
Evolution & Ecology

Freshwater and marine environments each produce their own unique selective pressures which result in variation in body morphology in teleost fishes. Relative body depth may be affected by many factors, including pressures to heighten maneuverability. Given that conditions vary extensively between marine and freshwater environments, we hypothesize that there is a disparity between the variation of body depths between fish from marine habitats and those in freshwater habitats. Furthermore, considering that saltwater is comprised of a larger amount of habitats, we expect to see a larger body depth diversity among marine species. Using morphometric data collected from the Smithsonian, we will take the measurements of body depth and standard length to compare marine and freshwater teleost fishes. Our preliminary findings indicate that freshwater fishes have deeper body depths than marine fishes, however until further analyses are conducted that take phylogeny into account, it is difficult to relate this to overall body depth diversity. Analysis of these data will provide new insight into the variations of morphology across vastly differing habitats, allowing us to better understand morphological consequences of residence in a freshwater or marine environment, as well as macroevolutionary trends across teleost fishes.

Cross-Reactivity of *E. coli* and Human PDC Antibodies and Their Isotypes in Patients With Primary Biliary Cholangitis

Maria Vashchenko
Sponsor: Patrick Leung, Ph.D.
MED: Div Of Internal Med

The hallmark of Primary Biliary Cholangitis (PBC), an autoimmune liver disease, is the presence of anti-mitochondrial antibodies that recognize the Pyruvate Dehydrogenase Complex (PDC), an enzyme found in mitochondria. Some studies have indicated that the bacteria E.coli may have a role in the development of PBC. On a molecular level, comparison of the amino acid sequences of lipoyl domains of human PDC and E.coli PDC complexes has shown a degree of similarity between the two, which suggests that human and E.coli PDC enzymes might be a subject for the cross-attack by either bacterial or human antibodies; however, the exact relationship between the bacterial infection and the onset of the disease is still unknown (Ortega-Hernandez et al., 2010). The purpose of this research project is to evaluate the cross-reactivity and specificity of E.coli and human autoantibodies to PDC and identify their isotypes. The methods for this experiment include affinity purification of antibodies to human and E.coli PDC from the serum samples of patients with PBC, testing the cross-reactivity using absorption and immunoblotting techniques, and determining the isotypes. Thus far, I have successfully purified these antibodies and current work is in progress to assess their specificity and cross-reactivity.

Characterization of a Rice Mutant With Enhanced Resistance to *Xanthomonas oryzae* pv. *oryzae*

Adriana Vasquez
Sponsor: Pamela Ronald, Ph.D.
Plant Pathology

Rice is the world's most important staple crop. The bacterial pathogen Xanthomonas oryzae pv. oryzae (Xoo) infects rice plants causing a reduction in crop yields. The Ronald lab previously showed that XA21, a plasma membrane localized receptor kinase, confers resistance to Xoo carrying the RaxX peptide. Our lab has recently identified a rice mutant with enhanced resistance to Xoo, and named it enhanced XA21-mediated immunity 1 (exi1). I germinated and cultivated exi1 along with XA21 and Kitaake control plants and carried out expression assays to analyze the XA21-mediated immune response. I collected leaves from hydroponically-grown plants, treated them with a syntheticsulfated RaxX peptide for 9 hours, and extracted RNA from the leaf samples for reverse transcription and subsequent qRT-PCR. Two defense marker genes, PR10b and LOC_Os04g10010, were induced both in exi1 and XA21 leaves. In two biological replicates, exi1 showed an average of a 2-fold increase in defense marker gene expression over that of the XA21 control. These results indicate that the XA21-mediated immune response is strongly activated in the exi1 mutant, which is consistent with the observed enhanced resistance to Xoo.

Aquatic Macroinvertebrate Community Composition Gradients Along the Upper Sacramento River

Priscilla Vasquez-Housley
Sponsor: Randy Dahlgren, Ph.D.
Land Air & Water Resources

The clean, cold water of the Upper Sacramento River provides valuable habitat for aquatic macroinvertebrates which play an important role in processing organic matter and are also a major food source for fish. The River Continuum Concept predicts that physical conditions along natural streams change in a predictable pattern that is expected to translate into gradients in biological community composition along the length of the stream. Upstream communities are expected to consist of invertebrates which process leaf litter inputs (shredders) from shaded, narrow channels, while the downstream community is expected to shift towards invertebrates capable of scraping algae as stream canopies widen and additional light penetrates the water column. Three locations (from upstream to downstream) along the Upper Sacramento River were examined for changes in macroinvertebrate community composition: Mossbrae Falls, Sweet Briar, and Delta. Composite samples of aquatic macroinvertebrates were collected at each site using a D-frame kick net during July 2016. Aquatic macroinvertebrates from each sample were sorted and identified in the laboratory. The data was used to compare the differences in taxonomic richness, density, and functional feeding groups between sites to determine if the Upper Sacramento River follows expected community adjustments consistent with the River Continuum Concept.

La Raíz de Alma, Mente, y Corazón in Central Valley Mexican-Origin Teens

Elvia Velazquez
Sponsor: Mary Lou de Leon Siantz, Ph.D.
Betty I Moore Nursing School

This study takes place in the community of San Joaquin, located in California's Central Valley, which has experienced disparities across education, economics, and health. Through a Community-Based Participatory Research (CBPR) approach, Developing Educational Strengths: Promoting Individual Early Reproductive Teen Awareness (DESPIERTA), seeks to unravel the health status of the Mexican-origin teens of migrant farm-working backgrounds. The aim of this study is to examine the relationship of the health status, socio-demographics, and access to health care of the teens. Surveys were collected from 58 participating Mexican-origin teenage females. Results from the survey data on the health status and demographics of the participants and their families will be presented. The socio-demographic data has been previously collected and will be merged with the latest DESPIERTA data. Findings from this study may have implications for researchers and mental health programs and services which seek to work with underserved communities inside and outside of agricultural regions.

E. coli CTP Synthetase Exhibits Specificity in Substrate Inhibition

Marysol Velazquez
Sponsor: Enoch Baldwin, Ph.D.
Molecular & Cellular Bio

Cytidine triphosphate synthetase (CTPS) is an enzyme that catalyzes the formation of cytidine triphosphate (CTP) from UTP, ATP and glutamine. Due to the major role CTP plays in cell metabolism and maintaining homeostasis, CTPS has elaborate regulatory mechanisms, including substrate inhibition. My work is directed at characterizing and determining the mechanism of this newly discovered property of E. coli CTPS (EcCTPS) for UTP and ATP substrates. I demonstrated that, as happens with most substrates, increased ATP and UTP at low concentrations (0-1 mM) increases reaction velocity. However, at high concentrations (1-8 mM), these substrates diminish the enzyme's function. I generated the full titration curve for UTP and ATP from 0-8 mM at 20 mM Mg^{+2} ions and determined $S_{0.5}$ (60 uM and 120 uM respectively), and IC_{50} values (2.8 mM and ~10 mM, respectively). As shown by separate titrations with sodium acetate and sodium chloride, the increased sodium ion concentrations present at the highest nucleotide concentrations used does not account for a majority of the inhibition seen. Thus, all four nucleotides inhibit EcCTPS and control its activity.

Effects of Human-Induced Isolation on Conspecific Behaviors in Captive Chimpanzees (*Pan troglodytes*)

Paloma Venegas
Sponsor: Brenda McCowan, Ph.D.
VM: Population Hlth & Reprod

As of June 2015, the U.S. Fish and Wildlife Service declared all chimpanzees in the United States endangered under the Endangered Species Act. No laboratory or caretaker is able to conduct invasive studies on chimpanzees. With the current retirement of laboratory chimpanzees, there is a need to place many into sanctuaries or change their environment to one structured by social communities. Previously formed abnormal behaviors as well as habitation in solitude, may negatively affect some chimps transitioning to larger social groups. The study aimed to understand how prior time spent in isolation affects the social behaviors of captive chimpanzees. Eighteen adolescent and adult chimpanzees (Pan troglodytes) already laboratory retirees since 1996, were studied at Wildlife Waystation sanctuary in Los Angeles, California. All social behaviors were recorded using scan-sampling and all-occurrence sampling. We predicted that chimpanzees who spent the greatest amount of time in solitude would be involved in the least amount of social grooming and proximity sitting. We found that the time spent is isolation was not significant to proximity sitting, yet there was a slight effect on the amount of social grooming. These results suggest isolation may have some effect on the innate social skills of chimpanzees.

Clarifying the Functions of Cardiac Protein Kinase D1

Marie Verberckmoes
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

Protein Kinase D1 (PKD1) is an important stress stimuli transducer impacting numerous signaling pathways and cellular functions such as actin dynamics, cell survival and metabolism, contractility, and gene transcription. In the heart, PKD plays a key role in activating gene programs driving adverse remodeling and functional changes in heart disease. However, few cardiac PKD targets haven been identified and its function remains poorly understood. Here we use western blotting of cardiac homogenates from cardiac-specific PKD1 knockout (cPKD1 KO) mice and wild type (WT) littermates to determine alterations in select excitation-contraction coupling (ECC) and fibrosis-related proteins. Thus far, the baseline phenotype of cPKD1 hearts is very mild, and the expression patterns of many proteins appear unchanged e.g. phospholamban, SERCA, Na pump, LTCC, NCX. The most remarkable finding thus far is a reduction of phorylated Troponin I (TnI) and in PKD cKO mice, confirming existing in-vitro data that TnI is a target of PKD1. We also find changes in PP1 and in extracellular matrix proteins. By examining the protein expression profile of these PKD1 cKO mice, we will further elucidate the role of PKD in ECC and ECM regulation.

Characterizing the Structure and Function of the Amygdala in an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

Candice Vieira
Sponsor: Robert Berman, Ph.D.
MED: Neurological Surgery

Fragile X premutation carriers have an expanded CGG repeat (55-200 repeats) in the 5' UTR of the fragile X mental retardation 1 (FMR1) gene and are at risk of developing Fragile X-associated tremor/ataxia syndrome (FXTAS). The core FXTAS symptoms are tremor, gait ataxia and cognitive decline; however socioemotional problems have also been reported, including depression, anxiety and increased impulsivity. The neurobiological basis of these deficits still remains unknown, but recent studies suggest that the FXTAS-associated mood and social behavior alterations may be caused by changes in amygdala structure and function. Therefore, to better characterize the amygdala and the role of the CGG repeat expansion in FXTAS, we selectively expressed an ectopic CGG(n) repeat in neurons using a doxycycline inducible mouse model. Varying the treatment of doxycycline allowed us to assess disease progression over time as well as the potential for disease reversibility. Immunohistological techniques were used to identify specific nuclei in the amygdala and cell populations were estimated using stereological methods. Socioemotional behaviors were assessed in the mice using the three-chamber social interaction test (sociability) and the elevated plus-maze (anxiety). Together, results from this study will further elucidate the role of the amygdala in the underlying mechanisms of FXTAS pathology.

The Effect of Iron Type on Healing of Hot-Iron Disbudding Wounds in Dairy Calves

Savanah Vieira
Sponsor: Cassandra Tucker, Ph.D.
Animal Science

Hot-iron disbudding, the process of cauterizing the horn buds of calves at an early age to prevent growth of horns, is routinely performed on dairy farms. Little is known about the duration of healing after hot-iron disbudding or possible strategies to hasten healing (e.g., the type of iron used). This study compared healing rates following disbudding using 2 different irons: Rhinehart X50 electric disbudder and the Portasol gas disbudder. Ten calves 3-10 days of age were disbudded using the Rhinehart X50 on one horn bud and the Portasol on the opposite one, with side (left vs right) balanced between treatments. Wound healing progress was scored daily using a 4-stage system. Thermal and digital photography were taken twice a week from the day of disbudding until they were scored as healed for 4 consecutive days. The thermal photographs will be used to evaluate wound surface temperature. Preliminary results from 4 calves indicate that wounds from the Portasol took an average of 49 ± 5 (SD) days to heal while those from the Rhinehart X50 took an average of 52 ± 5 days to heal, suggesting that the type of iron used does not affect healing rate.

Impediments to Academic Success and Well-Being of UC Davis Graduate Students

Natalie Villalobos Gomez
Sponsor: Natalia Deeb Sossa, Ph.D.
Chicano Studies

With regard to the number of doctorate degrees produced over the last two decades, Chicanas/os continue to be the most underrepresented group of students, earning one percent of all doctorates produced at universities in the United States from 1990 to 2000 (Yosso 2006), followed by other students of color (African American, Native American, and Pacific Islander). This research seeks to document, with the use of counterstories, and using the Critical Race Theory framework, the persistence of racism from the perspective of those injured by its legacy, bring attention to those who courageously resist racism and struggle toward a more socially and racially just society; and challenge the denial of the ongoing significance of race and racism on campuses by offering a critical reflection of the lived experiences and histories of students at three graduate schools at the University of California, Davis: School of Education, Law School and School of Medicine.

Thermal and Tensile Strength Testing of Thermally-Conductive Adhesives and Carbon Foam

Yasmeen Vinson
Sponsor: Maxwell Chertok, Ph.D.
Physics

Particle physics experiments discovered the Higgs boson in 2012 and are now searching for additional exotic particles. Future collider detectors, including silicon tracking detectors planned for the High Luminosity Large Hadron Collider, will require components and mechanical structures providing unprecedented strength-to-mass ratios, thermal conductivity, and radiation tolerance. We have performed studies of carbon foam used in conjunction with thermally conductive epoxy and thermally conductive tape for such applications. Thermal performance and tensile strength measurements of aluminum-carbon foam-adhesive stacks are reported, along with initial radiation damage test results. Thus far, initial findings have proven that boron nitride loaded epoxy provides better thermal conductivity and ultimate tensile strength, although thin layers exhibit substantial inconsistencies of response. Thermally conductive tape can be a viable alternative depending on the application. Initial radiation damage testing with neutrons shows the epoxy-carbon foam interface is robust, although more testing is required. We plan further studies with complex configurations, such as for systems with embedded cooling pipes.

Effects of Social Interaction on Infant Exploratory Behavior

Jeannine Viruet
Sponsor: Lisa Oakes, Ph.D.
Psychology

It is suggested that social interaction between infant and parent leads to a "unique boost" in infant exploratory behavior (Johnson & Woods, 2015). In order to further explore this concept this study analyzes two groups of infants who participated in two play sessions. The first group of infants played alone in both play sessions; the second set of infants played with their mother in the first session and alone in the second session. This study aims to answer whether parent social interaction increases exploratory behavior, and whether or not that interaction will have a lasting effect in the second session. Exploratory behavior in this study was defined as infant touches of toys during the play sessions. We predict that in the first session infants who play with their mother will exhibit more exploratory behavior than the infants who play alone. We also predict that this effect will last, and during the second session the infants who initially played with their mother will display more exploratory behavior than the infants who initially played alone. This study ultimately strives to better understand the impact of parental interaction on infant exploratory behavior.

A Comparative Analysis of Positive Symptom Markers From Early Adolescence to Adulthood

Shailee Vishnubhatt
Sponsor: Tara Niendam, Ph.D.
MED: Psychiatry & Behav Sci

Many individuals suffering from psychosis develop subthreshold positive symptoms, including unusual thoughts or perceptual experiences prior to a full psychotic break. These symptoms can be measured through self-report instruments such as the Prodromal Questionnaire-Brief Version (PQ-B). The PQ-B examines the number of positive symptoms, and the associated distress, that individuals, ages 12 and up, are experiencing. Recent research indicates that younger adolescents show a higher prevalence of psychotic-like experiences than older adolescents. This analysis examines the correlation between age and self-reported attenuated positive symptoms of psychosis reported on the PQ-B in help-seeking individuals ages 12-30, referred by local mental health sites. We predict that younger ages will be associated with higher self-report of psychotic-like experiences. Additional analyses will examine 1) the outcomes of clinical evaluations to determine if there were higher rates of false positives on the PQ-B in younger individuals, and 2) the positive symptom markers most frequently answered by the younger individuals. As a whole, these findings could suggest the need for age-related cut offs for PQ-B screenings in the child and adolescent populations.

Construction and Expression of a Polycistronic Plasmid Encoding Human Protein Complex Composed of Tubulin Binding Cofactor D,E, and Arl 2

Quynh Vo
Sponsor: Jawdat Al-Bassam, M.D.,Ph.D.
Molecular & Cellular Bio

Microtubules are essential components of cytoskeleton. Their subunits are alpha-beta tubulin heterodimers, whose concentration in cells drives microtubule dynamic. During the process of forming native heterodimer subunits, there are five conserved tubulin binding cofactors (named TBC A to E) and Arl2 (ADP ribosylation factor-like 2) which are involved and regulate the concentration of soluble tubulin subunits. The structure and function of these cofactors in bovine, pig, and yeast have been subjected for research many decades ago. They are chaperones which control biogenesis and degradation of tubulin heterodimers. Here, the conserved protein complex of cofactor D,E, and Arl2 in human is studied. This complex is not stable enough to be expressed and purified from bacterial culture, which also lacks post-transciption modification process.The complex is expressed in insect cells using Bac-to-Bac baculovirus expression system and purified using Nickel column and gelfiltration. The structure of the complex is further studied by cryo-EM.

Development of a Rapid High-Throughput Mass Spectrometry-Based Method for the Quantification of Monosaccharides in Food

Thai-Thanh Vo
Sponsor: Carlito Lebrilla, Ph.D.
Chemistry

Despite being the predominant biomolecule, carbohydrate landscapes of common foods remain largely unknown. When not digested by the host, carbohydrates are involved in a symbiotic relationship with the gut microbiota and hold an important role in immune development and nutrient absorption. Until now, there is no known method that can easily elucidate and analyze the food glycome rapidly and accurately. Understanding the role of carbohydrates in food requires complete determination of their composition and structure; however, the large size of polysaccharides renders them difficult to analyze using any analytical platform. This project aims to develop a robust high-throughput method to quantify and characterize the monosaccharide compositions of foods with the ultimate goal of generating a database of food monosaccharide profiles. Foods such as rice, flour, and fruits were lyophilized, pre-cooked, and broken down to their monosaccharide components via hard acid hydrolysis with trifluoroacetic acid (TFA). Samples then underwent derivatization with 3-methyl-1-phenyl-2-pyrazoline-5-one (PMP) and analysis was carried out using ultra-high performance liquid chromatography paired with triple quadrupole mass spectrometry (UHPLC/QqQ-MS). This robust and sensitive method will further our knowledge of each food's unique carbohydrate profile and aid in the development of modified foods that can target specific health problems.

The Impact of Social Norm Comparisons on Residential Water Consumption

Linda Vo
Sponsor: Katrina Jessoe, Ph.D.
Ag & Resource Economics

Water is an essential natural resource in California. It helps to support a growing population and sustain various activities that contribute to the California economy. Unfortunately, due to the ongoing drought in California and the rise in urban water demand, water scarcity and overconsumption are an increasing concern for many areas. Water conservation measures can help to reduce water demand during times of scarcity. In this study, a randomized control trial is deployed in the city of Riverside to test the impact of social norms messaging about water usage on residential water consumption. Preliminary results suggest that this intervention induced a 1% reduction in household water consumption. Currently, we are deploying empirical tests to uncover heterogeneity in the timing of the response and how it correlates with rainfall. The results from this study will provide a better understanding of how residential water consumers respond to a behavior-based water conservation measure.

User-Friendly Graphical User Interface to Assess the Instability and Sensitivity of Cardiac Electrical Activities

Syed Wahaj
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

The heart is a highly complex system. Cardiac arrhythmia, which is a major cause of sudden cardiac death, is due to disordered/chaotic membrane voltage activities in the heart. The membrane voltage dynamics is itself highly nonlinear. Therefore, it is difficult to understand the electrical activities in the heart intuitively. In fact, modifications at the single channel level often cause unpredicted phenomena at the cellular and tissue levels. Understanding the mechanisms of arrhythmias using computational modeling is critical for development of effective therapies and drugs. However, it is not easy for non-programmers to use the computational models. In this study, we developed a user-friendly graphical user interface to assess the instability and sensitivity of the cardiac action potential. Using this interface, we demonstrate how single ion channel properties affect the instability of the cardiac action potential interactively. We show healthy and unhealthy action potentials simulating normal and pathological conditions. This study provides an easy and convenient way to evaluate effects of drugs without knowledge of programming.

Effects of Mesenchymal Stem Cell Secreted Factors on B and T Cell Activation

Melodie Walker
Sponsor: Isaac Pessah, Ph.D.
VM: Molecular Bio Sciences

Recent studies found that Feline Chronic Gingivostomatitis (FCGS), an oral inflammatory disease in cats, can be improved through the intravenous application of Mesenchymal stem cells (MSCs). While more research must be done for clinical treatment in felines, it is necessary to first design a potency assay to verify MSC consistency in treatment. It is hypothesized that the severe inflammation observed in FCGS is due to a hyperactive immune response, which is characterized by an increase in T and B cell activation. Consequently, it is shown that MSCs have an immunomodulatory effect when interacting with lymphocytes. Based on the assumption that MSCs will decrease activation of T and B cells, we will determine if MSC secreted factors have an effect on feline T and B cell activation. We will use CD4, CD8, and CD21 to track T and B cell response and will utilize flow cytometry, which will measure T cell activation using the CD4/CD8 ratio and B cell activation using CD21-. In the experimental group, we will expose lymphocytes to MSC conditioned media. This high throughput potency assay will ultimately measure MSCs' ability to effectively act as an immunomodulator in the treatment of FCGS and potentially other autoimmune diseases.

Assistance Dogs for Autism and Psychiatric Disabilities Placed by ADI or IGDF Accredited Facilities, and by Non-Accredited U.S. Facilities

Sandra Walther
Sponsor: Lynette Hart, Ph.D.
VM: Population Hlth & Reprod

Assistance dogs' roles rapidly diversify to support people with many disabilities. We surveyed worldwide facilities associated with Assistance Dogs International (ADI) or the International Guide Dog Federation concerning numbers and types of assistance dogs placed in 2013-2014. 55 North American and 34 international facilities responded (2,374 , 1,143 dogs). 22 non-accredited U.S. facilities responded (797 dogs). Guide dogs are most numerous worldwide. Mobility dogs tied in the U.S. European mobility and hearing dogs are second and third. ADI categories are guide, service, hearing; service roles encompass mobility, autism, psychiatric, diabetes, seizures. Autism dogs were third in North America (n = 205), fourth internationally (n = 120), third for non-accredited facilities (n = 72). Internationally 2013-2014, autism dogs increased 26%, 16% in North America, Europe and non-accredited facilities place autism dogs. Non-accredited facilities have

Cocaine- Versus Methamphetamine-Abusing Patients in the Emergency Department: How Do They Differ?

Colin Wang
Sponsor: John Richards, M.D.
MED: Emergency Medicine

Cocaine and methamphetamine abuse continues to be a major worldwide problem, and abusers present to the ED for diverse reasons. The study aim: determine if differences exist between these patients. Patients presenting to UCDMC ED over a 3-month period with positive toxicology screens for cocaine and/or methamphetamine were compared. Of 718 patients, 610 (85%) were positive for methamphetamine, 80 (11%) cocaine, and 28 (4%) both. There was no significant difference between the subgroups with regard to age and gender. For laboratory results, there was no significant difference between subgroups for creatinine, Troponin I, B-type natriuretic peptide, and creatine kinase. No significant differences were detected for maximum heart rate, systolic, and diastolic blood pressure. With regard to presenting complaint, there were differences: the proportion of cocaine patients with blunt trauma was higher than the other subgroups, and lower for altered mental status. There was no significant difference in proportion of patients admitted to the hospital or discharged home. However, cocaine patients were placed on 72-hour psychiatric holds and/or transferred to an inpatient psychiatric facility at a significantly lower rate than the other subgroups. These differences may in part be explained by the unique neuropsychopharmacological differences between cocaine and methamphetamine.

Dual Labeling of RecBCD Enzyme by Site Specific Incorporation of Unusual Aminoacids for Single Molecule Förster Resonance Energy Transfer Analysis-Part I

Zunqiu Wang
Sponsor: Theetha Pavankumar, Ph.D.
Microbiology & Molec Genetics

RecBCD enzyme is a helicase and nuclease that plays a major role in double strand breaks (DSBs) repair process in E. coli. RecBCD enzyme recognizes a specific DNA sequence (Chi, 5' –GCTGGTGG-3'). Before Chi recognition, RecBCD enzyme preferentially degrades 3' end of the DNA over the 5' end. Recognition of Chi sequence attenuates enzyme's nuclease activity and alters polarity of DNA degradation producing 3' ended ssDNA, where the RecBCD enzyme facilitates RecA loading and promotes RecA-mediated homology recombination. The modified behavior of RecBCD enzyme is attributed to Chi induced conformational change in RecBCD enzyme. However, the molecular mechanism of conformational changes is still not clear. To understand this phenomenon, we planned to incorporate unusual aminoacids at selected positions on RecBCD enzyme and label with Alexa 488 (a donor) or Alexa 555 (an acceptor) to study the Förster Resonance Energy Transfer (FRET) between them. In this part of project, On RecC subunit, we selected $RecC^{E195}$ to incorporate Azido-Lysine and conjugate with Alexa-555. On RecB subunit, we selected $RecB^{Q985}$, $RecB^{Q1011}$, $RecB^{Q1096}$ and $RecB^{L1167}$ to incorporate p-Acetylphenylalanine and conjugate with Alexa-488. Finally, RecBCD enzyme is immobilized on a passivated glass surface to study the FRET using TIRF microscopy.

Distress and Recovery of Technology Companies After the Dot.com Bust

Weizhou Wang
Sponsor: Jens Hilscher, Ph.D.
Ag & Resource Economics

In the late 1990s, the technology industry experienced dramatic growth; in the early 2000s the dot.com bust made the industry much smaller. The rise of the tech industry has not only significantly contributed to the U.S. economy but also changed the way people live and interact with each other. A better understanding of causes and consequences of the dot.com bust can help future growth of the industry be healthier, increasing welfare for society. This paper quantifies the impact of the dot.com bust on the technology industry, investigates the reasons behind the financial distress and failures of technology companies, and describes the unique characteristics of the recovery of the technology industry after the dot.com bust. Through analyzing accounting and market data, it is confirmed that the technology industry experienced a major contraction in the early 2000s. In addition, I find that general distress factors have different degree of impact on technology and non-technology companies. Regarding recovery strategy, distressed non-technology companies tend to favor issuing debt while distressed technology companies tend to issue equity. However, technology companies who failed to recover from distress were the ones who issued more equity.

Environmental Responses of Bioactive Enzyme Cathepsin D in Human Milk

Jiaqi Wang
Sponsor: J German, Ph.D.
Food Science & Technology

Human milk is critical for an infant's development and health. In addition to provide infants with nutritional components, human milk also delivers diverse bioactive components, including enzymes. As a major enzyme present in human milk, cathepsin D may enhance an infant's immune defense and help human milk to release nutrients in an infant's stomach. Cathepsin D is an acidic proteinase that displays greatest activity around pH 4 and has no action at pH 7.4. Therefore, cathepsin D has low activity in neutral expressed human milk. On the contrary, the acidic environment of infants' stomach suggests that this enzyme may exert important physiological functions in infants. This project is to develop methods for extracting and measuring cathepsin D from human milk, and to apply the validated method in studying the pH effect on cathepsin D in breast milk. Concentration of cathepsin D is measured by enzyme-linked immunosorbent assay (ELISA), and activity of cathepsin D is measured by fluorescence-based assay. Understanding the responses of cathepsin D to environmental changes will reveal the bioactive mechanism of enzymes in human milk, contributing to the utilization of its properties to improve infant health.

Garnir Polynomials and Their Properties

Yu Wang
Sponsor: Evgeny Gorskiy, Ph.D.
Mathematics

We are studying the polynomials in n variables which behave nicely under permutation of variables. Such polynomials appear in various problems in algebra, representation theory and physics. We start with some basic operations. For example, symmetric polynomials do not change the value if one permutes the variables (for example: x_1^2+x_2^2), and anti-symmetric polynomials may change the sign under permutation (for example: x_1^2-x_2^2) to illustrate how permutation works, as well as some other properties of these polynomials. Then we will focus on more interesting examples like Garnir polynomials and how they are related to Young diagrams (a finite collection of boxes, arranged in left-justified rows, with the row lengths in non-increasing order). Garnir polynomials (for example, (x_1-x_2)*(x_3-x_4)) form a more interesting class of polynomials which behave nicely under permutations. Garnir polynomials have many interesting properties. We will mainly care about Garnir polynomials which only involves four variables at a time, and study the relations between them.

The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Egypt" in the New York Times (1930-1939)

Tayler Ward
Sponsor: Suad Joseph, Ph.D.
Anthropology

The term “Egypt” was used by the West in reference to both ancient and modern day Egypt. I examined 15,881 articles published from 1930 to 1939, and critically analyzed 213 relevant articles where the term “Egypt” was used by New York Times correspondents. I discovered that the while present day Egypt was represented as ahistorical and inferior to the West, ancient Egypt was depicted as a prosperous and model “civilization.” I argue that this depiction of an affluent ancient Egypt was used as a contrast to further the representation of present day Egypt as subordinate, which justified British colonial acts that claimed to “save” the people of modern day Egypt from chaos and disorder. This misrepresentation engraved into American society that the people of the East were backwards and inferior. I suggest that such news media misrepresentation which is persistent in the 21st century, served as an opportunity for the West to portray itself and Christianity as heroic, modern, and advanced in order to depict the East and Islam as backwards. This research is part of an analytical project of the New York Times over 150 years conducted in Dr. Suad Joseph’s lab.

Strawberry Runner Colonization by *Fusarium oxysporum* f. sp. *fragariae*

Dean Watson
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Strawberry production in California requires coordinated action between high-elevation nurseries and fruit-production fields. At high-elevation nurseries, mother plants are established in the spring that produce runners (= stolons), which rise to new plants (= daughter plants). In the autumn, daughter plants are used to establish plantings in commercial fruit-production fields in the coastal regions of California. Fusarium wilt of strawberry, caused by the soil-borne fungal pathogen Fusarium oxysporum f. sp. fragariae (Fof), is a growing threat to the strawberry production industry worldwide. Symptoms of the disease typically include stunting, wilting, crown discoloration, and eventual plant death. One possible explanation for the increasing incidence of Fusarium wilt in fruit-production fields is the introduction of the pathogen from high-elevation nurseries via contaminated transplants. The present study evaluates the ability of Fof to colonize the stolons of infected mother plants and infect daughter plants without producing identifiable symptoms, providing a potential mechanism for the contamination of transplants. Furthermore, the movement of the pathogen through daughter plants is being analyzed. Preliminary results indicate that Fof does colonize the stolons and daughters of infected mother plants, and there is some evidence to suggest that there is a difference in colonization frequency between strawberry cultivars.

Effects of Mesenchymal Stem Cell Secreted Factors on B and T Cell Activation

William Wen
Sponsor: Isaac Pessah, Ph.D.
VM: Molecular Bio Sciences

Recent studies found that Feline Chronic Gingivostomatitis (FCGS), an oral inflammatory disease in cats, can be improved through the intravenous application of Mesenchymal stem cells (MSCs). While more research must be done for clinical treatment in felines, it is necessary to first design a potency assay to verify MSC consistency in treatment. It is hypothesized that the severe inflammation observed in FCGS is due to a hyperactive immune response, which is characterized by an increase in T and B cell activation. Consequently, it is shown that MSCs have an immunomodulatory effect when interacting with lymphocytes. Based on the assumption that MSCs will decrease activation of T and B cells, we will determine if MSC secreted factors have an effect on feline T and B cell activation. We will use CD4, CD8, and CD21 to track T and B cell response and will utilize flow cytometry, which will measure T cell activation using the CD4/CD8 ratio and B cell activation using CD21-. In the experimental group, we will expose lymphocytes to MSC conditioned media. This high throughput potency assay will ultimately measure MSCs’ ability to effectively act as an immunomodulator in the treatment of FCGS and potentially other autoimmune diseases.

RNA Interference-Mediated Knockdown of Bla G 4, an Asthma-Related Allergen, in Male *Blatella germanica* (L.) (Dictyoptera, Blatellidae)

Jade White-Dobbs
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

Blatella germanica, also known as the German cockroach, is an urban pest found in human habitats worldwide. In lower-income housing such as apartment complexes, they are both costly and difficult to control. This becomes a medical concern when children living in the units are exposed to high levels of BlaG4, a male-specific allergen known to cause asthma (Do et al 2016). Currently, little is known about the function of BlaG4 in the cockroaches, but it is hypothesized to be part of the spermatophore transferred to females during copulation (Fan et al 2005). The aim of this study is to knock down the BlaG4 gene with RNAi in adult males, and evaluate levels of BlaG4 in male and female reproductive tissues following mating trials. Currently, mating trials are being performed between virgin females and either RNAi-treated or control males. If the RNAi treatment is successful, the females who mate with the treated males should not have any BlaG4 in their system, and may possibly exhibit lower fecundity than those mated with control males. The results of this study may have implications for RNAi methods of pest control that target both underlying medical concerns and reproductive success of German cockroach populations.

Exploring Catalysts for Allylsilane Oligomerization Reactions

Benjamin Wigman
Sponsor: Annaliese Franz, Ph.D.
Chemistry

Silicon-containing materials have broad applications, and so investigations into new silicon-containing oligomers and polymers are of great potential value. The use of catalysts can provide efficiency and desired selectivity in a chemical synthesis. In this study, various catalysts were screened to optimize the oligomerization of a relatively unexplored monomer, allylsilanes. Several metal salt Lewis acids ($Sc(OTf)_3$ and $Y(OTf)_3$) and the Brønsted acid H_3PO_4 provided full consumption of the monomer in the presence of sodium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate (NaBArF). It was determined that both NaBArF and the acid catalysts are required for oligomerization. Reaction progress was monitored by ^1H NMR spectroscopy, and utilized in combination with MALDI-TOF mass spectrometric analysis to characterize the oligomers' structures. Investigations into the role of the catalyst were performed using a proton scavenger to determine the metal salt catalysts role as either a Lewis or Brønsted acid. A variety of allylsilanes undergo oligomerization; this is advantageous as structure can influence the properties of potential materials or the silyl group can be involved in further chemical transformations to provide more diverse structures. Future studies will determine the potential usage of this new class of oligomer in the design of new materials.

Analyzing Popular Music: Identifying Elements of Popular Songs That Correlate to Success Within Specific Audiences

Wyatt Williams
Sponsor: Christopher Reynolds, Ph.D.
Music

My research aims to develop a new method of examining popular music that explains, in detail, what specific facets of a song correlate to the song's success. It focuses on identifying specific elements of popular songs to explain why certain audiences favor certain songs. These elements will be identified and categorized using a five-point system inspired by and derived from Kay Kauffman Shelemay's Soundscapes model. The five-point system analyzes lyrical, aural, theoretical, and visual aspects of a song and its performance, as well as traits of the artist to evaluate the cultural significance of the song. These aspects serve as quantifiable elements that will be compared with the song's popularity on ranking charts, the amount of digital sales, and other forms of rating success. I use Pharrell William's 2014 hit single "Happy" to illustrate this system. My goal is to create metrics and a methodology for analyzing music that will benefit academic and commercial understanding of modern popular music.

Effects of Mesenchymal Stem Cell Secreted Factors on B and T Cell Activation

Reese Wilson
Sponsor: Isaac Pessah, Ph.D.
VM: Molecular Bio Sciences

Recent studies found that Feline Chronic Gingivostomatitis (FCGS), an oral inflammatory disease in cats, can be improved through the intravenous application of Mesenchymal stem cells (MSCs). While more research must be done for clinical treatment in felines, it is necessary to first design a potency assay to verify MSC consistency in treatment. It is hypothesized that the severe inflammation observed in FCGS is due to a hyperactive immune response, which is characterized by an increase in T and B cell activation. Consequently, it is shown that MSCs have an immunomodulatory effect when interacting with lymphocytes. Based on the assumption that MSCs will decrease activation of T and B cells, we will determine if MSC secreted factors have an effect on feline T and B cell activation. We will use CD4, CD8, and CD21 to track T and B cell response and will utilize flow cytometry, which will measure T cell activation using the CD4/CD8 ratio and B cell activation using CD21-. In the experimental group, we will expose lymphocytes to MSC conditioned media. This high throughput potency assay will ultimately measure MSCs' ability to effectively act as an immunomodulator in the treatment of FCGS and potentially other autoimmune diseases.

Developing Course-Based Undergraduate Research Experiences (CUREs) in STEM and Assessing Their Relation to Student Interest and Retention in STEM Fields

Christian Wirawan
Sponsor: J. David Furlow, Ph.D.
Neuro Physio & Behavior

National efforts to reform undergraduate STEM education emphasize integrating students into research early in their careers. Course-based undergraduate research experiences (CUREs) provide students with the unique opportunity to participate in a research project that is of interest to the scientific community. Students entering research-intensive institutions face unique challenges including lack of sense of community, unfamiliar large-enrollment courses, and difficulty approaching faculty. Many students declare STEM majors, but general science courses have left some students uninterested or unable to connect class concepts to problems of today. CUREs have the potential to not only improve student scientific thinking and data analysis skills, but also impact long-term student retention in STEM disciplines. To test the impact of CUREs at UC Davis, several courses were developed on taking faculty's current scientific research and applying it to a small classroom setting for undergraduates. We are currently using surveys and student reflections to evaluate the immediate impact of these CUREs and plan to continue tracking the students to assess any long-term effects. We here describe the efforts to implement the first CURE courses offered at our institution, their impact on students, and current plans to scale up the offering of these courses in future quarters.

Adaptations of Skeletal Muscle Extracellular Matrix in Response to Acute Resistance Exercise and the Role of the Mechanistic Target of Rapamycin (mTOR)

Moses Wolfe-Polgar
Sponsor: Keith Baar, Ph.D.
Neuro Physio & Behavior

The extracellular matrix (ECM) is critical for effective force transmission in skeletal muscle (SKM). However, the roles of Early Growth Response 1 (Egr-1), a known regulator of collagen expression, and mTORC1, the principle regulator of SKM anabolism, in regulating SKM ECM remodeling following resistance exercise (REx) remain understudied. We sought to determine the change in Egr-1 expression in SKM post REx and the potential role of the mTORC1 in regulating Egr-1. F344BN rats underwent unilateral REx of the tibialis anterior (TA) muscle using electrical stimulation of the sciatic nerve. A subset were treated with rapamycin, an mTOR inhibitor, prior to exercise. TA muscles were extracted at various time intervals following REx. RNA was isolated and analyzed by qPCR; protein content was determined by Western blot. There was ~2-fold increase in Egr-1 protein 6 hours post-REx, which followed a >100-fold increase in Egr-1 mRNA 1.5 hours post-REx. Fibrillar and transfer collagen isoforms increased >4-fold at 48 hours post-REx. Regulators of fibrosis and ECM remodeling were acutely elevated at 12 hours, all largely independent of rapamycin. Further research is needed to determine the importance of Egr-1 and associated proteins in mediating adaptations of the ECM in response to loading.

Do Early Traumatic Experiences Spur Addictive Behavior?

Amy Wong
Sponsor: Karen Bales, Ph.D.
Psychology

Titi monkeys (Callicebus cupreus) are New World primates that develop monogamous social bonds with pair-mates in adulthood. There have been studies that provide evidence for a neurological link between social attachment and addiction. Furthermore, research at the California National Primate Research Center with the titi monkeys show that their pairing status causes different responses to 'addictive' sweet stimuli. Paired monkeys show a greater preference to sweet stimuli than non-paired individuals. Thus, since adverse childhoods have been linked to difficulty with social attachments in adulthood, we are interested in the correlation of infant trauma to addiction. In this study, we will test how adverse experience (illness, injury, relocation, handling, etc.) during an infant titi monkeys' first year of life will affect their response to a rewarding, sweet stimuli as adults. First, we categorize infant trauma through archival data collection from the titi monkeys' health records. Then we conduct a sucrose test on individuals in the colony to assess their preference towards the sweet stimuli. We predict that individuals that had early adverse experiences will show greater preference in the sucrose test, exhibiting addictive behavior. If so, this model of primate behavior could even translate to implications for human behavior as well.

Heavy Metal Sequestration by Douglas Firs on Serpentine Soil

Joyce Wong
Sponsor: Benjamin Houlton, Ph.D.
Land Air & Water Resources

Serpentine soils are derived from ultramafic rocks, creating harsh soil environments with heavy metals that are toxic to plants such as Ni, Cr, and Mg. Some evergreens respond to heavy metal toxicity by sequestering heavy metals in their foliage, roots, or bark. Black spruce growing in soils contaminated with heavy metals sequesters Cu and Pb in their needles (Aznar et al., 2009), while Turkish red pine has been found to to sequester heavy metals from the air in its bark (Dogan et al., 2010). Douglas fir (Pseudotsuga menziesii) is an evergreen tree species that is widespread across the Pacific Northwest. It is non-endemic to serpentine environments but is found growing on serpentine soils in the California coast ranges. We examined potential Douglas fir adaptations to heavy metal toxicity in serpentine soils by collecting foliage from Douglas firs located on serpentine and adjacent, non-serpentine soils in the California coast ranges. Preliminary results from elemental analysis of these foliage samples suggest elevated heavy metal accumulation in needles of Douglas firs growing on serpentine soils as compared to Douglas firs growing on adjacent, non-serpentine soils. Our findings have important implications for understanding the ways evergreens adapt to heavy metal toxicity in soils.

An App for Documentation of Roadkill

Clarice Wong
Sponsor: Fraser Shilling, Ph.D.
Environmental Science & Policy

The ability to obtain observation data from third parties is a crucial tool in research, and the motivation behind this project for the Department of Environmental Science and Policy. To supplement Professor Fraser Shilling's research of wildlife/roadkill observation, we built a mobile app that enables everyday users and Caltrans maintenance workers to take photos of roadkill they have come across. Data collected through the app includes images, geolocation information, and timestamps, which will be used by Caltrans workers for roadside pick-up. With a larger set of users to collect observations on animal-related incidents on the road from, we are hoping to help Caltrans be able to make roadkill pickup a more efficient process in addition to identifying their locations more accurately. Another result of this expanded data set is that we wI'll be able to better understand the relationship between road collisions and accidents involving wildlife on highways/roads, and ultimately, minimize roadkill occurrences.

Restoring the Original: Gothic Architecture Reimagined

Harley Wong
Sponsor: Letja Ch'ien, Ph.D.
Art

In 2009, restorers began a controversial restoration of the famed Gothic Chartres Cathedral that changes its massive stone interior from gray to pink. While this is not the first restoration of the site, this project attempts to visually return the medieval structure to its untouched thirteenth-century presentation, and refuses Chartres Cathedral the ability to exist beyond its medieval identity. This paper, to be presented in a conference-style format, argues that the restorers have exploited the uncertainty of the thirteenth-century design to implement their own narrative, which further hinders the site's physical and historical formation. The allusion to the medieval original without the ability to fully execute that representation results in admiration for a version of Chartres Cathedral that did not exist in the thirteenth-century or any other part of history, but was conceptualized and materialized only post 2009. As the restoration team alludes to the first constructors of the site, it becomes apparent that in addition to fabricating the intentions of the thirteenth-century builders through authorship in restoration, they are also imposing their ownership of the site.

Early-Stage Technologies and the Public University: Lessons About Intellectual Property and Social Responsibility From the UC Blackwelder Tomato Harvester

Maria Angelica Wong Chang
Sponsor: Colin Milburn, Ph.D.
English

For early-stage technologies developed within public universities, two issues arise: the need for a system of technology transfer to the industry for development, manufacture, and commercialization; and the uncertainty about social and economic consequences and barriers for introducing a new technology into the market. The latter is of particular concern, as public universities hold both social and economic responsibilities in their role as public institutions. This work takes the UC Blackwelder tomato harvester as a case study for early-stage technologies developed in public research universities, to argue the relevance of intellectual property in connecting university and industry, and of appropriate policies in making university research achieve positive social and economic returns. As the history of the tomato harvester shows, the patentability of university research was key in the technology transfer between the UC and the Blackwelder Manufacturing Company. At the same time, the end of the bracero program stimulated the adoption of the harvester, while a lack of foresight led to a lawsuit between the UC and California Rural Legal Assistance (CRLA). Therefore, the tomato harvester exemplifies the importance of intellectual property and appropriate policies in the development and introduction of early-stage technologies initiated in a public university.

The Effects of Drought Conditions on California Crop Production Decisions

Erin Woolley
Sponsor: James Sanchirico, Ph.D.
Environmental Science & Policy

California is one of the nation's leading agricultural producers, growing 14% of all U.S. agricultural products. The impacts of climate change on local temperature and precipitation levels combined with the state's history of drought, however, are putting this sector at risk. As water becomes more scarce throughout the state, the pressure on the agricultural sector to use the resource more efficiently increases. The current body of research is primarily focused on how policymakers can influence water conservation in agricultural irrigation through changes in the price of water. In this study, I examine the relationship between water availability and crop choice in California agriculture, in order to better understand the impacts that continued drought conditions may have on agricultural production decisions in California. Using crop survey data, compiled by the California Department of Food and Agriculture, and temperature and precipitation data, I compare pre- and post – drought production of different crop types.

Sovereignty and Slavery: Southern Whigs, a "British Conspiracy" and the Annexation of Texas

Brian Wright
Sponsor: Gregory Downs, Ph.D.
History

In early 1843, news reports around the United States broke that President John Tyler had been secretly negotiating terms for the annexation of the newly independent Republic of Texas into the Union. Spurred by rumors that Great Britain wanted to threaten the slave power and annex Texas for itself, Tyler abandoned his own Whig party's platform and precipitated a diplomatic crisis, forcing Southern Whig politicians to side with party in opposing annexation or support their pro-slavery constituents. I aim first to recognize both how Texas' annexation laid the ground for the Civil War and how foreign actors can and have influenced such critical historical junctures. Next, I will analyze Southern Whigs' reactions to Britain's alleged meddling, their rhetoric supporting or opposing annexation, and the broader historical consequences of annexation for the Whig party and the increasingly sectional political landscape. Drawing from the vast existing secondary literature, Congressional debates, personal correspondences, and newspaper editorials, this research will not only produce a new perspective on the crisis but trace a historical arc from Texan independence to Tyler and Britain's clandestine diplomacy, from the fraught legal and political process of annexation to the eventual collapse of centrist politics and the Whig party itself.

Thermodynamics of Lipid Monolayers

Robert Wu
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering

1,2-Dipalmitoyl-sn-glycero-3-phosphocholine (DPPC), 1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC), and cholesterol are major components of cell membranes with the latter thought to greatly affect membrane packing structure by inducing a condensing effect in some lipid species. To quantify the effect of cholesterol, two-component mixtures of DPPC-cholesterol, DOPC-cholesterol, and DPPC-DOPC were studied as Langmuir monolayers at 25 °C and 37 °C. Surface pressure – area (π-A) isotherms of these binary lipid systems were measured using a computer-controlled Langmuir trough. Thermodynamic analysis of the data was conducted to obtain the Gibbs free energy of mixing as a function of lipid concentration at various surface pressures. Gibbs free energy diagrams allow for the determination of attractive and unfavorable interactions, which are instrumental to understanding biomembrane structure functionality. The results indicate that the lipid mixtures of DPPC-cholesterol and DOPC-cholesterol were less favorable at physiological temperature than at room temperature. Further thermodynamic analyses of π-A isotherms allow for conclusions to be drawn about phase transitions of mixed lipid monolayers in comparison to bulk-like properties.

Monitoring Subcellular Localization of Effectors Delivered From *Pseudomonas* Into Plant Cells

Susan Wu
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Various pathogens deliver proteins called effectors into their host cells to facilitate pathogenesis by inhibiting the host's immune system. The gram-negative bacteria, Pseudomonas uses the type III secretion system (T3SS) to deliver effectors into host cells to suppress host defense against bacteria. However, very little is known about the subcellular localization of effectors when delivered directly from bacteria due to the incompatibility of GFP with the T3SS system. GFP tagged T3SS effectors cannot be delivered into the plant cell through the T3SS. To overcome this problem, we optimized a split GFP system. The split GFP system is composed of two compartments, sfGFP1-10^{OPT} and sfGFP11, that reconstitute sfGFP and emit the fluorescence when two components are in the same compartment. We created a series of organelle specific split GFP system to monitor the Pseudomonas effectors delivered in target organelles through the T3SS. We first confirmed the system using transiently expressing Nicotiana benthamiana plants and using Arabidopsis transgenic plants which constitutively express sfGFP1-10^{OPT} to validate the feasibility of the system. This system will allow us to visualize effector deliveries from Pseudomonas into plant cells through the T3SS.

Regenerative Design of Richmond Oil Refinery Area

Haotian Wu
Sponsor: David De LaPena, Ph.D.
Human Ecology

The Chevron Oil Refinery in Richmond, CA has caused severe environmental and social issues in its surrounding area, that greatly affect local people's living quality and visitors' travel experience. People in this area are exposed to highly concentrated air and water contaminants, and are isolated from the bay, which is mostly used for industrial process, but can be potential outdoor activity spaces. This project aims at improving people's outdoor experience around the refinery area, particularly the bay, by recreating the landscaping setting, such as planting more pollution absorbing plants, building up buffering hardscape, and make use of water flow and wind direction to manipulate pollutants movement. The research phase will be analyzing the current situation, going over case studies of similar projects and related articles, and searching for potential solutions to major concerns regarding aesthetics and sustainability. For the design phase, I will create graphics that illustrate the site situation using collected scientific and social data, conduct site visits to observe existing landscape, and finally come up with a master plan as well as smaller scale detail renderings for the new design. This regenerative design will be able to improve people's outdoor experience, including recreational activities and daily travel.

High-Resolution Imaging of Cell and Molecular Interactions by Reflection Interference Contrast Microscopy

Zhiyu Xiao
Sponsor: Volkmar Heinrich, Ph.D.
Biomedical Engineering

The quantitative study of the behavior of cells and biomolecules requires high-resolution approaches with longtime stability. Reflection Interference Contrast Microscopy (RICM) meets these requirements by allowing us to visualize the dynamics of adhesion with nanometer and millisecond resolution. For example, past RICM experiments have demonstrated the ability to quantify ultraweak biomolecular interactions by tracking the motions of biomolecule-tethered glass beads. Other experiments have examined the area of contact between spreading cells and functionalized coverslips. Currently, I supplement these experiments by developing an autofocus algorithm, a center-finding algorithm, and a more precise theory to interpret the interference pattern. In particular, the autofocus algorithm compensates for the vertical drifts of the coverslip interface relative to the objective's focal plane. The center-finding algorithm combines cross-correlation and the gradient-crossing methods to automatically detect the center of Newton rings. The more precise theory replaces the original parabolic approximation of the underside of the glass beads with a spherical model. Along with these supplements to RICM, my examination of live human white cells—specifically, during frustrated neutrophil phagocytosis—have deepened our mechanistic understanding of the formation of cellular protrusions.

Investigating the Interaction Between LET-99 and Rac in Cytokinesis

Helen Xie
Sponsor: Lesilee Rose, Ph.D.
Molecular & Cellular Bio

Proper animal development requires cytokinesis, or the physical separation of daughter cells, which results from the inward furrowing of the membrane by a contractile apparatus. Cytokinesis must be spatially regulated such that division occurs between the two sets of chromosomes that are being segregated by the mitotic spindle. The spindle is comprised of two sets of microtubules that contribute to these signals: the astral and the central spindle microtubules. Recently the LET-99 protein was shown to be part of the astral furrowing pathway in the C. elegans embryo, but its mechanism of action is unclear. The LET-99 protein has a region with similarity to RhoGAP proteins. We hypothesize that this domain could serve as a binding platform for small G-proteins like Rho, Rac, and CDC-42, proteins that have been implicated in cytokinesis. To test for direct interactions between LET-99 and the small G-proteins, we are performing pulldown assays with recombinant proteins. Preliminary results suggest that LET-99 does not bind Rho, but may bind Rac. Consistent with this result, we also observe a genetic interaction between Rac and LET-99 in the one-cell embryo.

Spo11 Is Necessary to Prevent the Generation of Aneuploid Offspring in Zebrafish

Na Xiong
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

Meiosis comprises of two reduction cell divisions that result in the production of four haploid gametes. Errors in the segregation of chromosomes into daughter cells during meiosis can lead to aneuploid gametes and birth defects. Spo11 is a protein that initiates meiotic double stand breaks which allow homologous chromosomes to pair and form chromosomal crossovers. Zebrafish produce a large number of accessible embryos and provide us with an ideal model to investigate the connection between DNA double strand breaks and aneuploidy. To investigate whether Spo11 contributes to aneuploidy, wild type and spo11-/- females were crossed to wild type males and the resulting offspring were collected at 22 hours post fertilization. Metaphase spreads revealed a range of 40-50 chromosomes in wild type offspring, in contrast the offspring of spo11-/- females showed a higher distribution of aneuploidy with range of 30-60 chromosomes. This result suggests that Spo11-induced double strand breaks in the DNA contribute to the proper pairing and segregation of homologous chromosomes during meiosis.

Mathematical Models to Extract Key Features Determining Superconducting Properties on Iron Arsenic Compounds

Mengda Xu
Sponsor: Yulia Zaikina, Ph.D.
Chemistry

Our research begins by datamining superconductive compounds and performing machine learning analysis to uncover correlation between superconducting properties that can help prediction and classification of materials. These compounds are separated by class demonstrating differences in structure, composition, and symmetry elements that may affect their superconducting properties. Although a single structural parameter that defines the magnitude of critical temperature (Tc) has not been identified for, they all have in common the superconducting iron arsenic layer. Our main task is to uncover which features are important for the compound to exhibit superconducting properties. Hence, this study focuses on different classes of iron arsenic superconductors and implements several analytical techniques to accurately predict superconductivity within iron arsenic superconductors, such as Sparse Logistic Regression, Artificial Neural Network, SVD Decomposition, Support Vector Machine and SPCA. We also created an interactive webpage which allows the user to visualize information about this data in three dimensions. The standard k-means clustering algorithm in Javascript was implemented to help on the task of classifying which compound is a superconductor or not.

Arap1 Is Necessary for Photoreceptor Survival in Mice

Karen Xu
Sponsor: Ala Moshiri, M.D.,Ph.D.
MED: Ophthalmology

Arap1 is a protein that inhibits epidermal growth factor receptor degradation, but the importance and diversity of its function is poorly characterized. Our lab performed a series of experiments to determine the role of Arap1 in the mammalian retina. We examined the retinas of multiple mice of varying ages that expressed Arap1 and compared them to those of mice that had Arap1 knocked out. Mice were subjected to electroretinography (ERG) to measure retinal activity. Retinal sections were immuno-stained with various antibodies to determine the effect of ablation of Arap1. Results show that knockout animals (Arap1-/-) had a thinning of the retinal photoreceptor cell layer after 4 weeks of birth when compared to wild-type mice. Electroretinography of living animals also showed that the knockout mice had reduced retinal activity. It was also shown that Arap1 was predominantly expressed in Muller glia cells, however, its role is still unknown. From our results, it can be concluded that Arap1 is not necessary for normal retinal development in mice, but is required for photoreceptor survival. Further research is required to determine Arap1's role in Muller glia cells and the specific role this gene plays in retinal photoreceptor degeneration.

MARCKS Inhibition as a Novel Strategy to Attenuate Lung Fibroblast Activation and Fibrosis Progression

Jihao Xu
Sponsor: Ching-Hsien Chen, Ph.D.
MED: Div Of Internal Med

There is an urgent need to develop effective therapy targeting idiopathic pulmonary fibrosis (IPF) characterized by aberrant fibroblast activation. Through genome-scale integrated analysis of the IPF fibroblast gene signatures, myristoylated alanine-rich C-kinase substrate (MARCKS) was noticed and positively associated with expression of alpha smooth muscle actin (a-SMA), a marker for fibroblast activation. We previously discovered that MARCKS phosphorylation site domain peptide (MPS) effectively reduced lung cancer metastasis through blocking MARCKS phosphorylation. In this study, we determine if MPS peptide potentially reduce pulmonary fibrosis progression. First, we demonstrated a positive correlation between MARCKS phosphorylation level and a-SMA in primary lung fibroblasts isolated from IPF patients compared to normal fibroblast cells using real-time PCR and Western blot analyses. Next, we showed reduced cell proliferation and migration in MPS-treated IPF fibroblasts by performing MTT and wound-healing assays respectively. MPS treatment resulted in down-regulation of MARCKS phosphorylation and a-SMA expression. Surprisingly, attenuation of MARCKS using the MPS peptide synergistically interacted with nintedanib treatment and decreased survival of IPF fibroblasts, but not normal fibroblast cells. Taken together, our data suggest MPS peptide can be used to target MARCK phosphorylation, which may lead to novel and effective treatment of IPF.

Engineering of Plant Bioproducts Through Combinatorial Expression of Promiscuous Diterpene Synthases

Omar Yaacoobi
Sponsor: Philipp Zerbe, Ph.D.
Plant Biology

Plant diterpenes are a diverse class of natural compounds that play critical roles in plant development and defence against environmental stressors. Their diverse structures and bioactivities also have inspired their application towards industrial bioproducts. Diterpene biosynthesis involves the stepwise cyclization of a central precursor, geranyl geranyl diphosphate, commonly enabled by a pair of class II and class I diterpene synthases (diTPSs). Some of these diTPSs exhibit extreme functional promiscuity and are capable of acting in different enzyme combinations producing an array of compounds from only a few shared intermediates. For example, the related class I diTPSs ZmKS2 and ZmKS4 from maize (Zea mays) transform the same set of intermediates into a different blend of diterpenes with defensive functions. To better understand and harness the mechanistic features defining the natural promiscuity of these diTPS towards formation of novel compounds we utilized a combinatorial metabolic engineering system to probe the extent of promiscuity of ZmKS2 and ZmKS4 with a collection of ten distinct class II diTPS enzymes from different plants species. Our results indicate the formation of natural and "new to nature" diterpenes and highlight the possibility of producing valuable plant bioproducts for which biosynthetic routes have so far been inaccessible.

The Effects of Alternate Wet Dry Irrigation on the Microbial Communities Associated With Rice Roots

Jia Yan
Sponsor: Venkatesan Sundaresan, Ph.D.
Plant Biology

Microbial communities associated with plant roots can influence host biology by facilitating nutrient acquisition, mediating disease suppression, and directly promoting plant growth. Agricultural practices can alter the composition of these communities, potentially affecting their functional capabilities. Here we explore the impact of alternate wet dry (AWD) irrigation on rice root microbiomes. This method, in which field soil is allowed to drain periodically to increase water efficiency, drastically changes the root microenvironment and restructures the root microbiome. To test this hypothesis, field-gown rice plants were exposed to two irrigation treatments: continuous flooding and intermittent flooding and drying. Samples from three different compartments (bulk soil, rhizosphere, and endosphere) were collected throughout the growing season. Microbial DNA was extracted from these samples, followed by amplification and high-throughput sequencing of the V4-5 region of the 16S rRNA gene. The microbial profiles associated with each of the samples are currently being analyzed to detect significant differences in the overall microbial composition between the two treatments. The results can be useful for growing rice with reduced water inputs as well lowering greenhouse gas emissions from rice fields.

Understanding the Role of NPR1 in Stromule Induction During Plant Innate Immunity

Yiying Yang
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Plants innate immune response to pathogen attack includes induction of programmed cell death (PCD) that stops pathogen spread to the infection site. This response requires communication between different organelles. Recently, we reported that communication between chloroplasts and nuclei might be accomplished by induction of stromules during the immune response. Stromules are tubular structures that extend from plastids outer envelope. Currently, it is unknown precise immune signaling components required for the induction of stromules. Our published results indicated that the exogenous application of defense molecule salicylic acid (SA) is sufficient to induce stromules. It is known that the NPR1 (NONEXPRESSOR OF PATHOGENESIS-RELATED GENES1) is a major player in SA-mediated defense signaling. Therefore, to understand the role of NPR in stromule induction, we set out to analyze npr1::npr1l (npr1-like) double mutant. To monitor stromule induction, we transformed a stromule marker into npr1, npr1l, and a npr1::npr1l mutants by Agrobacterium-mediated transformation method. After screening mutants containing stromule marker, we infected plants with bacterial pathogens to induce stromules, and stromules were imaged by confocal microscopy. We will compare stromule induction in various mutant lines with the wild-type plants to understand the role of NPR1 in stromule induction.

The Effects of a Deficient Oxytocin Receptor Gene on Protein Expression in Prairie Voles (*Microtus ochrogaster*)

Henry Yang
Sponsor: Karen Bales, Ph.D.
Psychology

Failure to form or maintain attachments is seen in mental illnesses such as autism spectrum disorder and schizophrenia. As in humans, prairie voles also form adult social attachments, which are regulated by both oxytocin and vasopressin. However, there is an uncertainty of specific roles of oxytocin and vasopressin in pair bonding. To answer this ambiguity, we have produced, via CRISPR-technology, voles with a heterozygous genotype (HET) for the oxytocin receptor gene (OTR). To determine whether a deficent genotype influences OTR production, we extracted the brains of 10 female voles and 10 male voles, each group having half wild-type and half HET genotypes. After, we cryosectioned the brains in preparation for autoradiography to measure both OTR and AVP 1a receptor (AVPR1a) binding densities in the brain regions such as nucleus accumbens shell/core, medial/central amydalae, bed nucleus of the stria terminalis, lateral septum, and the caudate putamen. We expect HET voles to have decreased OTR expression relative to wild-type voles. But, we expect an increase in AVPR1a to compensate for the loss of OTR in HET voles. This study will provide insight into the developmental role of the OTR gene while establishing a framework for potential social deficits in OTR gene mutants.

Forward Genetic Screen for Mutants of Enhancers of Nuclear Migration Defect of unc-84 (emu)

Qiming Yang
Sponsor: Daniel Starr, Ph.D.
Molecular & Cellular Bio

Nuclear migration in cells is crucial to many fundamental and developmental processes, including cellular migration through constricted spaces, cell differentiation and fertilization. In Caenorhabditis elegans larvae, a null mutation in unc-84 hinders progenitor cell (p-cell) nuclear migration at 25°C, leading to p-cell death and the lack of motor neurons and vulva. However, at 15°C, unc-84(null) animals have normal p-cell nuclear migration. We thus hypothesize that there is a second pathway that functions parallel to the unc-84 pathway. To identify components of the second pathway, I performed a forward genetic screen to isolate enhancers of nuclear migration defect of unc-84 (emu). Ethyl methanesulfonate was used to generate random point mutations throughout the worm genome. At 15°C, F3 lines with emu mutations were identified by normal worms with unc-84(+) transgene and uncoordinated worms without vulva under unc-84 null background. I have screened 950 genome equivalences and found one emu mutant with average 2.47 p-cell migration failure events per adult worms. The mutation only disrupts nuclear migration under unc-84 null background at 15°C, which is consistent with our prediction of a second pathway that functions for nuclear migration at the permissive temperature.

Identification of Force-Sensitive Protein Interactions Surrounding Akt1 Using Proximity Dependent Biotin Identification

Jacqueline Yee
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Physical forces exerted by adjacent cells and the extracellular matrix profoundly alter cell and tissue physiology. Thus, understanding how cells convert these mechanical signals to chemical signals may lead to insight on a variety of biological processes. Isolation of these force-sensitive protein interactions remains difficult, however, as traditional biochemistry techniques fail to retain external forces during purification. Instead, we are using a technique called Proximity Dependent Biotin Identification to identify these interactions in situ. In this technique, mutant biotin ligase (BioID2) promiscuously biotinylates adjacent proteins. By examining biotinylation profiles, we can determine spatial proximity of proteins relative to the BioID2 tagged target protein under control and force-bearing conditions, thereby identifying potential mechano-sensitive protein interactions. We are currently using this technique to identify force-dependent binding partners of signaling molecule Akt1, a kinase often up-regulated in cancer. Thus far, we have generated stable cell lines expressing BioID2 tagged Akt1, and isolated biotinylated proteins, including BioID2-Akt1. We will investigate Akt1's force-dependent protein interactions using a custom designed cell stretch device. Since metastasizing cells are subject to forces from the extracellular matrix and adjacent cells, determining how physical forces alter the regulation of Akt1 may lead to a better understanding of carcinomas.

Investigation Into Endogenous Protein Fragments Secreted by Cancer Cells Undergoing Radiation Treatment: A Mass Spectrometry Peptidomics Study

Victoria Yee
Sponsor: Armann Andaya, Ph.D.
Campus Mass Spec Facilities

Radiation therapy is commonly used to treat cancer in patients. Radiation damages the DNA of tumor cells with the ultimate aim to slow or halt the spread of the cancer. Although some cancer patients experience success with radiation treatment, others do not, and their cancer cells are only slightly damaged or completely resistant to the effects of the therapy. Thus, the response of cancer cells to radiation warrants further investigation in order for researchers and health care providers to provide the proper therapies to administer to patients. Peptidomics, an emerging field, investigates endogenously produced peptides, protein fragments, produced from cells. These peptides may act as signaling molecules or are simply artifacts of the cellular environment but, more importantly, may provide clues and insight into physiological processes cancer cells undergo upon radiation exposure. Herein, we used mass spectrometry to investigate peptides released from a breast cancer cell line upon administering radiation. MCF7 cells were cultured and exposed to varying doses of radiation and the surrounding media containing peptides was gathered with subsequent mass spectrometry analysis. The endogenous peptide fragments reported here represent a behavioral profile of cancer cells undergoing radiation treatment and may shed light on cancer cell biology.

EEG-Based Brain-Controlled Mobile Robots: Insights and Lessons

Albert Yeh
Sponsor: Zhaodan Kong, Ph.D.
Mechanical & Aerospace Engr

With the rapid development of brain-computer interface (BCI) technology, researchers are now attempting to put current BCI techniques into practical applications, particularly by combining them with robotics. BCI systems translate signals from the central nervous system to device control signals. The goal of the project is to explore the possibility of controlling a mobile robot to perform simple navigation tasks by using electroencephalography (EEG) signals directly. Machine learning algorithms, such as common spatial patterns (CSP) and linear discriminate analysis (LDA), are used to extract a set of EEG features that are capable of accurately classifying human cognitive states, e.g., left turn intention and right turn intention. These features are then used by an online control algorithm to recognize a human operator's intention in real time and subsequently control the motion of a ground mobile robot. The insights and lessons learned from the project have significant practical implications for future neuroprosthetic devices and robotics.

EEG-Based Brain-Controlled Mobile Robots: Insights and Lessons

Chenxiong Yi
Sponsor: Zhaodan Kong, Ph.D.
Mechanical & Aerospace Engr

With the rapid development of brain-computer interface (BCI) technology, researchers are now attempting to put current BCI techniques into practical applications, particularly by combining them with robotics. BCI systems translate signals from the central nervous system to device control signals. The goal of the project is to explore the possibility of controlling a mobile robot to perform simple navigation tasks by using electroencephalography (EEG) signals directly. Machine learning algorithms, such as common spatial patterns (CSP) and linear discriminate analysis (LDA), are used to extract a set of EEG features that are capable of accurately classifying human cognitive states, e.g., left turn intention and right turn intention. These features are then used by an online control algorithm to recognize a human operator's intention in real time and subsequently control the motion of a ground mobile robot. The insights and lessons learned from the project have significant practical implications for future neuroprosthetic devices and robotics.

The Effect of Turbidity on the Foraging Behavior of Two Nearshore Crabs

Daniel Yim
Sponsor: Eric Sanford, Ph.D.
Evolution & Ecology

Multiple studies have shown that increased turbidity can result from both natural and anthropogenic activities. These spikes in turbidity have been shown to significantly affect predator-prey interactions and foraging behavior. To test how increased turbidity affects the foraging behavior of the crabs Pachygrapsus crassipes and Pugettia producta, we performed a choice experiment between chemically versus visually appealing prey in ambient versus turbid conditions. We determined that turbidity did not hamper the crabs' ability to forage or how long the crabs generally took to choose a stimulus. However, when examining the crab's decision speed by stimulus type, turbidity did cause the crabs to take longer choosing the chemical stimulus and to more quickly choose the visual stimulus. We did not observe a decrease in visual foraging under turbid conditions as other studies have documented. This indicates that increased turbidity does not have a strong effect on the foraging behavior of these nearshore crabs.

Effects of Systemic Oxytocin Receptor Antagonist and Stress on Markers of Brain Activity in Male and Female California Mice

Sae Yokoyama
Sponsor: Brian Trainor, Ph.D.
Psychology

Oxytocin (OT) is popularly associated with increased trust and bonding but recent research has shown that OT can increase anxiety under certain conditions. We previously showed that social defeat stress (SDS) induces social withdrawal in female California mice but not males. Furthermore, in females SDS increases the activity of OT neurons in the bed nucleus of the stria terminalis (BNST), a nucleus associated with anxiety. Intranasal administration of OT increases social interaction behavior in males but reduces this behavior in females. Furthermore, administration of OT receptor antagonist reverses stress-induced social withdrawal in females while it decreases social interaction behavior in males. These results suggest that OT may have different effects on brain activity and behavior in males and females. Current studies are using detection of egr-1, an immediate early gene that serves as an indirect measure of brain activation, to assess if inhibiting OT receptors has different effects on brain activity in males vs. females. Intranasal OT increases egr-1 in anterior BNST and nucleus accumbens, an area important for reward, in females but not males after stress. Therefore, we predict that egr-1 in these regions will increase in defeated females, and that oxytocin antagonist treatment will block this increase.

Mite Domatia in Plants: The Phylogenetic and Taxonomic Distribution of a Widespread yet Often Overlooked Defense Mutualism

Jenna Yonenaga
Sponsor: Marjorie Weber, Ph.D.
Evolution & Ecology

Many plants across the tree of life have evolved defense mutualism traits that facilitate tri-trophic interactions between plants, bodyguards, and plant-enemies in order to provide protection to plants. Mite domatia are an example of this specialized trait, as they provide rewards to predatory mites that in turn protect plants against herbivorous and fungivorous mites. Despite their ecological importance, there is little knowledge about their evolution and distribution. In this meta-analysis study we attempt to gain a greater understanding of the phylogenetic and taxonomic distribution of mite domatia. To do this, we compiled a database of documented domatia records from a digitized compilation of records from the last 100 years, and updated records from scientific literature within the last 30 years. The database will be used to run analyses to determine how many species, genera, and families have obtained mite domatia to understand the evolutionary origins, patterns and widespread distribution of this trait. These often over-looked traits can have major impacts on tri-trophic and top-down interactions. By considering these physically small traits, there is potential for greater understanding and future work regarding these mutualistic defense interactions in both natural and economically significant agricultural systems.

KAPA Biosystems HTP Library Preparation Kit Using Agilent Electrophoresis Instruments for Quality Control of Library Construction Pipeline

Vanessa Young
Sponsor: Bart Weimer, Ph.D.
VM: Population Hlth & Reprod

Next Generation Sequencing (NGS) is a process that can be used to construct DNA libraries for large scale sequencing projects. NGS utilizes the input of high molecular weight and intact genomic DNA to construct high quality libraries. The assessment of DNA integrity is a key step in library construction. The Agilent 2200 TapeStation System with the genomic DNA assays assist in the determination of DNA quality. The system's software algorithms allow for a visual inspection of DNA as well as generate a DNA Integrity Number (DIN) to indicate the integrity of extracted DNA. With these quality control steps for gDNA quality, it allows the next step in the library pipeline to be normalized and at optimal size to produce quality final libraries using the KAPA HTP Library Preparation Kit. Genomic DNA quality was analyzed with the Agilent 2200 TapeStation Analysis Software and DIN values were generated. Samples with values closer to 10 were accepted as high molecular weight and intact can easily produce quality final libraries.

Contralateral Delayed Activity During Visual Working Memory in the Presence of Intervening Consonant Clusters and Pseudowords

Clayton Young
Sponsor: Steven Luck, Ph.D.
Psychology

The purpose of this experiment is to explore the possibility of a passive visual working memory system. Visual working memory research has correlated active visual working memory with electrophysiological summation of negative potentials contralateral to attended visual stimuli around 300ms after presentation. This distinct activity is known as Contralateral Delay Activity (CDA). What has been less explored, however, is visual working memory in the absence of CDA. To investigate this, electroencephalography (EEG) was used to measure event-related potentials (ERPs), that is, neural activity time-locked to an event. To ensure the use of visual working memory, participants were asked to compare to sample and press a button when there was a change in color in the set of bilaterally presented shapes that they attended to on the screen. Centrally presented intervening lexical stimuli was used to disrupt the laterality of recorded neural activity to investigate the possibility of a passive visual working memory system. Preliminary results suggest change detection performance remains the same despite differences in CDA. If the marker for active working memory, CDA, remains the same without a decrease in performance, this would suggest that there is another, passive system.

Am I the Right One for Muscular Men? A Glance at the Effects of Media Images of Ideally Muscular Men on Young Adult Women

Muheng Yu
Sponsor: Laramie Taylor, Ph.D.
Communication

Research has shown that idealized body images in the media can have negative effects on audiences. While abundant studies have focused on the effects of viewing media images of idealized bodies of the same gender, the effects of viewing media images of idealized bodies of the opposite gender have received little attention. Therefore, an experiment was conducted to examine the effects of exposure to media images of ideally muscular men on young female perceptions of their own bodies. Romantic confidence as a mediator and female body esteem as a moderator were also tested. Young women (M age = 20.36) were exposed to media images of men who either ideally muscular (n = 224) or non-ideally-muscular (n = 202), but otherwise comparable in attractiveness. Results showed that exposure to media images of idealized male bodies indirectly caused young women to perceive their own bodies more negatively by reducing their confidence in attracting and interacting with good-looking men. Also, viewing media images of ideal-body males caused young women who had high preexisting esteem of their bodies to feel worse about their bodies. This study implies that media portrayals of ideally muscular men can negatively affect young women, especially those with high preexisting body esteem.

The Environmental Robustness of a Point-Of-Care WBC-Differential Instrument Used to Screen for Highly Infectious Diseases

Amanullah Zadran
Sponsor: Gerald Kost, M.D.,Ph.D.
MED: Pathology & Lab Medicine

Point-of-care (POC) instruments perform rapid diagnoses at or near patient sites, useful in regions of high risk diseases. Changes in WBC and lymphocyte counts determined by optical scanning can help identify communicable infections, such as Ebola virus disease, and stop spread. We evaluated the environmental robustness of a POC WBC-Differential instrument under high and low temperatures encountered during field use. POC instruments must withstand environmental stresses in order to achieve high impact and help prevent outbreaks through early detection where cases first appear. Human whole-blood measurements were obtained in simulated hot and cold, and static and dynamic conditions versus room temperature control. Humidity was held constant to eliminate that confounding variable. We used Student's t-test for paired differences. Findings indicate that dynamic high temperature (> 30°C) impairs WBC-Diff measurements. Additionally, the time spent between microcuvette filling and instrument loading can produce inaccurate readings. Month-long storage of reagents at static high temperatures (~50°C) did not affect paired differences significantly (P>0.05). We conclude that the WBC-Diff instrument and future POC devices: a) must be evaluated for environmental limits, b) can perform well within objectively defined temperature brackets, and c) should be robust enough to withstand environmental stresses in limited-resource epidemic settings.

Synthesis and Characterization of Metal Oxides Mesoporous Monoliths for Water Remediation

Julio Zamora
Sponsor: Jesus Velazquez Mojica, Ph.D.
Chemistry

In recent years, a large number of industrial oil spills and toxic impurities have become an enormous environmental hazard for coastal human inhabitants and oceanic ecosystems. Due to such events, there has been much progress in the development of hydrogels and polymer based membranes capable of extracting such impurities from water. However, hydrogels and polymer-based membranes are not robust systems and have shown deleterious behavior under highly acidic and alkaline environments as a function of time. Metal oxide mesoporous monoliths are promising candidates to tolerate such harsh environments. The network of micropores and mesoporous can be modified to enhance hydrophilicity and oleophilicity by tuning the structure surface functionality. We will implement sol-gel synthesis methods to construct free standing metal oxide mesoporous monoliths and tune structure chemical functionality to selectively remove small organic molecules from water while sustaining mechanical integrity. Characterization techniques such as High Performance Liquid Chromatography (HPLC) will be used to quantify oil removal from water-while the use of Infrared Spectroscopy (FTIR) will help monitor surface adsorption of small molecules. Results from this study will enable implementation of scalable and robust materials to selectively remove oil from water and potentially further extend contaminant removal of heavy transition metals particulates.

Identification of a Novel Signaling Complex Involved in Stimulation of Vascular L-Type Ca2+ Channels and Vasoconstriction During Diabetic Hyperglycemia

Juan Zarate
Sponsor: Manuel Navedo, Ph.D.
MED: Pharmacology

Increased contractility of vascular smooth muscle leading to enhanced vascular tone during diabetes is attributed, in part, to the effects of elevated glucose on L-type Ca2+ channels. Stimulation of these channels is attributed to glucose-mediated activation of anchored protein kinase A (PKA) by the scaffolding protein AKP150. The identification of upstream elements involved in PKA activation and L-type Ca2+ channel regulation in response to elevated glucose was assessed using the Proximity Ligation Assay (PLA) technique. PLA incorporates the detection of protein-protein interactions. PLA generates fluorescent puncta when proteins of interest are less than 40 nm apart, permitting the dissection of macromolecular signaling complexes. Using this technique, we found that a purinergic receptor coupled to Gs associates and co-localize with AKAP150, adenylyl cyclase 5, PKA and the L-type Ca2+ channel in native vascular smooth muscle cells. The formation of this macromolecular complex may be essential for glucose-mediated activation of anchored PKA leading to simulation of L-type Ca2+ channels and vasoconstriction during diabetes. These studies provide the basis for further understanding of the mechanisms by which calcium complexes regulate contractility of vascular smooth muscle cells upon exposure to elevated glucose, and may reveal novel targets to treat vascular complications during diabetes.

Diversity and Function of Scent-Producing Microbes in the Suborder Feliformia

Thant Zaw
Sponsor: David Coil, Ph.D.
UC Davis Genome Center

From previous studies, we know that animals use chemical signals to defend territories, identify mates and communicate each other. However, the functional role and diversity of bacteria producing these chemicals signaling are not well studied. The aim of this study is to shed light on the diversity and function of these scent-producing microbes and how these bacterial communities may have effect on the origins of social behavior in the host animals. To conduct this experiment, we have selected eleven species in suborder Feliformia like cats, hyenas, mongooses and genets and will compare their anal sac and micro-biomes. The bacteria will be cultured in an anaerobic environment, volatile production will be recorded and selected bacteria genomes will be sequenced. Ultimately, we hope to merge information about biochemical pathways present in the microbes, volatiles produced and an understanding of how those volatiles may affect the survival and behavior of their animal hosts.

Characterization of an *In Vivo* Transgenic Reporter System for Thyroid Hormone in the Frog *Xenopus laevis*

Wafa Zeidan
Sponsor: J. David Furlow, Ph.D.
Neuro Physio & Behavior

Thyroid hormone (TH) is essential in initiating metamorphosis in Xenopus laevis, African clawed frog. TH is also important for human development; for example, cretinism, a condition that leads to short stature and impaired brain development in infants, results from insufficient TH. Founder lines of X. laevis carrying a TH response element (TRE)-luciferase reporter gene co-injected with a marker gene expressing green fluorescent protein (GFP) in the eye lens were evaluated for the co-segregation of the reporter and marker transgenes in the F3 generation, including the effect of Triiodothyronine (T_3) on luciferase activity in lens-GFP+ tadpoles. The luciferase activity serves as a surrogate for TH receptor (TR) target gene induction. Week-old GFP+ tadpoles were treated with either DMSO (vehicle), or 10nM T_3 from each mating, and tissue extracts were tested for luciferase activity and normalized for total protein concentrations. Data revealed that F2 GFP+ adult mated with a wild-type animal produced 50% GFP+ offspring with an average fold activation of 60.8 for 10nM T_3 treated tadpoles over DMSO. Evidence suggests co-segregation of GFP marker and inducible luciferase reporter genes through the F3 generation, and induction of the luciferase reporter in response to T_3.

Sequence Analysis and Cloning of a Protein Kinase Potentially Involved in the Sugar Starvation Response in *Arabidopsis*

Joshua Zhang
Sponsor: Diane Beckles, Ph.D.
Plant Sciences

The aim of this project is to functionally characterize protein kinase STY46 in Arabidopsis thaliana Col-0. To deal with, and adapt to adverse environmental conditions that lead to sugar starvation, plants have evolved complex mechanisms to ensure sugar availability through regulating the metabolism of storage and structural compounds. This process is called the sugar starvation response (SSR). Gene network analysis suggested that STY46 is co-expressed with most of the genes within the SSR network, and its expression is up-regulated under low carbon conditions, which leads to our hypothesis that STY46 could possibly be a master regulator of the SSR. To test this hypothesis, in silico analyses will be employed, and, transgenic lines (i) constitutively over-expressing, and (ii) expressing STY46 only upon induction, will be created, and their response to short and long term stress-induced sugar starvation will be compared to the Col-0 control. The information from this analysis could provide a better understanding of the events that enable plant survival, and could potentially be used to develop agricultural techniques or new germplasm that strengthen crop yield under stressful environments. In this specific experiment, the results of the sequence analysis and generation of transgenic lines will be presented.

Validation of a One-Step Method for Extracting Fatty Acids From Food Samples

Zhichao Zhang
Sponsor: Ameer Taha, Ph.D.
Food Science & Technology

Fatty acid extraction methods can be both time-consuming and expensive because they involve multiple steps and copious amounts of extraction solvent. In an effort to streamline the fatty acid extraction process, this study compared the standard Folch lipid extraction method to a novel one-step method involving a column that selectively elutes the lipid phase. The methods were tested on raw beef, salmon, and chicken. Compared to the standard Folch method, the one-step extraction process yielded statistically insignificant total fat content and fatty acid concentrations and percent composition when tested on chicken and salmon. Beef stearic and oleic acid concentrations were significantly lower by 10% with the one-step method compared to Folch, resulting in a similar reduction in total fatty acids and total fat percent composition. The findings reflect the utility of a one-step extraction method for routine and rapid monitoring of fatty acids in the food supply. Prior validation of the method on the matrix of interest is necessary, however, to ensure comparable results to the standard Folch method, as demonstrated for chicken and salmon.

Children's Memory and Suggestibility When Interviewed by Their Mothers Versus by Strangers

Jody Zhou
Sponsor: Gail Goodman, Ph.D.
Psychology

Concerns about the reliability of children's testimony are prevalent within the legal system. This is especially true when mothers have questioned their children about abuse before reporting abuse to the authorities. Because of these concerns, the aim of the current study is to evaluate children's secret-keeping and suggestibility when interviewed by their own mothers compared to when interviewed by strangers. Participants were mothers and their 3- to 5-year-old children. The children participated in a scripted babysitting event, which included a novel activity and a receptive language test. Mothers' attachment orientations were also assessed. After a short time delay (approximately 20 minutes), children were interviewed about the babysitting event either by their own mothers or by strangers. All babysitting activities and interviews were videotaped. Research assistants who are blind to study hypotheses and conditions are coding the children's responses for accuracy. Binary logistic regression analyses will be conducted. It is expected that children will be less suggestible and less secretive when interviewed by their own mothers versus when interviewed by strangers, and that accuracy will correlate positively with mothers' own attachment orientations and children's receptive language ability.

Neonatal EPEC-Induced Changes in the Microbiota-Gut-Brain Axis

Jamie Zhou
Sponsor: Melanie Gareau, Ph.D.
VM: Anat Physio & Cell Biology

Neonatal establishment of the microbiota-gut-brain axis is important for the development of the intestinal barrier, neurogenesis, and cognitive behavior in later life. Enteropathogenic Escherichia coli (EPEC) is an enteric bacterial pathogen that infects children in the developing world. Multiple pediatric infections are associated with development of cognitive defects in adulthood, however mechanisms through which this occurs remain unknown. We hypothesize that neonatal infection with EPEC will disrupt the development of the microbiota-gut-brain axis in adult mice. Given the critical role of the immune system in responding to enteric bacterial infections, we assessed expression of cytokines (IL-6, IL-10), Nf-kB signaling (IkB), and pattern recognition receptors (NOD1, NOD2) in the gut and brain in mice following infection. Mice were infected with EPEC on post-natal day 7 (P7) and tissues collected at weaning (P21) and adulthood (6-8 weeks). Our preliminary results indicate an increase expression of anti-inflammatory cytokines (IL-10) and intracellular pattern recognition receptors (NOD1, NOD2), and a decrease expression in pro-inflammatory cytokines (IL-6) in the ileum and hippocampus of EPEC-infected p21 mice compared to sham-infected controls. This change in inflammatory response suggests that neonatal infection can both impact locally within the gut and distally in the brain.

Development of Non-Fluorocarbon Durable Water Repellent Cotton Fabrics

Danjie Zhu
Sponsor: Gang Sun, Ph.D.
Textiles & Clothing

Environmental friendly and durable hydrophobic cotton fabric has attracted broad technological implications for areas ranging from clothing, protective equipment to building materials. However, the conventional industrial methods used for manufacturing hydrophobic cotton fabric usually involved fluorocarbon compounds, which have become restricted with respect their toxic potential. Herein, we reported a high-efficient strategy to fabricate fabric with good water resistance and durable performances by using a new silicone agent as a novel hydrophobic agent. Benefiting from the ether bonds provided by a reaction from this agent with cellulose, the resulting cotton fabrics have obtained outstanding hydrophobicity and remarkable durability in daily laundry characterized by hydrostatic pressure, water contact angle, laundry durability test, air permeability test, tensile test, and FT-IR spectroscopy which have been proved by data collected from a great deal of experiments. The green method developed here has showed good promise in potential applications especially in the area of industry.

Characterizing the Unique Phagocytic Behavior of Eosinophils One Cell at a Time

Julie Zimmer
Sponsor: Volkmar Heinrich, Ph.D.
Biomedical Engineering

Compared to more abundant types of white blood cells such as neutrophils and macrophages, eosinophils are poorly characterized. In particular, relatively little is known about their behavior during phagocytosis, i.e. the engulfment of foreign particles. In this study, we set up one-on-one encounters between single live eosinophils and a target particle (either an antibody-coated bead or a fungal particle) and record the cell response for subsequent analysis. Two glass micropipettes, with their suction controlled by adjustable water reservoirs, are used to gently bring a target particle into contact with an eosinophil. In a subset of recent experiments, the cells have been preloaded with a fluorescent calcium indicator. Simultaneous brightfield and fluorescence microscopy allows us to capture video micrographs of both the physical movement of the cell as well as its intracellular calcium concentration. Our data show a dramatic increase in calcium concentration coinciding with the start of engulfment, followed by oscillatory increases and decreases of the calcium level sustained throughout the remainder of engulfment. Additionally, we occasionally observe vomocytosis (reversible phagocytosis), a process not seen with other leukocytes. We are optimistic that these single-live-cell experiments will illuminate the mechanisms underlying the unique phagocytic behavior of human eosinophils.

Dickenson and Degas: Performing Ballet and Artistic Authority

Helena Zittel
Sponsor: Diana Strazdes, Ph.D.
Art

In this paper I will compare the poetry of Emily Dickenson with the artwork of Degas to explore the idea of the feminine body in relation to Ballet and movement. Dickenson and Degas are contemporaries who have not often been compared, even though they treat the same subject of dance in famous poems and paintings respectively. Though Dickenson is American and Degas is French, comparing the two in the context of Ballet will provide a framework to discuss constructs of femininity and womanhood in the 19th century. Degas' depictions of dancers provide insight into the relationship between class and gender. His "Ballet Rehearsal on a Stage" exemplifies the male gaze and the way that it sees ballerinas as available objects instead of independent agents in a patriarchal society. Similarly, in the poem "I cannot dance upon my toes," Dickenson deploys the figure of the dancer as a male-influenced performer to emphasize her own poetic artistry as independent from the male gaze and authority.

Effects of Nutrition Literacy Training on Empowerment Among Adult Cancer Survivors: A Pilot Study

Tooka Zokaie
Sponsor: Lisa Miller, Ph.D.
Human Ecology

The purpose of this pilot study is to examine the effects of nutrition literacy training on changes in empowerment among adult cancer survivors (n=9). Empowerment is operationalized here as the ability and willingness to make healthy food choices, which is possible when teaching adults new skills. The cohort studied is unique, in that self-care is of upmost importance to survivors of this chronic disease, and it is therefore a teachable moment in their lives. Participants of the study learned about nutrition, practiced reading nutrition labels, and were quizzed with choosing the healthier option between two food labels to exercise healthy decision-making. Results showed that label-reading accuracy improved with training, and moreover, that empowerment increased from pre- to post-training. Furthermore, with an increase in nutrition behavior awareness, healthy adjustments in nutrition habits were seen as well. Thus, the findings from the present study suggest that cancer survivors can be empowered with nutritional literacy.