26th Annual Undergraduate Research, Scholarship and Creative Activities Conference

Poster Presentations
Friday, May 1, 2015
3–6 p.m.
ARC Pavilion

Arts Exhibit
Friday, May 1, 2015
3–6 p.m.
ARC Pavilion

Oral Presentations
Saturday, May 2, 2015
1–6 p.m.
Wellman Hall

Sponsored by:
Undergraduate Education
and the Division of Student Affairs

UCDAVIS

26th Annual Undergraduate Research, Scholarship and Creative Activities Conference

Letter from the Chancellor

May 1, 2015

Dear Students, Colleagues, and Guests:

It is my pleasure to welcome you to the 26th annual University of California, Davis Undergraduate Research, Scholarship and Creative Activities Conference! This two-day conference highlights the accomplishments of students who have immersed themselves in faculty-mentored research and creative projects. Promoting collaboration between students and faculty in research is central to the mission of our campus, and I am proud of the long-standing tradition in undergraduate research at UC Davis.

The work you will see here represents the passion students have for their topics of study and their excitement to share their results with the public. These students have dedicated a great deal of time and sweat equity to their research. They have learned how to approach problem-solving and how to overcome challenges. They have garnered valuable experience with time management. They are actively honing their skills for communication. There will be some nervous looks on our students' faces today, but every one of them should be proud to be participating. As someone who spent years working in research labs, I commend the students on the diligence, creativity, and courage required to bring them here today.

I also want to offer my deepest thanks to the faculty mentors who engaged, challenged and inspired these undergraduates in their research projects. The mentorship and supervision of student researchers requires dedication and a degree of altruism. I truly appreciate our faculty's commitment to mentoring students. The many faculty volunteers who have taken time out of their schedules to moderate oral and poster sessions also deserve our gratitude. Without your participation, this event would not be possible.

My warm congratulations to the Undergraduate Research Center for its organization of the conference and its tireless dedication to connecting students with research opportunities. The Center represents our campus's commitment to exposing students to training that can connect the theoretical foundations of their coursework with research and critical thinking skills that will prepare them for their future careers.

I invite you to sample all that the conference has to offer and let yourself to be amazed and inspired by the incredible accomplishments of the dedicated young people who will be presenting their work in the poster and oral sessions. Thank you for participating in this celebration of undergraduate research, scholarship and creative excellence!

Linda P.B. Katehi
Chancellor

26th Annual Undergraduate Research, Scholarship and Creative Activities Conference

Vice Provost and Dean's Welcome

May 1, 2015

Dear Colleagues, Presenters, and Guests:

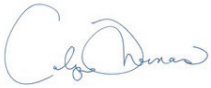
Welcome to the 26th annual UC Davis Undergraduate Research, Scholarship, and Creative Activities Conference. More than 500 students, representing each of our colleges and divisions, will present their work at this two-day event.

The conference's format encourages all who attend to encounter new discoveries within and beyond their own disciplines. Here you will meet students working to advance solutions in health, agriculture, world hunger, and renewable energy. They are contributing to cutting-edge design and engineering breakthroughs. They are forging a better understanding of critical issues in human development and human rights. They are discovering data that lead to a better understanding of ourselves as human beings. And all of this new knowledge is coming to us in a cacophony of formats from colorful posters to complex charts and graphs to impassioned presentations and engaging exhibits of objects and spaces.

Take time to engage with and learn from our students. Ask them how they found their projects. Re-create with them the moment in a class or reading a text or settling into a new lab position or internship or talking with a friend late at night when they happened upon a topic that grabbed them. Ask them who they learned from. You'll no doubt hear about amazing faculty who are truly engaged with undergraduate research and the dedicated teaching assistants and postdoctoral scholars who round out our instructional teams. And ask them what they've discovered that's really new. You'll be surprised at how many students have found, in the midst of so much that we already know, things we don't. They're asking new questions, demanding new answers, and in so doing improving the world we live in for the generation to come.

To the students who are sharing their research and creative projects this weekend, I offer my congratulations and best wishes. To our mentors, I offer my thanks for your commitment to our undergraduates. All of you make real the promise of our world-class research and teaching institution.

Lastly, I commend the Undergraduate Research Center for hosting this conference this year as they have each year since 1990, with great care, attention to detail, and commitment to the highest standards of student excellence. As each student participating over the next two days can assure you, the URC's commitment to engaging UC Davis students in world-class research is a model for us all.



Carolyn Thomas
Vice Provost and Dean for Undergraduate Education

UCDAVIS
UNDERGRADUATE EDUCATION

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For more information, visit **urc.ucdavis.edu/ResearchWeek**

Undergraduate Research Center

UCDAVIS UNDERGRADUATE EDUCATION

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. Among these are the following: Biology Undergraduate Scholars Program (BUSP); California Alliance for Minority Participation (CAMP); Interdisciplinary Agriculture Medicine Science Technology Engineering and Mathematics (iAMSTEM); Internship and Career Center; McNair Scholars Program; 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; Undergraduate Research Center; University Honors Program; UC Davis Washington Program; and UC Leadership Excellence Through Advanced Degrees (UC LEADS).

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Design and Publications

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Special Thanks

Dean Witter Fund

AGENDA

Poster Sessions: Friday, May 1, 2015

3–6 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

Arts Exhibit: Friday, May 1, 2015

(concurrent with poster session)
3–6 p.m., ARC Pavilion

3–6 p.m. ..... *Arts Exhibit*
ARC Pavilion

Oral Sessions: Saturday, May 2, 2015

1–6 p.m., Wellman Hall

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

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

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

5–6 p.m. ..... *Oral Session 3*
Wellman Hall Rooms

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Acord, Katherine	Session 1	Oral	1:00 p.m.	107 Wellman
Agulto, Regina	Session A	Poster 107	3:00 p.m.	Pavilion
Alexiev, Alexandra	Session 2	Oral	3:00 p.m.	233 Wellman
Alkadri, Susan	Session C	Poster 79	5:00 p.m.	Pavilion
Allen, Brian	Session C	Poster 6	5:00 p.m.	Pavilion
Anberg, Alena	Session 1	Oral	1:00 p.m.	230 Wellman
Ancheta, Patrick	Session A	Poster 106	3:00 p.m.	Pavilion
Andersen, Bridget	Session A	Poster 1	3:00 p.m.	Pavilion
Andrews, Bryanna	Session 2	Oral	3:45 p.m.	202 Wellman
Aristov, Michael	Session 1	Oral	1:45 p.m.	103 Wellman
Asher, Samuel	Session C	Poster 41	5:00 p.m.	Pavilion
Ashmore, Anne	Session 2	Oral	3:45 p.m.	106 Wellman
Atai, Kice	Session 3	Oral	5:30 p.m.	202 Wellman
Bachaalany, Santana Maria	Session C	Poster 23	5:00 p.m.	Pavilion
Baker, Sammy	Session B	Poster 83	4:00 p.m.	Pavilion
Baldwin, Laura	Session A	Poster 20	3:00 p.m.	Pavilion
Balla, Hagr	Session A	Poster 34	3:00 p.m.	Pavilion
Banderas, Jesus	Session 1	Oral	2:15 p.m.	26 Wellman
Barney, Naomi	Session B	Poster 109	4:00 p.m.	Pavilion
Baskin, Andrew	Session 2	Oral	3:30 p.m.	106 Wellman
Batarni, Samir	Session 2	Oral	4:00 p.m.	26 Wellman
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Bellard, Maverick	Session B	Poster 7	4:00 p.m.	Pavilion
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Bergman, Maximilien	Session B	Poster 69	4:00 p.m.	Pavilion
Berry, Tanya	Session C	Poster 5	5:00 p.m.	Pavilion
Betts, Makayla	Session C	Poster 9	5:00 p.m.	Pavilion
Bevir, Lawrence	Session 1	Oral	1:45 p.m.	230 Wellman
Bhatnagar, Sam	Session B	Poster 9	4:00 p.m.	Pavilion
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Birla, Srishti	Session B	Poster 11	4:00 p.m.	Pavilion
Blahut, Derek	Session 1	Oral	1:00 p.m.	229 Wellman
Boghospor, Lorita	Session A	Poster 42	3:00 p.m.	Pavilion
Boinapalli, Jay	Session B	Poster 47	4:00 p.m.	Pavilion
Bouffard, Nichole	Session 3	Oral	5:30 p.m.	216 Wellman
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Brochard, Laura	Session 1	Oral	2:15 p.m.	119 Wellman
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Caynak, Rachel	Session 2	Oral	3:30 p.m.	26 Wellman
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Chan, Hilary	Session C	Poster 12	5:00 p.m.	Pavilion
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Chang, Ashley	Session C	Poster 102	5:00 p.m.	Pavilion
Chang, Yvonne	Session C	Poster 61	5:00 p.m.	Pavilion
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Cheah, Jenice	Session 2	Oral	3:45 p.m.	103 Wellman
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Chikere, Nyemachi	Session C	Poster 59	5:00 p.m.	Pavilion
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Chu, Roy	Session 1	Oral	1:45 p.m.	106 Wellman
Chua, Austin	Session A	Poster 74	3:00 p.m.	Pavilion
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Cossman, Ian ..... Session C ..... Poster 38 ..... 5:00 p.m. ..... Pavilion
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Ewald, Jacob ..... Session 3 ..... Oral ..... 5:30 p.m. ..... 226 Wellman
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Flores, Michael ..... Session C ..... Poster 53 ..... 5:00 p.m. ..... Pavilion
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Katznelson, Andrew ..... Session B ..... Poster 22 ..... 4:00 p.m. ..... Pavilion
Kaur, Amanjot ..... Session A ..... Poster 67 ..... 3:00 p.m. ..... Pavilion
Kaur, Parneet ..... Session A ..... Poster 90 ..... 3:00 p.m. ..... Pavilion
Kaur, Preetveer ..... Session C ..... Poster 66 ..... 5:00 p.m. ..... Pavilion
Kayoshi, Kamieko ..... Session B ..... Poster 48 ..... 4:00 p.m. ..... Pavilion
Keisling, William ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 226 Wellman
Kelley, Michelle ..... Session A ... Poster 103 ..... 3:00 p.m. ..... Pavilion
Khil, Alina ..... Session A ..... Poster 66 ..... 3:00 p.m. ..... Pavilion
Killion, Jack ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 106 Wellman
Kim, Anna ..... Session A ... Poster 110 ..... 3:00 p.m. ..... Pavilion
Kim, Hope ..... Session 3 ..... Oral ..... 5:15 p.m. ..... 126 Wellman
King, Ligaya ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 26 Wellman
King, Rebecca ..... Session 2 ..... Oral ..... 3:45 p.m. ..... 119 Wellman
King, Sarah ..... Session A ..... Poster 3 ..... 3:00 p.m. ..... Pavilion
Klyver, John ..... Session 1 ..... Oral ..... 1:00 p.m. ..... 2 Wellman
Koehler, Sam ..... Session C ..... Poster 70 ..... 5:00 p.m. ..... Pavilion
Kolluru, Shalini ..... Session C ..... Poster 67 ..... 5:00 p.m. ..... Pavilion
Konyn, Peter ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 229 Wellman
Kovarik, Gabriella ..... Session C ..... Poster 7 ..... 5:00 p.m. ..... Pavilion
Kruger, Avery ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 216 Wellman
Kubond, Bryce ..... Session A ..... Poster 77 ..... 3:00 p.m. ..... Pavilion
Kumamoto, Akira ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 226 Wellman
Kumar, Akhilesh ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 106 Wellman
Kumar, Natasha ..... Session A ..... Poster 97 ..... 3:00 p.m. ..... Pavilion
Kumar,Udyam ..... Session C ... Poster 100 ..... 5:00 p.m. ..... Pavilion
Kuzara, Stephanie ..... Session C ..... Poster 99 ..... 5:00 p.m. ..... Pavilion
Kyger, Ryan ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 216 Wellman
Lai, Jennifer ..... Session A ..... Poster 96 ..... 3:00 p.m. ..... Pavilion
Lam, Anna ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 230 Wellman
Lam, Chelsea ..... Session A ..... Poster 49 ..... 3:00 p.m. ..... Pavilion
Lam, Jovian ..... Session B ..... Poster 84 ..... 4:00 p.m. ..... Pavilion
Lam, Myron ..... Session A ..... Poster 17 ..... 3:00 p.m. ..... Pavilion
Lassetter, Alexandria ..... Session 1 ..... Oral ..... 1:00 p.m. ..... 119 Wellman
Lawrence, Chrislyn ..... Session C ..... Poster 49 ..... 5:00 p.m. ..... Pavilion
Le, Brittney ..... Session B ... Poster 105 ..... 4:00 p.m. ..... Pavilion
Le, Victoria ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 106 Wellman
Leach, Brian ..... Session 3 ..... Oral ..... 5:00 p.m. ..... 212 Wellman
Lee, Christie ..... Session C ..... Poster 4 ..... 5:00 p.m. ..... Pavilion
Lee, Kelsey ..... Session 1 ..... Oral ..... 1:45 p.m. ..... 234 Wellman
Lee, Gabriella ..... Session B ..... Poster 72 ..... 4:00 p.m. ..... Pavilion
Lee, Michelle ..... Session A ..... Poster 43 ..... 3:00 p.m. ..... Pavilion
Lee, Ruth ..... Session C ..... Poster 19 ..... 5:00 p.m. ..... Pavilion
Lee, Yong ..... Session C ..... Poster 14 ..... 5:00 p.m. ..... Pavilion
Leelin, Adrian ..... Session A ..... Poster 73 ..... 3:00 p.m. ..... Pavilion
Lemos, Camila ..... Session A ..... Poster 23 ..... 3:00 p.m. ..... Pavilion
Leung, Jordan ..... Session 3 ..... Oral ..... 5:15 p.m. ..... 119 Wellman
Leung, Kevin ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 212 Wellman
Leventhal, Amanda ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 126 Wellman
Lewis, Nichole ..... Session 2 ..... Oral ..... 3:45 p.m. ..... 216 Wellman
Lewis-Mummert, Logan ..... Session B ..... Poster 63 ..... 4:00 p.m. ..... Pavilion
Lewy, Tyler ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 2 Wellman
Li, Erica ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 234 Wellman
Li, Leesa ..... Session A ..... Poster 21 ..... 3:00 p.m. ..... Pavilion
Li, Magdalen ..... Session D .Art Exhibit 1 ..... 3:00 p.m. ..... Pavilion
Li, Tony ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 6 Wellman

PRESENTERS

Lim, Ashley ..... Session A ..... Poster 88 ..... 3:00 p.m. ..... Pavilion
Lim, David ..... Session B ..... Poster 36 ..... 4:00 p.m. ..... Pavilion
Lin, Jason ..... Session D .Art Exhibit 9 ..... 3:00 p.m. ..... Pavilion
Lin, Kristi ..... Session D .Art Exhibit 7 ..... 3:00 p.m. ..... Pavilion
Liongson, Danica ..... Session A ..... Poster 29 ..... 3:00 p.m. ..... Pavilion
Liska, Megan ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 103 Wellman
Liu, Jiayin ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 202 Wellman
Liu, Kendra ..... Session C ... Poster 107 ..... 5:00 p.m. ..... Pavilion
Liu, Natalie ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 216 Wellman
Lloyd, Sarah ..... Session A ..... Poster 5 ..... 3:00 p.m. ..... Pavilion
Long, Kira ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 212 Wellman
Lozano, Rocio ..... Session B ..... Poster 21 ..... 4:00 p.m. ..... Pavilion
Lucas, James ..... Session B ..... Poster 6 ..... 4:00 p.m. ..... Pavilion
Luo, Shengqiao ..... Session 3 ..... Oral ..... 5:45 p.m. ..... 119 Wellman
Luong, Peter ..... Session C ..... Poster 24 ..... 5:00 p.m. ..... Pavilion
Ly, Kristie ..... Session C ..... Poster 28 ..... 5:00 p.m. ..... Pavilion
MacDonald, Benjamin ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 107 Wellman
Macway, Katherine ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 212 Wellman
Magee, Andrew ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 233 Wellman
Mak, San Ming ..... Session A ... Poster 108 ..... 3:00 p.m. ..... Pavilion
Mandzyuk, Boguslav ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 103 Wellman
Manela, Alexander ..... Session A ..... Poster 19 ..... 3:00 p.m. ..... Pavilion
Maniscalco, Sydney ..... Session C ..... Poster 81 ..... 5:00 p.m. ..... Pavilion
Manuel, Tracy ..... Session 2 ..... Oral ..... 4:15 p.m. ..... 119 Wellman
Martinez, Marcos ..... Session C ..... Poster 3 ..... 5:00 p.m. ..... Pavilion
Martinez, Travis ..... Session C ..... Poster 56 ..... 5:00 p.m. ..... Pavilion
Mastrili, Noelle ..... Session C ..... Poster 77 ..... 5:00 p.m. ..... Pavilion
May, Jordyn ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 226 Wellman
McCarthy-Sinclair, Brendan .. Session 2 ..... Oral ..... 3:30 p.m. ..... 202 Wellman
McCracken, Debra ..... Session 1 ..... Oral ..... 1:45 p.m. ..... 216 Wellman
McElroy, Amy ..... Session A ..... Poster 78 ..... 3:00 p.m. ..... Pavilion
McKinley, Gweneth ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 234 Wellman
McMillan, Grace ..... Session C ..... Poster 89 ..... 5:00 p.m. ..... Pavilion
Mehrsaz, Jessica ..... Session A ..... Poster 84 ..... 3:00 p.m. ..... Pavilion
Meky, Eman ..... Session C ..... Poster 92 ..... 5:00 p.m. ..... Pavilion
Memar, Fatemeh ..... Session A ..... Poster 40 ..... 3:00 p.m. ..... Pavilion
Mengesha, Zion ..... Session A ..... Poster 46 ..... 3:00 p.m. ..... Pavilion
Meza, Kayla ..... Session B ... Poster 104 ..... 4:00 p.m. ..... Pavilion
Ming-Whitfield, Brittni ..... Session C ... Poster 106 ..... 5:00 p.m. ..... Pavilion
Mo, Xuan ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 107 Wellman
Monroy, Robert ..... Session B ..... Poster 61 ..... 4:00 p.m. ..... Pavilion
Montes, Annie ..... Session A ..... Poster 71 ..... 3:00 p.m. ..... Pavilion
Morales, Alexander ..... Session 3 ..... Oral ..... 5:30 p.m. ..... 106 Wellman
Morales, Oscar ..... Session C ..... Poster 75 ..... 5:00 p.m. ..... Pavilion
Moreo, Alexander ..... Session C ... Poster 105 ..... 5:00 p.m. ..... Pavilion
Morgan, Ryan ..... Session B ..... Poster 18 ..... 4:00 p.m. ..... Pavilion
Morrar, Sohail ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 2 Wellman
Moyers, David ..... Session A ..... Poster 16 ..... 3:00 p.m. ..... Pavilion
Mullin, Briga ..... Session B ..... Poster 92 ..... 4:00 p.m. ..... Pavilion
Munoz, Yvonne ..... Session B ..... Poster 14 ..... 4:00 p.m. ..... Pavilion
Murray, Larissa ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 119 Wellman
Musigapala, Vanvisa ..... Session B ..... Poster 33 ..... 4:00 p.m. ..... Pavilion
Myers, Stephanie ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 226 Wellman
Myers, Victoria ..... Session C ..... Poster 47 ..... 5:00 p.m. ..... Pavilion
Nakagawa, Rachel ..... Session A ..... Poster 92 ..... 3:00 p.m. ..... Pavilion
Naranjo, Anna ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 233 Wellman
Narayanan, Tirumular ..... Session 3 ..... Oral ..... 5:30 p.m. ..... 212 Wellman
Natarajan, Arjun ..... Session A ..... Poster 15 ..... 3:00 p.m. ..... Pavilion
Nelson, Mackenzie ..... Session A ..... Poster 7 ..... 3:00 p.m. ..... Pavilion
Ngo, Julie ..... Session B ..... Poster 86 ..... 4:00 p.m. ..... Pavilion
Ngo, Thuy-Quynh ..... Session C ..... Poster 13 ..... 5:00 p.m. ..... Pavilion
Nguyen, Alexander ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 202 Wellman
Nguyen, Anh Tuyet ..... Session A ..... Poster 53 ..... 3:00 p.m. ..... Pavilion
Nguyen, Bao ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 230 Wellman
Nguyen, Bryan ..... Session A ..... Poster 31 ..... 3:00 p.m. ..... Pavilion
Nguyen, Diane ..... Session C ..... Poster 65 ..... 5:00 p.m. ..... Pavilion
Nguyen, Don ..... Session C ..... Poster 88 ..... 5:00 p.m. ..... Pavilion
Nguyen, Emerald ..... Session B ..... Poster 46 ..... 4:00 p.m. ..... Pavilion
Nguyen, Jessica ..... Session A ..... Poster 85 ..... 3:00 p.m. ..... Pavilion
Nguyen, Kenny ..... Session B ..... Poster 87 ..... 4:00 p.m. ..... Pavilion
Nguyen, Lan-Uyen ..... Session B ..... Poster 58 ..... 4:00 p.m. ..... Pavilion
Nguyen, Linda ..... Session A ... Poster 105 ..... 3:00 p.m. ..... Pavilion
Nguyen, Lynh ..... Session A ..... Poster 70 ..... 3:00 p.m. ..... Pavilion
Nguyen, Natalie ..... Session A ..... Poster 44 ..... 3:00 p.m. ..... Pavilion
Nguyen, Valerie ..... Session B ..... Poster 27 ..... 4:00 p.m. ..... Pavilion
Nguyen, Vincent ..... Session C ..... Poster 95 ..... 5:00 p.m. ..... Pavilion
Nguyen, Vinh ..... Session C ..... Poster 57 ..... 5:00 p.m. ..... Pavilion
Nirmal, Niba ..... Session B ..... Poster 74 ..... 4:00 p.m. ..... Pavilion
Nishida, Kristine ..... Session A ..... Poster 91 ..... 3:00 p.m. ..... Pavilion
North, Jacob ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 230 Wellman
Olomi, Julie ..... Session B ..... Poster 85 ..... 4:00 p.m. ..... Pavilion
Olson, Alexander ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 212 Wellman
Olson, Matthew ..... Session 3 ..... Oral ..... 5:45 p.m. ..... 126 Wellman
Olson, Natalie ..... Session C ... Poster 104 ..... 5:00 p.m. ..... Pavilion
O'Neill, Kathryn ..... Session B ..... Poster 54 ..... 4:00 p.m. ..... Pavilion
Opastpongkarn, Arunwong .. Session A ..... Poster 22 ..... 3:00 p.m. ..... Pavilion
Or, Victor ..... Session 2 ..... Oral ..... 4:15 p.m. ..... 212 Wellman
Ordones Sanchez, Evelyn ..... Session A ..... Poster 83 ..... 3:00 p.m. ..... Pavilion
Orozco-Carpenter, Shakevia . Session 2 ..... Oral ..... 3:45 p.m. ..... 6 Wellman
Orozco-Llamas, Mayra ..... Session A ..... Poster 63 ..... 3:00 p.m. ..... Pavilion

Ortiz, Alina ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 226 Wellman
Osterlund, Alina..... Session B ..... Poster 28 ..... 4:00 p.m. ..... Pavilion
Owyoung, Danielle ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 26 Wellman
Pabbisetty, Lakshmidevi..... Session A ..... Poster 69 ..... 3:00 p.m. ..... Pavilion
Pai, Gloria..... Session A ..... Poster 4 ..... 3:00 p.m. ..... Pavilion
Palmer, Ian ..... Session B ..... Poster 67 ..... 4:00 p.m. ..... Pavilion
Palmer, Lira..... Session B ..... Poster 59 ..... 4:00 p.m. ..... Pavilion
Palumbo, Michelle..... Session C ..... Poster 76 ..... 5:00 p.m. ..... Pavilion
Parker, Thomas ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 6 Wellman
Pearsons, Kirsten..... Session C ..... Poster 71 ..... 5:00 p.m. ..... Pavilion
Pedersen, Brian..... Session B ..... Poster 5 ..... 4:00 p.m. ..... Pavilion
Pedroza, Gabriela ..... Session 3 ..... Oral ..... 5:00 p.m. ..... 226 Wellman
Peña Gomez, Guadalupe ..... Session A ... Poster 102 ..... 3:00 p.m. ..... Pavilion
Peralta, Jade..... Session A ..... Poster 50 ..... 3:00 p.m. ..... Pavilion
Perez, Iris ..... Session A ..... Poster 61 ..... 3:00 p.m. ..... Pavilion
Perez, Jessica..... Session A ..... Poster 86 ..... 3:00 p.m. ..... Pavilion
Pham, Michelle ..... Session A ..... Poster 64 ..... 3:00 p.m. ..... Pavilion
Phang, Kelly ..... Session A ..... Poster 25 ..... 3:00 p.m. ..... Pavilion
Phin, To Lan ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 126 Wellman
Pirir, Mauricio..... Session A ..... Poster 13 ..... 3:00 p.m. ..... Pavilion
Poa, Philip..... Session C ..... Poster 45 ..... 5:00 p.m. ..... Pavilion
Prakash, Ahalya..... Session C ..... Poster 90 ..... 5:00 p.m. ..... Pavilion
Prasad, Shalvi..... Session B ... Poster 107 ..... 4:00 p.m. ..... Pavilion
Prom, Daisy..... Session B ..... Poster 99 ..... 4:00 p.m. ..... Pavilion
Puccetti, Monica..... Session 2 ..... Oral ..... 4:15 p.m. ..... 106 Wellman
Putinar, Corina..... Session C ..... Poster 39 ..... 5:00 p.m. ..... Pavilion
Qu, Roy ..... Session 2 ..... Oral ..... 4:15 p.m. ..... 103 Wellman
Quezada, Juvenal..... Session B ..... Poster 82 ..... 4:00 p.m. ..... Pavilion
Rahimzadeh, Radin..... Session 1 ..... Oral ..... 1:45 p.m. ..... 126 Wellman
Rajan, Sahana..... Session 2 ..... Oral ..... 3:15 p.m. ..... 106 Wellman
Rajavel, Anisha..... Session B ..... Poster 4 ..... 4:00 p.m. ..... Pavilion
Rajpurkar, Aparna ..... Session A ..... Poster 55 ..... 3:00 p.m. ..... Pavilion
Ram, Shivneel..... Session B ... Poster 108 ..... 4:00 p.m. ..... Pavilion
Ramalingam, Jordan ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 234 Wellman
Rasmus, Madison..... Session C ..... Poster 15 ..... 5:00 p.m. ..... Pavilion
Rayburn, Maire..... Session C ..... Poster 96 ..... 5:00 p.m. ..... Pavilion
Remick, Matthew..... Session 1 ..... Oral ..... 2:00 p.m. ..... 234 Wellman
Ren, Yikai..... Session C ..... Poster 20 ..... 5:00 p.m. ..... Pavilion
Reynolds, Ryan ..... Session A ..... Poster 37 ..... 3:00 p.m. ..... Pavilion
Rezvani, Sabah..... Session B ..... Poster 19 ..... 4:00 p.m. ..... Pavilion
Rice, Dawn ..... Session B ... Poster 106 ..... 4:00 p.m. ..... Pavilion
Richards, Rachael..... Session D .Art Exhibit 4 ..... 3:00 p.m. ..... Pavilion
Roberts, John ..... Session B ..... Poster 2 ..... 4:00 p.m. ..... Pavilion
Rockholt, Rachel..... Session 1 ..... Oral ..... 1:30 p.m. ..... 229 Wellman
Rodriguez, Javier ..... Session B ..... Poster 62 ..... 4:00 p.m. ..... Pavilion
Rodriguez, Michael ..... Session A ..... Poster 35 ..... 3:00 p.m. ..... Pavilion
Ronne, Eric ..... Session B ..... Poster 24 ..... 4:00 p.m. ..... Pavilion
Rothstein, Ruth ..... Session 1 ..... Oral ..... 1:45 p.m. ..... 226 Wellman
Rowan, Elizabeth ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 126 Wellman
Rowe, Susan..... Session C ..... Poster 80 ..... 5:00 p.m. ..... Pavilion
Ruan, Luyao..... Session B ..... Poster 43 ..... 4:00 p.m. ..... Pavilion
Ruano, Elizabeth..... Session B ..... Poster 29 ..... 4:00 p.m. ..... Pavilion
Rupasinghe, Mark..... Session 1 ..... Oral ..... 1:30 p.m. ..... 6 Wellman
Rusoff, Sam ..... Session B ..... Poster 75 ..... 4:00 p.m. ..... Pavilion
Ryklansky, Carolina..... Session 2 ..... Oral ..... 3:00 p.m. ..... 229 Wellman
Rystov, Alice ..... Session A ..... Poster 14 ..... 3:00 p.m. ..... Pavilion
Saeteurn, Courtney..... Session B ..... Poster 66 ..... 4:00 p.m. ..... Pavilion
Saleem, Saba ..... Session 3 ..... Oral ..... 5:45 p.m. ..... 216 Wellman
Sanchez, Estevan ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 126 Wellman
Santoso, Michelle..... Session C ..... Poster 83 ..... 5:00 p.m. ..... Pavilion
Sapre, Manali..... Session C ..... Poster 44 ..... 5:00 p.m. ..... Pavilion
Saron, Gabriel..... Session B ..... Poster 41 ..... 4:00 p.m. ..... Pavilion
Sartori, Federica ..... Session 3 ..... Oral ..... 5:15 p.m. ..... 234 Wellman
Satkowski, Cori..... Session 1 ..... Oral ..... 1:15 p.m. ..... 6 Wellman
Schmidt, Katarina ..... Session A ..... Poster 2 ..... 3:00 p.m. ..... Pavilion
Schmidt, Mason ..... Session A ..... Poster 47 ..... 3:00 p.m. ..... Pavilion
Schnider, Ashley ..... Session A ..... Poster 79 ..... 3:00 p.m. ..... Pavilion
Schoefer, Erica..... Session A ..... Poster 82 ..... 3:00 p.m. ..... Pavilion
Sedarous, Mary..... Session 2 ..... Oral ..... 3:45 p.m. ..... 212 Wellman
Sharma, Ajay ..... Session B ..... Poster 44 ..... 4:00 p.m. ..... Pavilion
Shaw, Claire..... Session A ..... Poster 24 ..... 3:00 p.m. ..... Pavilion
Shere, Berrah..... Session A ..... Poster 76 ..... 3:00 p.m. ..... Pavilion
Shim, Kyumin ..... Session C ..... Poster 54 ..... 5:00 p.m. ..... Pavilion
Shope, Megan ..... Session C ..... Poster 29 ..... 5:00 p.m. ..... Pavilion
Sierra, Valentin ..... Session 1 ..... Oral ..... 1:45 p.m. ..... 229 Wellman
Simon, Ido..... Session 1 ..... Oral ..... 1:30 p.m. ..... 26 Wellman
Snyder, Mitchell..... Session 2 ..... Oral ..... 4:00 p.m. ..... 226 Wellman
So, Marianne..... Session B ... Poster 101 ..... 4:00 p.m. ..... Pavilion
Soper, Tess..... Session C ..... Poster 86 ..... 5:00 p.m. ..... Pavilion
Staley, Simon ..... Session B ..... Poster 16 ..... 4:00 p.m. ..... Pavilion
Stapleton, Timothy..... Session C ..... Poster 48 ..... 5:00 p.m. ..... Pavilion
Stone, Katherine..... Session 1 ..... Oral ..... 1:30 p.m. ..... 234 Wellman
Stout, Sean ..... Session A ..... Poster 10 ..... 3:00 p.m. ..... Pavilion
Suarez, Sassan ..... Session C ..... Poster 78 ..... 5:00 p.m. ..... Pavilion
Sugiyama, Masumi ..... Session A ..... Poster 36 ..... 3:00 p.m. ..... Pavilion
Suh, Young Ha..... Session 2 ..... Oral ..... 4:15 p.m. ..... 202 Wellman
Sullivan, Kelli ..... Session B ..... Poster 3 ..... 4:00 p.m. ..... Pavilion
Swain, William ..... Session A ... Poster 109 ..... 3:00 p.m. ..... Pavilion
Swiedler, Elaine..... Session 1 ..... Oral ..... 1:00 p.m. ..... 234 Wellman
Syed, Raisa ..... Session C ..... Poster 84 ..... 5:00 p.m. ..... Pavilion

PRESENTERS

Tajrishi, Raha ..... Session B ..... Poster 49 ..... 4:00 p.m. ..... Pavilion
Takhar, Savneet ..... Session B ..... Poster 70 ..... 4:00 p.m. ..... Pavilion
Taleghani, Sophia ..... Session A ..... Poster 18 ..... 3:00 p.m. ..... Pavilion
Tam, Mitchell ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 106 Wellman
Tamayo, Jesse ..... Session 1 ..... Oral ..... 1:00 p.m. ..... 103 Wellman
Tan, Janet ..... Session 1 ..... Oral ..... 1:45 p.m. ..... 26 Wellman
Tan, Jiahui ..... Session C ..... Poster 10 ..... 5:00 p.m. ..... Pavilion
Tan, Tianqi ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 6 Wellman
Tang, Audrey ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 226 Wellman
Tang, Peixin ..... Session C ..... Poster 36 ..... 5:00 p.m. ..... Pavilion
Tangog, Ekaterina ..... Session A ..... Poster 59 ..... 3:00 p.m. ..... Pavilion
Tapia-Nunez, Brittney ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 2 Wellman
Tatavarthy, Manvita ..... Session 3 ..... Oral ..... 5:15 p.m. ..... 106 Wellman
Taylor, Jack ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 119 Wellman
Tellez, Norma ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 230 Wellman
Thai, Huy ..... Session B ..... Poster 80 ..... 4:00 p.m. ..... Pavilion
Thanasuwat, Burinrutt ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 230 Wellman
Thomas, Jackson ..... Session 2 ..... Oral ..... 3:45 p.m. ..... 233 Wellman
Tibbett, Emily ..... Session A ..... Poster 33 ..... 3:00 p.m. ..... Pavilion
Tolfa, Kirk ..... Session A ..... Poster 38 ..... 3:00 p.m. ..... Pavilion
Torres, Danielle ..... Session A ..... Poster 8 ..... 3:00 p.m. ..... Pavilion
Torrest, Audrey ..... Session 1 ..... Oral ..... 1:15 p.m. ..... 119 Wellman
Torrevillas, Brandi ..... Session C ..... Poster 87 ..... 5:00 p.m. ..... Pavilion
Tran, Hong ..... Session C ..... Poster 18 ..... 5:00 p.m. ..... Pavilion
Truong, Lisa ..... Session 1 ..... Oral ..... 1:00 p.m. ..... 106 Wellman
Tsai, Alex ..... Session A ..... Poster 99 ..... 3:00 p.m. ..... Pavilion
Turcios, Christy ..... Session 1 ..... Oral ..... 1:00 p.m. ..... 6 Wellman
Tyer, Carly ..... Session A ..... Poster 32 ..... 3:00 p.m. ..... Pavilion
Utkina, Anastasia ..... Session A ..... Poster 52 ..... 3:00 p.m. ..... Pavilion
Van, Helen Phuong ..... Session 2 ..... Oral ..... 3:45 p.m. ..... 126 Wellman
Vang, Lay ..... Session B ..... Poster 91 ..... 4:00 p.m. ..... Pavilion
Vargas, Elizabeth ..... Session A ..... Poster 57 ..... 3:00 p.m. ..... Pavilion
Vasquez, Evelyn ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 230 Wellman
Velazquez, Patricia ..... Session D .Art Exhibit 5 ..... 3:00 p.m. ..... Pavilion
Vera, Diana ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 119 Wellman
Villalon, Ashley ..... Session B ... Poster 100 ..... 4:00 p.m. ..... Pavilion
Villegas, King Paul Deo ..... Session B ..... Poster 88 ..... 4:00 p.m. ..... Pavilion
Vincent, Marcus ..... Session C ..... Poster 64 ..... 5:00 p.m. ..... Pavilion
Vinogradova, Margarita ..... Session B ... Poster 102 ..... 4:00 p.m. ..... Pavilion
Vishwasrao, Revati ..... Session C ..... Poster 97 ..... 5:00 p.m. ..... Pavilion
Visla, Jasmeen ..... Session A ..... Poster 89 ..... 3:00 p.m. ..... Pavilion
Vitagliano, Nicholas ..... Session B ..... Poster 65 ..... 4:00 p.m. ..... Pavilion
Vo, Kim ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 216 Wellman
Vo, ThanhThanh ..... Session C ..... Poster 94 ..... 5:00 p.m. ..... Pavilion
Vo, Tina ..... Session C ..... Poster 82 ..... 5:00 p.m. ..... Pavilion
Vuong, Whitney ..... Session 2 ..... Oral ..... 4:15 p.m. ..... 26 Wellman
Wang, Alex ..... Session B ..... Poster 45 ..... 4:00 p.m. ..... Pavilion
Wang, Bonnie ..... Session A ..... Poster 6 ..... 3:00 p.m. ..... Pavilion
Wang, Cathy ..... Session A ..... Poster 95 ..... 3:00 p.m. ..... Pavilion
Wang, Deyu ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 126 Wellman
Wang, Dylan ..... Session C ..... Poster 17 ..... 5:00 p.m. ..... Pavilion
Wang, Zhuolin ..... Session 1 ..... Oral ..... 2:15 p.m. ..... 202 Wellman
Ware, Jeffrey ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 233 Wellman
Waring, Barbara ..... Session B ..... Poster 71 ..... 4:00 p.m. ..... Pavilion
Watterson, Joanna ..... Session A ..... Poster 51 ..... 3:00 p.m. ..... Pavilion
West, Jessica ..... Session C ..... Poster 31 ..... 5:00 p.m. ..... Pavilion
Wetzel, Eric ..... Session 2 ..... Oral ..... 3:15 p.m. ..... 6 Wellman
Wieckowski, Bridget ..... Session A ..... Poster 94 ..... 3:00 p.m. ..... Pavilion
Wikle, Emily ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 216 Wellman
Wimenta, Adrianna ..... Session A ..... Poster 98 ..... 3:00 p.m. ..... Pavilion
Wizman, Joshua ..... Session 2 ..... Oral ..... 3:30 p.m. ..... 2 Wellman
Wong, Gary ..... Session 1 ..... Oral ..... 1:30 p.m. ..... 119 Wellman
Wong, Jessica ..... Session B ..... Poster 57 ..... 4:00 p.m. ..... Pavilion
Wong, Johnny ..... Session B ..... Poster 53 ..... 4:00 p.m. ..... Pavilion
Wong, Winnie ..... Session B ..... Poster 20 ..... 4:00 p.m. ..... Pavilion
Wood, Heather ..... Session 3 ..... Oral ..... 5:15 p.m. ..... 216 Wellman
Wren, Jannah ..... Session 1 ..... Oral ..... 2:00 p.m. ..... 26 Wellman
Wu, Ming ..... Session 2 ..... Oral ..... 4:00 p.m. ..... 212 Wellman
Wu, Tong ..... Session C ... Poster 108 ..... 5:00 p.m. ..... Pavilion
Wulf, Krystal ..... Session B ..... Poster 90 ..... 4:00 p.m. ..... Pavilion
Yacoub, James ..... Session 3 ..... Oral ..... 5:30 p.m. ..... 234 Wellman
Yang, Season ..... Session B ..... Poster 42 ..... 4:00 p.m. ..... Pavilion
Yao, Zi ..... Session 2 ..... Oral ..... 4:15 p.m. ..... 229 Wellman
Yau, Tammy ..... Session C ..... Poster 52 ..... 5:00 p.m. ..... Pavilion
Yip, Jennifer ..... Session B ..... Poster 77 ..... 4:00 p.m. ..... Pavilion
Yu, Joyce ..... Session B ..... Poster 81 ..... 4:00 p.m. ..... Pavilion
Yu, Sunny ..... Session A ..... Poster 93 ..... 3:00 p.m. ..... Pavilion
Yuen, Justin ..... Session A ... Poster 104 ..... 3:00 p.m. ..... Pavilion
Yun, Jason ..... Session 2 ..... Oral ..... 3:00 p.m. ..... 212 Wellman
Zacarias, Tatiana ..... Session 3 ..... Oral ..... 5:45 p.m. ..... 226 Wellman
Zeng, Jiawen ..... Session B ..... Poster 73 ..... 4:00 p.m. ..... Pavilion
Zermeno, Ricardo ..... Session C ..... Poster 98 ..... 5:00 p.m. ..... Pavilion
Zhang, Lu ..... Session C ..... Poster 72 ..... 5:00 p.m. ..... Pavilion
Zheng, Zengwei ..... Session B ..... Poster 40 ..... 4:00 p.m. ..... Pavilion
Zhu, Yiwen ..... Session B ..... Poster 39 ..... 4:00 p.m. ..... Pavilion
Zikry, Christopher ..... Session A ..... Poster 12 ..... 3:00 p.m. ..... Pavilion

2 Wellman Hall, Moderator: R. Holland Cheng

1:00 p.m. John M. Klyver – Microbiology
Optimization of MAP Kinase P38 Inhibitors for Use in Preventing the Transmission of the Malarial Parasite in the Anopheles Vector

1:15 p.m. Tyler Lewy – Microbiology
Effect of Aging on Viral Co-Infection in HIV Patients

1:30 p.m. David Ivanov – Biochemistry & Molecular Biology
Harnessing the HEV VLP for Targeted Cancer Therapy

1:45 p.m. Thinh H. Dang – Biochemistry & Molecular Biology
The Application of RGD Peptides in Enhancing Oral Vaccine

2:00 p.m. Giang N. Ho – Pharmaceutical Chemistry
Structure of Reconstructed Uncleaved Polyprotein 1 of Coxsackievirus B3 Virus-Like Particles

6 Wellman Hall, Moderator: Tonya Kuhl

1:00 p.m. Christy M. Turcios – Chemical Engineering
Thermodynamic Analysis of Interaction in Ternary Mixed Monolayers Containing Cholesterol

1:15 p.m. Cori Satkowski – Chemical Engineering
Molecular Dynamics Simulations of Lipid Bilayer Morphology Modifications Induced by Hydroquinones

1:30 p.m. Mark Rupasinghe – Biochemistry & Molecular Biology
Synthesis and Characterization of DIO Nanoparticles for Magnetic Particle Imaging

1:45 p.m. Sarah Y. Chow – Chemical Engineering
Polymerization of a Triblock Copolymer to Coat Fe(0) Nanoparticles for Magnetic Particle Imaging

2:00 p.m. Tianqi Tan – Chemical Engineering
Study of Phase Separation on AlInN Epitaxial Layers Grown by Metalorganic Chemical Vapor Deposition

2:15 p.m. Tony T. Li – Chemical Engineering
Wettability Comparison of Hydrophobic Surfaces: Fluorocarbons vs. Hydrocarbons

26 Wellman Hall, Moderator: Joanne Heraty

1:00 p.m. Cody L. Burr – Biochemistry & Molecular Biology
Elucidation of Novel Extracellular Plant Receptor Involved in Viral Defense Pathway

1:15 p.m. Danielle N. Owyoung – Food Science
Identification of Candidate Genes Required for Xa21-Mediated Immunity

1:30 p.m. Ido Simon – Viticulture & Enology
Genetic Potential of Lettuce Downy Mildew in California

1:45 p.m. Janet Tan – Biochemistry & Molecular Biology
Bacteria Manipulation of Plant Immunity by Targeting Key Transcriptional Reprogramming Events

2:00 p.m. Jannah A. Wren – Biochemistry & Molecular Biology
Elucidating the Cluster II Frankia Dependency on Its Host Plants - A Qualitative Approach

2:15 p.m. Jesus Banderas – Plant Biology
Characterization of the Arabidopsis thaliana Gene PBL13

103 Wellman Hall, Moderator: Alan Balch

1:00 p.m. Jesse Tamayo – Chemistry
One Electron Oxidation of an Oxo-Centered Cobalt(III) Trimer

1:15 p.m. Kevin M. Enriquez – Chemical Engineering
Synthesis and Characterization of Magnesium Aluminate With and Without Ytterbium Dopant

1:30 p.m. Megan Liska – Mathematics
Classifying 1-Lattice Maximal Polytopes

1:45 p.m. Michael M. Aristov – Chemistry
A Method for Rapid, High Yield Crystal Growth in Ruthenium Chemistry

2:00 p.m. Sharon Jun – Chemistry
Development of Fullerene and Piperazine

2:15 p.m. Susanne Y. Chen – Pharmaceutical Chemistry
New Insights into the Structural Complexity of $C_{60}{\cdot}2S_8$: Two Crystal Morphologies, Two Phase Changes, Four Polymorphs

106 Wellman Hall, Moderator: Joanne Engebrecht

1:00 p.m. Lisa Truong – Genetics
Role of the DNA Damage Sensor, ATR in Meiotic Chromosome Segregation in C. elegans

1:15 p.m. Mitchell Tam – Cell Biology
Finding Early Markers for Autism: Optimizing Primers for Assaying Global Methylation

1:30 p.m. Quang Minh Ha – Biochemistry & Molecular Biology
Optimizing qPCR Primers to Validate Galaxy Analysis of MeCP2 ChIP-Seq Data

1:45 p.m. Roy Chu – Biotechnology
Assaying Highly Repetitive Regions in Dup15q Syndrome

2:00 p.m. Victoria M. Le – Genetics
Towards Epigenetic Targeting in Neurological Diseases

107 Wellman Hall, Moderator: Kaka Ma

1:00 p.m. Katherine Acord – Materials Science and Engineering
High Frequency Vibration and High Gravity Force Shock Testing for Proposed Mars Sample Return

1:15 p.m. Xuan Mo – Materials Science and Engineering
Microstructure and Thermal Stability of Nanocrystalline Al Powders Produced by Cryomilling

1:30 p.m. Benjamin E. MacDonald – Materials Science and Engineering
Investigation Into the Contributions of Intermetallic Phases on the Mechanical Strength of Aluminum-Iron Binary Alloys

1:45 p.m. Kevin L. Butler – Mechanical Engineering
Influence of Heat Treatment on the Mechanical Behavior of Ultrafine Grained and Fine Grained Al-Mg-Sc Alloys

2:00 p.m. Ryan Cohn – Chemical Engineering
Differential Scanning Calorimetry Study of Precipitation in a Nanostructured Aluminum Composite

119 Wellman Hall, Moderator: Mu Yang

1:00 p.m. Alexandria P. Lassetter – Neurobiology, Physiology & Behavior
Derivation of Functionally Mature Human Embryonic Stem Cell Derived Hepatocytes by Organ-Matched Mesenchyme

1:15 p.m. Audrey Torrest – Neurobiology, Physiology & Behavior
Biomarkers of Cellular and Mitochondrial Dysfunction in Huntington's Disease Fibroblasts

1:30 p.m. Gary Wong – Biochemistry & Molecular Biology
Olfactory Bulb Mitral Cell Dendritic Morphogenesis and Plasticity

1:45 p.m. Gillian M. Foley – Psychology
Potential Autism Mouse Model Displays Cognitive Deficits in Novel Touchscreen Task

2:00 p.m. Jack C. Taylor – Biochemistry & Molecular Biology
Development of Yac128 - NSG, an Immunodeficient Huntington's Disease Mouse Model

2:15 p.m. Laura C. Brochard – Neurobiology, Physiology & Behavior
Altered Expression of Excitatory and Inhibitory Signaling in an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

126 Wellman Hall, Moderator: Catherine Puckering

1:00 p.m. Andrea Jao – International Relations
Political Islamist Movements and Post-Uprising Middle East

1:15 p.m. Estevan M. Sanchez – African American & African Studies
Arabic Poetry in Graffiti

1:30 p.m. Marla K. Greenway – Communication
The Sisters' Side of Islam: An Ethnography of Female Muslim Communication in the Context of Ritual and Culture

1:45 p.m. Radin Rahimzadeh – International Relations
Circumventing Economic and Financial Sanctions: The Case Study of the Islamic Republic of Iran

2:00 p.m. To Lan M. Phin – Middle East/South Asia Studies
How Non-Governmental Organizations Alleviate the Education Gap for Youths in Egypt

2:15 p.m. Werdah A. Kaiser – Political Science
Sex and Reproduction in Occupied Palestine

202 Wellman Hall, Moderator: Rebecca Bellone

1:00 p.m. Jasjeet K. Dhanota – Animal Biology
The Correlation of Endoplasmic Reticulum Aminopeptidase 1 and 2 Polymorphisms With Sebaceous Adenitis, an Autoimmune Disease of Standard Poodles

1:15 p.m. Jiayin Liu – Animal Science
Genetic Investigation of Limbal Squamous Cell Carcinoma in Haflinger Horses

1:30 p.m. Kelly A. Hagadorn – Animal Biology
Molecular Tools for Hummingbird Conservation: Determining Sex by DNA

1:45 p.m. Kevin Hu – Biochemistry & Molecular Biology
Determining the Roles of the Cyp19a1a and Cyp19a1b in Zebrafish Sex Determination

2:00 p.m. Lucydalila Cedillo – Animal Science
An Improved Genetic Map of Rainbow Trout Facilitates QTL Mapping and Other Genomics Research in Salmonids

2:15 p.m. Zhuolin Wang – Neurobiology, Physiology & Behavior
Differences in RE Array Profiles Between Cats and Dogs Suggest Their Contribution to Species-Specific Phenotypes

212 Wellman Hall, Moderator: John Harada

1:00 p.m. Aaron M. Goodman – Evolution, Ecology and Biodiversity
Suction Feeding Kinematics of Paedophageous Victorian Cichlids

1:15 p.m. Alec J. Chiono – Evolution, Ecology and Biodiversity
From the Mouths of Cats and Dogs: Inferring Ecology From Tooth Shape in the Carnivora

1:30 p.m. Alexander G. Olson – Biochemistry & Molecular Biology
Characterizing the Differential Expression of Transcript Isoforms

1:45 p.m. Samuel L. Deck – Biotechnology
Characterization of the Cag Pathogenicity Island in Helicobacter pylori from Naturally Infected Rhesus Macaques

2:00 p.m. Amy Dirksen – Wildlife, Fish & Conservation Biology
Behavior Classification from Accelerometer Data in Greater Sage-Grouse (Centrocercus urophasianus)

2:15 p.m. Kira M. Long – Evolution, Ecology and Biodiversity
Consequences of Variation in Female Behavior During the Initial Stages of Courtship in the Greater Sage-Grouse

216 Wellman Hall, Moderator: Corrie Decker

1:00 p.m. Alyssa Hurst – English
Traversing Boundaries of Humanness: "Nonhuman Persons" in Cinematic and Literary Science Fiction

1:15 p.m. Carmel Dor – Art History
Is God Really There?: Considering Issues of Presence and Brilliance in Byzantine Icon Paintings

1:30 p.m. Pei-si (Peggy) Chao – Art History
Dream Culture of the Late Ming Dynasty: A Discourse on Shitao's Authenticity and Originality

1:45 p.m. Emily C. Wikle – Art History
Paris's Second Empire Transformation Parallels

2:00 p.m. Debra M. McCracken – History
African Women in Tanganyika and the Rise of First Wave Feminism in Europe

2:15 p.m. Sequoya S. Collins – History
The Bantu World: Representations of Respectability and Delinquency

226 Wellman Hall, Moderator: Gloria Rodriguez

1:00 p.m. Adé Jackson – Anthropology
The Legacy of Political and Social Activism in the Bay Area: Historical Connections and Modifications

1:15 p.m. Akira O. Kumamoto – English
Self-Medicating in San Francisco: A Study of "Placebo Spaces" Amongst Black Americans in the Film Medicine for Melancholy

1:30 p.m. Alina Ortiz – Psychology
The Comorbidity of Alcohol Abuse and Internalizing Problems in Mexican-Origin Families

1:45 p.m. Ruth A. Rothstein – Sociology
Marijuana Legalization: Media Narratives and Policy Outcomes

2:00 p.m. Stephanie X. Myers – Human Development
Understanding the Influence of Peer Relationships on the College Aspirations of African-American High School Students in an Urban School District

2:15 p.m. William J. Keisling – History
The Ku Klux Klan: Terror in Taft California

229 Wellman Hall, Moderator: Jessica Perea

1:00 p.m. Derek J. Blahut – Biological Sciences
Beyond "Hawaiian Roller Coaster Ride": Analyzing Contemporary Reclamations of Traditional Mele and Hula

1:15 p.m. Jessica M. Gutierrez – Music
Mapping Zapotec and Mestizo Cultural Alliances in "La Zandunga"

1:30 p.m. Rachel M. Rockholt – Agricultural & Environmental Education
Pork, the Fountain of Youth: Okinawan Foodways as Cultural Preservation

1:45 p.m. Valentin Q. Sierra – History
Problematic Pedagogy: Examining Cultural Competency, Critical Race Theory and the Presence of Native American Studies Topics in 4th Grade Classrooms

230 Wellman Hall, Moderator: Bagher Modjtahedi

1:00 p.m. Alena Anberg – Sociology
Solutions in Poverty: Filling the Gaps

1:15 p.m. Anna H. Lam – Sociology
Poverty and Inequalities as Seen in the Form of Home Ownership

1:30 p.m. Evelyn G. Vasquez – English
Visualizing Socioeconomic Differences in Los Angeles

1:45 p.m. Lawrence A. Bevir – Economics
A Normative Analysis of Social Security

2:00 p.m. Melissa P. Chan – Neurobiology, Physiology & Behavior
The Interclinic Consortium and the UC Davis Student-Run Clinics: Understanding Health Disparities Through Demographic Data Collection

2:15 p.m. Norma Tellez – Chicana/Chicano Studies
Experiences of First-Generation Latina/o Transfer Students: Challenges and Resources Needed Not To Be Pushed Out

234 Wellman Hall, Moderator: Karen Riveles

1:00 p.m. Elaine W. Swiedler – Environmental Policy Analysis & Planning
California Land Use Ballot Measures: Trends for 1995-2013 and Predicting Election Results

1:15 p.m. Jordan Ramalingam – Environmental Policy Analysis & Planning
The Market Viability and Environmental Impact of Electric Power Assist Scooters: EcoReco M3

1:30 p.m. Katherine Stone – Community and Regional Development
Cultivating Community Development: How Kampot Pepper Can Sustainably Drive Alternative Community Development Programs in the Kingdom of Cambodia

1:45 p.m. Kelsey H. Lee – Environmental Toxicology
The Role of Toxicology and Public Health in Environmental Emergency Response and Recovery

2:00 p.m. Matthew Remick – Managerial Economics
Risk Assessment of the University of California's Divestment From Fossil Fuels

2 Wellman Hall, Moderator: Suad Joseph

3:00 p.m. Brittney Tapia-Nunez – Political Science
The Middle East and North Africa in U.S. Media Representation: Sticks and Stones: Constructing a Narrative for the Middle East in The New York Times

3:15 p.m. Azka Fayyaz – History
The Middle East and North Africa in U.S. Media Representations 1910-1919: Orientalizing and Criminalizing of Armenians and Armenian-Americans

3:30 p.m. Joshua Wizman – International Relations
The Middle East and North Africa in U.S. Media Representation: In the Eyes of the West: Exploring U.S. Media Portrayals of Ottomans

3:45 p.m. Alexis R. Chavez – International Relations
The Middle East and North Africa in U.S. Media Representations: An Analysis of the Term "Barbary" in the New York Times (1930-1939)

4:00 p.m. Sohail Z. Morrar – International Relations
The Middle East and North Africa in U.S. Media Representation: Algeria, the Territorial Property of France

6 Wellman Hall, Moderator: Stacey Harmer

3:00 p.m. Jennifer Cade – Biochemistry & Molecular Biology
Investigating Genes Involved in Arabidopsis Ovule Development

3:15 p.m. Eric Wetzel – Biotechnology
Agrobacterium-Mediated Transient Expression of Genes in Plant Shoot Apical Meristems

3:30 p.m. Samantha Cowdin – Cell Biology
Characterizing the DUF642 Genes in Nicotiana benthamiana Using Virus Induced Gene Silencing

3:45 p.m. Shakevia Orozco-Carpenter – Genetics
Understanding Seed Germination Process in Cuscuta Plant Parasites

4:00 p.m. Thomas C. Parker – Biotechnology
Developing an Artificial Host System for Studying Haustoria Development in Cuscuta

4:15 p.m. Emma C. Goguen – Biochemistry & Molecular Biology
Genes Involved in Arabidopsis Heat Tolerance Response

26 Wellman Hall, Moderator: Kiho Cho

3:00 p.m. Andrew Haddad – Biochemistry & Molecular Biology
Inhibition of Inflammatory Genes Early After Anterior Cruciate Ligament Injury Can Prevent or Delay the Onset of Post-Traumatic Osteoarthritis

3:15 p.m. Ligaya King – Anthropology
Molecular Evolution of Metabolic Genes and Its Implication in Personalized Nutrition

3:30 p.m. Rachel A. Caynak – Pharmaceutical Chemistry
Development of a LC-MS Assay for Determining the Clinical Impact of Tobramycin Pharmacokinetics in Acute Trauma Patients

3:45 p.m. Rachelle Hamblin – Biological Sciences
The Effectiveness of an Injury Risk Assessment in Predicting Injuries in Youth Athletes

4:00 p.m. Samir S. Batarni – Exercise Biology
Testosterone Supplementation Increases Protein Synthesis through Molecular Targets of Myostatin and mTORC1 pathways

4:15 p.m. Whitney Vuong – Exercise Biology
Inhibition of Inflammatory Tendinitis by Resveratrol in 3D Engineered Tendon

103 Wellman Hall, Moderator: Chao-Yin Chen

3:00 p.m. Boguslav Mandzyuk – Biological Sciences
Characterizing Stress-Induced Arrhythmia in Mice

3:15 p.m. Evan Chua – Microbiology
The Upregulation of PDE4D by Hyperinsulinemia impairs Heart Function

3:30 p.m. Jackie Hoe – Psychology
Implementation of Spatial Care Paths in Hualien County, Taiwan

3:45 p.m. Jenice X. Cheah – Biological Sciences
Effect of Troponin T-Related Hypertrophic Cardiomyopathy on Immunoproteasome Activity

4:00 p.m. Mikael R. Habtezion – Biochemistry & Molecular Biology
Epac, a Novel Mediator of CaMKII-Dependent Arrhythmia in Atrial Cardiomyocytes

4:15 p.m. Roy W. Qu – Genetics
Elucidating the Functional Difference Between Sost and Its Paralog Sostdc1 in Tissue Development

106 Wellman Hall, Moderator: Carolyn Thomas

3:00 p.m. Akhilesh Kumar – Statistics
Localized Sanitation Campaign to Affect Behavioral Change in the Rural Population of Kameshwaram, India

3:15 p.m. Sahana Rajan – Pharmaceutical Chemistry
Localized Sanitation Campaign to Affect Behavioral Change in the Rural Population of Kameshwaram, India

3:30 p.m. Andrew K. Baskin – Sustainable Agriculture and Food Systems
Unethically Sustainable? Feeling the Forest for the Trees: "Ethically-Informed Systemics"

3:45 p.m. Anne M. Ashmore – Biological Sciences
The Problems of Displacement: Internally Displaced Persons in Southern Uganda

4:00 p.m. Jack Killion – Anthropology
Ebola and Neoliberalism: An Inquiry Into Pharmaceuticals, Structural Adjustment, and Structural Violence

4:15 p.m. Monica N. Puccetti – Biological Sciences
Misplaced Development in Ghana: Challenging Assumptions of Medical Aid on the Undergraduate Campus

119 Wellman Hall, Moderator: Diana Strazdes

3:00 p.m. Diana Vera – Art History
Albert Bierstadt and the California Capriccio

3:15 p.m. Jonathan S. Hoolko – Design
Circadian Hospital Lighting

3:30 p.m. Larissa V. Murray – Economics
The Legion of Honor: Re-Creator of the Louvre?

3:45 p.m. Rebecca King – Art History
Supporting Science and Technology Through Art: The Legacy Left by a Renaissance Duke, and a Governor of California

4:00 p.m. Ricardo Cruz – Design
Knowing the World: Design Though the New Sciences of Human Nature

4:15 p.m. Tracy J. Manuel – Design
Be There and Be Square: Making the Most of Instagram

126 Wellman Hall, Moderator: Naomi Janowitz

3:00 p.m. Amanda Leventhal – Religious Studies
What Gender Would Jesus Do?: A Discourse Analysis on Evangelical Christianity and Its Navigation of the Gender Binary

3:15 p.m. Deyu Wang – Religious Studies
Abracadabra, Hexes, and Process Thought: Realizing Magick in Feminist Wicca

3:30 p.m. Elizabeth Rowan – English
Victorian Haunting: Physicality, Control, and the Male Gaze

3:45 p.m. Helen Phuong Van – International Relations
Women's Rights and Its Effects on Civil War Onset

4:00 p.m. Hillary Fong – Religious Studies
Voudou and Roman Catholicism in Haiti: a Study of Colonialism and Secrecy

4:15 p.m. Stephanie M. Hoogstad – English
The Dumbledore Conundrum: Homosexuality in Harry Potter

202 Wellman Hall, Moderator: Susan Handy

3:00 p.m. Alexander A. Nguyen – Entomology
Addressing the Issue of the Scarcity of Millipede (Diplopoda) Researchers on the West Coast of the United States

3:15 p.m. Alyssa Benjamin – Biochemistry & Molecular Biology
Genetic Analysis of Endemic Arroyo Chub Populations in the Los Angeles Basin

3:30 p.m. Brendan McCarthy-Sinclair – Biochemistry & Molecular Biology
Determining the Effect of Population Density on Rates of Encystation for Giardia lamblia

3:45 p.m. Bryanna M. Andrews – Wildlife, Fish & Conservation Biology
Coral Reef Degradation Severely Impacts Butterflyfish Distribution on Heron Island Reef Flat

4:00 p.m. Kendra M. Chan – Evolution, Ecology and Biodiversity
The Effect of Species and Genotypic Diversity on Eelgrass Detrital Systems

4:15 p.m. Young Ha Suh – Wildlife, Fish & Conservation Biology
Understanding Wood Duck Breeding Ecology Through Citizen Science

212 Wellman Hall, Moderator: Soichiro Yamada

3:00 p.m. Jason H. Yun – Pharmaceutical Chemistry
Spiropyran-Based Glutathione Nanosensors

3:15 p.m. Katherine G. Macway – Biomedical Engineering
Proximal Biotinylation Assay to Test Effects of Mechanical Forces on Cell-Cell Adhesion

3:30 p.m. Kevin H. Leung – Biomedical Engineering
Development of Multimodal PET/MRI Imaging Probes for Macrophages in Vulnerable Atherosclerotic Plaques

3:45 p.m. Mary Sedarous – Biomedical Engineering
Cadherin-Mediated Traction Force Analysis Using a Deformable Substrate

4:00 p.m. Ming L. Wu – Biomedical Engineering
Microcontact Printing for the Study of Adhesion Molecule Interaction With Ligand

4:15 p.m. Victor W. Or – Pharmaceutical Chemistry
Light Activation of Spiropyran Molecular Switches

216 Wellman Hall, Moderator: Kenneth Kaplan

3:00 p.m. Avery Kruger – Evolution, Ecology and Biodiversity
Larvae of the Purple Sea Urchin Strongylocentrotus purpuratus Demonstrate Depth Preferences Cued by Fluorescent Light

3:15 p.m. Kim H. Vo – Biochemistry & Molecular Biology
Identifying Cancer Mutations as Chemotherapeutic Targets

3:30 p.m. Natalie S. Liu – Genetics
Genetic Interactions Between Decatenase Top3-Rmi1 and Chromosome Structure Maintaining Complex SMC5/6

3:45 p.m. Nichole A. Lewis – Cell Biology
Bim1 Contributes to the Resolution of Chromosomes During Anaphase via Spindle Forces

4:00 p.m. Ryan Kyger – Cell Biology
Phospho-Regulation of Cin8 in Response to Linked Sister Chromatids

4:15 p.m. Shubhang K. Bhatt – Neurobiology, Physiology & Behavior
Chromosomal Localization of DNA polymerase β is Regulated by Ubiquitin Ligase HEI10 During Meiosis

226 Wellman Hall, Moderator: Brenda Schildgen

3:00 p.m. Audrey D. Tang – English
The Current Timeless Classics: A Study of the Change in Anthologies Over the Past Half Century.

3:15 p.m. Jordyn H. May – English
The Representation of British Victorian Religious Doubts Through the Portrayal of Gothic Buildings in Bram Stoker's Dracula

3:30 p.m. Karem Jarada – Philosophy
Conjectures and Refutations: Scientific Certainty, Objectivity, and Reality

3:45 p.m. Michael Bybee – Environmental Policy Analysis & Planning
Interpretation of Policy Implementation Relationships - Marcellus Shale, NY

4:00 p.m. Mitchell P. Snyder – English
Between Literary and Littoral: Non-Teleological Thinking and Phalanx Theory in The Log From the Sea of Cortez

229 Wellman Hall, Moderator: Cheemeng Tan

3:00 p.m. Carolina Ryklansky – Pharmaceutical Chemistry
Design and Kinetic Characterization of a Family 1 Glycoside Hydrolase

3:15 p.m. Claire Chen – Neurobiology, Physiology & Behavior
Design and Kinetic Characterization of a Family 1 Glycoside Hydrolase

3:30 p.m. Henry Effarah – Neurobiology, Physiology & Behavior
Designing New Compounds to Increase the Diagnostic Capabilities of Aptasensors

3:45 p.m. Jonathan Ho – Biochemistry & Molecular Biology
Finding Patterns in the Chaos: High-Throughput Quantitative Analysis of Bacterial Growth Dynamics

4:00 p.m. Peter Konyn – Pharmaceutical Chemistry
Engineering Thermostability Into PNGase F for Enhanced Efficiency of Glycoprotein Analyses

4:15 p.m. Zi Yao – Chemistry
Discovery of New Small Molecule Inhibitors of the Bacterial Cell Division Protein FtsZ

230 Wellman Hall, Moderator: Julin Maloof

3:00 p.m. Bao T. Nguyen – Biotechnology
Identification of a Candidate Gene for a High Temperature Germination Trait in Lettuce

3:15 p.m. Burinrutt Thanasuwat – Biochemistry & Molecular Biology
Characterizing the Mechanism of Atg1-Atg8 Complex in the Autophagy Pathway

3:30 p.m. Jacob R. North – Genetics
The Stress-Induced Plastidial Metabolite MEcPP Controls Plant Growth

3:45 p.m. Kevin M. Coe – Plant Sciences
Assessing Abiotic Stress Tolerance in Setaria viridis

4:00 p.m. Leslie Herrera – Genetics
The tep-1 Gene is Required for Shade Avoidance in Solanum lycopersicum

4:15 p.m. Shweta Dash – Biological Sciences
Shade Avoidance Response in Elongated Internode Mutants of Brassica rapa

233 Wellman Hall, Moderator: Brian Moore

3:00 p.m. Alexandra Alexiev – Microbiology
Microbial Community Composition Changes in Aquariums

3:15 p.m. Andrew Magee – Animal Biology
Investigating the Prevalence of Density-Dependent Diversification

3:30 p.m. Anna M. Naranjo – Animal Science
Impacts of Individual Variation in Infectiousness on Disease Persistence

3:45 p.m. Jackson Thomas – Electrical Engineering
Mobile Sensing Platform for Data Driven Strawberry Farming

4:00 p.m. Jeffrey Ware – Mechanical Engineering
Mobile Sensing Platform For Data Driven Strawberry Farming

4:15 p.m. Stephanie E. Herbert – Evolution, Ecology and Biodiversity
Phenotypic Variation of Mojave Milkweed in Early Life Stages

234 Wellman Hall, Moderator: Laramie Taylor

3:00 p.m. Corinne A. Beach – Communication
Watching Others Play: Motivations for Online Video Game Spectating

3:15 p.m. Erica Li – Psychology
Identity Theft: Satisfying Differentiation and Belongingness Needs Through Appropriation

3:30 p.m. Gweneth McKinley – Mathematics
Stacking the Deck: A Problem in Card Shuffling

3:45 p.m. Julie A. Carlin – Biological Sciences
The Media's Impact on Online Dating

4:00 p.m. Kala L. Clark – Communication
Just a Face: Communication on Online Support Forums

106 Wellman Hall, Moderator: Michal Kurlaender

5:00 p.m. J W. Greenig – History
School Engagement, Self-Efficacy Beliefs, and Self-Regulated Learning Strategies of Middle School Students

5:15 p.m. Manvita Tatavarthy – Neurobiology, Physiology & Behavior
The Influence of Pre-Existing Brain States on Decisions to Attend

5:30 p.m. Alexander B. Morales – Psychology
The Neural Correlates of Willed Attention

5:45 p.m. Maxwell Hong – Psychology
Psychometric Tests for Intellectual Abilities: Evaluating the Theoretical Framework of Intelligence Scales

119 Wellman Hall, Moderator: Naoki Saito

5:00 p.m. Daine L. Danielson – Physics
Diagnosing and Mitigating Electronic Noise in the Mini-CAPTAIN Liquid-Argon Time Projection Chamber

5:15 p.m. Jordan Leung – Statistics
The Sounds of Complexity in Aquatic Ecosystems

5:30 p.m. Julie He – Physics
Galaxies, Gravity, and the Young Universe

5:45 p.m. Shengqiao Luo – Physics
Simulation of the Collision of Neutrinos in Cosmic Ray and Nucleon in the Atmosphere

126 Wellman Hall, Moderator: Wendy Ho

5:00 p.m. Nicole A. Ellis – Psychology
"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

5:15 p.m. Hope Y. Kim – Psychology
"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

5:30 p.m. Megan Dunn – Psychology
"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

5:45 p.m. Matthew C. Olson – Psychology
"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

202 Wellman Hall, Moderator: Colleen Sweeney

5:00 p.m. Amanda M. Cruz – Biochemistry & Molecular Biology
LRIG1 Regulation of Canonical Wnt Signaling in Breast Cancer Cells Through Interaction With the Wnt Co-Receptor LRP6

5:15 p.m. Antonio Cuevas Navarro – Biochemistry & Molecular Biology
Mapping Domains of Nrdp1-Mediated Ubiquitination in Dvl1

5:30 p.m. Kice Atai – Cell Biology
ERK Activation as a Function of Cell Contact Density

5:45 p.m. Shadd N. Cabalatungan – Sociology
LRRC24 Expression and Functions in Breast Cancer

212 Wellman Hall, Moderator: Lynn Roller

5:00 p.m. Brian Leach – English
Terror in the Text: Biblical Intertextuality, Familial Violence and Isolation

5:15 p.m. Margaret M. Gonzalez – English
Rewriting Ophelia: The Narrative of a Body in Conflict

5:30 p.m. Tirumular Narayanan – Medieval & Early Modern Studies
A Thulian Prince in King Arthur's Court: An Analysis of Mark Twain's Influence on "Prince Valiant" and the Creation of the "American Arthurian Legend"

216 Wellman Hall, Moderator: Carolyn Thomas

5:00 p.m. Emma C. Cooper – Psychology
The Effect of Forced Eye Contact on Problem Solving for School-Age Children With Autism

5:15 p.m. Heather R. Wood – Psychology
Allocentric and Egocentric Spatial Representations: Restricted View Map Learning in Virtual Environments

5:30 p.m. Nichole Bouffard – Psychology
Temporal Method of Loci as an Effective Memory Mnemonic

5:45 p.m. Saba Saleem – Psychology
Varying Distribution of Attentional Control

226 Wellman Hall, Moderator: Annie King

5:00 p.m. Gabriela H. Pedroza – Animal Science
Sustainable Feed for Poultry: The Use of a Broccoli By-Product to Feed Laying Hens

5:15 p.m. Garrison Buss – Biochemistry & Molecular Biology
1-Octen-3-ol: The Attractant That Repels

5:30 p.m. Jacob A. Ewald – Wildlife, Fish & Conservation Biology
An Improved Analysis of Egg Shape Matching of Avian Brood Parasites to Their Host Species

5:45 p.m. Tatiana Zacarias – Animal Science
Horticultural By-Products as Novel Feedstuffs for Poultry

234 Wellman Hall, Moderator: Sharon Strauss

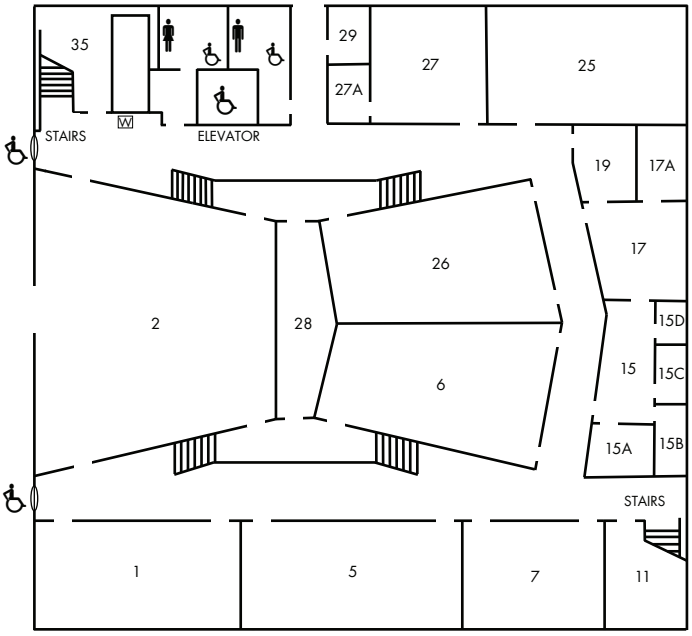
5:00 p.m. David S. Gibson – Psychology
The Neurobiological Mechanisms of Oxytocin in Modulating Stress Response

5:15 p.m. Federica Sartori – Cell Biology
The Effect of Wolbachia Titer on the Cytoplasmic Incompatibility Phenotype in Drosophila Simulans

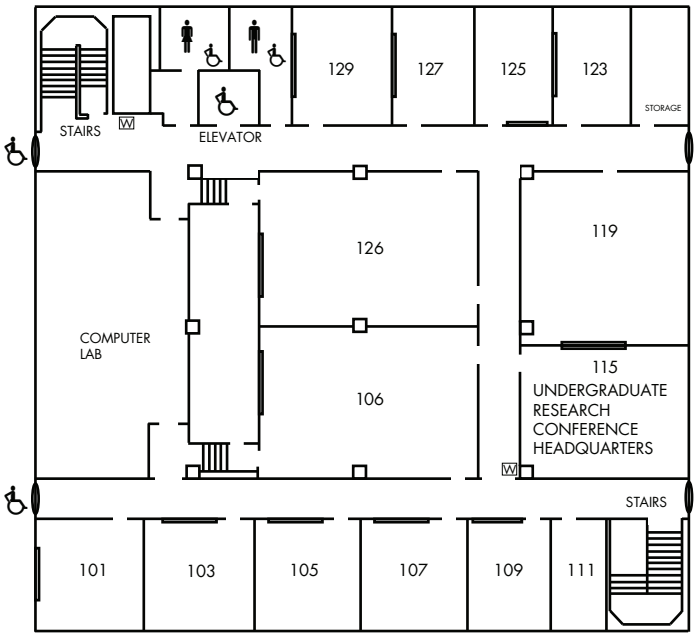
5:30 p.m. James F. Yacoub – Genetics
The Effects of Environmental and Genetic Perturbations on the Size of Drosophila Segments

5:45 p.m. Zheantesza Douglas – Genetics
Competitive Transgenerational Adaptations in Grasses Bromus hordeaceus and Aegilops triuncialis Are Induced by the Presence of Competition

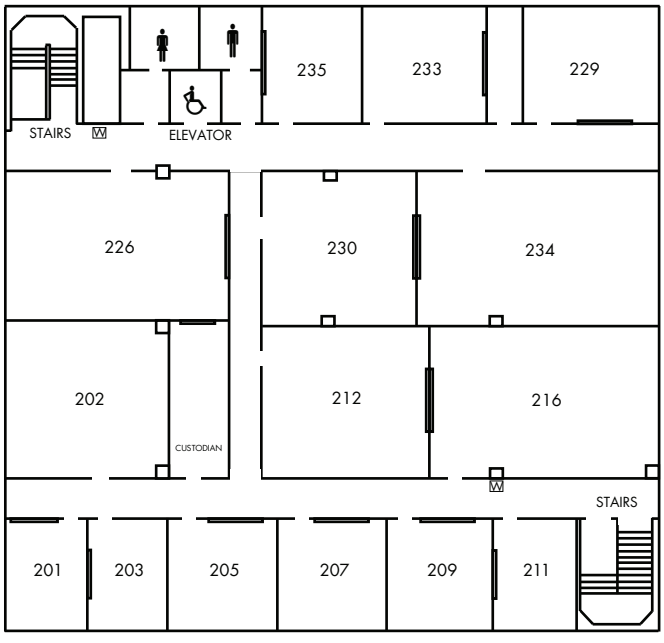
Lower Level



1st Floor



2nd Floor



= Building Entry - Exit = Wheelchair Access W = Water

= Front of Classroom

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W E
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ABSTRACTS

High Frequency Vibration and High Gravity Force Shock Testing for Proposed Mars Sample Return

Katherine Acord
Sponsor: Julie M. Schoenung, Ph.D.
Chemical Engineering & Materials Science

The current concept for a potential Mars Sample Return (MSR) campaign includes a series of missions that could drill, package, and return Mars rock cores to Earth through four sequential flight missions. A combination of structural stability, migration, force, hardware testing and analysis were employed to determine elements within the potential MSR campaign that could alter the mechanical integrity of Mars rock cores during transport to Earth. Therefore, Mars simulant rock cores, such as Bishop Tuff and China Ranch Massive Gypsum, were drilled to create samples for survivability tests to simulate the high frequency vibrations of a Mars Ascent Vehicle (MAV) and high gravity force shock of the Earth Entry Vehicle (EEV) that would be expected during MSR. Prototype hardware was designed and fabricated to accommodate the cores desired for vibration and shock testing. Proto-flight (PF) and flight acceptance (FA) vibration levels were established for both solid and liquid MAV fuel types. Drilling methods were investigated to produce both pristine and fractured cores. Elements such as core orientation, amount of ullage (headspace), and clamshell position were tested to better understand the causes and amount of fracturing throughout these flight-like environments.

Integrating the DNA Integrity Number (DIN) to Assess Genomic DNA (gDNA) Quality Control Using the Agilent 2200 TapeStation System

Regina L. Agulto
Sponsor: Bart C. Weimer, Ph.D.
Population Health & Reproduction
School of Veterinary Medicine

Next Generation Sequencing (NGS) requires the input of high molecular weight genomic DNA (gDNA) to construct quality libraries for large scale sequencing projects, such as the 100K Pathogen Genome Project. The assessment of DNA integrity is a critical first step in obtaining meaningful data, as much as intact DNA is a key element for successful library construction. The Agilent 2200 TapeStation System plays a highly important role in the determination of the DNA quality using the DNA genomic assay. Such profiles generated on the 2200 TapeStation System yield information on concentration while allowing a visual inspection of the DNA quality and generating a DNA Integrity Number (DIN), which is a value automatically assigned by the software that provides an indication of integrity (that is, lack of degradation). This application note describes a new software algorithm that has been developed to extract information about DNA sample integrity from the 2200 TapeStation System electrophoretic trace.

Microbial Community Composition Changes in Aquariums

Alexandra Alexiev
Sponsor: Jonathan A. Eisen, Ph.D.
Evolution & Ecology

Aquariums are a popular pastime for many people and therefore an integral part of the built environment, the man-made ecosystem humans have created. The study of the built environment has expanded with the recent popularity of microbiome research, yet few of these studies have looked at how aquariums function as part of this system. Research on aquarium microbial communities is usually limited to a few species or chemical cycles, particularly exploring the efficacy of bacteria that help circulate nitrogen in aquariums. However, an examination of this ecosystem's community structure to this depth has not been done. Our team hypothesized that there would be a correlation between water chemistry changes and shifts in microbial community. To this end, next-generation DNA sequencing techniques were used to examine shifts in community composition over time in duplicate aquariums. This sequence data was further paired with extensive water chemistry measurements. The microbial community composition and the nitrogen cycle were found to change with specific perturbations to the system, suggesting that they may be correlated. This further illuminates the small-scale chemical processes that are driven by the aquarium microbial community, and potential key players that cause fluctuations in water chemistry.

Functional Differentiation in the Anterior and Posterior Hippocampus

Susan Alkadri
Sponsor: Simona Ghetti, Ph.D.
Psychology

Though there has been extensive research done on the hippocampus in primates, researchers have yet to agree on its basic function. While some literature regards the hippocampus as a cognitive brain structure involved solely in memory processes, other literature focuses on its role in emotion regulation. In my research, I chose to focus on the latter. There have been several studies examining the relationship between hippocampal volume, anxiety, and depression. However, the breakdown of anterior and posterior hippocampal regions in respect to stress response and emotional behavior in children and adolescents has not been extensively researched. Therefore, there could be significant anatomical differences in regards to connectivity, neuronal densities, and the spread of neurotransmitter receptors between these two hippocampal regions. In turn, there could be a significant correlation between certain differentiations and a child/adolescent's stress response and emotional behavior. I compared self- and parent-reported questionnaires regarding these symptoms in children and adolescents with fMRI data to observe potential topographical differences both within and between the anterior and posterior hippocampal regions.

Analysis of Webbed Pinnacle Microbial Mat Variation Along a Decreasing Sediment Gradient in Lake Joyce, Antarctica

Brian J. Allen
Sponsor: Dawn Y. Sumner, Ph.D.
Earth & Planetary Sciences

Lake Joyce is a perennially ice covered lake in Antarctica's McMurdo Dry Valleys. Benthic microbial mats growing at specific locations in the lake, referred to as "webbed pinnacles," create needle-like structures buttressed by sheet-like biofilms. These structures are morphologically analogous to poorly understood microbial textures preserved in 2.5 billion year old carbonate rocks. By evaluating webbed pinnacle distribution in the lake, it may be possible to ascertain the environmental conditions required to form these ancient microbial textures. Here we provide a quantitative analysis of image data collected by a drop camera to determine the co-variance of webbed pinnacle structure, distribution, and orientation along a decreasing sediment gradient produced by a glacial till-fed delta in the lake. All data were collected at locations with relatively constant depth, light intensity, and water chemistry. Preliminary findings indicate that webbed pinnacles are more prevalent at locations farther from the delta, suggesting the morphology does not require high sedimentation rates to form. By determining how sediment influx influences webbed pinnacle morphogenesis in Lake Joyce, we provide a partial analog to constrain the environmental growth conditions under which morphologically similar microbial mats may have formed on Earth 2.5 billion years ago.

Solutions in Poverty: Filling the Gaps

Alena Anberg
Sponsor: Marianne Page, Ph.D.
Economics

Poverty directly affects 33% of residents in Northern California. We know that poverty is a significant indicator in the life chances of children, and we know that in-kind aid can help stabilize a family, namely children, in poverty. What do we know, though, about which programs are the most successful in providing true solutions to families struggling with poverty? Which are working? Which are not? Which components of which work the best? Who do these programs serve? How accessible are these programs? Where are they lacking? These are the questions we'll be asking in a comparative approach to programs available in Yolo and Colusa Counties. This primary research will help us to see which programs have the most success in three different categories: Government Programs, Non-Profits and Corporate. Through interviews with proprietors, staff and most importantly, recipients, I uncover which programs are the most successful in terms of results, the most accessible and the best models for specific situations. Likewise we will see where the gaps in services to these families lie, which gets to the bottom of our question. How do we fill these gaps? The results will help us build quality programs for struggling families.

Quality Control of High-Throughput Library Construction Pipeline for KAPA HTP Library Using an Agilent 2200 Tapestation

Patrick M. Ancheta
Sponsor: Bart C. Weimer, Ph.D.
Population Health & Reproduction
School of Veterinary Medicine

Next Generation Sequencing (NGS) requires the input of high molecular weight genomic DNA (gDNA) to construct quality libraries for whole genome bacterial sequencing. Large scale sequencing projects, such as the 100K Pathogen Genome Project, require methods to rapidly assess the quantity and quality of the input DNA using high-throughput methods that are fast and cost effective. In this study, both the Agilent 2200 TapeStation System and Agilent 2100 Bioanalyzer System were used to assess a few critical quality control (QC) steps for library construction. With minimal manual intervention, the Agilent 2200 TapeStation System determined the quality of genomic DNA (gDNA), fragmented DNA, and final libraries constructed from multiple types of foodborne pathogens. The Agilent 2200 TapeStation System provided a single platform that effectively evaluated the necessary quality control (QC) steps, which provided a distinct advantage to decrease the time needed for library construction and as well as a common instrument methodology for quality control (QC).

Cross-Cultural Comparison of Diet and Hunting Strategies in Glacier Bay, Greenland

Bridget Andersen
Sponsor: Christyann M. Darwent, Ph.D.
Anthropology

The Glacier Bay archaeological site, located in Northwest Greenland, is a multicomponent occupation of a series of gravel-covered benches with 65 discrete cultural features spanning the early Dorset (ca. 2400–2000 BP) to the early Thule periods (ca. 750 BP). As part of the Inglefield Land Archaeology Project (sponsored by NSF Polar Programs), excavations were undertaken on Feature 30 at this site in July 2009. Initially identified as a single-occupation Thule-style semisubterranean winter house, it turned out to be briefly occupied structure that had been excavated into and built on top of a late Dorset period tent ring, which in turn had been built on top of an early Dorset occupation. In this study I document changes in local subsistence practices through detailed analysis of the zooarchaeological materials. Preliminary analysis of the faunal remains from these different occupations indicates variation in the hunting (i.e., type of prey) and butchery practices between the Thule and the two earlier occupations.

Coral Reef Degradation Severely Impacts Butterflyfish Distribution on Heron Island Reef Flat

Bryanna M. Andrews
Sponsor: Brian D. Todd, Ph.D.
Wildlife, Fish & Conservation Biology

Coral abundance and structure dictates the composition of reef ecosystems, providing both shelter and food to reef fish. Butterflyfishes are among the most prevalent corallivorous fish on reefs, and as such can depend solely or partially upon coral for food. Because of their wide abundance, butterflyfishes' presence or absence functions as an indicator for overall reef health. Four species of butterflyfish – two obligate and two facultative corallivorous fish – were observed and tallied in the reef flat around Heron Island in Queensland, Australia along two transects in each a degraded and healthy habitat. The difference in coral coverage between the two habitats was found to be statistically significant, with a p-value of 2.234e-10. Principal Component Analysis revealed a shift of facultative butterflyfish toward the healthy habitat, with 77.5% of data explained by the relationship between location and transect. Additionally, means extracted from log-transformed data suggest that the twelve percent decrease in live coral between transects of the healthy habitat resulted in a 50% loss of fish abundance regardless of feeding guild. This suggests that a minor loss of coral can cause a dramatic loss of fish abundance and diversity, which has important implications in light of global warming studies.

A Method for Rapid, High Yield Crystal Growth in Ruthenium Chemistry

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

X-ray crystallography is one of the strongest tools for structural determination. However, it has a critical external weakness in that it requires formation of a suitable crystal. Crystals can take a significant amount of time to grow. It is a rarity that a combination of two chemicals forms X-ray quality crystals within hours. Crystals grown from rapid formation tend to be small, twined, or amorphous; hence numerous experiments are required to determine the ideal procedure for crystal preparation. Upon dissolving dichlorotris(triphenylphosphine)ruthenium(II) in CS_2, beautiful red-violet needles of the compound $RuCl_2(S_2CPPh_3)(PPh_3)\cdot CS_2$ form in an hour. However, these crystals suffer from low yields, thus the new challenge lies in obtaining enough of these crystals in purity to perform additional experiments. Addition of triphenylphosphine to the initial reaction increased the yield two- to seven-fold, depending on the molar ratio. However, this addition increased the amount of side products that formed decreasing their purity. Numerous trials are being performed in order to perfect a procedure which utilizes customized crystal tubes (5mm OD, 1m in length) to produce a yield of crystals of high purity in a reasonable time frame for further experimentation.

Assigning TAs to Sections: A Stable Marriage Problem

Samuel R. Asher
Sponsor: Jesús De Loera, Ph.D.
Mathematics

Every year, teaching assistants are chosen to teach classes. Initially, this is done by emailing graduate students for their preferences of classes for the coming quarter, with which a student affairs officer will match the graduate students to their preferred classes. Unfortunately, this process takes upwards of 8 hours to complete by hand and the designated human assignments generally fail to produce an optimal solution. In order to remedy this issue, we examined a mathematical model which incorporates integer programming to matching theory in order to pair graduate students to courses while attempting to maximize the satisfaction of the graduate students. Creating such a model required that we considered certain constraints, such as teaching assistant seniority, time conflicts, teaching ability, and happiness of each teaching assistant (as provided by their preferences of classes to teach. We also created a website interface for our model that gathers preference data from the graduate students and allows the staff to easily perform the matching.

The Problems of Displacement: Internally Displaced Persons in Southern Uganda

Anne M. Ashmore
Sponsor: Keith Watenpaugh, Ph.D.
Religious Studies

The civil war of Uganda - beginning in 1987 - internally displaced 1.6 million residents of the north of the country. Some of those citizens now reside in the Acholi Refugee Quarters in southern Uganda, where they lack many basic human rights; these include proper amenities, housing, healthcare, and education. The government's ambivalence to aid these IDPs (internally displaced persons) entrenches them in their position, and provides little opportunity for upward mobility and the chance to return back to their homeland. They are left in a vicious cycle of poverty due to lack of access to regular food, sanitation, education, and employment opportunities. This research explores the specific human rights violations that are transpiring, drawing from pinnacle sources such as the Makerere University Law School. This report uses archival overview and analyzes ways in which these human rights issues can be addressed from abroad, whether that be through exposure campaigning and fundraising, the sending of international relief workers, or other aid options. If successful, these policies prove applicable to the struggles of the 20 million-plus IDPs around the world to return to their homeland.

ERK Activation as a Function of Cell Contact Density

Kice Atai
Sponsor: John Albeck, Ph.D.
Molecular & Cellular Biology

Cells continuously process information about their immediate surroundings. This information is crucial in determining if a cell will proliferate, differentiate, or undergo apoptosis. The ERK/MAPK pathway in mammalian cells responds to both cell-to-cell interactions and growth factor stimulation. Additionally, increases in cell density lead to an overall weaker ERK response. Here, we studied ligand-induced ERK activation as a function of cell density to better understand how single cells process their microenvironment. Autocrine signaling, ligand depletion, and cell-cell contact all affect EGFR activation, but these factors are co-dependent in many experimental systems. To determine how cell-cell interaction affects EGFR without ligand depletion or variable autocrine signaling, we performed live-cell analysis on a constant number of ERK reporter cells with varying numbers of CHO (which lack EGFR) cells, to increase cell density without changing ligand depletion or autocrine signaling strength. Our findings indicate that increasing cell-cell contact density diminishes both the amplitude and duration of EGF-stimulated ERK activation as well as decreases the basal level of ERK activity.

Soluble Epoxide Hydrolase Pharmacological Inhibition Ameliorates Experimental Acute Pancreatitis in Mice

Santana Maria Bachaalany
Sponsor: Fawaz G. Haj, Ph.D.
Nutrition

Acute pancreatitis (AP), an inflammatory disease, is one of the most common gastrointestinal disorders worldwide. It's a common clinical problem whose incidence has been progressively increasing in recent years. Soluble epoxide hydrolase (sEH; encoded by Ephx2) deficiency and pharmacological inhibition have shown beneficial effects in inflammatory diseases but their significance in AP requires further elucidation. Ephx2 whole-body deficiency mitigates experimental AP in mice; however, the suitability of sEH pharmacological inhibition for treating AP still needs further determination. To that end, we investigated the effects of sEH inhibition on cerulein- and arginine-induced AP using the selective sEH inhibitor (sEHI) 1-trifluoromethoxyphenyl-3-(1-propionylpiperidin-4-yl) urea (TPPU) which was administered before and after induction of pancreatitis. Serum levels of amylase and lipase were lower in TPPU-treated mice compared with controls. In addition, pancreatic mRNA of the inflammatory cytokines TNFα, IL-1β and IL-6 was reduced in TPPU-treated mice. Moreover, sEH pharmacological inhibition before and after induction of pancreatitis was associated with decreased cerulein- and arginine-induced NF-κB inflammatory response and endoplasmic reticulum stress. Together, these findings suggest that sEH pharmacological inhibition may be of value in the therapy of acute pancreatitis.

Behavioral Phenotyping of C57BL/6 Mouse Substrains

Sammy Baker
Sponsor: Jill L. Silverman, Ph.D.
Psychiatry & Behavioral Sciences
School of Medicine

C57BL/6J (B6J) mice are used extensively in behavioral genetics. Numerous mutant mouse models have been generated using the B6J background strain and have established phenotypic precedents in various fields of research. Recently, a large initiative began generating new mutant mouse models using the C57BL/6N (B6N) mouse strain. Genetic studies found many differences between the two substrains. Therefore, identifying behavioral differences between them is important for directing future research using these lines. This study used three behavioral assays to measure learning, anxiety-like, and memory phenotypes between B6J and B6N mice. Both substrains were tested in contextual and cued fear conditioning, elevated plus-maze, and Morris water maze. Data indicate that B6N mice exhibit higher freezing in context and cued fear conditioning compared to B6J mice. Elevated plus-maze and Morris water maze data are currently being collected. Preliminary results suggest B6J and B6N may have significant differences in baseline behavioral phenotypes. Information on behavioral differences is critical for any future research using transgenic models created on these different backgrounds. Future B6 substrain genetic analyses will also help quantify the role that their genetic differences has on these behavioral phenotypes.

Investigation of the Molecular Mechanisms Behind Evolutionary Trait Expansion

Laura T. Baldwin
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

The process through which traits are modified is responsible for the diversity we see in nature. Many studies have been devoted to understanding trait loss, but far fewer to trait expansion. There are countless ways to break something; is increasing function more complicated? The model system we are using to study trait expansion is the sex-specific expansion of chemosensory bristles, which detect taste, on the front leg of *Drosophila prolongata* males. The sexually dimorphic nature of this trait suggests the involvement of the transcription factor *doublesex* (*dsx*), which plays a pivotal role in telling cells whether they are male or female. To understand how changes in *dsx* may influence patterns of expression of chemosensory bristles, we are analyzing the regulatory elements of *dsx* in *D. prolongata*. A chemosensory enhancer of *dsx* has already been identified in the closely related species *D. melanogaster*. We are now working to locate and isolate the homologous region in *D. prolongata* to determine whether changes to *dsx* alone are sufficient to account for the increase in chemosensory bristles. If this is confirmed, future work will focus on determining the nucleotide changes that gave rise to the expansion of the chemosensory bristles in *D. prolongata*.

Evaluating the Toxicity and Growth Effect of Copper Oxide Nanoparticles on Duckweed

Hagr Balla
Sponsor: Sanjai J. Parikh, Ph.D.
Land, Air & Water Resources

The production and use of nanoparticles is rapidly growing, increasing the likelihood of human contact through environmental exposure. Nanoparticles are widely used, from electrical and sensing materials to rocket propellant. The National Nanotechnology Initiative and the United States Environmental Protection Agency have prioritized understanding the transport of nanoparticles in the environment and the growth effects of nanoparticles on aquatic plants. Duckweed, *L. (Spirodela) punctate*, a model aquatic plant, was exposed to two types of copper oxide nanoparticles (CuO NP) and a copper salt ($CuCl_2$) to determine the 50% growth reduction level. Hoagland solution, buffered with MES, was used as the growth medium and the treatments were 0, 1, 2, 4, 6, 8, and 10 mg/L of rod and spherical shaped CuO NPs as well as $CuCl_2$. We hypothesize that the rod-shaped CuO NP will have a significant effect on NP toxicity to duckweed compared to both $CuCl_2$ and the spherical CuO NP. Further studies will be conducted to evaluate the environmental factors that may change the toxicity of these particles.

Characterization of the *Arabidopsis thaliana* Gene *PBL13*

Jesus Banderas
Sponsor: Gitta Coaker, Ph.D.
Plant Pathology

Plants are attacked by various pathogens, which can cause huge losses in agriculture. In response, plants have evolved to recognize pathogen associated molecules. This event triggers a defense response by reprogramming gene expression. Kinases help relay signals by attaching phosphate groups to proteins, thereby changing their structure and function to influence their biological activities. Because of its homology with known kinase coding genes, the *Arabidopsis* gene *PBL13* has been identified as a receptor-like cytoplasmic kinase involved in plant defense signaling. To better understand the function of *PBL13*, its promoter, which controls gene expression, was fused to the marker gene β-*glucuronidase (GUS). GUS* codes for an enzyme that reacts with glucuronosides to produce a visible color in a process known as GUS staining. Next, *Agrobacterium* was used to transform *Arabidopsis* plants with the aforementioned promoter-*GUS* fusion. After obtaining stable transgenic lines from these plants, GUS staining will be performed to reveal the location and timing of *PBL13* expression. By revealing this aspect of *PBL13's* function, this project will provide a better understanding of plant defense signaling, which can help in implementing better control strategies for pathogens.

Divergence of American Marten (*Martes americana*) Populations in the Cascade and Sierra Nevada Mountains

Naomi Barney
Sponsor: Benjamin Sacks, Ph.D.
Population Health & Reproduction
School of Veterinary Medicine

The American Marten (*Martes americana*) is a forest-dwelling mesocarnivore that first colonized North America following Pleistocene deglaciation events. Since this time, martens have expanded across the continent, fragmenting into multiple populations. This brings into question the genetic relationship between these different marten populations. Previous research has found that there is a genetic distinction between marten populations found in the Eastern and Western United States that predates human habitation; however, little is known about the genetic divergence between populations inhabiting the Sierra Nevada and Cascade mountain ranges along the Western United States. To provide more insight into this relationship, I gathered, extracted and sequenced mitochondrial DNA from 157 marten samples spanning three regions–the Cascade Mountains (Washington/Oregon), Lassen (California) and the Sierra Nevada Mountains (California). Twenty haplotypes were identified which will be used in further statistical analyses to determine the genetic relationship between the populations. A preliminary phylogenetic tree suggests that Washington Cascade martens are genetically distinct, forming their own branch of four haplotypes. F-statistic calculations will provide insight into the age of the separation between the populations in question and consequently aid in constructing effective conservation plans for the species.

Unethically Sustainable? *Feeling the Forest for the Trees: "Ethically-Informed Systemics"*

Andrew K. Baskin
Sponsor: Thomas P. Tomich, Ph.D.
Human Ecology

Constrained largely by exclusive reliance upon reductionist scientific approaches, we face multiple local and global crises - economic, ecological, ethical, etc. A need exists to better understand natural and designed complex systems, the relationships between them, and their interacting parts to advance the health and welfare of living systems. Thus, a systems approach is appropriate. It is the right tool for the job to integrate and synthesize scientific knowledge across disciplines and aid us in recognizing epistemic gaps in our worldview and meta-cognitive praxes. While this approach is invaluable, it potentially produces unethical 'solutions' that can exacerbate existing problems. Incorporating an ancient realm of philosophical inquiry - ethics - with the younger science of systemics, I hypothesize that this integration can unleash vigorous discovery of new insights, effectively bridging the identified gap between Sustainability Science (a *problem-solving application* of systemics) and ethics. After initial exploration of relevant history, theory, pedagogy, and leading directions of research/application from literature, I employ critical realism focusing upon pioneering academic programs (SA&FS) as a case study to inform the development of these programs that serve as a model for Sustainability Science praxis, pedagogy, and ongoing work in the field and in higher education.

Testosterone Supplementation Increases Protein Synthesis through Molecular Targets of Myostatin and mTORC1 pathways

Samir S. Batarni
Sponsor: Keith Baar, Ph.D.
Neurobiology, Physiology & Behavior

Testosterone (T) is an anabolic hormone that decreases protein degradation and increases protein synthesis. These effects are beneficial for patients with muscle wasting pathologies. However, T supplementation increases the risk for prostate cancer and cardiovascular disease. Determining T molecular targets could decrease off target effects and improve its potential as a therapy. Previous work has suggested T affects the myostatin and the mechanistic Target of Rapamycin Complex 1 (mTORC1) pathways. From this, we hypothesize that T supplementation increases protein synthesis through altered Notch and TSC2 expression, contributing to skeletal muscle hypertrophy. C2C12 cells (mouse myoblast cell line) were grown, differentiated, and treated with varying T concentrations (100nM-100uM) at time points: 2, 6 and 24h to determine peak levels of total protein content using Western Blot analysis (WB). Optimal concentrations and time points were selected and probed for changes in proteins involved in the myostatin and mTORC1 pathways using WB. T treatment was then repeated with the addition of rapamycin, an mTORC1 inhibitor in order to determine whether T requires mTORC1 to activate protein synthesis. T supplementation increased protein synthesis at 2h (58.4 ± 5.8%) and 6h (41.8 ± 7.2%). However, the molecular target for T still remains unclear.

Watching Others Play: Motivations for Online Video Game Spectating

Corinne A. Beach
Sponsor: Laramie D. Taylor, Ph.D.
Communication

Online video game spectating refers to watching others play video games online, either by watching video streams in real time or by watching recorded videos. Although millions engage in this pastime, no empirical research has examined the motives for or consequences of this viewing. The present study investigates what motivates viewers to spend time watching others play video games online. An online survey of over 100 adults was conducted. Participants responded to questions about use of video games and spectating services, and to items of well-being. Initial results suggest the importance of both entertainment and strategic learning motives. Relationships between specific motives for spectating, amount of video game play, and motives for playing video games were identified. Other connections to self-esteem, hours spent playing video games versus watching others play online, and demographics are expected. Findings are discussed in terms of the impact of this novel activity and its implications for the video game community at large.

Synthesis and Crystal Structure of SiAs and GeAs Compounds

Maverick D. Bellard
Sponsor: Kirill Kovnir, Ph.D.
Chemistry

Rechargeable lithium-ion (Li-ion) batteries are one of the most energy efficient and prevalent energy storage devices in today's society. They are not only the technology of choice for hybrid electric cars, but also the dominant power source for cell phones, digital cameras, laptops, *etc*., because of their superior energy density. Currently, graphite is the choice of anode for lithium-ion batteries because of its long cycle life. Despite graphite's lengthy cycle life, its energy density is low (370 mAh/g) hence alternative research on other materials is necessary. My research consists of the synthesis of two binary compounds, SiAs and GeAs. SiAs and GeAs have layered crystal structures and contain a pnicogen (element in the N family) and a tetrel (element in the C family). They are also isostructural compounds because they have the same arrangement of atoms, but with different unit cell dimensions. These compounds were synthesized and characterized by powder and single crystal X-ray diffraction (XRD), scanning electron microscopy (SEM), and differential scanning calorimetry (DSC). For future application, electrochemical properties will be evaluated.

Genetic Analysis of Endemic Arroyo Chub Populations in the Los Angeles Basin

Alyssa Benjamin
Sponsor: Bernie May, Ph.D.
Animal Science

Rapid human development of the Los Angeles basin has led to the severe decline or extirpation of many endemic Southern California freshwater fish species. Yet, maintaining biodiversity is critical to preserving the functionality and productivity of ecosystems. Conservation genetics can aid species preservation efforts by providing insight about population structure and genetic diversity in order to develop effective management strategies. One such fish in need of genetic analysis is the arroyo chub (*Gila Orcuttii*), which has declined precipitously in recent years and is classified by the California Department of Fish and Wildlife as a Species of Special Concern (threatened in native range). In this study, we genotyped 265 individuals using 10 microsatellite markers in order to examine the population structure and genetic diversity of arroyo chub within their native range. We calculated linkage disequilibrium, departures from Hardy-Weinberg equilibrium, observed and expected heterozygosity, number of alleles per locus, number of private alleles, pairwise F_{ST} values, effective population size, and the occurrence of population bottlenecks. We determined that the extant arroyo chub populations are genetically distinct and conservation efforts should focus equally on managing each population.

Do Birds Sing at a Higher Pitch in Noise, or Is It a Matter of Measurement?

Ayala N. Berger
Sponsor: Gail Patricelli, Ph.D.
Evolution & Ecology

Many animals rely on sound for communication, but acoustic communication may become less effective as the human development expands and noise pollution becomes more widespread. Recent studies have found that birds sing at higher frequency (i.e. higher pitch) in noisy areas making songs easier to detect against low-frequency noise pollution. However, many of these studies measure the minimum frequency of vocalizations by visual inspection of spectrograms, the 'by-eye' method, which is subjective and may be prone to bias if low-frequency components of songs cannot be detected. We tested the hypothesis that the 'by-eye' method is prone to bias by recording playback of an identical set of red-winged blackbird vocalizations in ambient-, medium- and high-noise conditions. We found that the 'by-eye' method was biased, resulting in a significant increase in measures of minimum frequency in noisier conditions, despite no such relationship in the playback set. We also tested the more objective threshold method, which was not prone to bias, but often missed the lowest frequency of the song. We discuss which types of vocalizations and environmental conditions are most prone to the limitations of each method and the importance of experimental validation of subjective measurement methods.

CaMKII Phosphorylation of S1503 on the Human Cardiac Voltage-Gated Sodium Channel $Na_V1.5$

Maximilien Bergman
Sponsor: Julie Bossuyt, D.V.M., Ph.D.
Pharmacology
School of Medicine

The cardiac voltage-gated sodium channel $Na_V1.5$, encoded by the gene *SCN5A*, is crucial for electrical excitability of the heart. Inherited mutations in *SCN5A* can lead to cardiac arrhythmias including Long QT Syndrome (LQTS) and Brugada Syndrome (BrS), which cause gain or loss of function defects in $Na_V1.5$ inactivation, respectively. A primary mechanism of $Na_V1.5$ inactivation is mediated through the domain III-IV IFM motif, which forms the channel inactivation gate. Previous studies in rat $Na_V1.5$ have shown that phosphorylation of serine 1503 by protein kinase C near the IFM inactivation motif affects inactivation gating. Recent mass spectrometry studies found that calcium-calmodulin dependent protein kinase II (CaMKII) also phosphorylates S1503. Here we examine the effect of CaMKII-dependent S1503 phosphorylation on the I_{Na} inactivation gating of human $Na_V1.5$ channels expressed in HEK293 cells using phosphomimetic (S1503E) and non-phosphorylatable (S1503A) mutants. We expect phosphorylation of this site to affect $Na_V1.5$ inactivation gating and these effects to be abolished in S1503A mutants compared to WT channels. Because kinases, such as CaMKII, are known to be more active in heart failure, this could be an important mechanism for the genesis of cardiac arrhythmias in these clinical patient populations.

Synthesis of Germanium Nanoparticles Using Various Amine Ligands

Tanya Berry
Sponsor: Susan M. Kauzlarich, Ph.D.
Chemistry

Group-IV semiconductors play a significant role in various applications such as energy conversion and bio-imaging. Germanium is one of the most efficient, environmentally friendly semiconducting material. Germanium has unique properties such as narrow band gap, large Bohr excitation radius, and high absorption coefficient. Solution-based synthesis of Ge-nanoparticles was done using microwave heating which was recently developed by our group. Microwave heating facilitates great control over size distribution, crystallinity, and high yield of the Ge-nanoparticles. Germanium(II) iodide is used as the precursor for the synthesis. The Ge-nanoparticles were prepared in inert atmosphere with nitrogen and argon gas in the glove box. The surface chemistry of Germanium nanoparticles was studied using different amine ligands as solvents in the synthesis. We investigated how these different amines influence the growth of Ge-nanoparticles and their dispersion stability. The characterization is done using powder X-ray diffraction and spectroscopic techniques such as NMR, UV-Vis, and IR and it will be shown in the poster.

Species Diversity and Structural Features of Microbial Mats in Lake Joyce, Antarctica

Makayla N. Betts
Sponsor: Dawn Y. Sumner, Ph.D.
Earth & Planetary Sciences

Microorganisms in the fossil record are windows into life on ancient Earth, preserved in structures called microbialites. However, interpreting the diversity and biogeochemical activity of these microbialites is challenging, as it relies on the as of yet poorly understood geological and biological processes underlying the structures' formation. Contemporary microbial mats in the benthic zone of Lake Joyce may provide insight into these influences. Supplied by melt-water from Taylor Glacier, Lake Joyce is a perennially ice-covered lake in the McMurdo Dry Valleys of Eastern Antarctica. Its waters are stratified into three main layers, increasing in chloride concentration and decreasing in oxygen availability with depth. Thick mats of interdependent microbes flourish in the relatively stable environment, unperturbed by macroorganisms and growing annually in distinguishable millimeter-scale layers. Lithifying pinnacles that protrude from smooth, flat regions are interconnected by filamentous webs. What dictates this variance in growth is uncertain, though preliminary findings with 16S ribosomal subunit RNA suggest differences between the species present, particularly within the Cyanobacteria. Using next generation sequencing, I will compare the species composition in different features of the pinnacles from multiple samples to explore how the diversity in morphology and metabolism relates to growth structure.

A Normative Analysis of Social Security

Lawrence A. Bevir
Sponsor: Emanuel A. Frenkel, Ph.D.
Economics

Social Security is one of the most active areas of policy discussion in America today. This project aims to contribute to that discussion by constructing an economic model to show that the time value of money makes Social Security inefficient. Social Security works by collecting money from working adults through the payroll tax and paying them back in benefits starting from when they reach the retirement age. The time value of money (TVM), the idea that money at the present time is worth more than the same amount in the future, means that the government must pay Social Security recipients more than they paid in. I use indifference curve graphs to show that this practice creates an inefficiency: because the government waits until recipients reach the retirement age to start paying them, TVM forces the government to pay out more than it would otherwise have to. My policy recommendation would end this inefficiency by paying out the benefits earlier in recipients' lives, so as to provide the same utility to recipients while decreasing the cost to the taxpayer. Taken to its logical conclusion, this policy would convert Social Security to a basic income system.

Crystal Structure Analysis of Adenosine Click Modifications of RNA With Small, Soluble Azides

Sam Bhatnagar
Sponsor: Peter A. Beal, Ph.D.
Chemistry

RNA modifications, accomplished by our lab, through synthesis of ribonucleoside analogues with terminal alkynes, such as 7-triazolyl-8-aza-7-deazaadenosine (7-EAA) in RNA, have numerous potential applications. By modifying preexisting alkyne-containing ribonucleoside compounds, our lab synthesized specific triazoles at the variable position of choice and integrated these into our selected RNA. Using copper-catalyzed azide/alkyne cycloaddition (CuAAC) with 7-EAA, an adenosine analogue, and two small, soluble azides - known as 4-azido anilinium hydrochloride and 4-methylazidoanilinium hydrochloride - we intend to introduce conformationally rigid triazoles at specific locations in the RNA. We were unable to observe the complete electron density of the 7-EAA clicked to N-ethylpiperidine in the previously solved crystal structure due to its flexible nature. To resolve this issue, we opted to analyze 7-EAA with two flexible azides instead. Crystal structure analysis of RNA duplexes with such analogues may show the exact location of all atoms of the triazoles substituents in the RNA major groove. These studies further expand our knowledge of novel nucleobase modifications, such as their structure and reactivity within an RNA strand.

Chromosomal Localization of DNA Polymerase β Is Regulated by Ubiquitin Ligase HEI10 During Meiosis

Shubhang K. Bhatt
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molecular Genetics

The DNA of every cell in the human body gets damaged more than 50,000 times a day. Precise levels of DNA polymerases are required to repair these damages which if left unchecked can lead to cancer, infertility, lupus and other auto-immune diseases. Previous works have revealed how levels of DNA polymerase β (pol β) are maintained in somatic cells, however, the same is not yet known for germline cells undergoing meiosis to produce sperm and egg. We found that inhibition of ubiquitination, the process that tags proteins for degradation, causes accumulation of pol β in mouse spermatocyte chromosomes. Further, in HEI10 mutant mice lacking an E3 ubiquitin ligase, pol β also accumulated. Western blot analysis further revealed reduced levels of ubiquitinated pol β in the testes of HEI10 mutants. Together these data suggests that DNA pol β undergoes HEI10 dependent ubiquitination and HEI10 plays a crucial role in maintaining levels of pol β in meiotic cells. These results will prove critical in further understanding the precise turnover regulation mechanism and function of DNA pol β in meiotic cells.

Women in Computer Science at UC Davis

Srishti Birla
Sponsor: Amy F. Smith, Ph.D.
iAMSTEM Hub
Undergraduate Education

Many papers have cited the gender disparity pertaining to computer science such as, "When Women Stop Coding" (Henn, 10/21/2014). This article explains that the number of women in other fields is growing, whereas the number of women in Computer Science is actually taking a downturn. I have seen this disparity in my own computer science classes at UC Davis. Thus, I will analyze the trajectory of women majoring in Computer Science at UC Davis and see how many of them actually go on to take higher-level courses; or, if they discontinue with Computer Science, what other majors they go in to. I will analyze data on students that attended UC Davis from the past 15 years. The data includes gender, class count, year, and major. I will use the Ribbon Tool to model this data visually through graphs and other diagrams. Lastly, the findings from this study will help inform the public, and more importantly the administration at UC Davis, about whether the gender disparity exists on campus and if so, at what level. Then we can push for more change in the field of Computer Science, and will know what class/level to start at.

Beyond "Hawaiian Roller Coaster Ride": Analyzing Contemporary Reclamations of Traditional Mele and Hula

Derek J. Blahut
Sponsor: Jessica Bissett Perea, Ph.D.
Native American Studies

The Hawaiian Islands have a complex history of multinational contact overlaid on deep cultural roots of music and dance. Over the past 150 years, Hawaiian music has transitioned from a banned practice, to a commercial commodity, to a thriving art form. This project examines Keali'i Reichel's *Kūkahi* concert as an example of widely accessible traditional and contemporary mele (song) and hula (dance). As the recipient of over 20 Nā Hōkū Hanohano Awards (Hawaiian Music Awards), a renowned kumu hula (hula teacher), and a major sponsor of Hawaiian lingual and cultural reclamation, Keali'i Reichel uses music and community to consistently redefine what it means to be a modern Hawaiian. This project also uses Beverly Diamond's Alliance Studies Model to reflect the aforementioned transitions in a musical history of the song "Adios Ke Aloha," written in the 1870's and still performed today. These analyses demonstrate the revival, gendering, reclaiming, and survivance (the act of resistance by surviving colonization) inherent in the creation of new, relevant Hawaiian art in traditional styles. These trends can be expanded to other indigenous cultures and musical styles through movements such as "Seventh Generation Rises," an indigenous movement focusing on reclaiming and rejuvenating indigenous cultures.

Identification and Visualization of *Giardia* Ventral Disc Proteins

Lorita Boghospor
Sponsor: Scott C. Dawson, Ph.D.
Microbiology & Molecular Genetics

Giardia is a parasitic protist that has 2 nuclei and 8 flagella essential for swimming. It possesses a ventral disc, which is used for attachment to the host intestine. The ventral disc is an organelle that is characterized by a spiral microtubule array including dorsal microribbons and cross bridges. We aim to understand the host attachment mechanism and to determine the protein components comprising the disc. We used a proteomics approach to generate a list of candidate disc proteins and assigned them to known genes in the *Giardia* genome. The goal is to tag candidate proteins with green florescent protein (GFP), introduce the tagged proteins into *Giardia*, and to confirm that the proteins localize to the ventral disc. For each candidate gene, we designed polymerase chain reaction (PCR) primers to amplify the entire coding sequence plus 200 bp upstream of the start codon to include the native promoter. PCR products were cloned into a Gateway entry vector, propagated in *E. coli*, extracted, and then recombined with a Gateway destination vector such that the GFP gene was fused to the C-terminus of each candidate gene. After propagation in *E. coli* and extraction, the final vectors were introduced into *Giardia* via electroporation.

Role of Hop1 SUMOylation in Yeast Meiosis

Jay Boinapalli
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molecular Genetics

Posttranslational protein modification is a critical aspect of cellular signaling and protein regulation. SUMO (Small Ubiquitin-like Modifier) is a modification that has essential roles in genome integrity, but its roles in meiosis are less understood. Budding yeast Hop1 is a conserved protein with central roles in chromosomal synapsis and checkpoint signaling during meiosis. Recent mass spectrometry analysis from the Hunter lab implies that Hop1 is modified by SUMO. After capturing cells during a meiotic checkpoint where Hop1 is most expressed, a western blot would hopefully indicate the presence of the protein and SUMO at a specific molecular weight. An immunoprecipitation of Hop1 followed by western blotting would confirm that this is SUMO modification. Once confirmed, candidate SUMO conjugation sites would be mutated to prevent modification in order to determine the role that SUMO plays in regulating Hop1. Thus, the overall goals of my research are to confirm that Hop1 is indeed SUMOylated and investigate how this modification regulates its function. With an understanding of this function, we could have a better understanding of the role of SUMO in meiosis.

Temporal Method of Loci as an Effective Memory Mnemonic

Nichole Bouffard
Sponsor: Arne Ekstrom, Ph.D.
Psychology

The method of loci is a highly effective mnemonic technique that recruits existing salient memory for spatial locations and uses this information as a scaffold for remembering a list of items. By mentally pairing each spatial locus with a list item, the list is more likely to be recalled, and in the same order as it was presented. This memory effect is believed to depend on spatial coding mechanisms in a brain area called the hippocampus. Recently, neurons coding temporal order were discovered in the hippocampus. This suggests that temporal coding strategies may also enhance memory. In the current study, we had participants learn lists of unrelated nouns using a spatial method of loci (using the layout of their home as the scaffold) or a temporal method of loci (using autobiographical life events as the scaffold). We then tested their memory for the lists with a free recall task. Given spatial and temporal coding mechanisms in the hippocampus, we predicted we would find little difference for the spatial and "temporal" methods of loci. Alternatively, a difference in coding efficiency could indicate which method is more "endogenously" effective based on a favoring of one coding mechanism over another in memory.

Detecting SUMO Targets in Mouse Meiosis

Sarah L. Bourne
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molecular Genetics

Aneuploidy is a common disorder caused by misregulation of meiotic chromosome segregation, with approximately 35% of pregnancy miscarriages being aneuploid. To minimize the risk of aneuploidy during meiosis, it is critical that the synaptonemal complex (SC: a zipper-like structure connecting matching chromosomes as they undergo homologous recombination) and homologous recombination are coordinated. It has been established that SUMO (Small Ubiquitin-like Modifier) localizes on the SCs, and that the SC components SCP1 and SCP2 are modified by SUMO. RNF212, an E3-ligase that promotes SUMO modification, has also been determined to be a dosage-sensitive regulator of chromosome recombination during meiosis in mammals. These findings suggest SUMOylation is key in the regulation of meiosis. However, precise targets of SUMO are not fully known. To identify precise targets, SUMO1 and SUMO2 were immunoprecipitated from mouse testes with the use of Laemmli buffer and peptide elution. Several proteins involved in homologous recombination were found to be modified by SUMO on Western Blot, including proteins such as SCP3 and Hormad1. This analysis will contribute to setting the stage for long-term functional analysis to establish how SUMOylation regulates proteins during meiosis.

Succulent Morphology: Determining Spectral Convergence

Jennifer D. Boyer
Sponsor: Susan Ustin, Ph.D.
Land, Air & Water Resources

We may be aware that plants utilize light for metabolism, and maybe more intuitively we know that the way the plant appears is specialized for it's survival. Something less intuitive to us may be that a plant's cellular tissue structure is fundamental for the amount of light it can capture. The light interactions within a plant's tissue are an inherent signature of the individual's genetic material and familial adaptations. This project will study the spectral reflectance of plant species with succulent morphology to determine similarities and differences across families and genera. Due to arid environmental conditions, succulent body forms have succeeded in plant evolution and are found in a wide range of unrelated species. This study will analyze the reflectance properties of succulent body forms across the Monocot and Eudicot lineages to deduce the evolutionary convergence of this trait. Measurements are to be taken by a handheld spectrometer with an active sensor, leaf clip, and integrating sphere to measure percent reflectance of individuals in the following families: Agavaceae, Cactaceae, Crassulaceae, Aizoaceae, Apocynaceae, Didiereaceae, and Euphobriaceae. The project will be conducted with specimens from the UC Davis Botanical Conservatory to better understand the evolution of succulent morphology.

Altered Expression of Excitatory and Inhibitory Signaling in an Inducible Mouse Model of Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS)

Laura C. Brochard
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Neurological Surgery
School of Medicine

The Fragile X gene (*FMR1*) has a variable number of CGG trinucleotide repeats in the 5' untranslated region. While 5-54 repeats is considered normal, an expansion of 55-200 CGG repeats results in a Fragile X premutation (PM). These carriers are at risk for developing Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS), a late-onset neurodegenerative disorder characterized by both motor and cognitive impairments. In PM carriers, intranuclear inclusions are observed in both neurons and astrocytes. However, the effects of this disorder on brain excitability and inhibition are not well characterized. To better characterize FXTAS, we created a transgenic mouse which expresses a doxycycline-activated CGG_{90} repeat expansion, expressed specifically in neurons. Previous research has suggested that key excitatory and inhibitory signaling pathways may be abnormal in both FXTAS patients and a knock-in mouse model of FXTAS. In this study, we characterized the protein expression levels of various glutamatergic and GABAergic receptors and transporters in our inducible mouse model of the Fragile X PM and FXTAS. Results from this study will provide important information on the effects of the ectopic CGG_{90} repeat expansion expression on excitatory and inhibitory transmission in the brain and thus shed light on the underlying mechanism of PM and FXTAS neuropathology.

Effect of Weight Gained During Pregnancy on Mitochondrial DNA Copy Number and Deletions in Placenta From Mothers With Previous Child With Autism

Casey Bronec
Sponsor: Cecilia Giulivi, Ph.D.
Molecular Biosciences
School of Veterinary Medicine

Over 2 million individuals in the U.S. and tens of millions worldwide are diagnosed with Autism spectrum disorders (ASD), a neurobiological disorder characterized by impaired social interaction, verbal and nonverbal communication, and repetitive or severely restricted activities and interests. More commonly children with autism (AU) than typically developing children (TD) have impaired mitochondrial function and mitochondrial DNA (mtDNA) abnormalities, include over replication and deletions, possibly mediated by reactive oxygen species (ROS) damage. In this study, we evaluated whether the weight gain during pregnancy of mothers enrolled in the Markers of Autism Risk in Babies-Learning Early Signs (MARBLES) study have an impact on mtDNA copy number and deletions in placenta and maternal To this end, mothers who gained a normal weight gain based on their pre-pregnancy BMI was 11-35 lb whereas those who gained 5 lb or more than the recommended range were classified as having an high weight gain. Our results indicated that high weight might cause over replication of mtDNA in placenta, which may have an adverse effect on the developing fetus, possibly increasing the risk for autism.

Should Non-Science Majors Learn Science?

Roberto Broy
Sponsor: Amy F. Smith, Ph.D.
iAMSTEM Hub
Undergraduate Education

College students are not only required to be proficient in their own subject majors, but to learn how to think and become more knowledgeable overall. For example, it has been broadly studied how Mathematics improves students' logical abilities and makes them more prepared for their academic careers (Dossey, 1992). Thus, students of all majors are required to complete some mathematics courses. However, despite all the advancements in science and science theory, most non-science majors do not require students to take science classes. Here I aim to investigate whether non-science students who completed a science class show an increase in performance compared to non-science students who never completed a science class. To assess performance, I will use multiple regression analysis on these two groups to compare differences in GPAs, controlling for prior academic achievement and demographics using data from the UC Davis databases on students who attended UC Davis during 2006-2013. I hypothesize the results will demonstrate that students who took a science class have higher GPAs than those who never took any. Perhaps, it is necessary to modify our curricula, to improve students' performance and give them a holistic view to apply in their own subjects, and future careers.

Altered Expression of Inflammatory Cytokines in Response to TCDD and LPS in Wild Type (WT) and AhRR Transgenic C57BL/6 Mice

Dipti Budhdev
Sponsor: Christoph F.A. Vogel, Ph.D.
Environmental Toxicology

AhR (Aryl Hydrocarbon receptor) is a cytosolic transcription factor present in many cells,activated by ligands such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). AhR dimerizes with ARNT (AhR nuclear translocator) causing changes in gene expression upon entry into the nucleus. AhRR (AhR repressor) dimerizes with ARNT and interferes with the binding of AhR with ARNT in a competitive fashion to alter gene expression, thus leading to changes in AhR activity as a negative feedback. Transgenic AhRR mice (AhRR over-expression) treated with inflammatory stimuli such as LPS (LipoPolySaccharide) showed slight repression of inflammatory cytokines such as the chemokine CXCL-3 in liver tissue compared to LPS treated WT mice. TCDD treatment had no significant effect on the expression of inflammatory cytokines TNF-α and IL-1a in liver of WT or transgenic mice. This study was conducted to understand the mechanism of stimulation of various inflammatory cytokines secreted in response to TCDD and LPS in WT and AhRR transgenic C57BL/6 mice.

Elucidation of Novel Extracellular Plant Receptor Involved in Viral Defense Pathway

Cody L. Burr
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Plants defend themselves against bacterial pathogens by employing extracellular Pattern Recognition Receptors (PRR) in order to detect the presence of bacteria. Till date there are no known extracellular PRRs involved in viral detection. The PRRs involved in recognition of bacteria form a complex with a co-receptor BAK1 to initiate the defense response pathway. Interestingly it was recently shown that BAK1 plays a critical role for antiviral defense in *Arabidopsis*. However a corresponding receptor which will detect the viral pathogen externally is still missing. Our lab has identified a novel extracellular kinase IRK which is involved in immunity against Tobacco Mosaic Virus (TMV). Due to BAK1s involvement in all known PRR I hypothesized that IRK is interacting with BAK1 as its PRR co-receptor. Currently I have cloned and purified IRK however optimization of the protein construct is still underway. The goal is to reconstitute IRK with BAK1 using purified proteins. I will also probe if IRK can auto-phosphorylate or get phosphorylated by BAK1 in-vitro. The second goal would be to mass spec IRK to determine the location of the phosphorylation site. In the case that BAK1 does not auto-phosphorylate IRK, new potential interacting proteins will be assayed.

1-Octen-3-ol: The Attractant That Repels

Garrison Buss
Sponsor: Walter Leal, Ph.D.
Molecular & Cellular Biology

Olfaction is a form of chemoreception that plays a critical role in host seeking for mosquitoes. These medically important insects may serve as a vector for dengue, malaria, yellow fever and West Nile virus. 1-Octen-3-ol has been shown to be a powerful attractant for various mosquito species except for the southern house mosquito, *Culex quinquefasciatus*. Our lab isolated odorant receptors (ORs) from *Culex quinquefasciatus* that were sensitive to 1-octen-3-ol. Intriguingly, an OR in *Culex* antennae responded to both isomers of 1-octen-3-ol, whereas a receptor located in the maxillary palps was activated only by the (*R*)-stereoisomer. Because the activation of the ORs was not accompanied by an attractant effect in *Culex quinquefasciatus*, we asked the corollary: is 1-octen-3-ol a repellent, and if so, whether chirality is biologically important. Our repellent assays demonstrated that racemic 1-octen-3-ol was active at 10% and 1% but not at lower doses. Our findings with enantiopure compounds suggested that 1-octen-3-ol is perceived by the antennae given that both the (*R*) and (*S*)-enantiomers were active.

Influence of Heat Treatment on the Mechanical Behavior of Ultrafine Grained and Fine Grained Al-Mg-Sc Alloys

Kevin L. Butler
Sponsor: Julie M. Schoenung, Ph.D.
Chemical Engineering & Materials Science

The addition of Sc to an Al-Mg alloy is known to increase the strength of the material through the formation of Al_3Sc precipitates. These nanometer-sized Al_3Sc phases form at the grain interiors and facilitate strengthening through precipitate-cutting mechanisms. The contribution of precipitates to hardness depends on their size and distribution, which are controlled by heat treatment. In the present work, Al-5Mg-0.4Sc was prepared by means of powder metallurgy including hot vacuum degassing and consolidation. While some precipitates are formed during these process steps, the resulting microstructure does not lead to optimal mechanical behavior. Here we investigate the influence of subsequent solid solution treatment and aging on the mechanical performance of the Al-Mg-Sc alloy, paying particular attention to the differences between ultrafine grained (UFG) and fine grained (FG) microstructures. The effect of variations in heat treatment temperatures on the dissolution and formation, respectively, of Al_3Sc precipitates was investigated through differential scanning calorimetry (DSC) and hardness testing on both UFG and FG materials.

Interpretation of Policy Implementation Relationships - Marcellus Shale, NY

Michael Bybee
Sponsor: Gwen Arnold, Ph.D.
Environmental Science & Policy

In the early 2000s, advancements in horizontal drilling enabled opportunities for extracting oil and gas in the Marcellus Shale via high-volume hydraulic fracturing, typically called "fracking." New York overlays a substantial area of the Marcellus Shale, and the state passed a moratorium (temporary prohibition) on fracking in 2008 to study implications of potential drilling. This was followed by a multitude of "home rule" policy implementations on fracking by local governments, a curious, nationally unprecedented phenomenon. These policies, in various forms with various clauses, address fracking both directly and indirectly. Interestingly, some were copies of one another, distributed across the state; sometimes they were passed by jurisdictions not even over the Marcellus. Through analyzing town meeting minutes and contacting town clerks, we collected and are in the process of categorizing nearly all local 2008-2013 fracking policies in New York. Analysis thus far suggests that passage was non-independent, or influenced by common factors. Currently, we are documenting newspaper records and public archives to identify key policy advocates who appear in multiple municipalities and may have influenced policy passages. Further analysis will determine whether socioeconomic and demographic characteristics, such as income and population size, influence how and why policies passed when they did.

LRRC24 Expression and Functions in Breast Cancer

Shadd N. Cabalatungan
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Biochemistry & Molecular Medicine
School of Medicine

The human genome encodes dozens of transmembrane proteins from different families that contain extracellular leucine-rich repeat domains. Many leucine-rich repeat proteins have yet to be examined and may play important roles in regulating the tumorigenic properties of cells involved in cancer. LRIG1 is a leucine-rich repeat protein that has been shown to be a negative regulator of several oncogenic receptor tyrosine kinases, including all members of the ErbB family and MET receptors. Overexpression of these receptors in breast cancer results in poor patient prognosis and therapeutic resistance. The study presented here examines the role of a related leucine-rich repeat protein known as LRRC24 (leucine-rich repeat-containing protein 24) on the regulation and expression of ErbB receptors. We observe that in co-transfected HEK293T cells, LRRC24 suppresses cellular receptor levels, shortens receptor half-life, and is involved in protein-protein interactions. Our observations indicate that LRRC24 functions as a negative regulator of the ErbB family of receptor tyrosine kinases. By highlighting the function of LRRC24 it may advance existing knowledge regarding how mammalian receptor tyrosine kinases are regulated among cell signaling pathways involved in cancer.

Association Between Meal Patterns and Childhood Obesity Among Mexican-Origin Children in Rural, Central California

Roxana Cabrera
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Internal Medicine
School of Medicine

According to the CDC, childhood obesity rates among children ages 6-11 has doubled from 7% in 1980 to 18% in 2012. The Niños Sanos, Familia Sana (Healthy Children, Healthy Family) study is aimed at preventing childhood obesity among Mexican-American children. The purpose of this study is to examine the relationship between the children's meal patterns and their current weight status. Researchers collected data from 64 children, 23 females and 41 males, ages 4 to 6. Bilingual researchers collected three parent-reported 24-hour diet recalls for each child. Mealtime and caloric intake data was assessed using Nutrition Data System for Research (NDSR). Mealtime was defined as follows: 5am to 11am morning meals, 11:01am to 3pm afternoon meals, 3:01pm to 8pm late afternoon meals, and 8:01pm to 4:59am evening meals. Preliminary results show a significant difference between the average calories consumed per meal and the child's weight status ($p=0.015$). However, no significant difference between mealtime and the child's weight status was found. There is a scarcity literature that investigates this topic, which is why more research needs to be done.

Investigating Genes Involved in *Arabidopsis* Ovule Development

Jennifer Cade
Sponsor: Charles Gasser, Ph.D.
Molecular & Cellular Biology

Ovules are the reproductive structures in plants that eventually become seeds. The outer cell layers of an ovule are the outer and inner integuments, which together house the embryo sac and later become the seed coat. The specific pattern of growth of the integuments shapes the ovule as a whole; plants without normal integuments have abnormal ovule shape and orientation. One gene involved in this process in *Arabidopsis* is *INNER NO OUTER (INO)*. Mutants without a functional copy of *INO* have a normal inner integument but no outer integument, and are nearly sterile. One *INO* allele, *ino-4*, is weakly functional; *ino-4* mutants have partial growth of the outer integument and produce viable seeds. Using *ino-4* as a genetic background for mutagenesis allowed us to find enhancer and suppressor mutants that have no visible phenotype in a wild type (*INO*) background. Identifying the genetic basis of these mutations may shed light on the processes regulating integument development. This presentation describes work on characterizing, mapping, and sequencing some of the enhancer and suppressor mutations, as well as examining the molecular basis of the *ino-4* mutation.

Transitions in Archean Microbialite Morphology

Kristina M. Calderon
Sponsor: Dawn Y. Sumner, Ph.D.
Earth & Planetary Sciences

Microbialites of the 2521±3 Ma Gamohaan Formation, South Africa, are composed of kerogen, herringbone calcite and void-filling calcite. Since kerogen holds information about ancient life, a microbialite sample was serial sectioned and polished vertically in 100µm increments. After every section, the sample was scanned and 120 sections were collected. Three general transitions in mat morphology were observed throughout the sample along with different abundances of components. The bottom of the sample contained a cuspate mound composed of dense draping laminae. Above the mound the microbialite morphology transitioned to honeycomb structure defined by branching of long, horizontal features. Farther up the sample, the honeycomb structures changed to cuspate structures defined by vertical draping of laminae. The cuspate structure on the top left transitioned from draping laminae with void-filling calcite into herringbone calcite. The lowermost mound can be an indicator of the structure's origin because that is where the microbialite structures begin to change morphology. The transition from honeycomb to cuspate structure may be due to less branching and more vertical growth of the microbial community. Future work includes fully characterizing these transitions by reconstructing the sample in three dimensions with the goal to understand what caused these morphological changes.

PCB 95 Modulates Dendritic Arborization in Rat Hippocampal Neurons via Production of Reactive Oxygen Species

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Despite the 1970's ban on production of polychlorinated biphenyls (PCBs), these chemicals persist in the environment and pose potential risks to the developing human brain. PCBs are categorized as either dioxin-like or non-dioxin-like (NDL) congeners, and the latter are largely responsible for the developmental neurotoxicity of PCBs. The NDL congener PCB 95 has been shown to alter dendritic growth of hippocampal neurons both *in vivo* and *in vitro* via ryanodine receptor (RyR)-dependent mechanisms. Interestingly, the effects of PCB 95 on dendritic arborization exhibit a non-monotonic concentration-effect relationship in which PCBs increase dendritic arborization at concentrations in the pM to low µM range, but have no effect on dendritic arborization at concentrations above the low µM range. These higher PCB concentrations are not cytotoxic, which raises questions regarding the biological mechanism(s) underlying the non-monotonic response. I hypothesize that NDL PCBs do not increase dendritic growth at higher concentrations because increased reactive oxygen species (ROS) generated at higher PCB levels inhibit RyR activity. My goal is to determine whether PCB 95 increases ROS at higher concentrations coinciding with the lack of dendritic response, and whether treatment with antioxidants reverses this effect such that higher PCB 95 concentrations promote dendritic growth.

Seeing Through a Cloud of Smoke: UC Davis Attitude and Behavior Patterns of the Increasingly Popular E-Cigarette

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E-cigarette usage has flourished in recent years, with many assuming they are safer than conventional cigarettes. However, federal regulations to date are absent and evidence suggests harmful chemicals and secondhand exposure risk. Furthermore, the spectrum of kid-friendly flavors has induced alarm for increasing youth uptake and child poisonings. In early 2014, the city of Davis was considering revising their tobacco policy to include e-cigarettes. Yolo County staff conducted a student survey to assess knowledge, attitudes, and behavior and recruited a convenience sample of 226 individuals around the UC Davis Silo. Most participants were undergraduate students (83%), and the remaining 17% were graduate students or identified as "other". Only 22% were e-cigarette users but 67% knew someone who used an e-cigarette and 90% were familiar with the term "e-cigarette". Less than half (42%) of participants did not associate a secondhand exposure risk associated with e-cigarettes, though the majority (79%) say they would support limiting where e-cigarettes may be used. These attitudes reveal a gap in knowledge among UC Davis students and potential for uptake with many knowing an e-cigarette user. These findings may help inform health education efforts assisting with policy enforcement.

No Other Gods Before Me: The Supreme Court, Public Opinion, and the Ten Commandments

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Political Science

Over the past three decades, scholarship regarding the effect of Supreme Court decisions on public opinion has produced several working hypothesis. One in particular, the "structural response hypothesis", predicts that when the Court rules on issues in opposition to public opinion, support for or against the issue will polarize. To test this hypothesis, changes in opinion on six individual characteristic levels were measured both prior to and after the release of two Supreme Court decisions regarding the public display of religious symbols. In nearly every category, prior to the release of the 2005 decisions, there were significant increases in the level of strong support for the public display of the Ten Commandments, with accompanying decreases in moderate support, and both moderate and strong opposition. Contrary to the results predicted using the "structural response hypothesis," analysis of changes within characteristic groups following the Court decisions did not show increases in polarization. Many groups showed a marked decrease in strong support or strong opposition to the public display of religious symbols, with a significant increase in moderated positions. This raises some doubts as to the Court's ability to affect public opinion, as well as the validity of the "structural response hypothesis."

The Media's Impact on Online Dating

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Human Ecology

The media has such a powerful influence on society that people change who they are to live up to social standards. Research has shown that the Internet has allowed and encouraged people to hide their true identity and give a false representation of themselves. I am investigating online dating to see how the media impacts what people look for when entering into a relationship and how people adjust their online profiles accordingly. I conducted observational studies on the TV show, Catfish, where fake profiles are exposed. In addition, I made three Tinder profiles of myself based on three increasing levels of sexualization. I took data on the number of matches and messages that I received. My study allowed me to conclude that the media values the superficial qualities of a person and encourages society to sexualize themselves in order to find a relationship. This research exposes the harsh reality of socialization and can be made of use to advocate against what the media emphasizes. This can teach society that a person's value is defined by qualities much deeper than their appearance.

Development of a LC-MS Assay for Determining the Clinical Impact of Tobramycin Pharmacokinetics in Acute Trauma Patients

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Trauma patients experience post injury physiological changes that influence the pharmacokinetic (PK) profile of numerous medications. The PK profile of a patient can be defined as the patient's physiological response to a drug, or the actions of the human body on a given drug (*i.e.*, absorption, distribution, metabolism, excretion). Tobramycin, a nephrotoxic aminoglycoside antibiotic, is often administered empirically in trauma care for suspected or identified infections. Current tobramycin dosing strategies do not take in to account the change in a patient's PK profile post injury. Determining the PK profile of trauma patients will allow for much more accurate and safe medication dosing. We developed and validated a novel liquid chromatography mass spectrometry (LC-MS) assay to determine tobramycin concentrations in human plasma samples. The development and validation of this assay will facilitate the creation of a physiologically-based PK profile for trauma patients. This will ultimately help optimize dosing strategies for antimicrobial therapy.

An Improved Genetic Map of Rainbow Trout Facilitates QTL Mapping and Other Genomics Research in Salmonids

Lucydalila Cedillo
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Animal Science

Rainbow trout (*Oncorhynchus mykiss*) is an important species in sport fishing, aquaculture, and biomedical research. Despite widespread interest in studying rainbow trout, many genetic resources are limited. Thus, a higher-density genetic map would greatly aid research in rainbow trout and related species. The low density of current genetic maps is due to the short read lengths that are produced while sequencing the DNA. Recent advances in sequencing technology now provide paired-end reads that are much longer and can be used to discover a greater number of genetic markers. In this study, we use next generation sequencing of restriction-site associated DNA (RAD) tags to discover and genotype approximately 20,000 single nucleotide polymorphisms (SNPs) in a sample of 85 recombinant progeny and construct the highest-density genetic map for rainbow trout. Furthermore, we map quantitative trait loci (QTL) to investigate the genetic basis of phenotypes including length, weight, and number of parr marks. The linkage and QTL maps will provide critical genetic resources and information that can be applied to conservation, aquaculture, and biomedical research.

Thermodynamic Analysis of Interaction in Ternary Mixed Monolayers Containing Cholesterol

Hilary Chan
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Chemical Engineering & Materials Science

Biological membranes are a complex mixture of different phospholipids, cholesterol, and proteins. Cholesterol, in particular, helps maintain membrane integrity and plays an important role in regulating cell membrane function and signaling. The regulation of the membrane properties is known to be dictated by the composite interactions and thermodynamics of cholesterol and the myriad of different lipids in biological membranes. In this work, we investigated and quantified the thermodynamics of cholesterol-lipid membrane interactions in a simplified, ternary system of a saturated and unsaturated lipid with cholesterol that captures the essential properties of real biological membranes. Surface pressure – area per molecule (π-A) isotherms were obtained on a Langmuir-Blodgett trough and used to determine the phase coexistence and Gibbs free energy of the mixtures. Isotherms were obtained for pure saturated, unsaturated lipids, cholesterol and for the binary and ternary mixtures under an inert argon environment using experimental parameters that mimic the physiological conditions of mammalian cells. The Gibbs free energy of mixing enables a quantitative determination of whether lipid-lipid and lipid-cholesterol interactions are favorable (attractive) or unfavorable (repulsive). The fundamental information obtained from these studies is then put into context with other literature on the behavior and properties of complex lipid cholesterol mixtures.

The Effect of Species and Genotypic Diversity on Eelgrass Detrital Systems

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Evolution & Ecology

Declines in biodiversity around the world have spurred numerous studies investigating the role of diversity in ecosystems, most commonly focusing on species-level consequences. However, intraspecific genetic diversity can also have important effects, including increased and ecosystem functioning and resistance. Eelgrass (*Zostera marina*) is found in temperate coastal waters, creating habitats for many organisms. However, most eelgrass production is not consumed, and instead enters the detrital food web. I examined how eelgrass detrital processing is affected by diversity at both the consumer species level and the eelgrass genotypic level, using three distinct eelgrass genotypes and three species of invertebrates commonly found in seagrass beds in Bodega Bay, California. Invertebrate species differed in rates of detritus consumption and, and not all species showed the same preferences to different seagrass genotypes. When I manipulated both the number of grazer species and number of eelgrass genotypes, high genotypic diversity resulted in an increased rate of detritus consumption, but increasing the number of invertebrate species did not affect the amount consumed. Variation in nutritional value and chemical defenses among eelgrass genotypes likely underlie the differences in consumption rates at high diversity levels. These results highlight the importance of genotypic diversity in detrital food webs.

The Interclinic Consortium and the UC Davis Student-Run Clinics: Understanding Health Disparities Through Demographic Data Collection

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The Interclinic Consortium began in 2013 to address a growing lack of knowledge about the UC Davis affiliated student-run clinics' populations and operations. In order to better understand the disparities that affect these patient populations, highlight the value of student-run clinics, and encourage collaboration and discussion between the clinics, the Interclinic Consortium developed an IRB-approved 18-question survey that is administered at 6 of the 9 student-run clinics by trained research volunteers. While the data collection will be completed in Spring 2015, initial results demonstrate a need for vision and dental services, a lack of knowledge about Covered California, and changing patient populations. Ultimately, we hope to use these findings to spur action among the student-run clinics to address identified health disparities. These findings are significant because these clinics' patient populations have never been surveyed before on such an extensive scale. Thus, from this project, we can better advocate on behalf of the patients for greater services and understand the medical conditions and social conditions that predominate in these patient populations.

Assigning TAs to Sections: A Stable Marriage Problem

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Mathematics

Every year, teaching assistants are chosen to teach classes. Initially, this is done by emailing graduate students for their preferences of classes for the coming quarter, with which a student affairs officer will match the graduate students to their preferred classes. Unfortunately, this process takes upwards of 8 hours to complete by hand and the designated human assignments generally fail to produce an optimal solution. In order to remedy this issue, we examined a mathematical model which incorporates integer programming to matching theory in order to pair graduate students to courses while attempting to maximize the satisfaction of the graduate students. Creating such a model required that we considered certain constraints, such as teaching assistant seniority, time conflicts, teaching ability, and happiness of each teaching assistant (as provided by their preferences of classes to teach). We also created a website interface for our model that gathers preference data from the graduate students and allows the staff to easily perform the matching.

An Investigation of Adaptive Introgression in *Anopheles* Mosquitoes in Mali

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Malaria is one of the most serious diseases in the world, affecting millions living in tropical regions. One common malaria control measure is insecticide treated nets (ITNs). A recent study demonstrated that two major malaria vectors in Africa, *Anopheles gambiae* and *Anopheles coluzzii*, hybridized in Selinkenyi, Mali. This resulted in the transfer of a portion of the *A. gambiae* genome into the genome of *A. coluzzii*. This was an important event because this *A. gambiae* genome region contains insecticide-resistance alleles. This is an example of adaptive introgression, when an advantageous gene is transferred from one species to another. The timing of hybridization coincided with mass-scale distribution of ITNs in Mali. With increasing exposure to insecticide, hybrid genotypes containing insecticide resistant allele are favored for survival. In this study, we want to understand if adaptive introgression happened independently in multiple locations throughout Mali. We will utilize archived mosquito collections with multiple yearly collections from a single village spanning a period of time both pre- and post-ITN use. A multi-plex SNP genotyping assay will be conducted to obtain genotypes of single nucleotide polymorphisms that distinguish species and insecticide-resistant mutations. Ultimately, we hope to understand relationships between insecticide treatment and resistance development.

Systematic Healthcare Breakdown and Its Affect on Disease Prevalence

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War causes healthcare systems to breakdown leading to unsanitary conditions, gaps in treatment, and lack of preventative medicine that allow emergence of infectious disease where it was previously not sustained. Infectious disease can be seen from the front lines to civilians to refugees, who are often most severely affected. In countries without developed medical systems, where many recent wars have taken place, the effects can be even more severe. Historical examples are typhoid in the American Civil War and cholera in the Rwandan Civil War. Each disease spreads through one or more mechanism, such as poverty, close quarters, infrastructure breakdown, dislocation, and stress. Within each of these mechanisms disease can travel through multiple physical transmission routes; directly, from person to person through skin to skin contact, aerosol/droplet spray, or bodily fluids. Indirectly, disease can be transmitted through contaminated objects, insect bites, food, water, and animals. Animals play an important role as disease reservoirs that allow the pathogen to attenuate or mutate to become more severe when animals are not controlled and vector borne diseases transfer to humans. Understanding the mechanisms of infectious disease during war can allow medical services to respond to and prevent future outbreaks.

Gene Expression of Thyroid Hormone Signaling Components in the Developing Zebrafish Brain

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Thyroid hormones (TH) are essential for proper embryonic neurodevelopment, as illustrated by mental retardation and sensory deficits in children affected by maternal hypothyroidism. Persistent organic pollutants, such as PCBs and PBDEs, are known developmental neurotoxicants and TH disrupters; however a causal link between TH disruption and the neurotoxic effects of these pollutants has yet to be demonstrated. Establishing this link is hindered by significant gaps in our understanding of the molecular mechanisms by which TH influences neurodevelopment. As a first step in addressing these gaps, we qualitatively assessed the spatiotemporal expression of genes encoding key TH signaling molecules using whole mount in situ hybridization of zebrafish embryos from 12 hours post fertilization (hpf) to 120 hpf. Preliminary results examining expression of TH transporter (lat2) and receptors (thrαa, thrαb) demonstrate that gene expression of TH signaling molecules varies temporally throughout neurodevelopment and reveals variable expression between the developing brain and peripheral organ systems. These studies set the stage for future work focused on determining whether PCBs, PBDEs and other environmental contaminants change the spatiotemporal expression profiles of TH signaling components and whether such changes are linked to altered neurodevelopment as assessed using morphometric and behavioral outcomes.

Dream Culture of the Late Ming Dynasty: A Discourse on Shitao's Authenticity and Originality

Pei-si (Peggy) Chao
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Art & Art History

A study of China's late Ming Dynasty intellectual culture reveals that art (painting, poetry, writing, and performance art) professed a purposeful expression of authenticity and individuality. Many artists often conveyed their originality through recording and discussion of their dreams in art and literature, and then utilizing them to reflect upon their lives and identities. Scholars today have acknowledged this body of work as an indication of the broader discourse of late Ming dream culture. Shitao (1642-1707), a prominent Chinese artist-critic, was born at the end of the Ming Dynasty (1368-1644) but lived most of his life in the Qing Dynasty (1644-1911). His artworks are often described as dream-like and otherworldly, but interestingly enough, no one has made the connection between his dream-like artistic style and the Late Ming dream culture. Through discussing Shitao's personal history and analyzing his paintings, I argue that Shitao manifests late Ming dream culture in his artworks and expresses utmost artistic originality and authenticity. As an artist and an individual, Shitao lives up to the legacy of late Ming's cultural dynamics and richness.

Characterizing the Activity of MUS81-EME1 in Homologous Recombination

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Microbiology & Molecular Genetics

Homologous Recombination (HR) is a template-dependent DNA damage repair pathway that responds to double strand breaks and stalled replication forks. The MUS81-EME1 endonuclease cleaves various intermediates that arise during HR. Previous studies have shown that cells lacking MUS81-EME1 are sensitive to interstrand crosslinking (ICL) agents that block replication. Since ICL agents are commonly used in anti-cancer therapy, MUS81-EME1 is a novel potential target to sensitize cancer cells to ICL agents. The specific aims of this project are to over-express and purify MUS81-EME1 and characterize its endonuclease kinetics. Utilizing fluorescently labeled substrates, we monitored the cleavage of DNA overtime to obtain Michaelis Menten kinetic parameters for MUS81-EME1 nuclease activity. In all substrates tested, MUS81-EME1 cleaves DNA joint molecules with a K_M ~25 nM and k_{cat} ~ 1.5 min-1. Interestingly, MUS81-EME1 exhibits substrate inhibition with a K_i ~ 150 nM. This work will lead to the understanding of MUS81-EME1 substrate selectivity and help establish MUS81-EME1 as novel anti-cancer therapeutic target.

Semiotics in Art

Jose Chavez-Verduzco
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Art & Art History

People generally tend to think of painting as either abstract or realistic, but a genre in painting has been emerging since the 1960's with text as its focal point. In order to understand this shift in painting and improve my own visual literacy, I used semiotics, which is the study of signs and symbols and their use or interpretation. Initially, my perception of what a painting could be was limited to iconic signs, which convey meaning through a likeness such as the portrait of the Mona Lisa or Andy Warhol's Campbell soup cans. After studying semiotics however, I've found that symbols, such as words and inevitably text based paintings, also fall under the category of signs. As a result, I've created my own series of text-based paintings to apply this renewed understanding of art, and to demonstrate that there are no hierarchies among signs or paintings.

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

Alexis R. Chavez
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Anthropology

The term "Barbary" was used by the West in reference to the countries of Morocco, Algeria, Tunisia, and Libya. I examined 401 articles published from 1930 to 1939, and critically analyzed 25 relevant articles where the term "Barbary" was used by New York Times correspondents. I discovered that the countries of the Barbary were represented as ahistorical and tied to a past of racketeering. I argue that this depiction of chaos and an uncivilized society was used to justify France's colonial acts as it had "freed" the people of the Barbary from oppression and disorder. This misrepresentation by the New York Times, which is considered to be a liberal news source, engraved into American society that the people of the East were backwards and ill-mannered. 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 and oppressive. 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 Troponin T-Related Hypertrophic Cardiomyopathy on Immunoproteasome Activity

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Neurobiology, Physiology & Behavior

Previous research has found changes in proteasome activity in cardiomyopathies. However, the involvement of the immunoproteasome in cardiomyopathies is unclear. The purpose of this research was to investigate the immunoproteasome activity in cardiomyopathies caused by troponin T mutations. The immunoproteasome is made up for three inducible proteolytic subunits: β1i, β2i, and β5i and the activities of β5i and β2i subunits were measured in crude and purified samples of WT, I79N, and R278C troponin T transgenic mouse models. The activity of the β5i subunit was measured in biological assays using the fluorescently tagged substrates Ac-ANW-2R110 and the activity of the β2i subunit was measured through MV151 in-gel detection. MV151 is a fluorescently labeled proteasome inhibitor which interacts with the active sites on the immunoproteasome. The results show that the β5i (chymotrypsin-like) activity was lower in the I79N mouse heart when compared to the wild-type heart suggesting that the immunoproteasome may play a role in in cardiomyopathies. The amount of active β2i was similar between I79N and wild-type hearts. Our results suggest that both the proteasome and the immunoproteasome are important in troponin T related cardiomyopathies.

Characterization of the Stability of ABF2 in *Arabidopsis thaliana*

Anna Chen
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Molecular & Cellular Biology

ABRE Binding Factor 2 (ABF2) belongs to a subfamily of bZIP-type transcription factors that play a critical role in abscisic acid (ABA) signaling in plants. ABA is important for tolerance to environmental stresses, such as drought, cold temperatures and saline conditions. ABA is a metabolite whose level rises under stress conditions. High ABA activates the bZIP transcription factors ABF1, ABF2, ABF3 and ABF4, which direct expression of genes that keep the plant alive until environmental conditions improve. To understand how high ABA activates ABF activity, we are investigating the post-translational regulation of ABFs in the plant *Arabidopsis thaliana*. Previous studies on ABF1 and ABF3 have shown that that they are rapidly degraded under normal growth conditions, but become long-lived in high ABA. Their degradation is sensitive to proteasomal inhibition, suggesting the ubiquitin pathway regulates their stability. Here, we expand these studies to ABF2. We have shown that ABF2 is degraded *in vitro*, and is stabilized by proteasomal inhibition. We are currently asking whether ABA regulates the stability of ABF2 and investigating the effects of phosphorylation, possibly induced by ABA, on ABF2 degradation. These results will help us understand the mechanisms by which plants respond to and tolerate environmental stresses.

Stereotype Activation and Visual Memory

Catherine P. Chen
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Psychology

Stereotypes can influence our daily judgments in displeasing ways. We distinguish between two processes underlying the influence of stereotypes: stereotype activation and stereotype application. Stereotype activation is the accessibility of stereotypic knowledge, whereas stereotype application is implementing the activated stereotypic knowledge to make judgments (Kunda & Spencer, 2003). Research indicates people more likely apply stereotypes to judgments shortly after viewing stereotype-activating images. When people delay their judgments, even briefly, they are less likely to apply stereotypes. Surprisingly, we find that stereotypes are more, rather than less, active when people delay their judgments. A possible explanation for this is that stereotype-activating images might be stored in short-term visual memory or iconic memory, increasing visual accessibility. We sought to test this possibility by presenting a backward visual mask, a well-established method of disrupting iconic memory, and delaying the judgment onset. If visual memory is pertinent, stereotype activation should again increase at longer delays, but only when people can use visual memory or when they are not presented with a visual mask. Our findings show no significant difference of stereotype activation at longer delays but peaks at shorter delays. This dismisses the iconic account representation but reveals other underlying processes to further explore.

Design and Kinetic Characterization of a Family 1 Glycoside Hydrolase

Claire Chen
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Chemistry

The major goal of this project is to amass a standardized data set of genetically engineered enzymes to enable accurate predictions of catalytic efficiency from sequence. In this study, Michaelis-Menten kinetic constants were determined for mutants created by a systematic alanine scan as well as computationally-designed mutants. We chose beta-glucosidase B (BglB) for our model enzyme because of its robustness and high yield output. Sequence-verified plasmids constructed via Kunkel mutagenesis were transformed into *E. coli*. Small-scale cultures were grown to saturation, pelleted, resuspended in induction media, and expressed before harvesting. Proteins were purified via immobilized metal ion affinity chromatography and concentration was determined. Mutant enzymes were spectrophotometrically assayed and their kinetic constants for the substrate 4-nitrophenyl-beta-D-glucopyranoside were calculated using the the Michaelis-Menten equation. While many of the mutations, particularly those conserved catalytic residues, have readily predictable effects, some reveal surprises in how the structure of this enzyme determines function. At the conclusion of data compilation, over 100 different mutants were kinetically characterized. This large data set serves as the foundation for the prediction of enzyme kinetics based on sequence. The application of the knowledge gained could potentially span across all facets of human advancement: agriculture, biofuel, and therapeutic enzymatic usage.

Fuel Poverty and Energy Policy

Mengyu Chen
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Economics

This paper continues the research of fuel poverty through thorough analysis of the official data from U.S. Energy Information Administration. It mainly discusses the notion of fuel poverty and its difference from the more common concept of income poverty. It defines fuel poverty in terms of the amount of money a household spends per unit of an energy service such as the amount of space heated or cooled—the so-called energy service price. We find that lower-income households face higher energy service prices for the major appliances such as heaters and air conditioners. We relate this result to the demographic, economic, and housing characteristics of the fuel poor. We find, for instance, that most fuel poor are renters or live in older homes. Finally, we discuss possible implications of our findings for the conduct of energy policies such as energy subsidies for the poor or energy efficiency and building standards.

Synthesis and Characterization of Novel Iron Chloride Formates

Michael Y. Chen
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Chemistry

We have developed a low temperature solvothermal pathway to create novel iron chloride formate compounds. These compounds are of interest because they yield large single crystals via simple solvothermal syntheses and their low dimensionality leads to interesting magnetic properties and structures. The crystal structure of NH4FeCl2(HCOO), a 1-D anisotropic antiferromagnet, was characterized and studied extensively by powder and single crystal X-ray diffraction, SQUID magnetometry, and neutron powder diffraction, revealing linear chains of distorted Fe-2+ - centered octahedra bridged by Cl-- and formate ligands. A cesium analogue was also discovered and characterized. Finally, a third iron chloride formate was synthesized – Cs2FeCl4(HCOO)(H2O) – which grew as octahedral crystals with a pseudo zero-dimensional structure. This compound contains significantly more coordinating ligands than the others and further magnetic experiments may reveal interesting properties. Further studies are being done on these materials as well as similar materials made with different transition metals (i.e. manganese and cobalt).

Students Dropping Out of STEM Fields

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iAMSTEM Hub
Undergraduate Education

Approximately 59% of first time, full-time students who began seeking a bachelor's degree at a four-year university actually complete the degree within six years. (Integrated Postsecondary Education Data Survey, 2013) Despite all the academic resources offered, about half of students across many four-year universities will drop out. In this study, the focus is to examine the factors that contribute to student dropout rates in the STEM fields. I will analyze the data on students who attended UC Davis between 2006 and 2014 from the UC Davis institutional databases. Logistic regression will be used to model students' probability of leaving STEM-based fields as a function of students' demographic characteristics, prior academic achievement, and experiences at UC Davis. This will identify variables that have a significant impact on the likelihood that a student leaves a STEM field. These conclusions will be used to inform policies and programs at UC Davis, leading to improvements upon the current academic resources the school offers students that will help them at any stage of their college career.

New Insights into the Structural Complexity of $C_{60}\cdot 2S_8$: Two Crystal Morphologies, Two Phase Changes, Four Polymorphs

Susanne Y. Chen
Sponsor: Alan L. Balch, Ph.D.
Chemistry

Polymorphism occurs when a material exhibits more than one crystal form. In 1993, Roth and Adelmann discovered the first known polymorph of $C_{60}\cdot 2S_8$ (denoted here as α). The α polymorph crystallizes in space group *C2/c* containing a disordered fullerene. When the temperature is decreased from room temperature to 90 K, the crystal undergoes a phase change to form a triclinic structure (β) in space group P-1 that is fully ordered. A new polymorph (γ) was discovered which crystallizes in space group $P2_1/c$. Similar to the α structure, this polymorph contains a highly disordered fullerene, and undergoes a phase change when the temperature is decreased to 90 K to space group P*c* (δ) to give a fully ordered structure. The crystal morphologies of the α/ β polymorphs are black lathes, whereas the γ/δ polymorphs are black needles. As indicated by geometric and temperature factor changes, it is clear that the low-temperature phases represent an increase in the level of order in the arrangement of C_{60} molecules. Both of the phase changes are reversible.

Diffusion Tensor Imaging: Comparison Among Tensor Estimators

Ge Cheng
Sponsor: Jie Peng, Ph.D.
Statistics

Diffusion tensor imaging (DTI) is a magnetic resonance imaging technology to probe the architectures of biological samples through measuring water diffusion and to produce neural fiber tracts. DTI is widely used to study neuro-degenerative diseases, brain functionality and segmentation or connectivity of brain. The most commonly used DTI model is the single tensor model where a tensor is used to represent water diffusion at each voxel. This work focuses on developing and comparing various tensor estimators based on linear regression, nonlinear regression without positive definite constraint. The leading eigenvector at each voxel is then extracted and used as input of fiber tracking algorithms. We compare different estimators using both simulation experiments and real data sets. From both scenarios, we find that tensor estimation based on nonlinear methods is superior to the commonly used linear regression estimator. In addition, tensor estimation based on nonlinear methods also leads to better fiber tracking results.

Functional Phenotyping of Inflammatory Monocytes Using Flow Cytometry

Alagu Chidambaram
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Biomedical Engineering

Atherosclerosis is a chronic inflammatory disease associated with the accumulation of cholesterol, lipids, and macrophages in arterial walls, culminating in plaque formation and vessel occlusion. Circulating monocytes, precursors to macrophages, take up lipid from blood, resulting in upregulation and activation of the membrane adhesion molecule CD11c/CD18 and recruitment to nascent plaque. CD11c cooperates with very late antigen-4 (VLA-4) to facilitate recruitment of cells to atherosusceptible regions. However, the mechanism of CD11c activation and cooperation with VLA-4 is unknown. This study aims to elucidate the cause for increased adhesion after lipid uptake. Flow cytometry and a fibronectin bead-binding assay showed that after a high-fat diet, mouse monocytes formed clusters of activated CD11c and VLA-4, subsequently increasing binding with vasculature cell adhesion molecule-1. The current objective of the study is to elucidate the signaling mechanism between lipid uptake and CD11c activation. Preliminary results show a similar upregulation and activation of CD11c on monocytic THP-1 cells exposed to lipid *in vitro.* Further experiments knocking out important signaling molecules in THP-1 cells are currently being performed. Understanding the signaling mechanisms provides a better understanding of the impacts of a high-fat diet on vascular health.

Targeting Transcription Factors in Canine Gliomas

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Molecular Biosciences
School of Veterinary Medicine

Activating Transcription Factor 5 (ATF5) is an intracellular transcription factor that is highly expressed in neural progenitor, neural stem cells, and certain tumors, including glioblastomas (GBMs). We describe a Dominant/ Negative (D/N) ATF5 peptide that can inactivate intracellular ATF5. We showed that the administration of Dominant/ Negative (D/N) ATF5 peptide after tumor formation can kill malignant cells while leaving normal brain cells surrounding the tumor undamaged in mice. The presence of ATF5 and the selective interference with ATF5 function and expression has not been extensively investigated in *C. lupus*. In this study, we quantified the expression of ATF5 in canine gliomas. A tissue microarray of canine gliomas that were immunostained for ATF5 showed nuclear expression (as defined by the presence in 90% or more of cells). The widespread expression of ATF5 in gliomas makes it an appealing target for therapeutic intervention for such tumors.

From the Mouths of Cats and Dogs: Inferring Ecology From Tooth Shape in the Carnivora

Alec J. Chiono
Sponsor: Peter C. Wainwright, Ph.D.
Evolution & Ecology

The Carnivora are an ecologically diverse group, and, despite their misleading taxonomic name, possess a range of diets from strictly carnivorous to almost herbivorous. This in turn has lead to diversity in tooth shape. By reconstructing the evolutionary history of tooth shape, we can learn more about the ecological history of these organisms. We collected diet data from the literature and took standardized photographs of specimens at the UCB MVZ. We then quantified tooth shape in 125 species of carnivorans by placing landmarks on four homologous points on photographs of the lower first molar. The two carnivoran suborders, Feliformia (cats and relatives) and Caniformia (dogs and relatives), were compared. Within both suborders, we found elongation of the shearing surfaces of the tooth in species with highly carnivorous diets. However, Feliforms and Caniforms achieved this elongation in different manners. Additionally, after splitting 50 mya, we found that Feliforms radiated quickly into their ecological niches and were unlikely to stray from them, while Caniforms had more changes in tooth shape, and therefore changes in niche, over time. These findings are in agreement with the established thought that highly carnivorous diets, more often found in Feliforms, act as an evolutionary dead-end.

Discovery and Characterization of Glycobiome-Derived Glycosyl Hydrolases for Prebiotic Production

Colleen Chiu
Sponsor: Alan B. Bennett, Ph.D.
Plant Sciences

Near the center of origin for the domestication of maize, several landraces hold a unique property of secreting mucilage from specialized organs called aerial roots. After sequencing and annotating the DNA of the bacteria present in the mucilage, it was found that there was a high number of glycosyl hydrolases (GHs). GHs are enzymes that facilitate the hydrolysis of glycosidic bonds in complex sugars where the covalent bond between two sugar residues is cleaved. Performing a BLAST search on coding sequences from the mucilage metagenome that had been annotated as "carbohydrate acting" revealed GHs from *Flavobacterium johnsoniae*, previously identified as an affiliate of plant glycan metabolism with nearly identical amino acid sequence homology. One identified GH of interest from *F. johnsoniae* belongs to Family GH51 and is classified as α-N-arabinofuranosidase, while the other two have activity targeted towards glycans composed by xylose residues. All three GHs have been produced and characterized through methods in enzyme kinetics that include the optimization of pH, temperature, and substrate specificity. We hypothesize that achieving a higher understanding of the linkage specificities of these novel GHs will lead to the synergistic exploitation of their unique functions to tailor customized plant oligosaccharides for use as prebiotics.

Encapsulated T7 Bacteriophages in Edible Food Coatings for the Reduction of *E. coli* on Fresh Produce

Angela H. Choi
Sponsor: Nitin Nitin, Ph.D.
Food Science & Technology

Pathogenic *Escherichia coli (E. coli)* contamination is one of the leading causes of foodborne illness in the nation. Although heat sterilization can be used to eradicate *E. coli* on cooked foods, it is not a viable option for fresh, ready-to-eat produce. To maintain the quality of these products, alternative methods must be innovated. My research focuses on developing an antimicrobial edible coating with encapsulated T7 bacteriophages (phages) that can be directly applied to fresh produce and reduce the risk of *E. coli* contamination. Due to the recent emergence of antibiotic-resistant bacterial strains, incorporating phages into novel packaging formulations can potentially provide an alternative antimicrobial solution, extend phage applications and generate widespread acceptance of their use. In this study, growth inhibition and viable count assays are utilized to evaluate the efficacy of the edible coatings. Simulated gastric digestion is also performed to determine the survivability of phages post-ingestion. Preliminary results suggest that phage-encapsulated edible coatings are successful in reducing *E. coli* populations with direct contact and phages cannot survive past the acidic environment of the stomach. These findings showcase the possibility of providing a safe and natural antimicrobial product without the use of synthetic chemicals or antibiotics to combat foodborne illness.

The Novel AUT1 and AUT2 Proteins Play Essential Roles in Mitosis in *Arabidopsis*

Yin Yin Chong
Sponsor: Bo Liu, Ph.D.
Plant Biology

Spindle assembly is essential for cell division among eukaryotes. Aurora kinases phosphorylate microtubule-associated proteins to assemble microtubules into the spindle array. In animals, the TPX2 protein acts as the essential targeting and activating factor of Aurora A kinase during mitosis. In the model plant *Arabidopsis thaliana*, we found that a homologous targeting factor AtTPX2 was not required for the activation of the homologous Aurora 1 kinase, suggesting there were other factors that targeted and activated Aurora 1 kinase. We identified two novel genes *AUT1* and *AUT2* that encoded homologous Aurora 1- binding proteins and might function redundantly. To test this hypothesis, we first generated *aut1* and *aut2* null mutants and found that neither one caused a noticeable phenotype, but double homozygous mutants were never recovered because of lethality. We also performed *in vivo* protein localization experiments through expressing an AUT1-GFP protein fusion and found its localization on spindle microtubules during mitosis, resembling the localization pattern of Aurora 1. Our results support that AUT1 and AUT2 play redundant roles in mitosis in *A. thaliana*. Future efforts are devoted to testing their interaction with Aurora 1 and revealing how spindle assembly is compromised upon the simultaneous loss of AUT1 and AUT2.

Polymerization of a Triblock Copolymer to Coat Fe(0) Nanoparticles for Magnetic Particle Imaging

Sarah Y. Chow
Sponsor: Angelique Y. Louie, Ph.D.
Biomedical Engineering

Magnetic particle imaging (MPI) is an emerging imaging technique that has been developing in recent years for applications such as diagnostic imaging using superparamagnetic nanoparticles. Thus far, researchers have implemented FDA approved iron oxide based magnetic resonance imaging contrast agents for MPI. However, these agents are not ideal MPI probes, and recent findings indicate that non-oxidized iron nanoparticles demonstrate better signal in MPI. To prevent the ready oxidation of Fe(0), we use a triblock copolymer, poly(methacrylic acid), poly(methyl methacrylate), and poly(styrenesulfonate) (PMAA-PMMA-PSS) reported in literature to protect the iron nanoparticle as a MPI probe. The PMAA block adsorbs strongly to Fe(0) nanoparticle and serves as the anchor to the magnetic core. The PMMA block is hydrophobic and hinders water access to the core to minimize iron oxidation, while the PSS block is hydrophilic and provides aqueous colloidal stability by strong electrosteric repulsions. Currently, PMAA has been successfully synthesized using atom transfer radical polymerization (ATRP) and will be characterized by gel permeation chromatography (GPC), followed by the addition of the other two blocks. The triblock copolymer is promising for coating the nanoparticles and paves the way for future applications in the biomedical field.

Chromosome Remodeling in Response to Meiotic Checkpoint Activation

Isabel Chu
Sponsor: Sean M. Burgess, Ph.D.
Molecular & Cellular Biology

Meiosis is a form of cell division that produces four haploid gametes from a diploid cell. An integral step in this process is the accurate segregation of homologous chromosomes, where defects in this process can result in aneuploidy leading to spontaneous abortions or birth defects in humans. Accurate segregation depends on pairing and recombination, which requires DNA double-strand break formation and repair. In *Saccharomyces cerevisiae*, budding yeast, the Pch2 protein plays an important role in monitoring and signaling defects in this process within the chromosome axis. A detected error activates the recombination checkpoint, triggering a delay in meiotic progression. A yeast-two hybrid screen conducted in the Burgess Lab found the protein Sqs1, an ATPase stimulator, to physically interact with Pch2. We further found null mutations in both Pch2 and Sqs1 are able to bypass the meiotic delay in checkpoint-activated strains. We hypothesize that Pch2 and Sqs1 play a role in remodeling the chromosome axis in response to checkpoint activation. We will assay the timing of meiotic progression through DAPI, a DNA binding dye, stained chromosomes and the binding of chromosomal axial protein Hop1 fused to green fluorescent protein (GFP) in mutants undergoing synchronized meiosis.

Assaying Highly Repetitive Regions in Dup15q Syndrome

Roy Chu
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology
School of Medicine

Dup15q syndrome, a genetic disorder due to a duplication of the 15q11-13 genomic region, is associated with autism spectrum disorders, developmental delays, and seizures. The breakpoints of chromosome 15 are of particular interest in studying this syndrome because abnormal breakage of chromosome 15 during meiosis is often the cause. Using whole genome bisulfite sequencing (WGBS), I compared DNA methylation differences of post-mortem human brain tissue between Dup15q patients and controls. Unfortunately, the highly repetitive sequence composition of the chromosome 15 breakpoints renders much of this region hidden through standard analyses. To improve the assay, I created a general-purpose bioinformatics pipeline which is not only able to assay this region, but other repetitive regions as well. Maximizing the proportion of sequence that is alignable increases the amount of data available as well as the accuracy of the final results. Using my pipeline, we were able to assay the DNA methylation of these breakpoints, which may help create cures and preventative measures for Dup15q Syndrome.

Creating a Next Generation Antimicrobial Protein Chimera to Combat Pierce's Disease in Grapevine

Austin Chua
Sponsor: Abhaya M. Dandekar, Ph.D.
Plant Sciences

Xylella fastidiosa (*Xf*) is a xylem inhabiting gammaproteobacteria which causes Pierce's Disease in grapevine. Different strains of *X. fastidiosa* cause different diseases in other important crops such as olive, citrus, alfalfa and almond. In order to reconstruct the immune system in grape, we have previously constructed a chimeric anti-microbial protein containing a pathogen recognition domain linked to a lytic peptide. Human neutrophil elastase (HNE) was chosen as the surface recognition domain while Cecropin B (CB) acts as a lytic domain. Now we wish to replace these domains with plant derived proteins with similar active sites and function. Using Catalytic Active Site Prediction (CLASP) software, we have identified such proteins from grape origin called VsP14 and PPC20. These proteins will help us engineer a cisgenic plant derived version of the HNE and CB chimera. Using *Agrobacterium* mediated plant transformation; we will express the chimeric protein in SR1 tobacco and *Vitis* species. Generated cisgenic plants will be challenged with *X. fastidiosa* infection to test the efficacy of the new plant derived chimera and heightened disease resistance.

The Upregulation of PDE4D by Hyperinsulinemia impairs Heart Function

Evan Chua
Sponsor: Yang K. Xiang, Ph.D.
Pharmacology
School of Medicine

Recent evidence in humans and in animal models of diet-induced obesity demonstrates that metabolic syndrome and obesity are associated with cardiac hypertrophy and contractile dysfunction. This research project aims to investigate the role of hyperinsulinemia and the excessive insulin signaling on the pathways affecting the cardiovascular system. The overall strategy is to analyze *in vivo* models (transgenic and High Fat Diet (HFD) mice), specifically their Insulin Receptor (IR) and Beta Adrenergic Receptor (βAR) signaling pathways, to determine the mechanisms of hyperinsulinemia-associated heart dysfunction. The βAR signaling pathway is associated with heart muscle contraction and cardiac output and is originally thought to be separate from the IR signaling pathway. However, preliminary studies indicate that IR and β2AR form a complex with one another in the heart, implying that insulin can affect β2AR. So far, we found that the expression of PDE4D (phosphodiesterase 4) was upregulated in the heart from HFD mice. PDEs are a class of enzymes that degrade cyclic AMP whose downstream effects affect cardiac contractility. This project confirms that upregulation of PDE4D contributes to heart dysfunction and examines the mechanism behind PDE4D upregulation in relationship to hyperinsulinemia through specific inhibitors and other analytic laboratory techniques.

Wearable Training Assist Device for Quantifying Intensity, Speed, and Power in Cyclists

Manuel S. Cisneros
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Neurobiology, Physiology & Behavior

Heart rate is a common biometric signal used by many athletes to monitor training intensity. There are many commercially available heart rate monitors designed to meet the needs of various athletes. These monitors use one of two common measurement techniques (electricrocardiogram (ECG), photoplythesmography (PPG)). The purpose of this project was to design and fabricate a heart rate monitoring system specifically for cyclists. The heart rate monitor was designed based on the PPG technique, requiring a light source and a photodetector. Light emitted from the light source penetrates through capillary tissue, where it is either absorbed or reflected by blood cells. The fluctuations of reflected light can be analyzed by a mathematical algorithm to determine heart rate. The optical heart rate monitor consists of a power source, micro-controller, display, and optical sensor. Heart rate can be monitored before, during, and after any physical activity by placing the sensor on the fingertip, earlobe, or any other capillary tissue. Future research can be conducted to validate the accuracy of this device by comparing heart rate data obtained from athletes by the optical sensor with data collected from the same athletes by a benchmark device, which for heart rate is a 12 lead ECG.

Just a Face: Communication on Online Support Forums

Kala L. Clark
Sponsor: Bo Feng, Ph.D.
Communication

Communication in online forums has been steadily increasing over past decades. Previous research in the field of communication has studied relational and health outcomes associated with online disclosure, yet few studies have attended to the relationship between source and recipient characteristics. The goal of the current study was to investigate the factors that influence an individual's likelihood of offering support online as well as the type of support provided. College students at the University of California, Davis participated in this study by responding to an online questionnaire after reviewing a screenshot from an online support forum. Participants were asked to rate their likelihood of offering support, provide a response, and were then prompted to evaluate their perception of the support seeker. It was predicted that perceptions of similarity would have the greatest impact on participants' likelihood of offering support, the quality of support given, and the types of support they would provide.

Ecological Dimensions of Reticulated Giraffe Conservation

Katie A. Clarkson
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Anthropology

The reticulated giraffe (*Giraffa camelopardalis reticulata*) is one of the more understudied subspecies of giraffe, with relatively little known in regards to social behavior and group structure in the species as a whole. Utilizing a pattern recognition program, it is possible to identify individual giraffe based on their unique neck patterns. This research will take field image data on individuals identified on Mpala Ranch in Laikipia, Kenya, to gather an estimate of overall reticulated giraffe population size on the reserve. Combining ExtractCompare, which uniquely fits a 3D model to each individual and creates an algorithm for each, with a mark-recapture analysis strategy, we can simultaneously assess the utility of ExtractCompare for our study and create an accurate estimate of reticulated giraffe population size on the reserve. For such an understudied organism, finding the best way to conduct group and population estimates may aid in fully understanding the impact of poaching and shifting land-use types in the region.

Assessing Abiotic Stress Tolerance in *Setaria viridis*

Kevin M. Coe
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Plant Sciences

S. viridis is a diploid monocot grass that utilizes C_4 photosynthesis and is becoming a model organism for C_4-type grasses. Although a number of different *S. viridis* accessions are being used for research, the response of these accessions to environmental stress has not been evaluated. Ten different accessions of *S. viridis* will be exposed to irrigated conditions, drought stress, and salt stress in the greenhouse for the duration of 14 days. The expression of Na^+/H^+ transporters will be assessed to determine salt tolerance during the experiments. Extraction and determination of the quantity of enzymes (ascorbate peroxidase, catalase, superoxide dismutase, and peroxidase) that protect plants from the deleterious effects of reactive oxygen species will provide an indication of the response(s) of the different accessions to salinity and drought. The results of these experiments will contribute to shed light on the capacity of the different accessions of *S. viridis* to respond to and tolerate drought and salt stress. These results will provide insight into which accessions are appropriate for studies related to drought and salt stress, but they will also provide a basis for identifying genes associated with the response of *S. viridis* to abiotic stress.

Intensive Meditation Training and Heart Rate Responding to Scenes of Human Suffering

Wesley O. Cohen
Sponsor: Clifford Saron, Ph.D.
Neurobiology, Physiology & Behavior

Previous literature has linked a specific class of empathy-related emotional responses and their accompanying physiological markers–generally qualified as outwardly focused and signaling empathic concern–to an increased likelihood to offer help when observing a suffering person. In our study, participants viewed a series of film segments depicting human suffering at two assessment points, three months apart; between assessment points, non-control participants practiced meditation daily during a three-month intensive retreat, intended to improve focused attention and develop compassion. I plan to analyze patterns of heart rate responses to these film trials, and compare mean heart rate change from baseline between the training and wait-list control groups during film segments that evoked high mean levels of self-reported sympathy across all participants. Following training, I predict that trainees will display greater cardiac deceleration than control participants during these segments, implying outward attention and empathetic sadness, rather than self-focused and aversive responses. By analyzing the effects of intensive meditation training on empathy-related responses to suffering, I hope to increase our understanding of how meditation can be used as a training to develop greater compassion and prosocial helping behavior.

Differential Scanning Calorimetry Study of Precipitation in a Nanostructured Aluminum Composite

Ryan Cohn
Sponsor: Julie M. Schoenung, Ph.D.
Chemical Engineering & Materials Science

In an effort to investigate the influence of the ceramic reinforcement phase on precipitation in heat treatable Al-7000 series alloys, nanostructured Al composite powder consisting of AA-7091 reinforced with 5 wt% submicron sized boron carbide (B_4C) was fabricated through cryomilling. The precipitation of η' $MgZn_2$ in the composite was characterized through differential scanning calorimetry (DSC) measurements at four different heating rates. The results were compared to nanostructured AA-7091 counterparts without any ceramic reinforcement. The activation energy of η' precipitation in each material was determined through Kissinger analysis. The results deviated from the expected linear trend, leading to further investigation of the statistical accuracy of the analysis. After repeating DSC experiments, it was determined that the difference in the resulting activation energies of η' precipitation between the two materials was too small to resolve. Shifts in the first exothermic peak temperatures were consistently observed, indicating that precipitation occurred at a higher temperature in the composite than it did in the alloy. The results support the hypothesis that the Al-B_4C interface affects η' $MgZn_2$ precipitation.

The Bantu World: Representations of Respectability and Delinquency

Sequoya S. Collins
Sponsor: Corrie Decker, Ph.D.
History

The interwar period in South African history has been thoroughly researched as a moment in which Africans experienced rapid urbanization and segregation, yet few studies illustrate how Africans created their own communities to alleviate the hardships under the colonial experience. The youth gang Amalaita and the Pathfinder scout-like movement were two contrasting images in *the Bantu World*,a popular and important newspaper intended for South Africa's middle class indigenous population. One image represented young male delinquency and the other represented young male respectability. At the same time, urban African women struggled against the newspapers' negative representations of them as sellers of illegal drink and thus a threat to female respectability. This threat was evident in a series of knife attacks in 1937 linked in the newspapers to African women's participation in urban cultures. My paper will illustrate how the African middle class viewed these groups and how these groups viewed themselves. By analyzing the Bantu World and other South African newspapers, this paper demonstrates how gender, violence, and notions of respectability intersected in order to provide African men and women access to status and privilege denied them in interwar South Africa.

Lactobacillus plantarum B38 Reduces Populations of Potential Pathogens in a Nursing Mammal Model of Human Neonates

Lindsey N. Contreras
Sponsor: David A. Mills, Ph.D.
Food Science & Technology

Recent work has shown that host-derived glycan monomers can facilitate the growth of intestinal pathogens, including *Salmonella* and *Clostridium difficile*. As probiotics have a growing body of work to demonstrate their safety and therapeutic potential, we tested whether a *Lactobacillus* could be applied to reduce similarly freed milk sugar monomers in nursing pigs and whether this resulted in a reduction in populations of potentially pathogenic Enterobacteriaceae. We sequenced the genome of *Lactobacillus plantarum* B38 and found that it is capable of consuming these sugars. We then measured its ability to grow on select components of milk sugars, including sialic acid (Neu5Ac) and N-acetylglucosamine (NAG). Finally, we tested the ability of B38 to reduce populations of Enterobacteriaceae in nursing pigs, where Neu5Ac and NAG may promote the growth of these and other intestinal pathogens. Using quantitative PCR, we quantified populations of B38 and select taxa that are known to consume these sugars and showed that B38 supplementation reduced problematic populations throughout the digestive tract of 14-day-old pigs. These findings suggest that *L. plantarum* B38 and this strategy may help to reduce populations of potential pathogens in nursing mammals, and that milk sugar components may contribute to infection in neonates.

The Effect of Forced Eye Contact on Problem Solving for School-Age Children With Autism

Emma C. Cooper
Sponsor: Peter C. Mundy, Ph.D.
School of Education

Maintaining eye contact with others may interfere with problem solving during social interactions, especially for individuals with Autism Spectrum Disorder (ASD). One study suggests that both children with ASD and children with typical development (TD) perform poorly on math tasks when required to maintain eye-gaze (Riby et al., 2012). However, some children with ASD displayed a greater negative effect of eye contact. In this study, we explored two objectives: 1) to examine whether eye contact impairs cognitive performance in children with ASD more severely than in other groups of children, and 2) to determine if this effect is moderated by anxiety or attention problems in the children with ASD. Eighty children with ASD, 40 with ADHD and 40 with TD will participate. Videos will be taken while children listen to simple math problems, think about solutions and provide verbal answers. Math problems will be presented in two conditions: one with no restraint on the participant's gaze, and one where the participant is required to maintain eye contact with a tester. Analyses will be conducted to assess whether children with ASD and anxiety or attention problems display a greater negative impact of forced eye contact on problem solving than other children.

Interrupting the MXD3/AX Complex to Test for Max-Independent Function in Cancer Proliferation

Abraham Corrales
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Pharmacology
School of Medicine

Uncontrolled growth of cerebellar granule neuron precursors (GNPs) leads to the development of medulloblastoma, the most common brain tumor in children. Mutations in the Sonic Hedgehog (Shh) signaling pathway lead to medulloblastoma in mice and humans. In previous studies, the Diaz lab identified MXD3 as a critical regulator of mouse GNP proliferation and as down stream target of the Shh pathway (Yun et al., 2007). Furthermore, MXD3 is an important regulator of the proliferation of human medulloblastoma cells (Yun et al., 2007, Barisone et al., 2012). MXD3 is a basic-helix-loop-helix-leucine-zipper (bHLHZ) transcription factor that is part of the MYC/MAX/MXD transcriptional network in which MYC and MXD form heterodimers with MAX through the leucine zipper domain to exercise opposite cellular responses. MYC/MAX heterodimers are associated with cell proliferation while MXD/MAX heterodimers are associated with differentiation and repression of cell cycle progression. MXD3 is an atypical member of the MXD family because it promotes cell proliferation like MYC (Yun et al., 2007). These data suggest a possibility that MXD3 may be able to function through a MAX-independent pathway. Here we test if MXD3 has MAX-independent functions by mutating the leucine zipper (LZip) region of MXD3 that is required for association with MAX.

Basking Site Distribution of Native and Introduced Turtle Populations in the UC Davis Arboretum Waterway

Ian Cossman
Sponsor: Brian D. Todd, Ph.D.
Wildlife, Fish & Conservation Biology

The UC Davis Arboretum waterway hosts both the native Western Pond Turtle (*Emys marmorata*) and the invasive red-eared slider (*Trachemys scripta elegans*). *T. s. elegans* is highly invasive in many urbanized habitats worldwide, yet few studies have focused on the ecological consequences of their introduction. Competition for basking sites is one likely consequence, and observational studies by Lambert et al., 2013, suggest that these two species utilize basking sites differentially, potentially resulting from innate preferences to particular basking site characteristics. Since this study, the Arboretum has undergone a habitat modification project to restore the Western Pond turtle population. I compare basking behavior before and after these modifications to determine if differential basking site use is caused by innate preferences to physical properties of basking sites. The following features are compared: water depth, slope at the water's edge, midslope between basking site and path, substrate, and degree of shading. Preliminary observations support preferences for steeper slope and shallower water depth for native turtles. Identification of these characteristics will clarify a mechanism for differential basking site preference and provide directions for future turtle conservation efforts in the Arboretum and other urbanized waterways.

Hydraulic Fracturing and the UC Davis Opinion

Jordan T. Costello
Sponsor: Gwen Arnold, Ph.D.
Environmental Science & Policy

Hydraulic fracturing, or "fracking", involves drilling into underground shale formations using highly pressurized liquid to create fissures from which oil and gas can be extracted. This research explored the level of knowledge and opinions UC Davis students have towards fracking, and influencing factors. I sent an original, 10-question online survey to 1,044 UC Davis students; the survey achieved a 12% response rate. The targets consisted of the Environmental Sciences listserv, the University Honors Program listserv, and Kappa Kappa Gamma sorority. The goal was to study the knowledge and opinions of Environmental Science majors, honors students, and the female population. The survey was designed to explore 3 main hypotheses: 1) Increased knowledge about hydraulic fracturing is positively associated with a negative opinion of hydraulic fracturing; 2) The number of information sources is positively associated with a negative opinion of hydraulic fracturing; and 3) A more liberal political opinion is positively associated with a negative opinion of hydraulic fracturing. The results suggest that the UC Davis undergraduate community tends to have stronger opinions towards hydraulic fracturing as number of information sources and knowledge about the process increases. I plan to conduct further analyses to confirm the statistical significance of these relationships.

Characterizing the DUF642 Genes in *Nicotiana benthamiana* Using Virus Induced Gene Silencing

Samantha Cowdin
Sponsor: Stacey L. Harmer, Ph.D.
Plant Biology

The DUF642 genes are a relatively uncharacterized family of genes. Studies in the model plant *Arabidopsis thaliana* have implicated their involvement in seed development and cell wall related processes. Through comparative analysis we identified five, eight, ten, and fourteen members of this family in *Cucumis sativus*, *Solanum lycopersicum*, *Arabidopsis thaliana* and *Nicotiana benthamiana*, respectively. Phylogenetic analysis revealed several instances of in species duplications which suggest functional redundancy. My project aims to characterize the DUF642 proteins in *N. benthamiana* using a reverse genetics technique, virus induced gene silencing (VIGS). VIGS takes advantage of plants' natural antiviral mechanisms to silence selected genes and is a fast method to silence multiple genes at once to better identify associated mutant phenotypes. Gene specific sequences were identified and assembled into a chimeric sequence to be incorporated into a viral vector. Upon plant injection by this engineered virus, the different parts of the chimera sequences will silence the complementary sequences of the transcriptome - the DUF642 genes. Phenotypic differences in control and treated plants will be recorded. This research would offer direct evidence concerning the biological functions of the DUF642 gene family, processes that may well be conserved across plant species.

Development of a Hand-Held Biolistic Device for Plasmid Delivery and Transient Gene Expression in Plants

Donald J. Coyle
Sponsor: Bryce W. Falk, Ph.D.
Plant Pathology

Our biolistic device utilizes pressurized helium as a driving force and 1 µm diameter gold spheres as a carrier to deliver DNA constructs into plant tissue samples allowing expression of genes of interest within target cells. Our constructs express plant viruses, allowing the study of virus replication and infection in plant hosts. By utilizing biolistic delivery versus transmission via feeding by insects or infiltration by *Agrobacterium tumefaciens*, a broader range of host species can hopefully be infected at higher rates with reduced time, input, and cost. Two different preparation methods of creating DNA/gold constructs were successful in delivery at 5, 6, or 7 bar of 1 µg DNA encoding a GFP recombinant *Tobacco mosaic virus*, carried on 0.5 mg of gold causing expression of the virus in *Nicotiana benthamiana* plants. Four future experiments are scheduled. First, to vary the amount of DNA and gold to find the minimal amounts needed for efficient expression of gene product. Next, create RNA/gold constructs and use to cause infection. Then, we will assess infection of other plant species. Finally, delivery of genes to insects will be attempted.

Parental Hostility Mediates the Association Between Parenting Practices and Punishment as an Emotion Socialization Strategy Toward Young Children

Ashley Crouch
Sponsor: Katherine Conger, Ph.D.
Human Ecology

Darling & Steinberg (1993) frame parenting style as a context for understanding child development. Further, they suggest that parenting style and practices must be examined together to gain a more accurate representation of parent socialization practices and how those practices predict child socialization and outcomes. This study examines the association between negative childrearing practices and punishment as an emotion socialization strategy, and whether parent hostility mediates this process. The sample included 119 (56 female) 2-5 year old children and their parent(s) recruited from the Family Transitions Project, a 25 year longitudinal study with over 500 Midwest families. Negative childrearing practices, parental hostility toward the child, and punishment as a response to child negative emotionality were reported by parents; scale reliability was satisfactory (α = .66-.82). As expected, negative childrearing, hostility, and punishment in response to child anger were significantly and positively correlated. No significant sex differences were found for the association between negative childrearing practices and punishment toward child anger. Hostility significantly mediated the association between negative childrearing practices and punishment in response to anger (.47 reduced to .28). Results suggest that hostility functions as a mechanism between childrearing practices and punishment, and identifies a possible point of family intervention.

LRIG1 Regulation of Canonical Wnt Signaling in Breast Cancer Cells Through Interaction With the Wnt Co-Receptor LRP6

Amanda M. Cruz
Sponsor: Colleen Sweeney, Ph.D.
Biochemistry & Molecular Medicine
School of Medicine

Despite dramatic improvements in screening, prevention and treatment of breast cancer over the last few decades, one in every eight women in the United States will be diagnosed with breast cancer during her lifetime. Up to 20% of these cases are classified as being "triple negative" (TNBC), as they test negative for the three pathological hallmarks of other breast cancer subtypes and have a poor prognosis with a dramatic decrease in survival. In the past, studies have suggested aberrant activation of the canonical Wnt signaling pathway in TNBC. Upon activation, this pathway stabilizes a protein called β-Catenin, which activates expression of genes implicated in the growth and spread of cancer. As such, the proteins involved in the activation of the canonical Wnt signaling pathway may serve as novel molecular targets for TNBC. Previous studies in our laboratory have implicated a protein called LRIG3 (Leucine reach repeat protein 3) in the stabilization of a Wnt co-receptor called LRP6 (Low density lipoprotein receptor 6). Additional studies from our laboratory have shown that LRIG1 (a tumor suppressor called Leucine rich repeat protein 1) and LRIG3 functionally oppose each other. Therefore, I hypothesize that LRIG1 inhibits canonical Wnt signaling through interaction with LRP6.

Knowing the World: Design Though the New Sciences of Human Nature

Ricardo Cruz
Sponsor: Christina Cogdell, Ph.D.
Design

The new sciences of human nature illuminate an understanding of ourselves that cuts across multiple fields of scholarly endeavor. Biology, psychology, evolution and sociology are bridged by an interest in how each contribute and interact to prescribe an end-product that sees, feels, and navigates the world. How can that knowledge become a framework to illuminate further fields of research? Design, across multiple branches, is primarily concerned with humans and how create experiences that facilitate learning and function. It is then in our best interest to understand humans as best we can. The objective goals of design have a long history that spans art, entertainment, markets, and products therefore offer a trajectory of successes and failures that speak to what good design can be. In this way human nature informs design thinking while new approaches to researching design can illuminate an understanding of ourselves.

Mapping Domains of Nrdp1-Mediated Ubiquitination in Dvl1

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Glioblastoma is a rapidly progressing, fatal brain cancer diagnosed in more than 11,000 patients within the U.S. every year. Despite multimodal treatment typically including surgery, radiation, and chemotherapy, the median survival time is only 14.6 months due to high rates of invasion and recurrence. Expression of non-canonical Wnt signaling components is elevated in glioblastoma. This developmentally important pathway includes the protein Dishevelled (Dvl1), a critical signaling hub that promotes tumor cell motility and invasiveness. Our findings indicate that Nrdp1, a RING finger E3 ubiquitin ligase, can ubiquitinate and suppress the function of Dvl1. However, Nrdp1-mediated ubiquitination of Dvl1 does not signal the protein for proteasomal degradation and the molecular consequences leading to its inhibition of non-canonical Wnt signaling have not been elucidated. The project presented here aims to identify the region(s) of Dvl1 that are ubiquitinated by Nrdp1. Dvl1 contains three highly conserved structural domains: the DIX, PDZ, and DEP domains. The DEP domain is necessary for non-canonical Wnt signaling; therefore, I hypothesize that Nrdp1 ubiquitinates the DEP domain of Dvl1. Preliminary data using Dvl1 mutants lacking ubiquitination sites in each domain indicate that Nrdp1 does not exclusively ubiquitinate the DIX or PDZ domain of Dvl1.

Analyzing the Ability of a Local Population of Stickleback Fish to Respond to Visual Cues

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Animal Science

Recent research supports that different populations of stickleback fish, Gasterosteus aculeatus, rely on spatial and visual cues to find food and safety (Odling-Smee, Braithwaite, 2003). In this experiment a t-maze was used to train the stickleback to locate a food reward associated with the color purple. Throughout testing, the time required for stickleback to reach the desired target was recorded as evidence of learning. The objective of this experiment was to record the ability of Putah Creek Stickleback to learn to respond to a specific visual cue. Histology of organ tissue allows for the identification and analysis of organ structures and tissue compositions of the Stickleback. This information can be used to draw connections between structures within the control centers of the fish and the observed learning behavior. This experiment is similar to experiments performed using other stickleback populations (Odling-Smee, Braithwaite, 2003). The results of this experiment could help determine the stickleback's ability to respond to changing environments. Upon successful training of this associative learning, further experiments can be done with certain addictive substances. A possible question is whether nicotinoid insecticides found in polluted stream waters improve the time it takes for the stickleback to swim to the desired target.

Pharmacokinetics of Chloramphenicol in Horses

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This project investigates the relative bioavailability of the antibiotic, chloramphenicol, and how this drug is absorbed and eliminated in horses. The pharmacokinetics of two compounded preparations of this drug were also investigated. Previous drug absorption studies have shown inconsistencies in the absorption of chloramphenicol, suggesting a short half-life and variable oral absorption in horses. This project aims to evaluate the pharmacokinetics of three forms of chloramphenicol in horses: FDA approved human tablets, compounded suspension, and compounded paste. The hypotheses are 1. The concentrations of chloramphenicol after oral administration in horses will be significantly lower than that reported for humans, and 2. The relative absorption of compounded preparations will be even lower. These results will help veterinarians better understand how to correctly prescribe chloramphenicol. In order to properly investigate this issue, chloramphenicol will be administered to seven horses through a single oral dose of each formulation of chloramphenicol, administered in a randomized, cross over design. Blood will be collected in set time intervals, using jugular catheters. The concentration of chloramphenicol in serum will be measured. A future component of this study will determine the pharmacokinetics of chloramphenicol in horses after multiple doses and steady state concentrations have been achieved.

The Application of RGD Peptides in Enhancing Oral Vaccine

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Molecular & Cellular Biology

Pathogen transcytosis through Microfold cells (M-cells) on the intestinal epithelial layer plays a critical role in eliciting antigen-specific immunity at mucosal surface. Thus, the delivery system targeting M-cells is proven to effectively induce mucosal immunity in laboratory animals. On apical surface of the M-cells, $\alpha 5\ \beta 1$ integrin exists at high concentration and specifically recognize the Arginine-Glycine-Aspartic (RGD) motif. In this project, we aim to genetically insert the cyclic peptide containing RDG motif onto the surface of hepatitis E viral like particle (HEV-VLP). This insertion of RGD was expressed via the baculovirus expression system. The proposed cyclic RGD peptides (CDC**RGD**CFC) is designed to stabilize RGD loop with two pair of cysteine residues that form stem of disulfide linkage. The self-assembled HEV-VLP possesses icosahedral symmetry with 60 copies of RGD-motif on the surface, the enhanced local concentration is predicted to effectively induce strong binding to the M-cell, therefore lead to specific targeting for gene therapy.

Diagnosing and Mitigating Electronic Noise in the Mini-CAPTAIN Liquid-Argon Time Projection Chamber

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Physics

Mini-CAPTAIN is a liquid-argon time projection chamber under development at Los Alamos National Laboratory. Mini-CAPTAIN forms a reduced-scale prototype for the CAPTAIN (Cryogenic Apparatus for Precision Tests of Argon Interactions with Neutrinos) neutrino detector, itself part of larger research and development efforts for Fermilab's Long Baseline Neutrino Facility. Early in its construction, mini-CAPTAIN displayed critical levels of electronic noise on its wire planes—its primary particle detection apparatus. We systematically diagnose this noise: first, we perform a frequency analysis to identify periodic noise sources such as radio frequency interference. Second, we perform a detailed analysis of the detector electronics design, from wire planes to digitizer. Third, we develop a detector readout software package to map the digital output back onto the wire-plane geometry, and to characterize the noise on each detection wire. From our diagnosis results, we develop and implement an engineered solution to mitigate this noise. Finally, we demonstrate our solution's successful reduction of mini-CAPTAIN's wire-plane noise to well within acceptable levels for particle detection.

Shade Avoidance Response in Elongated Internode Mutants of *Brassica rapa*

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Plant Biology

The global food supply is under increasing pressure from the expanding human population, climate change, loss of agricultural land, and demand for biofuels. A better understanding of both basic and applied plant biology is critical to meet these challenges. Shade avoidance response (SAR) is a natural response whereby plants grown in high density or shade environments display a variety of phenotypes, which can result in loss of yield. At the genetic level, the phytochrome B (phyB) gene is responsible for sensing shade. In order to characterize this gene in *Brassica rapa*, wild type (B3) and phyB mutants (ein9, ein 194, and ein 40) were analyzed collectively. Through phenotypic measurements such as hypocotyl, internode, petiole, and blade length, it was shown that the mutants had an elongated phenotype regardless of whether they were grown in the shade or the sunlight. Molecular biology experiments including PCR and RNA sequencing were completed to determine the location and precise nature of the mutations as well as the genes and pathways involved. By studying the shade avoidance response of mutants, we can extend the knowledge to crops to manipulate the SAR in a way that may allow us to increase biomass and seed yield.

Understanding Genotype by Environment Interaction in *Brassica rapa* Under Crowding and Limited Nutrient Availability

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Plant Biology

More and more space is required to grow crops to sustain our rapidly expanding human population in the face of climate change. However, increasing crop density on the farmland we currently have may limit seed/biomass yield. This is due to shade avoidance in crowded conditions and increased competition for a limited supply of nitrogen. To better characterize plant resource allocation under these limitations, we measured and compared the morphological and physiological changes in two *Brassica rapa* parental genotypes grown in field conditions. Tradeoffs between reproductive traits such as flowering time and seed yield and vegetative characteristics such as leaf size and plant height under different density and nitrogen treatments are being compared. These indicate how much plant resource regulation is environmentally and genetically dependent. I am currently analyzing this dataset in the R programming environment. Understanding plant response to shade and limited nitrogen can help maximize productivity in crops, such as the agriculturally important oilseed *B. rapa*.

Effects of Varying Cardiac Progenitor Cell Density in Hyaluronic Acid Hydrogels on Neovascularization

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Biomedical Engineering

Many tissues in the body are non-regenerative, once they have been damaged they cannot be healed by the body alone. Tissue Engineering, the integration of cells, scaffolds and biochemical signals is the up-and-coming approach of tissue regeneration.This project, in particular, focuses on neovascularization. Cardiac progenitor cell (CPC) encapsulation in acrylated hyaluronic acid hydrogels conjugated with transforming growth factor β1 (TGF β1) bound heparin, arginylglycylaspartic acid (RGD), and crosslinked with matrix metallopeptidase 13 (MMP13) has shown improvement in the field of neovascularization. This particular study explores changes in cell viability, cell spreading, endothelial spindle formation, and endothelial cell differentiation when varying the CPC encapsulation density *in vitro.* Results show that cell function is not ideal at very high (15 million cells/ml) densities and very low (1 million cells/ml) densities. These results suggest that cell-to-cell interactions, cell-to-surface interactions, adequate surface space, and cell hindrance all play a role in proper cell function and tissue regeneration.

Light Controls Lettuce Seed Germination Through *LsGA2ox2*

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Plant Sciences

California produces 90% of the U.S. lettuce crop. Its seedling establishment depends on seed germination that is regulated by genetic factors and environmental cues such as water, temperature and light. Seeds of some genotypes such as Salinas (*Lactuca sativa*) and W48 (*L. serriola*), can germinate in the dark, whereas seeds of Grand Rapids (*L. sativa*) and US96UC23 (*L. serriola*) require light after hydration to promote germination. Using Quantitative Trait Locus (QTL) analysis of a Recombinant Inbred Line (RIL) mapping population derived from Salinas and US96UC23, a significant QTL for germination light requirement was mapped to lettuce chromosome 7. A candidate gene, *LsGA2ox2*, was subsequently identified based on its distinct expression pattern in the two parental genotypes in response to light. The gene encodes an enzyme responsible for inactivation of gibberellin, a plant hormone required for seed germination. DNA sequence analyses revealed that the deduced protein sequences of the *LsGA2ox2* genes from both dark-germinating and light-requiring genotypes are identical, and molecular complementation showed that *LsGA2ox2* from lettuce can restore a light requirement to seeds of the Arabidopsis *ga2ox2* mutant, confirming that *LsGA2ox2* is involved in regulating light responses of seed germination.

Characterization of the Cag Pathogenicity Island in *Helicobacter pylori* From Naturally Infected Rhesus Macaques

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Helicobacter pylori is a bacterium that commonly infects the gastric mucosa and epithelial layer of the human stomach and causes several gastric diseases, including peptic ulcers, gastric adenocarcinoma, and gastric lymphoma. *H. pylori* is a genetically diverse species, and the most important bacterial virulence factor that increases the risk of developing disease, versus asymptomatic colonization, is the presence of a cytotoxin associated gene pathogenicity island (*cagPAI*). The *cagPAI* encodes a type IV secretion system (T4SS) that translocates the *cagA* oncoprotein into epithelial cells, and is required for the induction of the pro-inflammatory chemokine, interleukin-8 (IL-8). Socially housed rhesus macaques often are naturally infected with *H. pylori* similar to humans, but little is known about their *cagPAI*. Here we present data showing the prevalence of the *cagPAI* in *H. pylori* strains isolated from naturally infected rhesus macaques. Our results indicate that infection with *H. pylori* strains processing the *cagPAI* was ubiquitous among rhesus macaques, that these strains were able to induce IL-8, and that the DNA sequence is highly related to strains found in human infection. These results provide evidence for the usage of rhesus macaques as a valid experimental model for *H. pylori* infection in humans.

Effects of Nutritional Manipulation on Mammary Gland Development in Pigs

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Animal Science

The mammary glands are conserved across all mammals, where breasts of humans produce milk during lactation to feed infants and can become a site of cancer. Optimizing lactation also enhances the production of dairy and meat. Dietary manipulation is an effective tool for increasing mammary gland development and studying how obesity affects breast cancer risk. Two experiments using pre-pubertal female pigs are being conducted. Animals in Experiment 1 were assigned to one of six treatments that provided differing amounts of dietary lysine and metabolizable energy (ME; 85% and 100% lysine and 85%, 100%, and 115% ME in a 3x2 factorial arrangement). Animals in Experiment 2 were assigned to one of two treatments: a control diet or 120% ME diet. Samples of mammary gland tissue were collected at necropsy in both experiments and throughout Experiment 2 for the analysis of cell proliferation by localizing phosphohistone H3 with immunohistochemistry, and by whole mount examination. We anticipate that a high-energy diet will induce more mammary gland development. Assessing how nutrition affects mammary gland development will provide a greater understanding of how diet affects lactation potential and the effects of obesity on mammary gland development and breast cancer risk.

Predicting Native American Travel Routes in the Clear Lake Basin, California

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Anthropology

With the growth of geographic information systems (GIS), a mapping and spatial analysis technology, archaeologists have been able to generate predictive models for the movement of humans in the past, and the distribution of sites and artifacts. Least cost path analysis is one such model that can compute the easiest path a person could travel from one point to another. This research examines least-cost models that account for the slope of the landscape, as well as surface conditions and vegetation coverage, to predict the amount of energy expended during travel. The model is applied to calculate the optimal paths between eight known Native American sites in the Clear Lake Basin of Central California. Observing overlap of these paths reveals potential high-traffic areas used as travel routes in between sites. This research will be used as a guide to direct planned archaeological survey in the area during summer 2015, and is an advancement in the methodology of least cost analysis.

The Correlation of Endoplasmic Reticulum Aminopeptidase 1 and 2 Polymorphisms With Sebaceous Adenitis, an Autoimmune Disease of Standard Poodles

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Purebred dogs often suffer from autoimmune diseases. Some polymorphisms of the Endoplasmic Reticulum Aminopeptidase 1 and 2 (*ERAP1* and *ERAP2*) genes are correlated with autoimmune diseases in humans, but no prior research has explored the relationships of these genes with autoimmune diseases in dogs. In this study, we sought to determine if a correlation exists between Sebaceous Adenitis, a common autoimmune disease of Standard Poodles, and polymorphisms in the *ERAP1* and *ERAP2* genes. To achieve this, we first sequenced *ERAP1* and *ERAP2* in dogs and identified 9 single nucleotide polymorphisms (SNPs) in *ERAP1* and 12 in *ERAP2*, several of which caused amino acid changes (4 changes in *ERAP1* and 4 in *ERAP2*). We then developed a Sequenom assay to identify these SNPs in 203 Standard Poodles. We noticed that the polymorphisms were linked to form "haplotypes." Standard Poodles had 10 distinct haplotypes in *ERAP1* and 13 in *ERAP2*. Relative risk was used to determine if any of the haplotypes correlated with Sebaceous Adenitis in Standard Poodles, but no significant correlation was found. Further study is needed to determine if there are other regions in the genome that may indicate genetic predisposition to this disease.

PKD Modulation of the β-adrenergic Signaling Pathway

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Dysregulation of the beta-adrenergic (β-AR) signaling pathways is a hallmark of heart failure, leading to beta-blockade as a cornerstone of current therapeutic strategies. Protein kinase D (PKD) has recently emerged as another pivotal signaling point in maladaptive cardiac remodeling. Moreover, there appears to be profound crosstalk between β-AR signaling and PKD: β-AR stimulation dramatically reduced PKD signaling following Gq-coupled receptor stimulation. It is unknown whether PKD conversely affects the β-AR signaling pathway. Here we investigate if PKD activity likewise modifies the β-AR signaling pathway. We test the hypothesis that PKD affects the β-AR signaling pathway at the level of the β-adrenergic receptor. We measured expression levels of β-AR cascade components in PKD knockout vs. wildtype hearts via Western blotting. Translocation of GFP-tagged β-ARs following ISO stimulation (i.e. signaling termination) was measured with confocal and total internal fluorescence (TIRF) microscopy and cAMP signals emanating from the receptors were measured with the FRET biosensor ICUE3. These studies provide novel insight into the regulation of the β-AR signaling pathways and the role of PKD in the heart.

Menopause: The Effects of Hormonal Changes on the Function and Inflammatory Responses to HIV in the Intestinal Epithelium

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Cardiovascular disease (CVD) causes death in over one million people annually in the United States. For women, the onset of menopause increases their susceptibility to inflammatory conditions such as CVD especially in the context of Human Immunodeficiency Virus (HIV). HIV infection affects the gut barrier function and increases intestinal microbial translocation; however, the effects in post-menopausal women who are experiencing hormonal changes is not well understood. In this study, we examine the effects of 17β-estradiol (E2) and HIV infection on intestinal epithelial cells. We hypothesize that epithelial cells grown with E2 will have decreased inflammatory responses to HIV and improved function. Small intestine (Caco2) epithelial cells were treated with E2 and exposed to either HIV, 16S bacterial DNA, or both. Epithelial proliferative response was analyzed by the MTT assay, inflammatory response by real-time PCR, and tight-junction integrity by transepithelial resistance (TEER). Caco2 cells show a decrease in inflammatory response to HIV and a large increase in TEER and proliferation in the presence of physiological levels of E2. Thus, intestinal epithelial cells show fluctuations in function and inflammatory response to hormone changes and HIV infection indicating that more studies are needed to delineate these effects.

Behavior Classification From Accelerometer Data in Greater Sage-Grouse (*Centrocercus urophasianus*)

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Evolution & Ecology

Observing animal behaviors in the wild rather than in captivity has the benefit of allowing subjects to express their full range of natural behaviors, but also the challenge of increased difficulty in measuring behaviors when animals range widely or are wary of humans. Recent technological advancement in bio-logging techniques offer new methods to address this challenge. Here, we tested accelerometer-based behavioral classification in the Greater Sage-Grouse, (*Centrocercus urophasianus*), a bird species of conservation concern. Male sage-grouse display for females on breeding grounds called leks, but they are difficult to locate and observe when roosting and foraging off the lek. To study their off-lek activity, we tracked males with GPS-accelerometer tags that record movement and behavioral data, respectively. We developed decision algorithms to classify behaviors such as walking, foraging, and standing based on the behavioral data and trained these algorithms with video recording of on-lek behaviors of tagged birds. To further validate classification outputs, we tested whether these behaviors matched likely behaviors inferred from the movement data. Our study affirms that accelerometers, in conjunction with other monitoring technology, can provide critical information regarding the importance of various portions of their habitat and ultimately facilitate species conservation.

The Social Limitations of Gender Expression

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Sociology

Many transgender and gender non-conforming boys express their femininity by only associating with toys and ideas that mainstream culture defines as being for girls. Drawing on semi-structured interviews with parents who self-identify as supporting their gender non-conforming child and through analyses of data coded from children's toy magazines, I examine how cultural constructions of what it means to be feminine and masculine affect the ways that transgender girls and gender non-conforming boys enact femininity. These children often show their "girlness" through love of the color pink, obsession with Disney princess movies or playing dress-up, all things that are represented as feminine in mainstream culture. Further, several children in this study explicitly link being female with the ability to give birth and fulfilling the role of a mother. These children choose to enact femininity mainly through association with what society defines as feminine, which shows that definitions of femininity and masculinity are increasingly narrow; they may want to be a different kind of girl, but do not see any others represented in the media. Through an analysis of these behaviors, I argue that the media, toyshops and our culture restrict the ways that children can express their gender.

Genetic Variation in Sensitivity of *Fusarium circinatum* to Monoterpene Constituents of Pine Resin

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Plant Pathology

Pitch canker, a disease caused by the fungus *Fusarium circinatum*, results in tip dieback, loss of branches, and occasionally, death of entire trees. Monterey pine, *Pinus radiata*, a species native to California is the most widely affected host of this pathogenic fungus, and is especially vulnerable to pitch canker. Although *Fusarium circinatum*is known primarily as a pathogen of pines, recent studies have shown that this fungus can also colonize grasses1. If *F. circinatum* became a pathogen of pine following a host jump from a grass species, it would need to be able to grow in the presence of monoterpenes, which are found in pine resin2. To determine if *F. circinatum* has retained variation in this trait, 30 progeny of a cross between wild type isolates of *F. circinatum* were grown in a saturated atmosphere of monoterpenes. The reduction in growth relative to growth in the absence of monoterpenes was recorded for all 30 progeny. Variation in tolerance of β-pinene and limonene was significant ($p < 0.0001$). Experiments with the monoterpenes α-pinene and myrcene are currently underway. Inoculation of *P. radiata* will show if tolerance of monoterpenes correlates with virulence to pine.

Is God Really There?: Considering Issues of Presence and Brilliance in Byzantine Icon Paintings

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Art & Art History

Using visual evidence from immediately before and after Byzantine iconoclasm, this essay examines the use of icons during traditional Orthodox prayer in tandem with the preservation of brilliance over the conflict-ridden eighth and ninth centuries in the Byzantine capital, Constantinople. Through this comparison, what is revealed is the power innate in color and brilliance which is exemplified in the spiritual experience achieved through image-guided prayer and the turmoil caused by these potent images. Other avenues of investigation include the preservation of artistic techniques tied to brilliance, such as translating the well-known Byzantine mosaic tradition to the more personal icon painting tradition. Also how the idolatrous worship of miracle icons fed the beliefs that artists were possessing too much power and finally the reaction of Orthodox officials towards iconophiles. The fact that simple tempera and encaustic paintings on wooden panels could induce holy visions and instigate murderous rampages against monks and iconophiles truly speaks to the power that color and brilliance possess.

Competitive Transgenerational Adaptations in Grasses *Bromus hordeaceus* and *Aegilops triuncialis* Are Induced by the Presence of Competition

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Evolution & Ecology

Adaptive phenotypes can arise from genetic changes and from plastic responses to the environment due to epigenetics and transgenerational effects. Here, we explore how the competition density of a maternal plant can affect the performance of her offspring in the next generation when growing in the presence and absence of competitors. If the plant's offspring is maturing under similar competitive regimes as the parent, adaptive change might allow the offspring to be a better competitor. To assess this possibility, seeds from grasses *Bromus hordeaceus* and *Aegilops triuncialis*, coming from parents with either high or low competition history, were grown under five different competition treatments: alone, and with high and low densities of conspecific and heterospecific competitors to gauge the relationship between maternal history and subsequent performance of the offspring across competition environments. Focal performance included measuring above ground biomass, height, number of leaves and tillers. We find that when maternal competition background matched offspring background, offspring had the highest fitness. Interestingly, when grown in the absence of competition, there were no differences in performance between offspring with different histories. Thus, response to competition is an induced response, and responses to high and low competition are different.

Uncovering the Role of TORC2-Sphingolipid Signaling in Regulating Caloric Restriction Induced Autophagy

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Molecular & Cellular Biology

Autophagy is a catabolic process that degrades cellular components to facilitate homeostasis and adaptation upon nutrient deprivation. Misregulation of autophagy is linked to numerous metabolic and neurodegenerative diseases, including cancer and Parkinson's disease. Recent work demonstrates that the mechanisms inducing autophagy differ in response to various forms of nutrient deprivation. Specifically, the Target of Rapamycin (TOR) kinase is a nutrient-sensitive autophagy regulator which forms two complexes, TORComplex-1 and -2 (TORC1 and TORC2) that independently regulate autophagy upon nitrogen and amino acid starvation, respectively. While various forms of nutrient deprivation differentially regulate autophagy, a detailed understanding of the molecular mechanisms governing such differences remains elusive. To expand upon the nutrient-dependent regulation of autophagy, we aim to uncover the role of the less well-characterized TORC2 signaling network upon glucose limitation (caloric restriction [CR]). We found that inhibiting either TORC2 signaling or downstream sphingolipid biosynthesis leads to defects in CR-mediated autophagy. Thus, TORC2-mediated regulation of sphingolipids is necessary for CR-autophagy. We are now focusing on the mechanistic role of sphingolipids during autophagy. As defects in both autophagy and sphingolipid metabolism are linked to similar diseases, a better understanding of this crosstalk may shed light on the pathogenesis of these disease states.

"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

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Psychology

Racism has gradually transformed from overt practices to more subtle forms that are embedded in cultural values, institutional policies and practices, and deeper psychological processes. People of Color report racial microaggressions as the most common form of racism. Racial microaggressions are defined as "commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (D.W. Sue, 2010). Research indicates that microaggressions act as a significant physiological stressor, and more frequent exposure can result in greater physiological stress (D.W., 2010). Some researchers theorize that certain personality traits may exacerbate the negative effects of discrimination on psychological and physiological well-being. Using a sample of Asian Americans, this study investigated the aspects of *social, performance*, and *appearance* self-esteem and their moderation on the effect of a microaggression. Of these aspects, *performance* self-esteem was the only significant moderator ($b = .145$, $SEb = .067$, $\beta = .143$, $p < .05$). Those who had more confidence in their performance experienced greater physiological stress from the microaggression than those who had little confidence in their performance. We interpret these findings by discussing how pathways to positive self-regard may vary among individuals from different cultures.

Student-Athletes: Role Identity and Conflict

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Sociology

According to the National Collegiate Athletic Association (NCAA) there are more than 460,000 student-athletes at colleges and universities across the nation. The NCAA claims "student-athlete is a term that conjures the nobility of amateurism, and the priority of scholarship over athletic endeavor," in which the NCAA's own characterization acknowledges that one role may need to be prioritized. Scholars have questioned if this claim is possible within the increasingly commercialized sphere of college athletics. Previous studies of role-conflict theory have been applied to illuminate the dynamics of work-family conflict. They suggest conflict between roles may be produced in situations where one role places excessive demands on that individual. This study will apply this analytical frame to amateur college athletes to better explore if the role experiences and time demands of these members produce tension that impact their ability to perceive and maximize the full potential of both roles. This study will explain how student-athletes identify and manage their roles as athletes and as students within their educational institution and athletic department through qualitative analysis of in-depth interviews with Division 1AA student-athletes at the University of California, at Davis.

Designing New Compounds to Increase the Diagnostic Capabilities of Aptasensors

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Chemistry

Cytokines are signaling proteins released by cells undergoing an immune response. Analyzing cytokines released by stimulated cells can provide information about the current disease state of the cells. Aptamer-based biosensors (aptasensors) utilize small DNA strands that can be selected to bind to a specific cytokine. Because DNA strands can be easily functionalized with a redox-active compound, their binding can be transduced into measurable electrical signals when also bound to an electrode. Current aptasensor designs limit the number of cytokines that can be simultaneously detected. I am exploring the coupling of different DNA strands with compounds of different redox potentials as an approach to differentiate electrical signals and increase the number of different cytokines that can be simultaneously monitored. I am synthesizing derivatives of a commonly used redox-active molecule with the hypothesis that altering the compound's conjugated system will affect its redox potential. Thus far, several synthesized derivatives have shown significant variation in redox potential from the original molecule when not bound to DNA, providing evidence that altering the conjugated system affects redox potential. In further research, the newly designed and synthesized derivatives will be bound to DNA and tested in aptasensors for efficacy and robustness.

The Effects of Abscisic Acid on *Anopheles stephensi* Lifespan and Fecundity

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Abscisic Acid (ABA) is a hormone found primarily in plants where it regulates responses to stress. ABA also acts as a homeostatic regulator in mammals, controlling several processes that can affect lifespan. Our current work suggests that ABA may also have therapeutic and transmission blocking potential in the context of malaria. While feeding, mosquitoes ingest many factors in human blood including insulin, growth factors, and ABA. We are interested in how ABA affects lifespan and fecundity in *Anopheles stephensi* mosquitoes, which transmit *Plasmodium* parasites, the causative agents of malaria. Because *Plasmodium* must develop within the mosquito before transmission, mosquito lifespan is critical to the efficiency of parasite transmission or vectorial capacity. Preliminary results show that ABA supplemented *A. stephensi* increases mosquito lifespan and fecundity. Mosquitoes with longer lifespan may imply a healthier immune system and perhaps greater protection against parasite infection. However, longer lifespan and increased egg production may increase vectorial capacity. Further studies on the underlying mechanisms of these effects of ABA may shed light on lifespan regulation in mosquitoes and identify potential targets for genetic modification. For example, targeting genes that are implicated in the effects of ABA could also decrease mosquito lifespan, thus reducing vectorial capacity.

A Rodent Model to Assess the Effects of Sports-Related Concussion on Cognition Between Different Stages of Adolescence

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Each year over 1.7 million people experience a traumatic brain injury (TBI) in the United States. Many of these injuries occur in mid-teen and young adult populations and are often associated with sports-related concussions. Injury severity can determine the likelihood of developing cognitive disorders. In this study, we compared performance between early and late adolescent rats (post-natal day 35 and 55 respectively), following a sports-related concussive injury. To generate an injury, a metal disk helmet was glued to the skull, midline between lambda and bregma. An electrically driven piston impacted the skull at either 2 or 5 m/s (mild and moderate injury respectively). Performance in the Morris water maze, a spatial navigation task, was assessed between days four and eight post-injury to analyze cognitive status. The results from this study will provide insight on whether there are age-related differences in cognitive outcome following a sports-related TBI. Ultimately, the goal of this project is to develop concussion assessment tools and innovative treatment options.

Modulation of the Cardiac Sodium Channel by Antiepileptic Agents

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School of Medicine

Sodium channel blockers are the first line of defense in controlling seizures, but these compounds' mechanism of action is not without problem. As action potential initiators, sodium channels stand at the beginning of all communication in excitable tissues. What is more, sodium channel structure and function are highly similar across brain, heart, and muscle, which translates into off-target effects: a sodium channel blocker designed to alleviate neuronal issues carries a high chance of muscular and cardiac complications. We are interested in the cardiotoxicity of a particular subclass of antiepileptic agents, the so-called slow inactivation enhancers (SIEs). Unlike traditional antiepileptic agents, SIEs reduce the number of active sodium channels rather than altering their basic biophysical behavior. One SIE has attracted the attention of the Federal Food and Drug Administration because of an elevated risk of arrhythmias with use. Voltage-clamping analyses conducted under heterologous expression indicate that the molecular cause for this toxicity may relate to actions on the cardiac sodium channel, Nav1.5. Preliminary data are consistent with modulatory effects on Nav1.5 voltage dependence and use dependence in addition to the expected slow-inactivation enhancement.

The Effect of Estrogen and Copper on the Anterior Cruciate Ligament

Charlotte Ellberg
Sponsor: Keith Baar, Ph.D.
Neurobiology, Physiology & Behavior

The Anterior Cruciate Ligament (ACL) is an important stabilizer in the knee that is injured 4-6 times more frequently in females doing the same activity as males. The fluctuations in estrogen levels throughout the menstrual cycle are one contributing factor to the greater injury rate. Our lab has shown that high levels of estrogen have negative effects on ligament strength due to a decrease in the activity of lysyl oxidase, a copper-dependent enzyme that cross-links collagen. The current study is designed to test whether supplementing with copper can stimulate lysyl oxidase activity and prevent the negative effects of estrogen on ligament mechanical strength. Ligaments were engineered from primary human ACL fibroblasts and grown in the presence of low estrogen for 12 days. Ligaments were then split into 4 groups 1) low estrogen (5pg/ml); 2) low estrogen with copper; 3) high estrogen (500pg/ml); and 4) high estrogen with copper. Two days later, the tensile strength and collagen content of the ligaments were analyzed showing the negative effect of estrogen. The effect of copper is currently being determined. If confirmed, this study would suggest that female athletes should consider increasing dietary copper in days 5-10 of their cycle.

"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

Nicole A. Ellis
Sponsor: Nolan Zane, Ph.D.
Psychology

Racism has gradually transformed from overt practices to more subtle forms that are embedded in cultural values, institutional policies and practices, and deeper psychological processes. People of Color report racial microaggressions as the most common form of racism. Racial microaggressions are defined as "commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (D.W. Sue, 2010). Research indicates that microaggressions act as a significant physiological stressor, and more frequent exposure can result in greater physiological stress (D.W., 2010). Some researchers theorize that certain personality traits may exacerbate the negative effects of discrimination on psychological and physiological well-being. Using a sample of Asian Americans, this study investigated the aspects of social, performance, and appearance self-esteem and their moderation on the effect of a microaggression. Of these aspects, performance self-esteem was the only significant moderator (b = .145, SEb = .067, β = .143, p< .05). Those who had more confidence in their performance experienced greater physiological stress from the microaggression than those who had little confidence in their performance. We interpret these findings by discussing how pathways to positive self-regard may vary among individuals from different cultures.

Synthesis and Characterization of Magnesium Aluminate With and Without Ytterbium Dopant

Kevin M. Enriquez
Sponsor: Ricardo Castro, Ph.D.
Chemical Engineering & Materials Science

Magnesium Aluminate ($MgAl_2O_4$) is known for its intrinsic, high mechanical strength, which can be enhanced with nanocrystallines using the Hall-Petch relationship. However, at high temperatures, grain growth affects this property. When temperatures are high (>1000°C), grain size increases, thus decreasing its strength because they are inversely proportional to one another. The decrease of strength is not favorable for high performance applications, so the goal of this research is to find a way to maintain small grain sizes. We do so by introducing Ytterbium (Yb) as a dopant to $MgAl_2O_4$. $MgAl_2O_4$ spinels and 2mol% Yb-$MgAl_2O_4$ spinels are synthesized through co-precipitation. The measured grain sizes of the spinels were 5.9 nm for 2mol% Yb-$MgAl_2O_4$ and 6.7 nm for the pure $MgAl_2O_4$. After sintering both spinels through Spark Plasma Sintering, the grain size for 2mol% Yb-MgAl2O4 and pure $MgAl_2O_4$ pellets were 15.7 nm and 25.8 nm, respectively. The results show that by introducing Yb as a dopant the grain size is indeed stabilized, increasing its strength as well. A future experiment is to have the $MgAl_2O_4$ and 2mol% Yb-$MgAl_2O_4$ pellets go through the grain growth experiment and have their grains size measured and compared.

Prevalence of Ionic Liquid Tolerance Among Yeasts in Genera *Galactomyces* and *Wickerhamomyces*

Lauren L. Enriquez
Sponsor: Kyria L. Boundy-Mills, Ph.D.
Food Science & Technology

High CO_2 emissions are fueling change towards research in finding sustainable biofuels from lignocellulosic plant biomass. Pretreatment is needed to break down the crystalline structure of lignocellulose and increase the yield of fermentable sugars. Deconstructing lignocellulose with ionic liquid (IL) is a new promising pretreatment. Residual amounts of IL remaining on the pretreated lignocellulose can inhibit yeast growth and affect their ability to ferment sugar monomers into ethanol. It is common to have a concentration of 4% IL on the pretreated biomass after washing. In previous work, we identified yeasts in the UC Davis Phaff Yeast Culture Collection that are able to tolerate up to 5% IL, based on their ability to grow in a yeast nitrogen base (YNB)-glucose media containing 1-ethyl-3-methylimidazolium acetate.One strain of *Galactomyces geotrichum* and one strain of *Wickerhamomyces ciferrii* exhibited particularly high IL tolerance. To determine how prevalent IL tolerance is within these taxonomic clades, fifty-nine strains from the *Galactomyces* genus, and eight strains from the *Wickerhamomyces* genus were classified by ribosomal sequencing, and screened for IL tolerance. Growth rate was quantified by measuring absorbance. Yeasts that exhibited IL tolerance require further investigation of their properties that allow them both for ethanol production and saccharification.

An Improved Analysis of Egg Shape Matching of Avian Brood Parasites to Their Host Species

Jacob A. Ewald
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Entomology & Nematology

Avian brood parasites are birds that minimize their parental investment by laying their eggs in the nests of one or more host species. Several studies have shown that to a certain degree, brood parasite eggs emulate the color and speckling patterns of host eggs to avoid detection by host parents (which leads to egg rejection). Brood parasites may additionally emulate host species' egg shapes, but this has not been studied extensively. To test for egg shape matching, I photographed specimens of brood-parasitic *Molothrus ater* (Brown-headed Cowbird) eggs held in several museum collections. I then extracted the outlines of each photographed egg using imageJ software and analyzed the shape of each outline using four parameters: egg width, center of mass, tip shape, and pointiness. Where possible, I also photographed the eggs of the host clutches collected with the *M. ater* specimens. Results will compare the host/parasite shape relationships as potential evidence for shape matching. This project is an improvement on the research I presented last year. I have increased my sample size tremendously and improved my statistical method to reach a more robust conclusion.

Uncovering the Role of TORC2 Signaling in Mediating Autophagy Induction

Samya Faiq
Sponsor: Ted Powers, Ph.D.
Molecular & Cellular Biology

Autophagy is a catabolic process that degrades cellular components to maintain homeostasis and adaptation upon nutrient deprivation. Numerous metabolic and neurodegenerative diseases including cancer and Alzheimer's are linked to the deregulation of autophagy. Autophagy is measured by two resulting aspects: the induction of autophagy-related proteins (ATG), namely ATG8, and protein turnover (flux). A conserved regulator of autophagy is Target of Rapamycin (TOR) kinase that functions in two distinct complexes TOR-Complex-1 and -2 (TORC1 and 2), where TORC2 promotes flux and inhibits ATG8 induction. While the regulation of flux via TORC2 is characterized, that of ATG8 induction remains to be determined. We examined the role of two stress-response transcription factors, multi copy-suppressor-of-SNF1 (MSN) -2 and -4, in promoting autophagy induction downstream of TORC2. We found that inhibition of TORC2 signaling led to MSN2/4 activation, which was necessary for ATG8 induction in TORC2 mutants. Our data supports that TORC2 negatively regulates MSN2/4 which promote ATG8 induction. We are currently focusing on the mechanism governing TORC2 regulation of MSN2/4 to determine whether ATG8 regulation via MSN2/4 is by direct transcriptional control. We believe a detailed understanding of autophagy regulation may help shed light on the pathogenesis of autophagy-related diseases.

The Middle East and North Africa in U.S. Media Representations 1910-1919: Orientalizing and Criminalizing of Armenians and Armenian-Americans

Azka Fayyaz
Sponsor: Suad Joseph, Ph.D.
Anthropology

My research explores the *New York Times*' representation of Armenians and Armenian-Americans through the use of newspapers articles from the years 1910-1919. My findings demonstrate that a pattern of negative depiction of Armenians existed during this period of time. I argue that these findings challenge the notion that the *NYT* was an objective newspaper during that period. To produce these findings, I reviewed 1973 articles under the term "Armenian" in the database ProQuest. Through an in-depth analysis of the relevant articles, I found that Armenians are portrayed as criminals and more broadly as Orients, people of the East and thus inherently different from Occidents or Westerners. Preliminary findings suggest a similar pattern of representation in the *New York Times* of other groups as well. This paper suggests that the criminalization of the Armenian subjects can be seen as a part of the larger pattern of Orientalizing of the Armenians. The *NYT* thus contributes to the "Othering" of the Armenians. This research is part of a larger project analyzing 150 years of the *New York Times* conducted in the lab of Professor Suad Joseph.

Statistical Analysis of Soil Bulk Densities - The Century Experiment at the Russell Ranch Sustainable Agriculture Facility

Farhad K. Fazel
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Land, Air & Water Resources

This study examines the bulk densities of the soil core samples collected at the Century Experiment at the Russell Ranch Sustainable Agriculture Facility in 2012. Maintaining low bulk densities plays an important role in optimum plant growth. This is due to the fact that bulk density affects the water infiltration, air porosity and water-holding capacity of the soil which are essential for a good root system. In an effort to document soil bulk density changes in Russell Ranch's 12 cropping systems, archival samples have been collected in the fall of 1995, 1999, 2007, and 2012. To account for variability, soils in each plot were sampled at six locations, for eight depths. Using a Giddings probe, bulk densities were measured using the length and diameter of the soil cores. The soil samples were air-dried and subsequently oven-dried, and soil weights were recorded to determine the moisture content of the air-dried subsamples and the dry bulk-density. Using the preliminary data, statistical analyses revealed higher variances with the two topmost depths.

Characterization and Development of Multi-Drug Resistant TNBC and ER+ Breast Cancer Cells by Introduction of Combination Drug Therapy

Michael A. Flores
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Biochemistry & Molecular Medicine
School of Medicine

75% of all breast cancers are estrogen receptor positive (ER+), and grow in response to estrogen. Blocking estrogen receptors by drugs such as tamoxifen may decrease a proliferative response. Triple negative breast cancer (TNBC) cells lack estrogen and progesterone receptors and do not over express HER2. These cells cannot be targeted and are typically treated with adjuvant chemotherapy drugs, such as docetaxel and doxorubicin. Despite the initial effectiveness of treatment, ER+ and TNBC cancer cell progression often occurs over a variable amount of time. Prior studies show that resistance can develop against every effective anticancer treatment. Multi-drug resistance (MDR) is a major factor in the failure of systemic treatments. Possible causes such as increased drug efflux, decreased drug uptake, and activation of DNA repair mechanisms can be identified by methods that measure relevant gene and protein expression levels. Developing drug resistant cell lines *in vitro* may serve as a useful model for the study of underlying MDR mechanisms and aid in the development of anticancer agents for clinical anticancer drug resistance. The objective of my study is to develop diverse MDR breast cancer cell lines through the introduction of clinical anticancer drugs and study the relative mechanisms of MDR.

Potential Autism Mouse Model Displays Cognitive Deficits in Novel Touchscreen Task

Gillian M. Foley
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Psychiatry & Behavioral Sciences
School of Medicine

Deletion at chromosomal region 16p11.2 in humans is associated with an increased risk of developing autism spectrum disorders (ASD). We tested a mouse model with a similar chromosomal deletion to detect whether animals with this mutation have similar cognitive deficits seen in some humans with ASD. Specifically, we expected to observe deficits in the animals' ability to reverse their learning after acquiring a cognitive task (visual pairwise discrimination task in this study). During the initial task, animals were trained to discriminate two images juxtaposed on a computer screen and were rewarded with a droplet of milkshake for each correct response. For the reversal task, correct and incorrect images from the acquisition phase were switched and the animals learned to touch the previously incorrect (now correct) image to receive the reward. We found that 16p11.2 deletion mice not only showed deficits in acquiring the initial discrimination task, but also in their ability to reverse their learning when the task was switched, as predicted. These findings support the hypothesis that the 16p11.2 mutation may be related to the development of ASD in humans, as the cognitive deficits observed in 16p11.2 deletion mice resemble cognitive deficits seen in some humans with ASD.

Voudou and Roman Catholicism in Haiti: A Study of Colonialism and Secrecy

Hillary Fong
Sponsor: Naomi Janowitz, Ph.D.
Religious Studies

The religious history of Haiti has been studied as a site of conflict between Voudou and Roman Catholicism. In contrast, my research challenges this narrative, asserting that in Haiti, Voudou and Roman Catholicism have always interacted in more complicated ways, and there is no pure form of either religion. The religious history of Haiti is an intertwining phenomenon particular to Haiti and its complex history of both successful slave rebellions and the imposition of Catholicism by the leaders themselves, followed by "nativistic" movements to revive African religious traditions led sometimes by those wishing to repress the public. The constant struggle for dominance and power between Haitian Voudou and Haitian Roman Catholicism has shaped Haitian identity internally and externally in the international stage. The legacy of colonization is at the core of this struggle. Colonizers and colonized argued for and against various traditions as these religious traditions helped consolidate power. For example, FranÃ§ois Duvalier's manipulation of indigenous Voudoo traditions, including secrecy, in parallel to his appeal to "Haitianise" the Roman Catholic Church, was a means to obtain power and control in a post-colonial context.

Development of an Experimental Procedure for Examining Nutritional Regulation of Heart Rate Variability: Implications for Health

Natasha Fowler
Sponsor: Kevin D. Laugero, Ph.D.
Nutrition

Little research has been done testing the effect of sweet comfort foods on Autonomic Nervous System (ANS) activation. This study aimed to 1) test ANS response to mental and nutritional (food) stimuli by measuring changes in Heart Rate Variability (HRV), 2) establish an experimental model to test the roles of key homeostatic systems in nutritional responsiveness and 3) determine how variable responsiveness of these systems influences the effect on mental and metabolic health. Participants underwent emotional recall tasks in which they thought about a happy or anger inducing event for two minutes, and shared their event with the investigator for three minutes. Stress was also induced using the Stroop Color Word task. Participants thought about their preferred or non-preferred comfort food for five minutes, and then were given five minutes to eat the food. Although our data did not lead to statistical differences in ANS responsiveness during the tasks, further analysis of the data lead to different patterns of responsiveness for the emotional and food tasks. The data suggest that ANS responsiveness to food and emotional tasks may vary across different population subgroups.

Human-Animal Bond Promotes Survivorship

Yolanda F. Franklin
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Human Ecology

Research on human and animal bonding reveals health benefits such as lowering high blood pressure, reducing stress hormone levels, and improving immune-response. More recent medical studies show a significant link in the rapid and / or improved healing and recovery of hospitalized patients visited by their own animal pets or volunteer companion animals compared to non-visited patients. The physiological and psychological benefits provided by animal companions include supportive therapy for physical and emotional trauma. Domestic Violence (i.e. Intimate Partner Violence (IPV)) is recognized by the Centers for Disease Control and Prevention (CDC) as a significant public health problem and source of trauma. One avenue for treating trauma capitalizes on the benefits of human-animal bonds, for example using Animal-Assisted Therapy (AAT). The purpose of the current research project is to explore effective uses of the human-animal bond to help IPV survivors recover from trauma. The study is qualitative, using interviews from individual cases and volunteer survey responses. Preliminary data showing how animals affect resiliency of IPV survivorship will be presented.

Cis?tainability, Ar(queer)tecture, and Community Living

Jessica (Daniel) Friedman
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Human Ecology

We need to queer up the space. Does this phrase comes across a large blank screen multiple times throughout the day? School, work, home...where do the inter-sectional edges of race, class, gender fit into these binaries and structures? Through a series of mixed media images, experiences, interviews and stories, this project hopes to capture the unheard and underrepresented voices in community-based living on and off campus at UC Davis. The goal is to leave the audience with a sense of urgency to rethink the structures they enforce, to engage in further conversations surrounding cis/sustainability, language and design of school, work and home spaces. We need to be uncomfortable and vulnerable in order to move forward with participation in this cis//tem. We have an obligation as designers and holders of educational spaces to push the boundaries and re-imagine the work and school place. How does agency and responsibility play a role in QTPOC (queer/trans people of color) and LGBTQIA experiences in school and work places? This performance art/landscape ar(queer)tecture thesis presentation will inspire a multitude of answers and provoke more questions through art, confrontation and storytelling.

Changes in Intestinal Bacterial Populations in Pigs With Dextran Sodium Sulfate-Induced Colitis

Kathleen L. Furtado
Sponsor: Elizabeth A. Maga, Ph.D.
Animal Science

Inflammatory bowel disease (IBD) is caused by several potential factors, including an individual's genetic composition, immune function, microbiome, and the environment. Over one million Americans suffer from IBD, and symptoms can greatly impact quality of life. Dextran Sodium Sulfate (DSS) is commonly used in experiments to induce symptoms of colitis, a form of IBD, in mice. Our pilot study used DSS in an attempt to produce an effective model for studying colitis in the pig, by inducing symptoms similar to human presentation of the disease. By analyzing bacteria present in pigs' feces and intestinal contents, we can study the effect of DSS-induced colitis on bacterial populations over time, and how populations change in response to natural healing. After isolating bacterial DNA, the 16S rRNA V-4 region was amplified using PCR with barcoded primers, and then sequenced to identify bacterial species in each sample. From this study, we can compare the bacterial populations in DSS-treated pigs to those in healthy pigs, analyze significant changes, and discover how the microbiome relates to human presentation of colitis. This pig model of human colitis is intended for future experiments, to test the efficacy of human lysozyme transgenic goat milk in relieving symptoms of colitis.

Fracture-Induced Systemic Bone Loss

Anisha Gaitonde
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Orthopaedic Surgery
School of Medicine

More than 40 million Americans currently have or are at high risk for osteoporosis, a disease that weakens bones and makes them more likely to fracture. Current treatments alleviate symptoms, but little progress has been made towards understanding the underlying mechanisms that lead to systemic bone loss and fracture risk. We hypothesize that the healing response after fracture systematically decreases bone mass and strength. To investigate the systemic fracture response, we created three groups of mice: femoral fracture, sham injury, or no manipulation. We then 1) conduct micro-CT analysis, finite element testing and mechanical testing to measure changes in bone structure/strength; 2) perform gait analysis and quantify voluntary activity to determine the effect of bone disuse on systemic bone loss; and 3) use real-time PCR techniques to determine the effect of fracture on inflammation and bone turnover markers. Results from these three methods together will help us describe bone loss in mice following femoral fracture and understand the mechanisms contributing to the loss. Establishing the existence of such a process can then potentially lead to new treatments for preventing osteoporotic fractures.

Particle Tracking Method for Upscaling Reactions on Mixing Fronts

Titus Garrett
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Civil & Environmental Engineering

Many chemical reactions in the environment depend on mixing between two solutions, where one displaces another. One example involves continuous injection of a solution into contaminated groundwater for remediation. To predict and control the impact of environmental pollution where mixing rates control reactions it is necessary to quantify the speed with which the governing reactions go to completion. The challenge in characterizing the rates is that the mixing occurs at small scales and is difficult to simulate deterministically. We outline a new approach that focuses on the mixing front at the interface between two solutions moving in a heterogeneous flow field. By simulating the transport of particles placed along the initial interface we can mathematically approximate the mixing front position and deformation at any given time. The interface segment between each pair of mathematical particles is called a lamella that is a linearized piece of the interface. We develop lamella-based averaging methods useful for determining the overall reaction rate even in highly complicated flow fields. The reaction extents are expressed given the geometry of a given lamella, and this allows us to sum the reaction rate of all the lamellae in order to find the overall rate of reaction.

Associations Between Caregiver Emotional Well-Being and Patient Qualities

Jessica N. Gee
Sponsor: Lisa S. Miller, Ph.D.
Human Ecology

Previous research has shown that caregiving can be a burden on caregivers' health and well-being (Vitaliano et al., 2004) and that this can be associated with the well-being of the patient (Soldato et al., 2007). However, less is known about specific patient qualities (e.g., ADLs, emotional-well-being, need for help) that can affect caregiver mood and emotional well-being. This study examined this issue using data from the Resources for Enhancing Alzheimer's Caregiver Health Study, which includes 670 caregivers (age 21+) who cared for a family member with dementia. Caregivers were asked about their emotional well-being and family member's needs during their past week of caregiving. Questions included the types of support provided by the caregiver and how the caregiver felt about their tasks. Results indicated that caregiver's attitudes towards caregiving were associated with the patient's mood. More specifically caregivers were more likely to feel bothered by caregiving when they were caring for family members who had greater anxiety (β=0.13, $p < .01$), threatened to hurt others (β=0.14, $p < .01$), and argued (β=0.13, $p < .05$). This has important implications for caregiving because it demonstrates that the caregivers' mood and behavior are related to the patients' experiences.

The Neurobiological Mechanisms of Oxytocin in Modulating Stress Response

David S. Gibson
Sponsor: Brian C. Trainor, Ph.D.
Psychology

Psychosocial stressors are significant risk factors that facilitate the onset of depression and anxiety disorders. The neuropeptide oxytocin (OT) is released during episodes of stress and has been found to dampen neurobiological and behavioral responses to stress. In female California mice (*Peromyscus californicus*), social stress induces long term increases in the activity of oxytocin producing neurons. The introduction of intranasal oxytocin induces social withdrawal behaviors in females, very similar to the social withdrawal phenotypes observed in females that have experienced social stress. The extent to which brain regions are affected by the administration of intranasal oxytocin is not yet fully understood. This is why this study approaches the issue by examining how the administration of the neuropeptide affects the expression of immediate early genes, actuated by neural activity. Exploring the areas of the lateral septum and the nucleus accumbens is essential to further understanding the neurobiological mechanisms behind behavior response to stress. These two areas express copious amounts of the neuropeptide's receptor (OTR), indicating their function in modulating responses to stress.

Associations Between Parental Physical and Mental Health and Children's Externalizing Behaviors

Michelle N. Giese
Sponsor: Lenna Ontai, Ph.D.
Human Ecology

Parental mental health (Nworie 2006, Tzoumakis, Lussier, & Corrado 2014, Homes 2013) and physical functioning (Evans, Shipton, & Keenan 2006) have been associated with child externalizing behaviors. However, studies of parental physical functioning have only focused on chronic conditions, leaving daily physical limitations not well understood. In addition, mental and physical health have never been considered together, even though parents with poor physical health likely also suffer poor mental health. I hypothesize that both parental physical and mental health problems will uniquely predict more child externalizing behaviors. The current study will use data from the Rural Families Speak study (N = 444). The measures used in this study consist of the Child Behavior Checklist (CBCL) and the Adult Health Inventory. The analysis will consist of a stepwise multiple regression model to test the relative contribution of mental and physical parental health on predicting child externalizing behaviors. Child age and parent age will be included as covariates.

Assigning TAs to Sections: A Stable Marriage Problem

Miguel Gil
Sponsor: Jesús De Loera, Ph.D.
Mathematics

Every year, teaching assistants are chosen to teach classes. Initially, this is done by emailing graduate students for their preferences of classes for the coming quarter, with which a student affairs officer will match the graduate students to their preferred classes. Unfortunately, this process takes upwards of 8 hours to complete by hand and the designated human assignments generally fail to produce an optimal solution. In order to remedy this issue, we examined a mathematical model which incorporates integer programming to matching theory in order to pair graduate students to courses while attempting to maximize the satisfaction of the graduate students. Creating such a model required that we considered certain constraints, such as teaching assistant seniority, time conflicts, teaching ability, and happiness of each teaching assistant (as provided by their preferences of classes to teach).

Genes Involved in *Arabidopsis* Heat Tolerance Response

Emma C. Goguen
Sponsor: Stacey L. Harmer, Ph.D.
Plant Biology

A wave of extreme heat and drought conditions has dramatically affected agriculture production during the past three years, resulting in huge economic losses and threatening global food security. Increasing our understanding of the genes and mechanisms involved in plants' heat tolerance response will help us engineer them to withstand increasing temperatures and changing climates. The aim of this project is to identify genes involved in *Arabidopsis thaliana* seed germination under heat stress. We obtained mutant lines with foreign T-DNA inserted into selected genes of interest and we are in the process of determining whether the T-DNA insertion in these genes effectively knock out their expression. Confirmed loss-of-function alleles will be assessed for seed germination under heat stress. Mutant and wild-type seeds will be exposed to 50°C heat stress for one hour and their germination rates compared. We have conducted initial heat stress experiments with different ecotypes of *Arabidopsis* to confirm heat tolerance levels discussed in the literature. Identifying genes involved in heat tolerance response in *Arabidopsis thaliana* might provide valuable information about the roles of their homologs in other species.

Effect of Hand Pollination on Seed Set and Offspring Quality

Carlos Gomez
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Entomology & Nematology

When considering the reproductive strategies employed by insect pollinated plants it is becoming increasingly apparent that the consequences of pollen limitation must be considered. Pollen limitation occurs when a plant is unable to reach its maximum seed production due to insufficient pollen resources. Current practice among pollination biologists to quantify pollen limitation in a plant population is by comparing seed set by open pollinated plants to experimental plants that have received supplemental pollen via "hand-pollination." Pollen limitation has been observed across ecosystems, but its ecological consequences are yet to be determined. Pollen limitation represents a reproductive constraint on angiosperm sexual reproduction in addition to resource availability. There is a general assumption that seed set is a direct measure of fitness. I ask, are greater seed set measures resulting from hand pollination manipulation during pollen limitation studies an accurate measure of greater reproductive success? I will answer this question by measuring the quality of offspring produced by hand pollinated plants and compare them to the offspring of naturally pollinated plants. It may be that sheer number of seeds does not necessarily ensure a greater offspring survival, or higher F2 recruitment.

Childhood Obesity Prevention in the Central Valley of California: Exploring Purchasing Patterns of Sweetened Beverages by Mexican-Origin Families

Karla Gomez
Sponsor: Banafsheh Sadeghi, M.D., Ph.D.
Internal Medicine
School of Medicine

Childhood obesity has duplicated in the last 30 years in the US. Children who are obese are likely to be obese as adults and have a higher risk for cardiovascular disease and other health concerns. National costs of treatment for preventable diseases is estimated to increase by 48-66 billion a year by 2030. Mexican origin children and youth present one of the highest obesity rates in the country. Lack of access to resources and an unbalanced caloric intake are at the center of concern. Expenditure on sweetened beverages in particular, are of interest due to the direct source of added sugars in American diets according to the American Heart Association. The present study analyzes purchasing patterns of sweetened beverages by Mexican-origin families. The study uses data from a multi-disciplinary five-year intervention study aiming at preventing childhood obesity in the Central Valley of California. Descriptive and bivariate analysis will be completed to explore the purchasing patterns of sweetened beverages for families that participate in nutritional classes and receive vouchers for their food purchases. It is expected that families who participate in the intervention adjust their intake of sweetened beverages throughout the study.

Rewriting Ophelia: The Narrative of a Body in Conflict

Margaret M. Gonzalez
Sponsor: Michael Ziser, Ph.D.
English

The widely recognized figure of Ophelia from Shakespeare's *Hamlet* is the premier figure in English literature of a femininity that is both under extreme external scrutiny and site of internal conflict. Since the 17th century, Ophelia's representation has changed through paintings, theater, literature, and medical discourses. She has portrayed ostensibly feminine qualities ranging from docility to lustfulness. Ophelia's figure became a medical classification for the young female lunatic in the 19th century, and in the 20th century, she was associated with a troubled-teen discourse. While Ophelia's representation has changed, some aspects of her narrative have remained the same: her body is objectified to suit cultural needs and desires. My project focuses on the circumstances that shape the Ophelia-body and the conflict about female agency that occurs across borders among literary, cultural and scientific realms. The female body is a battlefield: cultural expectations and conceptions of femininity can create a conflict within those who feel powerless against their forces.

Suction Feeding Kinematics of Paedophageous Victorian Cichlids

Aaron M. Goodman
Sponsor: Peter C. Wainwright, Ph.D.
Evolution & Ecology

Lake Victoria in Eastern Africa is one of the largest tropical lakes in the world. It contains over 300 species of Haplochromine cichlid fish, many of which have evolved unusual feeding strategies. One of the most peculiar behaviors is paedophagy, the consumption of fry via attacks on mouth-brooding females. This behavior has been qualitatively observed in aquariums, in the field, and inferred via gut contents, but the kinematics of prey capture has never been studied. We analyzed prey capture behavior in two paedophagous Victorian cichlids: *Lipochromis* sp. 'Matumbi Hunter' (n=4) and *Kleptochromis parvidens* (n=5). Using a high-speed camera filming at 2000 frames per second, our lab recorded at least ten videos from each individual capturing Zebrafish (*Danio rerio*). Using the program Dltdv3 in MATLAB, we tracked 10 landmarks along each fish's body to produce a set of 10 kinematic variables associated with prey capture. Our data suggests that *Kleptochromis parvidens* strikes prey with a small gape and highly protruded mouth, while *Lipochromis* 'Matumbi Hunter' strikes prey using a large gape and low jaw protrusion. Despite their shared use of a novel resource, each paedophage species exhibits different prey capture techniques.

Dietary Reconstruction Using Stable Isotope Analysis at Two Prehistoric Sites in Yolo County

Jena F. Goodman
Sponsor: Jelmer W. Eerkens, Ph.D.
Anthropology

Dietary information from prehistoric sites in Yolo County is limited due to the small number of sites that have been excavated by archaeologists. Using stable isotope analysis of carbon and nitrogen, this project analyzes human bone collagen and apatite to reconstruct subsistence patterns of 15 inhabitants from CA-YOL-187, a Late Period (~500 year-old) site on lower Cache Creek, and 4 inhabitants from CA-YOL-171, an Early Period (~3000 year-old) site on Willow Slough in the Yolo Basin. Both sites were excavated over a decade ago as part of salvage projects associated with urban development, for a swimming pool and a landfill, respectively. We compare our isotopic data against animal and plant remains recovered from the sites, as well as available stable isotope data from other sites in the region. Together, the information allows us to to establish the general trophic level of inhabitants, the relative importance of marine-derived foods such as salmon and sturgeon, and overall dietary preferences. We also examine potential dietary changes over time in the Yolo Basin region.

Evaluation of *Salmonella* Inactivation in Poultry Carcasses

Vinoj Govinthasamy
Sponsor: Pramod Pandey, Ph.D.
Population Health & Reproduction
School of Veterinary Medicine

Microbial safety of food and water is a serious issue posing risk to public and environmental health. For example, every year in the U.S. *Salmonella* is estimated to cause 1.2 million illnesses, costing the economy more than $2.4 billion. *Salmonella* presence is often reported in poultry. The disposal of pathogen contaminated poultry carcasses can be hazardous, therefore identifying a safe and eco-friendly method of disposal is crucial. One option is composting, which is often the preferred method due to its low-cost and its use as a fertilizer. A common problem with composting is the temperature variability, which increases the likelihood of pathogen survival that can eventually lead to the contamination of crops and subsequently harm the public health. This experiment focuses on enhancing our existing weak understanding of the *Salmonella* inactivation in poultry carcasses at composting temperature (≈60°C). The effect of mixing and non-mixing of ground poultry carcasses on *Salmonella* inactivation were tested in batch reactors and compared to the inactivation in whole poultry carcasses. Results showed that mixing of ground poultry carcasses elevated *Salmonella* inactivation. The study is anticipated to help derive improved methods of poultry carcasses disposal, and reduce the risk of microbial pathogen contamination in the environment.

School Engagement, Self-Efficacy Beliefs, and Self-Regulated Learning Strategies of Middle School Students

J W. Greenig
Sponsor: Michal Kurlaender, Ed.D.
School of Education

Previous research in stage-environmental fit theory has shown that many students struggle to achieve academic success in the middle grades and that middle schools may not be sufficiently responsive to the psychological needs associated with specific stages of adolescent development (Eccles, Wigfield, et al., 1993). During this period of increasing self-awareness and biological change, many middle school students look to their peers for social approval and may form affiliations that negatively influence their academic motivation and performance (Steinberg, et al., 1996). In my thesis, I will analyze qualitative data from an ongoing research project involving the observation of classroom interactions of over fifty (N=56) middle school students in a small Northern California city. Specifically, my study seeks to ask: *What motivates middle school students of different academic abilities to do well in school?* I will answer this research question through close observation in two eighth grade classrooms and through interviews with a sub-sample of four students. Preliminary data suggests that academic performance in middle school may be heavily influenced – positively or negatively – by the self-efficacy of students and the peer groups from which they seek approval. These findings may have important implications for middle school reform efforts.

The Sisters' Side of Islam: An Ethnography of Female Muslim Communication in the Context of Ritual and Culture

Marla K. Greenway
Sponsor: Catherine Puckering, Ph.D.
Communication

Many Muslims in America pray, interact, and socialize by gender in their mosque or community center, which piqued an interest in how females in Islam communicate, individually and in groups, in religious ritual and culture. Ethnographic fieldwork was conducted in five visits over a four-month period at the Brentwood Muslim Community Center, and the resultant data includes field notes on direct interaction, interviews, observation of prayer rituals, such as ablution (washing feet and hands before prayer), and Islamic instruction for children as well as adults. The interpretive segment of the research is in progress, but a primary assessment seems to reveal diverse ethnicities, backgrounds, and religious ritual practices within a single mosque. Muslims who come to America from other countries bring along with them their unique religious rituals and perspectives, and disclosing these frames of reference may assist non-Muslims in understanding the rich, complex, religious culture of Islam in America.

Root Causes of Central American Unaccompanied Migrant Children Crisis

Jaskiran K. Grewal
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Sociology

There is a remarkable knowledge gap that exists about the causes of the rapid influx of unaccompanied migrant minors from the Central American region in the past five years. In an attempt to fill these gaps, a notable amount of research has been conducted recently to find the root causes, economic or refugee, that are prompting younger children to leave Central America. Currently, I am analyzing the relationship between the numbers of unaccompanied alien children (UAC) that have migrated to the United States and factors such as homicide rates, gross domestic product (GDP), Freedom House Index, and Good Governance scores over the the past five years. Alongside this data, I am encompassing various established migration theories from Hatton and Williamson, Massey, and Stinchomb and Hershberg. Hitherto, initial findings have shown that national violence and government instability are not responsible for the rapid influx of UACs. However, preliminary data points to signs of Central America experiencing mixed migration patterns with UACs seeking economic opportunities in the United State and other UAC's encountering extreme localized violence in certain Central American areas such as Guatemala, Honduras, and El Salvador.

Colonized Food, Colonized Self

Sean M. Guerra
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Human Ecology

The extractive economy subjugates indigenous culture, marginalizing them to provide commodities to privileged nations in a pattern of uneven development in systems rooted in colonialism. Our industrial food system is tied to these extractive limits of capitalistic modes of production however hidden behind illusions of abundance. This system privatizes land, concentrates buying power and accumulates wealth off the back of a devalued labor relationship via diminishing wages and the creation of dependence on the dominant political-economic paradigm where subsistence is replaced by exploitation and alienation. As Marx said, "the whole thing still remains the age-old activity of the Conqueror, who buys commodities from the Conquered with the money he has stolen from them." The term "sustainable" has lost something. Instead we see marketing terms: the labels and certification. But it hardly comes to mind to contemplate: What were the human, energy, and environmental costs of the inputs for everything around us. It is hidden and we are socialized to accept the "cheapness" of commodities under the bright discount sign bypassing all associated "externalities." We may be driven to be monetarily "efficient," but at what cost to ourselves, our historical narratives, our ecology, our finite resources, our spiritual wellbeing, our voices?

Stress, Mindset, and Self-Esteem

Estefania K. Guerreros
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Human Ecology

Research shows that stress has a powerful effect on a person's well-being (Keller et al, 2012). However, less is known about the psychological mechanisms linking stress to these long-term outcomes. This study tests whether a person's well-being (i.e., self-esteem) is influenced by their perception of their daily stressors. However, we hypothesize that this relation will only be present for people who believe that their abilities cannot change (Dweck, 2000). That is, if a person believes that her abilities are fixed (fixed mindset) and experiences many daily stressors, she will have lower self-esteem than people who experience less stress and/or have a growth mindset (believe they can change their abilities). We tested this in 523 second-year college students. We found a significant interaction between having a fixed mindset and perceptions of daily stress predicting self-esteem, such that the lowest levels of self-esteem were found for students who had a fixed mindset and high perceived stress. Interestingly, students with a growth mindset had the highest self-esteem, regardless of their perceived stress. Thus, students with a fixed mindset and high perceived stress are at greatest risk of developing low self-esteem, but further research is needed to test the causality of this effect.

Mapping Zapotec and Mestizo Cultural Alliances in "La Zandunga"

Jessica M. Gutierrez
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Native American Studies

"La Zandunga" is considered to be the unofficial national anthem of the Isthmus of Tehuantepec in Oaxaca, Mexico, and is celebrated annually at the week-long festival *Vela Zandunga*. The song's melodic origins are closely tied to Zapotec and *mestizo* (mixed Spanish and indigenous descent) cultures, and its lyrics were added in 1853 to promote the separation of Tehuantepec identity from the rest of Mexico, by dedicating the song to Tehuantepec women. This paper critically examines three contemporary recordings of "La Zandunga," including: Marimba Chiapas Hermanos Moreno (2006), Lila Downs' *La Sandunga* (2003), and a third from a Latin Wedding CD (2009). I use Beverley Diamond's "Alliance Studies Model" in order to trace real and imagined connections to Zapotec and *mestizo* cultures across the realms of genre and technology; language and dialect; citation and collaboration; and access and ownership. Since Diamond's model considers how social relationships from the past are sounded in the present, I conclude by discussing how songs such as "La Zandunga" have restorative abilities to create community for those who perform, listen, and study it. Ultimately, an alliance studies approach to historical ethnography illuminates the importance of social relationships across space and time, especially in the case of Zapotec and *mestizo* peoples and communities who are committed to the survival of cultural knowledges embedded in music and dance practices.

Characterizing Effects of Metabolic Disorders on the Post Translational Modifications of Circadian Clock Proteins

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Entomology & Nematology

Disruptions in the circadian cycle have been associated with many human health disorders, such as cancer, depression, and type 2 diabetes (T2D). Recent studies have illustrated the importance of O-linked glycosylation (O-GlcNAcylation) as a post-translational modification (PTM). Further, O-GlcNAcylation is metabolically sensitive and may have an affect on other regulatory PTMs of key animal circadian clock proteins. We therefore hypothesize that the O-GlcNAcylation status of circadian clock proteins may be altered in patients with T2D, leading to co-occurrence of circadian disruption. Since T2D models have been developed in *Drosophila melanogaster*, and the regulation of circadian clock is quite conserved between humans and flies, we will test our hypothesis using *Drosophila* as our experimental system. T2D models of flies, specifically mutants from the insulin signaling pathway, will be entrained to a 12hr day and 12hr night daily cycle and be subjected to locomotor activity assays. Analysis of activity patterns will determine the effects of T2D on the period of the circadian clock. Acquiring a clear understanding of clock disruptions associated with diet, nutrition, and metabolism may lead to development of new therapy for clock and metabolic disorders.

Understanding Transfer Shock: Results of a Research Intervention

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Difficulties with academic, social and psychological adjustment (Laanan, 2004) to the university take a toll on transfer students' academic performance resulting in a GPA drop in the first year (termed "transfer shock"; Hills, 1965). This phenomenon is being felt more and more at universities. This is largely seen in STEM transfer students, especially underrepresented minorities (URM). This GPA hit puts them at a disadvantage as their GPA steadily begins to lower, this adversely affect them if they wish to be admitted to graduate programs. Many studies have concentrated on understanding the difficulties these community college students experience while transitioning. I will present the preliminary results of a longitudinal randomized control study, which examines an intervention meant to ease the transfer shock. The study offered students a two-week research intensive, seminar, coupled with peer mentoring. I will utilize data collected from 67 first generation STEM transfer students attending University of California Davis. My focus will be on the first quarter GPA of students in the intervention who were URM compared to those who were non-URM's. The findings from this study will better inform school administrators in providing assistance to incoming transfer students.

Optimizing qPCR Primers to Validate Galaxy Analysis of MeCP2 ChIP-Seq Data

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Rett syndrome is an X-linked neurological disorder characterized by developmental regression around 6-18 months of age, reduced brain function, hypotonia, skeletal deformities, ataxic hand movements, seizures, and irregular breathing patterns. It occurs in around 1:10,000 births and occurs mainly in females. Rett syndrome is caused by the mutation of the transcription factor gene Methyl CpG Binding Protein 2 (MECP2). The location in which MeCP2 binds throughout the genome, however, is not well characterized. Previous MeCP2 Chromatin Immuno-Precipitation sequencing (ChiP-seq) returns ambiguous peaks all over the genome, so a new bioinformatics approach using the Galaxy platform has been used to analyze the data. Galaxy has identified significant/unique binding regions, but some are around repetitive regions, which make it difficult to analyze via PCR. To overcome this challenge, we have designed primers to potentially unique sequences, but initial PCR analysis indicates the presence of a non-specific amplicon. To validate the Galaxy analysis of ChIP-seq data, we need to use qPCR. For my project, I will be searching for the best PCR conditions to yield one amplicon. To do this, I will investigate optimizing the different reagents in a PCR Master Mix that affect the specificity of the DNA qPCR primers.

Epac, a Novel Mediator of CaMKII-Dependent Arrhythmia in Atrial Cardiomyocytes

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Epac is a recently discovered exchange protein directly activated by cAMP which is activated, together with PKA, during beta adrenergic stimulation. In ventricles, Epac activation is known to induce Ca^{2+} mishandling leading to cardiomyopathy such as heart failure, arrhythmia and hypertrophy. However, its role in atria has never been described. Here, we investigate the role of Epac in the regulation of atrial Ca^{2+} handling using a specific Epac activator, 8-CPT. Ca^{2+} signaling was measured by confocal microscopy in freshly isolated cardiomyocytes from the atria loaded with a Ca^{2+} sensitive fluorescent dye, Fluo-4 AM. We found that Epac activation, by 8-CPT, significantly enhances diastolic Ca^{2+} release leading to a drop of Ca^{2+} content from cellular Ca^{2+} storage as well as a reduction of systolic Ca^{2+}release evoked by field stimulation (1 Hz). Interestingly, those effects were fully blocked by CaMKII inhibition with KN93. Finally, 8-CPT triggered CaMKII-dependent arrhythmic events as seen in atrial fibrillation. In conclusion, we found that Epac modulates atrial Ca^{2+} signaling and triggers CaMKII-dependent arrhythmia suggesting a potential role in atrial fibrillation.

Inhibition of Inflammatory Genes Early After Anterior Cruciate Ligament Injury Can Prevent or Delay the Onset of Post-Traumatic Osteoarthritis

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Post-Traumatic Osteoarthritis (PTOA) is a disorder caused by traumatic injury to the joint. 50% of individuals who rupture their anterior cruciate ligament (ACL) develop PTOA 10-20 years after injury. We hypothesize that cellular activities early after injury help initiate PTOA. Cyclin-dependent kinase 9 (CDK-9) is a protein required for the transcription of all inducible genes. By preventing the transcription of inflammatory genes early after injury, we hope to prevent or delay the onset of PTOA. We test whether inhibition of CDK-9 using Flavopiridol (an ATP analog that inhibits CDK-9 kinase activity) and JQ1(an inhibitor of BRD4, which recruits CDK-9) early on after injury can prevent PTOA. In this study, we used a mouse OA model by applying direct force to the tibia in order to rupture the ACL. The mice were then separated into either 3 or 7 day treatment and further into uninjured and injured without treatment, Flavopiridol, JQ1, or Flavopiridol and JQ1 together. The knees were then analyzed using micro computed tomography (μCT) in order to measure trabecular bone remodeling and osteophyte formation, which are hallmarks of OA. Our results so far indicate that Flavopiridol and JQ1 are effective in preventing early signs of PTOA after ACL injury.

Molecular Tools for Hummingbird Conservation: Determining Sex by DNA

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Hummingbird sex identification is difficult to perform in the field because females and males often look alike, but is vital for determining population sex diversity and demographic structure. To accurately determine the sex of hummingbirds, a molecular approach using polymerase chain reaction (PCR) could help PCR primers that accurately determine sex in birds generate two bands for females (W and Z chromosome genes) and one band for males (Z chromosome genes). Seventeen PCR primers reported to sex various bird species were preliminarily tested in two males and females from four California hummingbird species (*Calypte anna, Archilochus alexandri, Selasphorus sasin, Selasphorus rufus*). Subsequently, using the two top amplifying primers, pectoral muscle DNA samples from at most ten males and ten females from each of the four hummingbird species were tested. Trace DNA from feathers was also compared to pectoral muscle DNA results to determine if a less invasive approach could be used to identify sex. Overall, one set of primers produced results that were consistently reliable (100% in all samples tested) and both pectoral muscle and feather samples were equivalent in quality of amplifiable DNA. This project has important conservation application for hummingbirds and for ensuring field data accuracy.

Effects of a Resource Pulse on a Carnivorous Plant Population

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Entomology & Nematology

Much ecological research considers phenomena that occur frequently. Uncommon events are often overlooked, though they can have consequences on multiple levels. Resource pulses are such events, when brief episodes rapidly introduce matter and/or energy into a system. An interesting system in which to study resource pulses is with carnivorous plants that persist in nitrogen-deficient soil and rely upon insect prey for sustenance. Individuals that receive strong pulses of nitrogen may have less incentive to trap prey, and may invest more resources towards growth. I investigated the effects of one nutrient pulse on a population of a temperate carnivorous plant. Fifty sundews (*Drosera rotundifolia*) were randomly treated with 0-8 pellets of sheep feces (representing pulses of nitrogen). I measured *D. rotundifolia's* leaf mucus mass (investment in carnivory) before the pulse, and subsequently three times per week in August 2014. Preliminary results indicate a significant effect of treatment on *D. rotundifolia's* investment in carnivory. Plans are made to perform a more comprehensive experiment in Spring 2015.

The Effectiveness of an Injury Risk Assessment in Predicting Injuries in Youth Athletes

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Neurobiology, Physiology & Behavior

One of the most popular sports in the US is soccer, with an estimated 3 million kids between the ages of 5-19 registering each year. While sports participation can be very beneficial, overtraining or improper movements can result in injury. Several factors increase an athlete's risk of injury, including gender, age, strength of supporting muscles, and characteristics of biomechanical movement. The aim of this study is to examine the relationships between lower extremity injuries, jump landing technique, athletic performance, and demographics in female soccer players ages 12-18 using a jump test called the Landing Error Scoring System (LESS). This clinical screening tool will be used to analyze biomechanical factors related to lower extremity injury risk at the beginning and end of an athlete's competitive season. Tests to determine athletic performance will also be conducted, including a T test for agility, a plank test for core strength, and a bridge test for hamstring strength. We believe that proper jump landing technique and strong scores on athletic performance will correlate with decreased lower extremity injuries. By determining factors that increase an athlete's risk for injury, we can develop training protocols to address these risk factors and decrease injuries in youth soccer players.

"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

Kristina K. Hanna
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Psychology

Racism has gradually transformed from overt practices to more subtle forms that are embedded in cultural values, institutional policies and practices, and deeper psychological processes. People of Color report racial microaggressions as the most common form of racism. Racial microaggressions are defined as "commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (D.W. Sue, 2010). Research indicates that microaggressions act as a significant physiological stressor, and more frequent exposure can result in greater physiological stress (D.W., 2010). Some researchers theorize that certain personality traits may exacerbate the negative effects of discrimination on psychological and physiological well-being. Using a sample of Asian Americans, this study investigated the aspects of *social, performance*, and *appearance* self-esteem and their moderation on the effect of a microaggression. Of these aspects, *performance* self-esteem was the only significant moderator (b = .145, SEb = .067, β = .143, p< .05). Those who had more confidence in their performance experienced greater physiological stress from the microaggression than those who had little confidence in their performance. We interpret these findings by discussing how pathways to positive self-regard may vary among individuals from different cultures.

Autophagy and Its Role in Aging Cardiac Muscle

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Neurobiology, Physiology & Behavior

Autophagy is an intracellular process that deals with the destruction of organelles and cytoplasmic protein aggregates through the lysosome. More specifically, it serves as a protein degradation pathway in muscle. Recent literature has demonstrated there is either an increase or decrease in protein degradation as one gets older. The purpose of this study was to investigate the role of autophagy with age by looking at autophagic flux in young and old rat hearts. Through a series of Western blots, we looked at the expression of the autophagy related proteins Atg3, Atg7, Atg5, Beclin, LC3B and p62, as well as how the cardiac expression of these proteins changed when young and old rats were treated with the autophagy inhibitor colchicine. Our results showed that expression of these proteins increased with age and that the rate of autophagy was higher in the old rats. Ultimately, this knowledge can be used to gain a better understanding of the role of protein turnover with age and whether changes in the activity of the autophagy pathway can lead to cardiac dysfunction.

An Analysis of Changes to the World Economy in the 17th Century and Their Impact on the Fall of the Safavid Empire

Eric Haunschild
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History

Current research on the fall of the Safavid Empire focuses on state-level economic, political, and military explanations as a model for Safavid decline. These explanations inadequately take account of changes to the world system and their impact on the fall of the Empire. To bridge this gap in understanding, I have researched numerous primary and secondary sources focusing on Safavid decline and changes in the world economy between 1600 and 1720. This investigation yielded the novel explanation that Safavid decline was a product of changes to the world system in the late 17th century. In this time period, changes in the European economic system decreased the profitability of Safavid trade. As a result, key cities along Safavid trade routes experienced a drastic decline in trade revenues. One key city was Qandahar, whose population would ultimately invade Iran and overthrow the empire. My research has shown that the key motivation behind the Qandahar rebellion was to recoup the revenue lost from the decline in trade profitability. Thus, changes to the world economy are a more adequate explanation for Safavid decline than any of the previous state-level arguments.

Galaxies, Gravity, and the Young Universe

Julie He
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Physics

Gravitational lensing plays a significant role in determining the mass distribution of a galaxy cluster. When light from a source travels to earth, it is deflected, due to gravity, by matter that fall in its path. Tracing back these deflected rays, we often find a scaled image of the source, hence "gravitational lensing". Sometimes, more than one image of a source are visible and the source is said to be multiply-imaged. Galaxy clusters can act as lenses, allowing us to observe objects that are difficult to detect because they are far and faint. We can determine the mass of the lens based on how much light is deflected. In this project, I analyze new data on the galaxy cluster MACSJ1423, obtained using HST, and measure its mass distribution and magnification properties. I have produced multicolored images that allow me to identify multiply-imaged sources and make a catalog of their positions in the sky. Colored images facilitate the identification of multiple images that belong to the same source. Using *lenstool*, I will produce an estimate of the mass and magnification of this cluster. Ultimately, we can observe and study the universe within a few percent of its age.

Assessing the Relationship Between Sugar-Sweetened Beverages and Fruits, Vegetables, and Dairy in Children's Diets

Mariana L. Henry
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Human Ecology

High consumption of sugar-sweetened beverages (SSBs) in childhood is linked to poor diet quality, and consequently an increased risk for obesity, diabetes, and cardiovascular disease. SSBs constitute only one component of a child's diet. Fruits, vegetables, and dairy, in contrast to SSBs, provide nutrients for healthy development and growth of young children. Children who regularly consume SSBs are less likely to consume foods from the nutritious food groups. It is important to examine a child's diet to better understand the association between SSB consumption and childhood obesity. The current project will address the relationship between SSBs and fruits, vegetables, and dairy groups. I hypothesize that students' self reported higher levels of consumption of SSBs will be associated with lower levels of consumption of fruits, vegetables, and dairy groups. Baseline data were collected during the Shaping Heathy Choices Intervention in fall 2014 (n= 349). The Block Kids Food Frequency Questionnaire was used to assess dietary intake, and rank participants based on level of consumption from the lowest to highest quartile. Chi-square analyses will be performed to examine associations.

Phenotypic Variation of Mojave Milkweed in Early Life Stages

Stephanie E. Herbert
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Evolution & Ecology

Asclepias nyctaginifolia is a rare desert perennial, native in the Mojave Desert and whose range overlaps with the Ivanpah Solar Electric Generating System (ISEGS) in southern California. Lower impact design of ISEGS reduced the amount of grated land under the mirrors (heliostats). Additionally, mitigation sites fpr rare plants including Asclepias nyctaginifolia, Mojave milkweed, were set aside within the solar units by adjusting the placement of heliostats to create small open areas for rare plant populations to persist. The presence of plants in the solar field and in nearby natural sites allows me to ask a series of questions concerning the impact of the largest solar project to date on milkweed success in early life stages. Do seeds from maternal plants in mitigation sites within the solar field vary in comparison to seeds from undisturbed sites? Laboratory and greenhouse germination experiments were conducted to provide information on the early growth of *Asclepias nyctaginifolia*. Analysis shows seeds collected from the solar field sites are taller and produce more leaves and axial buds than those collected from natural sites. These differences highlight maternal plant response to environmental differences within the solar energy installation.

College Students' Attention to "Good" vs. "Bad" Nutrients While Selecting Healthful Foods

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Human Ecology

Nutrition information on food labels is complex, containing both nutrients to be avoided and nutrients to be consumed. However, little is known about whether consumers use one type of information over the other when making healthfulness decisions. In this study, our goal was to examine whether consumers paid attention to both "good" and "bad" nutrients on food labels. Participants (n=34, mean= 19.6 years) compared two nutrition labels across trials that varied by difficulty, and their eye movements were monitored using an eye-tracker. We examined attention using proportion dwell time, for two types of nutrients: to-be-encouraged (e.g., fiber) and to-be-limited (e.g., saturated fat). We expected to find that consumers would pay more attention to to-be-limited nutrients than to-be-encouraged, however, it was unclear whether this would change across difficulty level. Results showed that individuals focused more on to-be-limited nutrients than to-be-encouraged nutrients. However, we also found a significant interaction such that to-be-encouraged nutrients increased across difficulty levels, whereas attention to to-be-limited nutrients remained constant. Findings suggest that consumers need more education on the benefits of to-be-encouraged nutrients when making healthful decisions, which may be important for preventing diet-related chronic health conditions.

The *tep-1* Gene is Required for Shade Avoidance in *Solanum lycopersicum*

Leslie Herrera
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Plant Biology

Plants require light to synthesize carbohydrates for food. When plants detect shade from neighbors, they undergo a series of physiological changes known as shade avoidance. Shade avoidance is a developmental response in plants that allows them to compete with their neighbors for light. During shade avoidance, finite resources are allocated to elongate petioles and internodes, and are thereby diverted from other physiological processes. Agriculturally significant plants undergoing shade avoidance redirect resources away from potential fruit production to elongating tissues; therefore, it is important to fully understand this process. To study shade avoidance in *S. lycopersicum*, we chose an elongated mutant line from a mutagenized population. The chosen mutant line, named *tomato elongated petioles (tep-1)*, displayed constitutive shade avoidance, with elongated hypocotyls, petioles, and internodes in sun and shade and a reduced response to shade. The mutation responsible for the elongated phenotype is being mapped using bulk segregant analysis combined with next-generation DNA sequencing and bioinformatics analysis. By analyzing a constitutive shade avoidance phenotype mutation, we can better understand how plants respond to their respective environments.

Structure of Reconstructed Uncleaved Polyprotein 1 of Coxsackievirus B3 Virus-Like Particles

Giang N. Ho
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Molecular & Cellular Biology

Coxsackievirus type B3 (CBV3) have been identified to have positive association with many chronic diseases such as meningitis, myocarditis, and pancreatitis, while having a negative association with diabetes type 1. Despite improvements in pathology and microbiology studies, there are still no vaccine candidate available for clinical trials due to poor production yield of the virus. One alternate way of introducing a new vaccine candidate is using its virus-like particle (VLP) without RNA to replace the poor-productive live virus. Through reconstruction program, a 3D model of the VLP was created in order to measure the stability and behavior of the VLP compared to the live particles. We have managed to reconstruct the model of the uncleaved polyprotein 1 VLP particle in with and without interaction with Fab fragment of its antibody. The next step would be measuring stability and similarities of the VLP compare to natural virus capsid. There are high expectations that the density map of VLP during interaction with Fab would fit X-ray crystallography structure of live virus capsid, thus indicate the potential of the VLP as vaccine candidate.

Finding Patterns in the Chaos: High-Throughput Quantitative Analysis of Bacterial Growth Dynamics

Jonathan Ho
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Biomedical Engineering

High-throughput quantitative screening has increasingly become a staple in molecular biological studies. Recent antibiotic resistance and biofilm development investigations in microtiter plate environments have shown tremendous insight into bacterial growth dynamics. However, it remains unclear how the physical microenvironment affects antibiotic assays. Here, we show that several environmental stressors, including oxygenation, antibiotics, culture perturbation, media evaporation, and heterogeneous cell composition, can all affect bacterial and biofilm growth. By tagging *Escherichia coli* strains with either blue fluorescent protein or luciferase, we created algorithms to predict cell count with reporter protein measurements. Using these engineered strains, we found that the stressors can significantly affect the outcomes of high-throughput quantitative experiments. When compared to frequent shaking in microplate reader protocols, sporadic shaking was correlated with increased antibiotic resistance. In addition, using a microtiter plate cover to prevent media evaporation resulted in more precise measurements than did using mineral oil, a more prevalent method. By adding *Lactobacillus acidophilus* or *Bacillus subtilis* into treatment wells, we showed that our algorithm can track cell strains of interest even in the presence of complex microconsortia and stressors. We anticipate that this study can guide *in vitro* tests of antibiotic treatments by accounting for previously overlooked environmental interactions.

QTLVizR- A Novel Way to Visualize QTL Data

Tiffany A. Ho
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Plant Biology

Data visualization is an integral part of almost every industry, but it is especially useful for scientists. It allows us to quickly examine large amounts of data, identify the underlying patterns, and determine which statistical tests we can use to followup on our observations. Quantitative Trait Loci, QTLs, are genetic loci that contribute to quantitative variation in a trait. QTL data can be massive, and it would be a great advantage to be able to quickly obtain a visual summary of the data. In order to solve this problem, I have created an interactive web application in R that visualizes QTL data along with gene expression data. The application displays the significance of the QTL and relative gene expression for just one trait, or for multiple traits, at a time. There also are many other options that the user can interactively select. We now can have a great overview of the data within minutes of loading a new dataset into the application. We would like to use this to find overlaps between QTL, gene expression, and phenotypic traits.

Implementation of Spatial Care Paths in Hualien County, Taiwan

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Pathology & Laboratory Medicine
School of Medicine

Current health access models are constrained by the lack of focus on the location of diagnosis. Point-of-care technology (POCT), defined as pathology testing at or near the site of patient care, is unique because it allows diagnostic information to be easily integrated into new locations. This project specifically focuses on acute myocardial infarction (AMI) in Hualien County, Taiwan. ArcGIS Network Analyst 10.2 was used to design a health access model based on population, roads, and health facilities. A survey was also created to understand how AMI is currently being diagnosed and treated to define current care paths. With this data, spatial care paths (SPCs), defined as the most efficient route taken by patients when receiving definitive care, were created to emphasize POCT placement in optimized locations. This information allows the streamlining of patient care paths, which saves time, resources, and quantifies the improved economic and medical outcomes. This methodology can be similarly applied to studying patient triage models for other diseases in various countries, regions, or sites where time to diagnosis and treatment is critical.

Age and Gender Impact Peer Selection and Response to Peer Feedback

Anna J. Hoehenrieder
Sponsor: Amanda E. Guyer, Ph.D.
Human Ecology

Gender plays an important role in how children process social feedback and build friendships. Often young children will segregate themselves by gender, but this tendency is reported to decline with age (Martin et al., 2013). In the present study, 62 participants ages 9-14 were asked to select 30 peers to interact with from a total of 60 (30 females). Participants were told these were other children participating in the study; however, they were actually standard stock photos. In a follow-up visit, participants received rigged feedback about whether their peers wanted to chat with them and were asked to report how much they expected this feedback and how it made them feel. Female participants chose significantly more females to chat with and male participants chose more males, with a marginally significant age interaction. Females expected more rejection from males and males expected more from females. Notably, there were no gender differences in expectations of feedback or reported negative affect. These results display an overall preference in childhood for same-sex friendship that declines with age. They also demonstrate changing expectations for social rejection as children enter adolescence, but no effect of gender on expectations of and subjective emotional response to social evaluation.

Haustorium Development in Parasitic Angiosperms

Austin Holzman
Sponsor: John Yoder, Ph.D.
Plant Sciences

Parasitic weeds are an increasingly devastating problem for agricultural yields throughout the world. By investigating how parasitic plants identify and invade host plants, we hope to be able to develop novel strategies for their biological control. The Yoder lab had previously isolated a gene, TvQR1, from the parasitic plant Triphysaria that plays a crucial role in the formation of haustoria; the root structure made by this family of parasitic plants that attaches to and infects the host. To investigate the transcriptional regulation of this gene during the infection process, we cloned the promoter into a plant transformation vector expressing the GUS reporter gene. This construct is being transformed into both parasite roots and non-parasite *Arabidopsis* roots using *Agrobacterium* transformation. By staining the transgenic roots for GUS expression, we can identify when and where this gene is expressed during host plant-parasitic plant interactions. I am currently screening the seeds of primary transformants to identify those that have been transformed with the TvQR1 promoter-GUS fusion construction. Verified transgenics are being self pollinated to produce T2 populations which will be used for further experiments. Once the underlying mechanisms of parasitic plants are understood, effective countermeasures can be developed to safeguard our food supply.

Organic Extraction of Pinot Grape Skin Pigment Compounds and Its Feasibility in Textile Coloration

Angeline Hong
Sponsor: You-Lo Hsieh, Ph.D.
Textiles & Clothing

Grape is one of the largest produced crops in the world, with the largest majority used for winemaking. The winemaking process leaves behind grape pomace, a residue of pressed skin, seed, pulp and stalk that is typically disposed of, however may be a suitable material for new uses and bio-products. Grape skin in particular is rich in flavonoid phenolics such as anthocyanins which are the pigment components that give grapes their red colors. The extraction of these pigment components in Pinot grape skins was studied and modified for optimal yield. The organic extraction was performed with 7:3 v/v ethanol/water, subjected to base treatment, and subsequently characterized by Fourier transform infrared spectroscopy (FTIR.) The feasibility of this extraction as a natural colorant for textile dyeing was studied using a multi-fiber strip. The addition of mordants to the extraction is another point of interest as it may fix and help facilitate dyeing.

Psychometric Tests for Intellectual Abilities: Evaluating the Theoretical Framework of Intelligence Scales

Maxwell Hong
Sponsor: Emilio Ferrer, Ph.D.
Psychology

General intelligence, also known to as Charles Spearman's *g* factor, is an artificial construct developed by psychologists to define overarching cognitive ability. Many researchers attempt to capture this characteristic by means of psychometric tests. I will discuss the methodology and test content of psychometric measures. To illustrate the substantive and statistical components of a test of general intelligence, I describe the Stanford-Binet, a prime example of a psychometric measure. To explain the methodology of testing, I introduce the concept of adaptive testing and different forms of it. Furthermore, I discuss the rigorous treatment of psychometric measures and modern test theory comparing item response theory (IRT) and classical test theory (CCT). Parameters based on the so-called Rasch (1960) model are presented as a foundation for understanding IRT. Applications of IRT are also shown in both education and workplace settings. I conclude that, as a result of the improvements in testing methodology, the future of intelligence tests must employ computerized adaptive testing (CAT) in order to produce the most reliable and valid measures.

The Dumbledore Conundrum: Homosexuality in *Harry Potter*

Stephanie M. Hoogstad
Sponsor: Frances Dolan, Ph.D.
English

Rowling's proclamation of Dumbledore's sexuality rocked readers around the world, and ever since fans and critics have questioned homosexuality in *Harry Potter.* Many debaters claim that homosexuality is entirely absent from the series. However, this reading is superficial. Slash fan fiction, which pairs characters in same-sex relationships, hints at the series' potential for homosexuality. I suggest that while *Harry Potter* does not present homosexuality through overtly homosexual relationships and characters, the texts code homosexuality in gendered character development and homosocial relationships. The series presents homosexuality as it does other examples of "otherness," or concepts outside the heterosexual, white male norm, such as the racial tensions symbolized by the purity of wizarding blood. The books' figurative representations of homosexuality exposes readers to the concept while allowing them the choice of accepting or rejecting it as homosexuality. My project examines the books through Sedgwick's homosociality, Foucault's sexuality, and slash fan fiction to part from the critique that *Harry Potter* is a strictly heteronormative series. Instead, the books present homosexuality this way so that readers grow to understand *Potter* sexuality as a complex construct that requires deeper interaction with and interpretation of the texts.

Circadian Hospital Lighting

Jonathan S. Hoolko
Sponsor: Michael Siminovitch, Ph.D.
Design

As the world transitions to modern LED lighting technology, opportunities arise for advancement not only in energy efficiency, but also in the quality of our lighting systems. Compared to older technologies, the increased color control of LEDs allows us to design lighting that does more than just illuminate a space. My research is focused on utilizing this increased control to create a dynamic color changing lighting system for a hospital patient room. The color changes mimic the diurnal cycle of our sun, allowing our circadian rhythms to sync to a more natural light schedule. This synchronization regulates cortisol and melatonin levels in your body, expediting the healing process and keeping patients comfortable. In addition to the color tunable sources, the inclusion of adaptive night lighting strategies prevents interruptions to our circadian rhythm that occur from exposure to blue light at night. This research is the initial step towards enacting a retrofit lighting project for the UC Davis Medical Center's facilities.

Determining the Roles of the *cyp19a1a* and *cyp19a1b* in Zebrafish Sex Determination

Kevin Hu
Sponsor: Bruce W. Draper, Ph.D.
Molecular & Cellular Biology

Unlike mammals, zebrafish sex determination is not decided by a major chromosomal locus. Instead, recent studies have shown that oocyte production is required for female primary sex determination. More recently the Draper lab has discovered that oocytes are also required for maintenance of the adult female sexual phenotype, as oocyte-depleted females sex revert to males. This suggests that oocytes produce a signal that is required for female development, and we hypothesize that its main function is to increase the production of the female sex hormone estrogen by cells of the somatic gonad. In mammals, estrogen is produced by the cytochrome P450 aromatase, encoded by the *cyp19a1* gene, using androgens as a precursor. In zebrafish there are two *cyp19a1* ohnologs, called *cyp19a1a* and *cyp19a1b*, which are expressed in the gonad and brain respectively. We hypothesize that only the ovary-expressed *cyp19a1a* is required for female sex determination. To directly test this hypothesis, we have induced loss-of-function deletion mutations in both genes using the TALEN genome editing technology. Our analysis has revealed that *cyp19a1a*, but not *cyp19a1b*, is essential for female sexual development. We are currently investigating how the oocyte signal regulates *cyp19a1a* expression.

Neuroprotective Effects of Glutamate Oxaloacetate Transaminase: An Experimental Study

Albin Huang
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Neurological Surgery
School of Medicine

Traumatic brain injury (TBI) is the result of a primary injury, but is also associated with secondary downstream excitotoxic glutamate cascades. Previous testing of glutamate receptor antagonists failed to perform in clinical settings, and a novel strategy of glutamate scavenging has appeared to be a possible mechanism for facilitating glutamate efflux from the brain. The key enzyme facilitating this process is glutamate oxaloacetate transaminase (GOT), which catalyzes the transformation of oxaloacetate and glutamate to aspartate and α-ketoglutarate in blood, lowering glutamate concentration–the gradient difference between the brain and blood facilitates glutamate efflux. The purpose of this study was to analyze the effects of administering GOT in a rat model, measured by the concentration of glutamate present in the blood at t = 30 min, 1 hr, and 2 hr after TBI. The animals underwent lateral fluid percussion to induce TBI, and blood was collected via tail vein. The blood was centrifuged and the serum was frozen, then assayed 24 hrs after to determine a final glutamate concentration. Animals treated with GOT had a lower blood glutamate concentration compared to the control. The results point towards GOT being a viable method for lowering brain glutamate concentrations produced by TBI.

Bilingualism, Parenting Factors, and Child Behavioral Outcomes: Cultivating Positive Outcomes in Asian American Children

Cindy Huang
Sponsor: Nolan Zane, Ph.D.
Psychology

Research suggests that bilingual children have better cognitive and educational outcomes than their monolingual counterparts. However, more research is needed on the impact of bilingualism on children's behavioral outcomes. The topic of bilingualism is especially pertinent to Asian American families due to potentially conflicting expectations of language use in the home. Since bilingualism is associated with positive outcomes for children, it is critical to understand how parenting may influence child bilingualism. This study will address gaps in the literature by examining the relationship between bilingualism and child behavior outcomes, and the parenting factors that are associated with bilingualism in Asian immigrant families. It is hypothesized that more bilingual language use at home is associated with positive child behavior outcomes, whereas positive parenting behaviors and parent-child relationships are associated with more bilingual language use in the home. In this study, Asian American immigrant parents with children between 9-13 years old will be recruited to self-report on child adaptive behaviors, parenting factors, and child language use at home. Data analysis will be conducted using hierarchical linear regressions. These findings have implications for interventions, which can address specific parenting factors conducive to better educational and behavioral outcomes for Asian American youth.

Stress, Mindset, and Self-Esteem

Julie Huang
Sponsor: Kali Trzesniewski, Ph.D.
Human Ecology

Research shows that stress has a powerful effect on a person's well-being (Keller et al, 2012). However, less is known about the psychological mechanisms linking stress to these long-term outcomes. This study tests whether a person's well-being (i.e., self-esteem) is influenced by their perception of their daily stressors. However, we hypothesize that this relation will only be present for people who believe that their abilities cannot change (Dweck, 2000). That is, if a person believes that her abilities are fixed (fixed mindset) and experiences many daily stressors, she will have lower self-esteem than people who experience less stress and/or have a growth mindset (believe they can change their abilities). We tested this in 523 second-year college students. We found a significant interaction between having a fixed mindset and perceptions of daily stress predicting self-esteem, such that the lowest levels of self-esteem were found for students who had a fixed mindset and high perceived stress. Interestingly, students with a growth mindset had the highest self-esteem, regardless of their perceived stress. Thus, students with a fixed mindset and high perceived stress are at greatest risk of developing low self-esteem, but further research is needed to test the causality of this effect.

Identification and Characterization of the MXD3 Nuclear Localization Signal

Tina Huang
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Pharmacology
School of Medicine

Medulloblastoma, one of the most commonly occurring brain cancers found in children, is caused by the uncontrolled proliferation of granule neuron precursors (GNPs) within the cerebellum. MXD3, a transcription factor, has been identified as an important regulator of cell proliferation in mouse GNPs and human medulloblastoma cells (Yun et al., 2007, Barisone et al., 2012). Nuclear localization signals (NLS) are required for the transport of nuclear proteins into the nucleus. The NLS for MXD3 has not been confirmed via structure-function studies. In order to better understand MXD3, we will conduct structure-function studies in which we will make deletions and replacements at the putative NLS. These NLS mutants will be compared to wild-type MXD3 in immunocytochemistry studies to determine if the putative NLS site is required for MXD3 nuclear localization. In addition, these mutants will be used in functional studies in medulloblastoma cells to determine the possibility of non-canonical functions of MXD3. These studies will help us gain a better understanding of MXD3 and how it functions in human medulloblastoma cells.

Red Dress for Heart Health

Susan Huey
Sponsor: Adele Zhang, M.F.A.
Design

Cardiovascular disease, a range of conditions affecting the heart and blood vessels, is the prominent killer of women in the United States. It continues to take females' lives every minute, yet it is largely preventable through the adoption of healthy lifestyles. As *The Red Dress®* is the national symbol for raising awareness of heart disease, the collaboration between the UC Davis Women's Cardiovascular Medicine Program and the Design Department commenced the UC Davis Red Dress Collection as a cross-disciplinary project to design red dresses campaigning for heart health awareness. The unity of fashion design and mindfulness of heart health invites recognition and personal engagement of the issue, and empowers students to create garments using elements, both tangible and symbolic, that have been applied outside their conventional context into research and conceptual development. In this group research exhibition by Jenny Chen, Judy Wu, Rumiko Adame, and Susan Huey, students used design as a metaphor to visually capture the importance of heart health and healthy lifestyle. From textile details to fitting silhouettes, the red dresses are unique yet uniformed in their beauty and the color usage of red in educating women of all ages about cardiovascular disease and encouraging them to seek preventative measures.

Traversing Boundaries of Humanness: "Nonhuman Persons" in Cinematic and Literary Science Fiction

Alyssa Hurst
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English

As readers or viewers of a given work, we expect the bodily descriptions and appearance of characters to orient us in identifying them as either "human" or "nonhuman." However, this division is not always clear. My project explores modern Science Fiction narratives in film and literature that pose questions about the boundary between these categories. Narratives such as *Never Let me Go* by Kazuo Ishiguro and *Ghost in the Shell* directed by Kenji Kamiyama first support the assumption that bodily descriptions are a trusted guide to identifying a character's human status, only to later disorient these expectations. By describing clones who are unaware of their status as such and cyborgs who can choose their own robotic bodies, these works manipulate the ways an audience understands a character's status of personhood. When characters defy conventional categorization as either human or nonhuman, this ultimately invites the audience to reconsider what counts as a "person." This reevaluation creates a category of what I call "nonhuman persons"–characters that traverse the boundaries of the human and nonhuman.

A Study on Using 4-(Nitrobenzyl)pyridine (4-NBP) as a Sensor for Toxic Agents

Van Huynh
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Textiles & Clothing

Fumigants are widely used to sterilize the soil on the field and are known to be harmful to humans as it can potentially cause cancer. Therefore, colorimetric sensors are developed to detect the concentration of fumigants on the field using the chemical reaction between 4-(nitrobenzyl)pyridine (NBP) and two alkaline agents: methyl iodide and bromomethane. In this experiment, I performed two selectivity tests on the colorimetric sensors. The first test was to ensure that no interference factors in application environment could reduce the sensibility of the sensor, and the second test was to explore the possibility of the sensor in detecting other toxic chemicals that functions similarly as methyl iodide and bromomethane. Both tests were done by using the highest permissible exposure levels of different fumigants and allowing each of them to react with the 4-NBP in a gas chamber. However, the difference is the first test is done with the presence of methyl iodide. It is predicted that the color only disappears when the chromophore is being oxidized. As for the second test, the color should appear on the sensor under the reaction of NBP and any low boiling point alkaline agents.

Genetic Requirements of Multiple Invasion-Mediated Chromosomal Rearrangements

Abou Ibrahim-Biangoro
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology & Molecular Genetics

Homologous recombination is a double-stranded break repair mechanism that uses an intact copy as a template for repair. Hundreds of nucleotides of the DNA strands flanking the break are exposed and coated by the recombinase Rad51. The search for the homologous intact copy is performed simultaneously and independently by multiple sections along the single-strand DNA. The consequence of this search mechanism is the possibility to invade several donor molecules resulting in a "multiple invasion" intermediate. We study the potential threat for genomic stability posed by this intermediate. We developed an assay in yeast that measures translocation of two halfs of the LYS2 gene (LY and S2) that serve as donors for a third, broken molecule bearing homology to each of these donors (YS). We showed that translocation depends on (i) the formation of a break, (ii) overlapping homology near the break to the two LY and S2 donors, and (iii) the recombinase Rad51. The translocation frequency increases with the length of the homology. We also show that nucleases (Yen1 and Mus81) are participating in the formation of the translocation, and that helicases (Sgs1 and Mph1) are inhibiting it. We are thus uncovering a new mechanism of genomic instability.

Natural Pseudotyping of HIV-1 with HTLV-II Co-Infection: Potential Mechanism for Rampant Spread of HIV-1

Brian S. Imbiakha
Sponsor: James Hildreth, M.D., Ph.D.
Molecular & Cellular Biology

The Human Immunodeficiency Virus (HIV-1) is only able to infect cells expressing CD4 and CXCR4/CCR5 (including T-cells, macrophage and dendritic cells). HIV-1 can be transmitted by sexual exposure. The vaginal mucosal membrane is lined with epithelial cells, a cell type normally resistant to HIV-1 infection. The high prevalence rates in young women in some countries of Southern Africa are unexpected. Recently we have demonstrated that co-infection of HIV-1 with the gammaretrovirus xenotropic murine leukemia virus-related virus (XMRV) in T-cells produce HIV-1, that are able to infect epithelial cells from the female genital tract. This phenomenon, described as "Natural Pseudotyping", involves the incorporation of non-HIV envelope glycoproteins from other co-infected viruses by HIV-1, thus expanding its cellular tropism. We hypothesize that HIV-1 can be naturally pseudotyped by HTLV-II during co-infection. In the preliminary studies, we have found that the progeny virus from HTLV-II and HIV-1 co-infected T cells was able to infect female genital epithelial cells, which suggest HIV-1 acquired HTLV-II glycoprotein to establish this active infection. Continuing to investigate the HTLV-II and HIV-1 natural pseudotyping could contribute a mechanism for HIV-1 rampant spread in some population of the world, such as Southern Africa.

Laboratory Evaluation of Different Biopesticides to Control The Fuller Rose Beetle, *Naupactus godmani* (Crotch) (Coleoptera: Curculionidae)

Fernando H. Iost Filho
Sponsor: Edwin E. Lewis, Ph.D.
Entomology & Nematology

The Fuller rose beetle (FRB), *Naupactus godmani*, is commonly found in California citrus orchards. Neither the adults nor the larvae cause economically important direct damage to the citrus plants or fruit. However, California's most important export market for navel oranges, the Republic of Korea, changed their importation requirements January 2014. Therefore FRB management in citrus became more important. We evaluated in the laboratory the effects of three commercial biopesticides; Mycotrol-O® (active ingredient - *Beauveria bassiana* strain GHA), GRANDEVO® (active ingredient - *Chromobacterium subtsugae* strain PRAA4-1T), and BioNEEM® (active ingredient - azadirachtin, a natural insect growth regulator extracted from the Neem seed). Petri dish assays with FRB adults were conducted following recommended dosages according to product labels. The products were sprayed on two different surfaces, filter paper or fresh citrus leaf. Single application of GRANDEVO® caused 0% mortality after 15 days. BioNEEM® and Mycotrol-O® caused 100%, and 10% mortality, respectively, after 25 days. However mixed application of Mycotrol-O® with BioNEEM® caused more than 70% mortality after 25 days. The data suggest that field trials should be conducted with Mycontrol-O®, BioNeem® and the combination of both.

Harnessing the HEV VLP for Targeted Cancer Therapy

David Ivanov
Sponsor: R. Holland Cheng, Ph.D.
Molecular & Cellular Biology

While there have been many recent advances in the treatment of cancer, the field of targeted cancer therapy is still in its infancy. With enhanced permeability and retention (EPR), medication can be delivered directly to the cancer cells and potentially avoid harmful interactions in the body, which can minimize side effects, improve efficacy, and reduce the dosage needed for therapeutic effect. One method for targeted delivery exploits the fact that cancer cells overexpress certain types of adhesion proteins on their surface, called integrins, which can be used as a marker to differentiate them from healthy cells, and as an 'address' to guide the delivery of medicine to the cancer cells. The Hepatitis E Virus (HEV) virus-like particle (VLP) can be used as a vehicle to deliver medication. The VLP is an empty icosahedral shell derived from viral capsid that poses no threat to the human body, but can carry anti-cancer drugs and be modified to carry a recognition motif for binding to the $\alpha v\beta 3$ integrin, which is overexpressed in many cancer cell types, e.g., breast cancer cells. The goal of our project is to modify the HEV VLP for tumor targeting with a better EPR effect in cancer therapy.

The Legacy of Political and Social Activism in the Bay Area: Historical Connections and Modifications

Adé T. Jackson
Sponsor: Halifu Osumare, Ph.D.
African American & African Studies

The current social environment of the United States provides a unique opportunity to utilize cultural studies to measure more discrete changes in local communities. The focus of this research examines the links and fissures between contemporary activism, such as the Black Lives Matter Movement, and historic activism, like the Black Panther Party from the 1960s. Both activist movements began as local responses to the rampant violence and marginalization incorporated into American society to hinder the development Black and minority populations, such as police brutality, income inequality, and inequitable justice. They also grew into globally recognized forces of change. The goal of this research is to further explore the unique cultural environment and history of sociopolitical activism within the Bay Area in order to assess the societal development of poor and minority populations in this region. Understanding this type of information will aide scholars to better comprehend the inspiration for political activism as well as the ideological features that motivate long-term sociopolitical dissent. Ethnographic fieldwork, participant surveys, and subject observation were utilized to gather data regarding current social and political activism in the region. Currently the research is ongoing with many distinct perspectives on activism in the Bay Area being gathered.

Growth and Behavior of *Xylella fastidiosa*

Elahe Jahani
Sponsor: Abhaya M. Dandekar, Ph.D.
Plant Sciences

Pierce's disease is a deadly disease, which affects grapevines and is caused by the bacterium *Xylella fastidiosa (X.f.).* The process by which *X.f.* causes disease is not well understood. However, one hypothesis is that the bacterium clogs the grapevine's xylem tissue (water conducting elements) causing leaves to yellow, brown, and then fall off. *X.f.* also secretes proteins with potentially negative effects on the grapevine. To better understand the disease process, we will look at the behavior and growth of the WT bacterium in comparison to mutants unable to produce secreted proteins LesA or PrtA. When and why these proteins are produced in *X.f.* is still unknown, but they appear to be phenotypically involved in *X.f.* growth. To begin characterization of these proteins, we will grow *X.f.* strains in liquid media and measure their growth and viability over the span of 15 days in order to create growth curves. Furthermore, the level of expression of Les A can be measured through a fluorescent assay for each strain under different conditions. It is important to study the behavior of *X.f.* so that we may find curative treatments for this significant disease in the future.

Political Islamist Movements and Post-Uprising Middle East

Andrea Jao
Sponsor: Zeev Maoz, Ph.D.
Political Science

In 2011, four countries in the Middle East went through dramatic political change as long-seated dictators were overthrown by popular movements. As seen in the aftermath developments, the fall of the authoritarian government opened up opportunities for the rise of Islamist actors on national stage. In Egypt and in Tunisia, the Muslim Brotherhood and Ennahda garnered overwhelming victory at the polling station while Libya split into a pro-liberalist and a pro-Islamist government. The popular and media fear surrounding extreme Islamist threats followed the apparent success piqued my curiosity in presenting a more holistic picture of the political situation in the state-building process, inclusive of Islamist forces. The paper examines the Islamist political involvement prior, during, and after the Arab Spring, as well as environmental factors. The select case studies from the four countries conducted in this paper so far suggest that factors outside of ideological pursue and political rhetoric, more so than Islamist doctrines, shape the decisions and actions taken by the Islamist actors. Ultimately, the purpose of the study is to understand the role of Islamist actors that choose to remain in formal national political process in the post-revolution states.

Conjectures and Refutations: Scientific Certainty, Objectivity, and Reality

Karem Jarada
Sponsor: Elaine Landry, Ph.D.
Philosophy

There is a gap between what we know and what *really* exists. However, truth is often measured by the extent to which what we claim to know mirrors, or corresponds to, reality. This view - the correspondence theory of truth - is mistaken. Working from the history and philosophy of science, I have sought to answer the question: To what extent does our knowledge reflect reality? More specifically: To what extent do scientific observational reports correspond to what is *real*? By focusing on the relation between theory and observation, I argue that science is fundamentally concerned more with theories than it is with the world. As a result, the gap between scientific knowledge and what really exists cannot be bridged by appeal to any correspondence between what we claim to know and reality itself. Hence, no scientific theory is able to provide us with a *real* understanding of the world, i.e. a truthful description of how the world *is*, and *not* how it appears to be. Supporting these arguments by appeal to episodes from the history of science, my research is ultimately intended to critically elucidate the essential role that the philosophy of science plays in understanding science itself.

α and β–Myosin Heavy Chain Expression in Rabbit Hearts Identify Novel Sub-Population of Ventricular Cardiac Myocytes

Katrin Jaradeh
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Internal Medicine
School of Medicine

We have previously reported 2 distinctive myocyte (MC) populations in mice hearts expressing αα and αβ myosin heavy chain (MyHC) isoforms. These 2 populations normally differ in size and total MyHC (T-MyHC) expression. It is not yet known if large animals, predicted to be more representative of humans, have similar sub-populations of MCs and size. Our hypothesis is that co-existing MC sub-populations in normal rabbit hearts are similar to mice in relative size and MyHC content. Cardiac single cells were isolated by enzymatic digestion from the ventricle of adult male rabbits. α and β-MyHC proteins were measured with antibodies validated for α, β, and T-MyHC in 1-2x10^4 adult MCs per heart using flow cytometry (FCM). Validated light side-scatter measurement compared MC sub-populations' size. Unlike mice, rabbits have 3 MC sub-populations based on MyHC expression: FCM results showed ββ-MyHC (72%), αα-MyHC (4%), and α β-MyHC (21%). Mice only have αα (97%) and αβ-MyHC (3%) sub-populations. Ongoing experiments will test size differences and T-MyHC content in all sub-populations. We have identified new sub-populations of rabbit MCs using FCM. This data supports that rabbits and mice's MCs are different and that rabbits may model human biology more accurately.

An Evaluation of Factors That Hinder the Success of the Hsp90 Inhibitors, Ganetespib, Tanespimycin and Retaspimycin, as Treatments for Cancer Patients

Claire H. Jaramishian
Sponsor: Ken Kaplan, Ph.D.
Molecular & Cellular Biology

Hsp90 is a chaperone protein that stabilizes a wide array of client proteins. In cancer cells, many Hsp90 clients are overexpressed and contribute to the canonical cancer phenotypes (e.g., increases in cell proliferation). Pre-clinical studies show that chemical inhibitors of Hsp90 cause degradation of clients in cancer cells, making this class of inhibitors an exciting class of potential new chemotherapeutics. Although researchers have spent years developing new drugs and have conducted several clinical studies, no Hsp90 inhibitor has been approved as a standard treatment for cancer. Factors that have impeded clinical success of Hsp90 inhibitors are unclear but might be associated with both the biology of current inhibitors and the economics of drug development. In an effort to identify the issues affecting Hsp90 inhibitor clinical success, we have undertaken a review of clinical trials literature that involve the Ganetespib, Tanespimycin, and Retaspimycin compounds We will present our analysis by evaluating how clinical trials involving these chemotherapeutics have evolved over time, the types of cancers that have been targeted and the criteria used for determining success or failure. We will discuss which factors presumably have decelerated the success of Ganetespib, Tanespimycin, and Retaspimycin as a clinically useful Hsp90 inhibitors in the treatment of cancer.

An Investigation Into Cell Plate Formation Using the Cytokinesis Inhibitor Endosidin 7

Nathan Jayne
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

While it is known that the cell wall is composed of various polysaccharides, the formation of the cell plate and its maturation into the cell wall remains to be elucidated. Research on the formation of the cell plate has become increasingly relevant given the heightened demand for bioenergy resources and food. Unfortunately, using a genetics approach to study cytokinesis frequently leads to lethal mutations. A small molecule, Endosidin 7 (ES7), however is a powerful alternative. ES7 leads to severed cell plates and cytokinesis defects in a concentration dependent manner. Two promising mutants, es7r-2 and es7r-41, show resistance to ES7 and were identified in a forward genetics screen. I will use confocal microscopy to analyze polysaccharide deposition in these mutants. I expect to observe restored callose deposition (albeit in possibly differing patterns) which can aid in uncovering the target of ES7. In addition to observing these phenotypes, I will backcross and outcross these mutants to create a mapping population for Next Generation Mapping (NGM). This technique will identify the causal mutation conferring ES7 resistance. This mutated gene will lead us to the target protein of ES7 and uncover a novel callose synthesis mechanism during cell plate formation.

Using Digital Photography for Quantifying Muscle Color and Predicting Migratory Condition in White-Crowned Sparrows

Eunice Jiang
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Neurobiology, Physiology & Behavior

White-crowned sparrows (WCS) migrate to high latitudes each spring to breed. To prepare for long-distance flight birds deposit extensive lipid quantities in adipose tissue as fuel and increase flight muscle size to power endurance flight. Recently, my lab confirmed with electron microscopy that lipid pools in flight muscles are utilized during flight. Flight muscles undergo pigmentation change from deep red to pink with lipid deposition. Thus, migratory readiness may be estimated by visual assessment of muscle pigmentation in free-living birds. However, this scoring system is highly subjective, so we developed a photographic protocol for pigment analyses. Birds were captured in the field throughout the stages of winter, molt, and spring departure on wintering grounds (38°N) and subsequent arrival on breeding grounds (68°N). Flight muscles of WCS were digitally photographed chronicling changes of pigmentation in the muscles as birds progress from wintering to pre- and post-migratory stages. Digital photographs were taken with a Nikon D7000, followed by processing in Adobe Photoshop to determine %hue, saturation and brightness of muscle color. Results confirm lipid deposition of muscle can be assessed throughout seasonal stages to accurately pinpoint physical condition of migratory WCS while introducing a unique method to predict timing of migratory departure.

Importance of Algal Bioinformatics - 18S Sequencing of UTEX 2341

Diana H. Johnson
Sponsor: Jean VanderGheynst, Ph.D.
Biological & Agricultural Engineering

Algae are of considerable interest to the scientific community due to their potential to resolve world challenges in fuel production, wastewater treatment and environmental conservation. Despite the potential benefits of algae, there is limited information on algal bioinformatics, and as a result, ambiguity regarding algae strains has arisen. In this study, we examine one such case of UTEX 2341, an algae originally annotated as *Chlorella minutissima*. Early research on UTEX 2341's lipids and pigments conflicts with more recent studies. Using PCR and Sanger sequencing, we were able to obtain a partial 18S rRNA sequence and observed an exact match to a 1257 bp segment of the 18S sequence of *Auxenochlorella protothecoides* (UTEX 250). When placed within a phylogenic tree, UTEX 2341 fell under a region occupied by other A. protothecoides, and did not cluster with other *C. minutissima* species. This suggests that UTEX 2341 is actually a strain of *A. protothecoides* and not *C. minutissima*. Although algae such as UTEX 2341 have a plethora of industrial uses, the lack of organized information available to the public is hindering this process. A renewed effort to provide global bioinformatics data would help algae to reach its full potential.

Development of Fullerene and Piperazine

Sharon Jun
Sponsor: Alan L. Balch, Ph.D.
Chemistry

Fullerenes are composed solely of carbon atoms and have a cage-like structure that has an empty space in it. The molecule exhibits high conductibility and great endurance against pressure, even stronger than what diamond or steel can endure, and these properties have triggered fullerene to be developed in various fields such as solar energy and strengthening of metal. Yet the high stability of the molecule hinders its reactivity, therefore, adding piperazine–an organic molecule with two nitrogen atoms that are inclined to undergo chemical reactions–to a fullerene becomes an outstanding method to make the complex more reactive. Thus far, C-70 (a fullerene composed of 70 carbon atoms) with piperazine has been functionalized and two C-70 products were isolated through extraction, purified, charactered and crystallized. Then they were reacted with metal ions to create metal-fullerene polymer structures. Other products from the C-70 reaction with piperazine are still going under experimental tests to characterize their structures.

Foreign Investment and US-China Relations: What a BIT Will Do

Natasha Kang
Sponsor: Brandon Kinne, Ph.D.
Political Science

Foreign investment is evolving through the thousands of bilateral investment treaties (BITs), which are now a cornerstone of modern international investment law. BITs are international agreements between two countries creating standards of conduct for governments to create more open and transparent investing environments. In this research study, I will examine the existing literature on BITs in order to understand their motivations and resulting effects. In particular, I will focus my study on the effects of BITs including: (1) the promotion of foreign direct investment (FDI), (2) the undermining of domestic governance, and (3) the strengthening of state relationships. I will test if the literature on BITs is consistent in the case of the highly anticipated US-China BIT, currently in negotiation. This BIT between the two largest economies in the world is expected to bring both the US and China significant economic benefits and an improved economic relationship, in a tradeoff with domestic state power.

Sex and Reproduction in Occupied Palestine

Werdah A. Kaiser
Sponsor: Amina Mama, Ph.D.
Women & Gender Studies

Reproduction and reproductive processes in war-torn or occupied/colonized lands carry with themselves a certain discourse. While women in many parts of the world are rallying for women's rights to abortion and contraceptive availability in the work-place is being argued for, I would like to focus on how these topics of feminist concern are understood in occupied Palestine. After Operation Protective Edge of summer 2014, wherein large amounts of Palestinian men, women and children were wiped out, it becomes important to view how and in which way the context of Palestinian life is discussed here and now. While this phenomenon is not new, what is is the way in which the liberal media and the West talks about it. Through research conducted on ME/SA scholarly websites Electronic Intifada and Jadaliyya, it becomes apparent that the way in which Palestinian life is contextualized is akin to the contextualization of Black life or Indigenous life: zoological, primitive and barbaric. My findings revolve around a championing of a Western discourse on human rights, not a visible agenda reminiscent of the Holocaust by the state of Israel. As we will see, this derailment of thought dehumanizes Palestinian life and makes its disposability "okay."

The Effect of *Wolbachia* Titer on the Cytoplasmic Incompatibility Phenotype in Drosophila simulans

Andrew Katznelson
Sponsor: Michael Turelli, Ph.D.
Evolution & Ecology

Wolbachia are ubiquitous maternally transmitted intracellular bacteria that persist in a variety of arthropods. Many of these symbionts spread within populations by reproductive manipulation. Previous analyses suggest that higher *Wolbachia* titer positively correlates with the level of reproductive manipulation on their host. Cytoplasmic incompatibility (CI), a form of reproductive manipulation that causes offspring inviability, is due to the presence of *Wolbachia*. The goal of this study is to examine the effect of *Wolbachia* titer levels on CI in *Drosophila simulans*. By crossing *D. simulans* containing high and low titer *Wolbachia* infections and measuring the subsequent hatch rate, we can observe and record the effects that titer variation has on CI intensity. Further, quantitative PCR will be performed to measure titer levels at distinct ages. These data are important, as they will demonstrate the effect of age on titer levels and subsequent CI. This study will help clarify the relationship between titer levels and CI expression in *D. simulans*.

Using Plant Growth Traits to Bridge the Gap Between Genotype and Phenotype in *Arabidopsis thaliana*

Amanjot Kaur
Sponsor: Julin N. Maloof, Ph.D.
Plant Biology

Since the inception of genetics, it has been essential to understand the intricate relationship between genotype and phenotype. In order to study this, we are looking at phenotypic differences between recombinant inbred lines (RILs) of two varieties of *Arabidopsis thaliana*, Col and Sha. Sha samples are from a mountainous region in China whereas Col are samples of *A. thaliana* grown in lab. We measured two traits in these varieties, leaf area and leaf number, using the imaging program ImageJ to phenotype these plants. By analyzing these pictures and counting plant pixels, we can estimate plant growth. We will next use quantitative trait loci (QTL) mapping to uncover the genomic regions that underlie and control these traits. Studying the genetic basis of plant growth will provide insights into resource acquisition and distribution in plants. In this advanced era of genetics and bioinformatics, therefore, understanding phenotype-to-genotype interactions using our methodology could be a valuable asset in plant breeding.

Inflammation in Early Adulthood Predicts Heart Disease

Parneet Kaur
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Internal Medicine
School of Medicine

Coronary heart disease (CHD) is caused by the buildup of cholesterol plaques on the inner walls of arteries. It is the most common type of heart disease and is the leading cause of death in the US in both men and women. Inflammation is a normal bodily response to any sort of damage (i.e., wound, infection) and can be measured by circulating levels of inflammatory markers. The levels of inflammatory markers increase with aging and have been shown to predict future CHD risk. To investigate the role of age-induced inflammation in CHD development, three inflammatory markers (C-reactive protein, fibrinogen, and serum amyloid A) were measured in Caucasian and African-American subjects with or without CHD (age range: 20-60 years; n=338). The trajectory patterns of inflammatory markers as a function of age differed across CHD status and ethnicity with an early start and faster rate of increase being observed in Caucasian patients with CHD. These findings suggest an accelerated inflammation over age in individuals with CHD with a possible modulatory role of ethnicity/race. It is concluded that a higher inflammatory burden in early adulthood may help to identify patients at risk for CHD.

Leaf and Shoot Apical Meristem Response to Abiotic Stress in Two Tomato Species

Preetveer Kaur
Sponsor: Neelima Sinha, Ph.D.
Plant Biology

The recent irregularity in local climates has impacted agricultural productivity as crop yield and quality require specific ratios of rain, sunlight and warmth. To this end, fluctuations in water availability leave plants vulnerable to both desiccation and drowning. In order to investigate susceptible and tolerant responses to drought and waterlogging within the tomato family, we compared domesticated tomato (*Solanum lycopersicum*) and its wild desert relative (*Solanum pennellii*). By comparing the anatomical responses to water stress, we can identify structures that vary between the sensitive and tolerant species. Then by using molecular genetics we can identify the differences in the gene networks involved in responses to water stresses. To do this, we will utilize 35S-driven transgenic reporter lines (Isolation of Nuclei TAgged in specific Cell Types (INTACT)) to compare the transcriptome and the chromosomal regulation mechanisms in leaves and in the shoot apical meristems of plants challenged with drought and flooding. Having an understanding of the mechanisms that lead to abiotic stress tolerance will allow us to identify breeding strategies to create more robust crops.

Identifying Transporters Important for NAD+ Precursors in *Saccharomyces cerevisiae*

Kamieko Kayoshi
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Microbiology & Molecular Genetics

Nicotinamide adenine dinucleotide (NAD^+) is classically known for its involvement in redox and oxidation reactions. Research studies have recently shown that NAD^+ plays a very important role in many different cellular processes including cell aging, chromatin structure, and Ca^{2+} signaling. Defective NAD^+ homeostasis and metabolism are observed in diseases such as cancer, diabetes, and neurodegenerative diseases. NAD^+ precursors like nicotinamide (Nam), nicotinic acid (NA), nicotinamide riboside (NR), and nicotinamide mononucleotide (NMN) can ameliorate side effects of these diseases. The synthesis of NAD^+ is highly similar between *Saccharomyces cerevisiae* (yeast) and vertebrates. Using a cell-based assay and gene deletion library we have identified possible NAD^+ homeostasis factors. Two low affinity transporters, Fur4 and Fen2, were hit in the screen. In this work I will determine if Fur4 and Fen2 are important for transport of NA, Nam or NR. I will also determine if these transporters have a significant impact on NAD^+ homeostasis.

The Ku Klux Klan: Terror in Taft California

William J. Keisling
Sponsor: Kathryn Olmsted, Ph.D.
History

Historians estimate that as many as five million individuals belonged to the Ku Klux Klan at the peak of its 1920s revival, comprising a staggering four to five percent of the American populace. Over the past two decades, fresh historical appraisals of the Klan's heyday run the gamut from painting the organization as a relatively benign fraternal order to exposing the Klan as a secretive vehicle for bitter social righteousness. Inarguably however, flagrant cases of mob intimidation and violence, often lacking any rational basis in typical Klan ideological hatreds, hastened the organization's collapse by the end of the decade. With this in mind, my research delves into a never previously examined case of Klan terror in California's Central Valley. Through court documents and news reports, I afford new perspective on this aspect of Klan moral hypocrisy, adding to the history of similar incidents in Los Angeles and Indiana. Between devious leadership, and ravenous expansion efforts in appeal to a carnival's worth of petty hatreds, the Klan of the early 20s invited those on the cusp of power to secure the aegis of an anonymous fraternal order to mete out arbitrary moral rectitude in their communities, wreaking havoc in their wake.

Analyzing the Ability of a Local Population of Stickleback Fish to Respond to Visual Cues

Michelle C. Kelley
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Recent research supports that different populations of stickleback fish, *Gasterosteus aculeatus*, rely on spatial and visual cues to find food and safety (Odling-Smee, Braithwaite, 2003). In this experiment a t-maze was used to train the stickleback to locate a food reward associated with the color purple. Throughout testing, the time required for stickleback to reach the desired target was recorded as evidence of learning. The objective of this experiment was to record the ability of Putah Creek Stickleback to learn to respond to a specific visual cue. Histology of organ tissue allows for the identification and analysis of organ structures and tissue compositions of the Stickleback. This information can be used to draw connections between structures within the control centers of the fish and the observed learning behavior. This experiment is similar to experiments performed using other stickleback populations (Odling-Smee, Braithwaite, 2003). The results of this experiment could help determine the stickleback's ability to respond to changing environments. Upon successful training of this associative learning, further experiments can be done with certain addictive substances. A possible question is whether nicotinoid insecticides found in polluted stream waters improve the time it takes for the stickleback to swim to the desired target.

A Study on the Role of Quantitative Variation of Centromere Strength on Inducing Genome Elimination in *Arabidopsis thaliana*

Alina Khil
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Plant Biology

Centromeres are chromosomal loci essential for segregation of chromosomes during cell division. CenH3 is a centromere specific histone H3 variant required for functional specification of the centromere. In *Arabidopsis thaliana*, crossing the *CenH3* null *plant* (-/-) functionally complemented with *GFP-tailswap* (a CENH3 variant) with wild-type leads to uniparental elimination of chromosomes contributed by the mutant parent (*GFP-tailswap*) and results in haploid progeny carrying exclusively wild-type genome. Haploids have immense value in plant breeding and understanding the phenomenon of genome elimination will help in developing a better haploid induction strategy. One of the hypothesis is that genome elimination happens due to a quantitative variation wherein a less quantity of CENH3 variant occupy the centromere resulting in a weak centromere compared to the wild-type CENH3. To test this hypothesis, a quantitative variation CENH3 in the gametes would be created by using *CenH3-1* heterozygote (+/-) plant. The gamete carrying a null allele will have relatively less CENH3 on its centromere compared to the gamete inheriting the wild-type allele due to two or three rounds of mitosis during male and female gametogenesis. The effect of this quantitative variation will be scored in resulting progeny by crossing the heterozygote with a wild-type parent.

Ebola and Neoliberalism: An Inquiry Into Pharmaceuticals, Structural Adjustment, and Structural Violence

Jack Killion
Sponsor: Cristiana Giordano, Ph.D.
Anthropology

Although the recent Ebola outbreak in West Africa has garnered a great deal of media attention in the US, relatively little of this has focused on the political and economic context from which it emerged. In this project, I hope to show the deep connections between globalized neoliberalism and the recent Ebola outbreak, analyzed through an anthropological lens. In particular, I will focus on the way in which profit-oriented pharmaceutical research & development has failed to provide adequate medicines for Ebola (as well as many other "neglected diseases"). Instead, much of the Ebola research that has been conducted was funded at least in part by the military to protect against potential bio-terrorist attacks, bringing into question what guides "global health" work today. Additionally, I will examine how neoliberal structural adjustment programs in West Africa may have contributed to the severity of this Ebola epidemic (e.g. through cuts to public health spending, environmental degradation, etc.). Finally, I will show how the recent Ebola outbreak can be usefully analyzed from an anthropological perspective as an example of "structural violence," in which large-scale human suffering is built into the very political, economic, and social systems that we inhabit.

Dental Pathology of the California Bobcat (*Lynx rufus californicus*)

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Surgical & Radiological Sciences
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The dental pathology of feral and domestic cats have been studied in the past. In comparison, very little studies have been done on the dental pathology of wild cats. This study of dental pathology of the California bobcat was done in order to categorize dental lesions found in bobcats, and compare these results with those of feral and domestic cats. We hypothesized that dental pathologies of bobcats and domesticated and feral cats will vary due to the cats' susceptibility to disease, behavior, and diet. California bobcat dental pathology was recorded through close evaluations of the external conditions of each tooth. X-rays of each specimen were taken in order to verify our findings. The observations of bobcat skull specimens allowed us to verify our hypothesis. In the cases studied, we observed a similar distribution of dental lesions in all species. All of the bobcats showed signs of resorptive lesions, attritions/abrasions, tooth fractures, periodontitis, periapical disease, and endodontal disease. Results indicate both similarities and differences of the dental pathology between the California bobcats and domesticated and feral cats. Because bobcats rely heavily on their dental functionality for hunting and feeding, dental diseases can significantly affect the mortality and survival of bobcats.

"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

Hope Y. Kim
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Psychology

Racism has gradually transformed from overt practices to more subtle forms that are embedded in cultural values, institutional policies and practices, and deeper psychological processes. People of Color report racial microaggressions as the most common form of racism. Racial microaggressions are defined as "commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (D.W. Sue, 2010). Research indicates that microaggressions act as a significant physiological stressor, and more frequent exposure can result in greater physiological stress (D.W., 2010). Some researchers theorize that certain personality traits may exacerbate the negative effects of discrimination on psychological and physiological well-being. Using a sample of Asian Americans, this study investigated the aspects of social, performance, and appearance self-esteem and their moderation on the effect of a microaggression. Of these aspects, performance self-esteem was the only significant moderator (b = .145, SEb = .067, β = .143, p< .05). Those who had more confidence in their performance experienced greater physiological stress from the microaggression than those who had little confidence in their performance. We interpret these findings by discussing how pathways to positive self-regard may vary among individuals from different cultures.

Molecular Evolution of Metabolic Genes and Its Implication in Personalized Nutrition

Ligaya King
Sponsor: Graham Coop, Ph.D.
Evolution & Ecology

The United States is a melting pot of cultures converging on a homogenized Western diet. Through globalization, this Western diet is rapidly spreading throughout the world and the health implications cannot be ignored. Governments, scientists, health professionals, and the media have all tried to identify the best diet to keep the population healthy, but obesity, cardiovascular disease, and metabolic syndrome still run rampant. With such a diverse population, one-size-fit-all diets cannot work. Current research on several metabolic genes has shown positive selection in recent evolutionary history. Our ancestors adapted to certain ecological pressures, and the evidence can be seen in our genes. Using this research, I will look at a sampling of these genes in individuals and suggest a basic diet for each in order to show similar and/or different dietary needs among a variety of individuals. By understanding where our ancestors came from, we can better understand our present health crisis. Investigating the molecular evolution of metabolic genes and understanding the ways in which these genes have been beneficial to certain populations throughout recent history can build the foundation of personalized nutrition.

Supporting Science and Technology Through Art: The Legacy Left by a Renaissance Duke, and a Governor of California

Rebecca King
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Art & Art History

That art and technology are opposite ends of an intellectual spectrum is a widely held idea. Yet technology intertwined with art in two very different eras: the late 16*th* century and the late 19*th* century. Two wealthy men, whose careers were separated by more than 300 years–Francesco I de' Medici (1541-1587), Grand Duke of Tuscany in the late Renaissance and Leland Stanford (1824-1893), one of California's early governors–made these connections. Their art collections would seem to have nothing in common, yet each supported technology through art. Stanford's passion for photography allowed art to be seen in a new medium, and his use of Carlo Ponti's Megalethoscope, an invention that shows images during different periods of the day, changed how people could view classical works of art. Francesco I mixed art with technology through his private *studiolo*, where natural wonders combined with marvelous handcrafted items. The 34 paintings inside this curious study symbolized Francesco's practice of alchemy and its applications. Though they come from different eras and places, these men challenged our conventional understanding of "art." Their collections held onto the belief that only through the combination art and technology could new and better things be created.

Morphometric Variability in Domestic Dogs (*Canis lupus familiaris*) and Island Foxes (*Urocyon littoralis*) from California's Channel Islands

Sarah D. King
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Anthropology

On California's Channel Islands, domestic dog (*Canis lupis familiaris*) and island fox (*Urocyon littoralis*) remains have been recovered from multiple archaeological sites in association with human occupation, ranging from formal burials to non-ceremonial cultural deposits. These deposits yield dates that vary in age from at least 6,400 years ago to the historic contact period during the early 19th century. Both of these canid species were brought to the islands and dispersed by native peoples from the mainland, and this site diversity suggests that these animals played an important role in the ritual and everyday lives of the people who inhabited the Channel Islands. Skull measurements of both species were taken in order to analyze the osteometric variation within and between the domestic dogs and island foxes. As demonstrated by preliminary data, greater variability across fox crania suggests that they have experienced significantly less selective pressure than dogs over their evolutionary history on the islands.

Optimization of MAP Kinase P38 Inhibitors for Use in Preventing the Transmission of the Malarial Parasite in the *Anopheles* Vector

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Medical Microbiology & Immunology
School of Medicine

Malaria is caused by the single-cell protozoan parasite *Plasmodium falciparum* that is transmitted to humans by the bite of *Anopheles* mosquitoes. Malaria is extraordinarily widespread, with over forty percent of the world at risk of infection, and over three hundred thousand deaths annually. Currently, there is no vaccine for the disease, and both the parasite and mosquito vector are becoming increasingly drug and insecticide-resistant. As traditional methods used in fighting malaria have failed, we need new strategies to prevent transmission. One novel technique involves the manipulation of key mosquito signaling pathways to prevent transmission of malaria parasites. In particular, the mitogen-activated protein kinase (MAPK) P38 signaling pathway has been shown to affect many different aspects of immunity, metabolism and lifespan in other insect species. Based on these studies, we hypothesized that activation of MAPK P38 via phosphorylation may contribute to decreased transmission of malaria. Accordingly, my project is focused on optimizing the use of commercially available inhibitors of the MAPK P38 pathway for use in *in vivo* studies of *Anopheles stephensi*. By studying the inhibition of proteins downstream in the MAPK P38 signaling cascade, we can determine how this signaling pathway impacts transmission of malaria.

Determining the Frequency of Infection and Extent of Colonization of Rotation Crops by *Fusarium oxysporum* f. sp. *fragariae*, the Cause of Fusarium Wilt

Sam I. Koehler
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Plant Pathology

Fusarium oxysporum f. sp. *fragariae* (FOF), the soil borne fungal pathogen responsible for Fusarium wilt of strawberry, is a serious concern for strawberry crop production. While it only causes disease on strawberries, FOF is believed to be able to live endophytically on other plant species. This would allow it to survive crop rotation and potentially increase soil inoculum levels even in the absence of its preferred host. The purpose of this research is to determine the ability of FOF to infect and reproduce on three common rotation crops of strawberry: lettuce, spinach, and broccoli. The relative ability for this fungus to reproduce on rotation crops will be evaluated through quantification of root infection attempts, and tissue assays of plants grown in FOF infested soil. This can only be accomplish if FOF can be distinguished from closely related non-pathogenic strains of *F. oxysporum*. We have documented the efficacy of a DNA test for this purpose. The results of this research will help farmers to rotate crops in a way that does not create favorable conditions for proliferation of FOF.

Differential Roles of PIFs in Shade Avoidance Syndrome

Shalini Kolluru
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Plant Biology

Plants display a set of responses, collectively known as the shade avoidance syndrome (SAS), when they are subjected to growth in shady conditions. Plants have evolved these responses to avoid current or future shade from neighboring vegetation. Shade is sensed by phytochrome photoreceptors that function in part by regulating the abundance of PHYTOCHROME INTERACTING FACTORS (PIFs). Several PIFs have been identified as transcription factors that promote shade avoidance by progressing hypocotyl and petiole elongation. However, the distinct roles of PIFs in SAS have not been determined. We aim to investigate whether *PIF1, PIF3, PIF4, PIF5,* and *PIF7* have specific functions in SAS by growing and measuring hypocotyls and petioles of *Arabidopsis* plants. Specifically, we are growing wild type and single, double, triple and quadruple *pif* mutant plants in simulated shade and sun conditions. Preliminary results have demonstrated that *pif1, pif3, pif4,* and *pif5* single mutants have no effect on hypocotyl shade avoidance, but do reduce petiole growth in SAS. Currently, we are analyzing double, triple, and quadruple *pif* mutant plants. The phenotypic comparison of single mutants with double, triple or quadruple mutants will reveal redundant or specialized roles of PIFs in SAS.

Engineering Thermostability Into PNGase F for Enhanced Efficiency of Glycoprotein Analyses

Peter Konyn
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Chemistry

Peptide-N(4)-(N-acetyl-beta-D-Glucosaminyl)asparagine amidase F (PNGase F) is the current industry standard for cleaving nitrogen-linked oligosaccharides from the asparagine residues on the proteins they are bound to. This enzyme is very significant in the world of analytical biochemistry because much research is being conducted to elucidate the function of carbohydrates attached to proteins in nature. However, in order for a high throughput chemical analysis of these glycoproteins to be economically feasible, a more stable version of PNGase F must first become commercially available. Computational enzyme design has proven to be effective in attaining more thermostable mutants of common proteins. Through the use of computer programs such as Rosetta and FoldIt, thermostability can be engineered into enzymes entropically by increasing hydrophobic interactions through core packing or enthalpically by increasing the number of hydrogen bonds on the surface of the protein in the form of surface salt bridges. This project aims to produce a new industry standard PNGase F enzyme using computational methods. The mutants will be tested by comparing their ability to deglycosylate RNase B after being heat shocked to that of the current industry standard PNGase F.

Reconstructing Oceanic Conditions of Midcontinent North America 300 Million Years in the Past Using Brachiopod Oxygen Isotopic Composition

Gabriella Kovarik
Sponsor: Isabel P. Montañez, Ph.D.
Earth & Planetary Sciences

Modeling of current and future climate processes depends on understanding processes preserved in the rock record. 300 million years ago, before Earth transitioned out of its only other vegetated ice age, the Midcontinent Basin was deposited by an incursion of seawater over the North American continent. Although isotopic ratios of oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$) from carbonates are used to reconstruct oceanic conditions of the past, carbonates are susceptible to post-burial alteration, diagenesis, which overwrites their chemistry with terrestrial signals. However, diagenetically resistant shells of fossil brachiopods found within these facies are suitable proxies due to the testability of their preservation and to their ecological, mineralogical, and isotopic comparability with relatives in modern marine environments. Brachiopods are examined by petrographic and scanning electron microscopy for preservation of original texture. Cathodoluminescence and staining screen for changes in trace magnesium and iron respectively. Well-preserved material is analyzed for $\delta^{18}O$ and clumped carbon and oxygen (Δ_{47}) using a mass spectrometer to determine the temperature and salinity of the Midcontinent Sea, as well as changes in sea level and ice-volume. By studying our closest climate change analogue, we can further insight into modern processes, verify past climate models, and better predict future environmental change.

Larvae of the Purple Sea Urchin *Strongylocentrotus purpuratus* Demonstrate Depth Preferences Cued by Fluorescent Light

Avery Kruger
Sponsor: Tessa Hill, Ph.D.
Earth & Planetary Sciences

After a harmful algal bloom decimated the sea urchin population off the Sonoma coast, California lost a lot of its purple hue. For a species that spans an entire coastline, it is important to understand how areas devastated by disease or other disturbances recover and how genetic variation is exchanged between populations. Changes in oceanic and environmental conditions can be related to eventual recruitment by understanding the mechanisms by which larvae reach their destinations and recruit. For pelagic larvae, location in the water column plays a key role in returning to shore. In this study, we observed plutei, larvae of the purple sea urchin *Strongylocentrotus purpuratus*, held in total darkness or mimicked natural light conditions in the laboratory to determine if they regulate their depth endogenously or in response to light. We found that plutei migrated downward in response to the presence of fluorescent light, but did not exhibit endogenously cued behavior. This indicates potential variability in recruitment dependent on changes in natural ambient lighting.

DNA Marker Selection of Interspecific Near-Isogenic Lines From Wild Tomato *Solanum habrochaites* for QTL Mapping of Water Stress Tolerance Traits

Bryce A. Kubond
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Plant Sciences

With a changing climate, fresh water is becoming a scarce resource, limiting agricultural production. Crop plants must be bred for increased tolerance to such abiotic stresses. Cultivated tomato (*Solanum lycopersicum*) lacks abiotic stress tolerances in contrast to its tolerant wild relative (*S. habrochaites*). Previously we mapped quantitative trait loci (QTL) for traits associated with water stress tolerance from wild S. habrochaites to chromosome 9. To further resolve QTL map locations, we are creating an expanded set of sub-near-isogenic lines (sub-NIL) for chromosome 9. To create the sub-NIL population, genetically segregating progeny were obtained from a NIL with a large chromosome 9 region from S. habrochaites. A set of 22 Single Nucleotide Polymorphisms (SNPs), representing 14 SNP markers, were developed for marker-genotyping to identify progeny with recombination events. We genotyped 2588 seedlings on a Sequenom MassArray to obtain the SNP allele 'call' for each marker. SNP data was used to construct graphical marker genotypes, identify recombinant sub-NILs, and create a chromosome 9 linkage map of 3.6 cM length with average marker spacing of .257 cM . We obtained approximately 20 unique recombinant heterozygous sub-NILs. Self-pollinated progeny from each sub-NIL will be marker-genotyped to obtain homozygous sub-NILs for experiments to map QTLs.

Self-Medicating in San Francisco: A Study of "Placebo Spaces" Amongst Black Americans in the Film Medicine for Melancholy

Akira O. Kumamoto
Sponsor: Hsuan L. Hsu, Ph.D.
English

Both physically and culturally, spaces once inhabited by American people of color, are slowly shrinking in gentrified cities such as San Francisco and in realms of hipster culture. These physical and cultural realms are alternatives spaces: places that divert from mainstream habits and promote counter-culture lifestyles. The dwindling of room in these alternative spaces has led black individuals to attempt to expand their presence, even if that expansion is metaphorical and imaginary. In this study, I will address how black citizens are "othered" from predominately white alternative spaces by analyzing African American filmmaker Barry Jenkin's independent film *Medicine for Melancholy*. In the film, the characters use mirrors and paintings to create the illusion of extra room. These areas of extra room are what I am calling "placebo spaces", which are illusive places that the film's black characters create in attempts to feel integrated into white alternative culture as self-medication to being "othered". I will look at these areas along with their entrances and exits to argue that and reveal how they represent the suffocating struggle of black existence in gentrified and alternative spaces, even if these places seem to be inclusive of both whites and non-whites in the U.S.

Localized Sanitation Campaign to Affect Behavioral Change in the Rural Population of Kameshwaram, India

Akhilesh Kumar
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Land, Air & Water Resources

It has come to our attention that the population of Kameshwaram, Tamil Nadu faces persisting hygiene and toilet accessibility issues. Although the sanitation infrastructure is growing as part of FIN-SWAM's toilet installation efforts, the usage of such facilities has not met its full efficiency. We aim to address this problem in two ways: i) Provide specifically targeted sanitation education projects that cause measurable behavioral change. Our sanitation campaign will be targeted at especially women and children, and the material will address both social, health, and sustainability needs. ii) Train a local team in Kameshwaram to carry on the work in a series of 3 to 4 three-hour workshops. We will focus on improving awareness about better hygiene and sanitation practices to ensure that preventable diseases stemming from poor waste management can be eliminated. Our approach will take into account the local needs of the villagers, so we will consider the specific types of behavior that are in need of change, the magnitude of the current problem, level of awareness present in the community beforehand, and the environment in which the toilets are being put in.

Overcoming EGFR-Induced Resistance to Enzalutamide in Castration Resistant Prostate Cancer

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Urology
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Prostate cancer (PCa) is the second most common cancer in men. The androgen receptor (AR) is highly-activated in PCa. Metastatic PCa is treated with hormonal therapy that decreases AR activity. The tumor regresses initially but later recurs in almost all patients. It is then called castration resistant PCa (CRPC). One option for CRPC patients is Enzalutamide, an AR antagonist; however, most patients become resistant to Enzalutamide therapy within a year. The epidermal growth factor receptor (EGFR) and family members ErbB2 and ErbB3 are frequently overexpressed in PCa. Therefore we hypothesized that Lapatinib, an ErbB2/EGFR inhibitor, in combination with Enzalutamide would decrease tumor growth. However, we observed that this drug combination *increased* cell viability; so we investigated why the combination made the disease worse. We found that Enzalutamide increased ErbB3 and EGFR phosphorylation in CRPC cells but decreased EGFR protein (not ErbB2 or ErbB3) significantly reduced cell growth. Using EGFR inhibitors (erlotinib and dacomitinib) also decreased tumor cell viability. Our results indicate that lapatinib, which mainly affected ErbB2, was unable to inhibit enzalutamide-induced EGFR and ErbB3, which are the main cause of enzalutamide resistance. We conclude that single-agent EGFR inhibition may be more effective than lapatinib in preventing enzalutamide resistance.

Histological Analysis of Intestinal Architecture in Malnourished Pigs Fed Lysozyme-Transgenic Goat Milk

Udyam Kumar
Sponsor: Elizabeth A. Maga, Ph.D.
Animal Science

Diarrheal illnesses are a persistent global health problem, and unconventional therapeutic agents may provide treatments for children in communities where access to clean water, proper nutrition, and medicinal storage are limited. Breastfed infants are protected in part from intestinal infections by an antimicrobial enzyme called lysozyme (hLZ). Goats were genetically engineered to produce human lysozyme (hLZ) in their milk that mimics the one produced in human breast milk. Consuming hLZ goat milk may treat or prevent gastrointestinal damage resulting from a combination of inadequate nutrition and bacterial ailments afflicting these individuals at crucial developmental stages. In this experiment, pigs were used to model the gastrointestinal tract of children beyond the age of breastfeeding, due to their similar structure and physiology. These pigs were malnourished via a calorie and protein restricted diet, and then fed control or hLZ goat milk for two weeks. At necropsy, tissue samples were collected from the small intestine to observe intestinal morphology. Villi height and width, crypt depth, and lamina propria thickness were measured. Preliminary results indicate significant changes in these structures when malnourished pigs were treated with hLZ goat milk, indicating a promising treatment in improving gut health.

Assessment of Asian and African Zoo Elephant Social Behavior

Stephanie Kuzara
Sponsor: Joy Mench, Ph.D.
Animal Science

To understand the welfare of Asian and African elephants in zoos, it is important to obtain information concerning their social environment. Additionally, determining whether sociality differs between zoo elephant species is valuable for effective management of social groups. In this study, approximately 18-24 hours of video, taken across one year, were analyzed for 11 Asian and 13 African elephants from 24 North American zoos to determine the percent of time spent in social contact and the frequency of specific social behaviors performed. Asian and African elephants did not significantly differ in time spent in social contact across the study year (Asians: median=1.00%, Africans: median=0.54%; W=56, p-value=0.39). On average, African and Asian elephants interacted most often using body contacts (51.3% and 35.5% of interactions, respectively), followed by trunk to mouth interactions by Africans (17.1%) and trunk to genitals interactions by Asians (23.2%). The only species differences in time spent performing these behaviors was for trunk to genitals (trunk to genitals: W=36, p-value=0.04; body contacts: W=98, p-value=0.134; trunk to mouth: W=90.5, p-value=0.284). Trunk to mouth and to genitals interactions are used for conspecific assessment and recognition. Overall, results indicate that zoo African and Asian elephants tend to socialize similarly.

Phospho-Regulation of Cin8 in Response to Linked Sister Chromatids

Ryan Kyger
Sponsor: Ken Kaplan, Ph.D.
Molecular & Cellular Biology

Successful cell division requires proper chromosome replication in S-phase and proper resolution of topologically linked sister-chromatids in anaphase. Recent work in our lab suggests that in budding yeast the Aurora B/Ipl1 kinase responds to the presence of linked sister-chromatids and is involved in increasing spindle forces during anaphase. Specifically, we have observed that Cin8, a bipolar kinesin, shows a change in spindle localization that is associated with increased spindle forces and linked sister-chromatids. This change is consistent with published reports showing that Cin8 localization is regulated by phosphorylation. Taken together, we hypothesize that Cin8 is phosphorylated by Ipl1 and that phospho-modification of Cin8 is dependent on the level of linked sister-chromatids. Consistently, we have found that inhibition of Ipl1 causes Cin8 to relocalize on the mitotic spindle. Additionally, bioinformatics was used to identify a putative Ipl1 phosphorylation site on Cin8. To test if this site is phosphorylated by Ipl1, we plan to purify Cin8 from yeast cells with and without increased linked sister-chromatids. We will use mass spectroscopy and SDS-PAGE to identify Ipl1-dependent phosphorylation sites on Cin8 and create mutants in these sites to assess their role in anaphase.

Surgical Boot Camp Enhances Transition From Medical School to Residency

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Surgery
School of Medicine

The shift from medical school to residency is one of the most difficult and crucial transitions in medical education. The disparity amongst fourth year medical students (MS4s) preparedness for internship has become a subject of concern. Thus, all MS4s at UCSF were enrolled in Coda, a two-week course focused on high yield clinical content intended to prepare students for internship. This study's purpose was to determine whether integrating a surgical boot camp into Coda increased preparedness and improved technical proficiency. The two-week boot camp included eight 3-hour sessions that incorporated didactic teaching followed by hands on practice. Enrolled students were expected to take a competency-based procedural test before and after the boot camp and tasks were evaluated on time to completion and a 10-point global scale (1=insufficient, 10=excellence). The evaluated tasks included five surgical skills (simple interrupted suturing, interrupted vertical mattress suturing, simple running suture, subcuticular running suture, and subcuticular interrupted suturing). The findings demonstrated significant improvements amongst all the tasks based on global scores and time to completion. Future investigations will focus on the equally important non-technical skills taught within Coda to determine whether these less tangible topics can improve competence among MS4s entering internship year.

Poverty and Inequalities as Seen in the Form of Home Ownership

Anna H. Lam
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Sociology

Accumulated wealth, particularly in the form of assets and home ownership, is often an overlooked explanation for the disparities among individuals who experience poverty. Two households who have the same income can face a significant discrepancy in financial struggles largely due to differences in wealth. However, the absence of wealth in the current poverty measures highlight a problematic representation of those who are under the poverty line and those who truly experience the struggles of poverty. It is particularly the case that the majority of Americans hold most of their wealth in the form of home equity. This research aims to understand wealth and poverty by exploring home ownership as regulated in the last century by banks and the real estate market, in conjunction with the formation of minority ghettos. While certain families were subsidized in the accumulation of wealth, racial minorities were not given access to wealth and thus, did not generate wealth and opportunity for both themselves and the next generation - this phenomenon is more prominently seen in those who experience poverty. Contemporary poverty and social inequalities could be better understood by addressing these issues through the lens of disparities in home equity.

Bloom of Harmful Algae, Microcystis aeruginosa, in the San Francisco Delta During Drought Year

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Drought conditions favor the growth of cyanobacteria. *Microcystis aeruginosa*, which is known to produce hepatotoxins, has been periodically reported in the San Francisco Delta during summer months over the last decades. Its bloom and toxin production deteriorate the water quality, which potentially impacts the aquatic ecosystem and human health by direct contact in recreational areas. As widely known, severe drought was recorded in 2014 and concern due to *M. aeruginosa* was rising, however little is known about how the cyanobacterial species impacted the water quality. To address the issue, we collected water and algal samples from 10 sampling locations in the San Francisco Delta throughout the summer and fall of 2014. Algal density and identification were analyzed by FlowCAM particle imaging system as well as quantitative PCR assays. The concentration of hepatotoxin, microcystin-LR, in algal samples was measured by high-performance liquid chromatography-mass spectroscopy. Furthermore, we assessed toxicity of the water samples using fish embryonic exposure tests. These results will be critically beneficial to local managers in 2015, which is expected to be another drought year.

Understanding the Mediating Role Between DHEA, Stress, Executive Function, and Health

Jovian C. Lam
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Psychology

While it is well known that cumulative stress can result in an increased vulnerability to health problems, recent theoretical work has suggested that the construct known as executive function–the ability to engage in controlled cognitive processing–might be a moderating factor in the link between stress exposure and poor health. In order to understand how executive function might moderate the association between stress and health, we collected saliva from participants both before and after an acute lab-induced stressor. The results indicated that participants with better executive function under stress had a diminished association between recent life stress exposure and poor health. To elucidate the biological mechanisms mediating this effect, we will investigate the role of DHEA–a hormone linked to executive function that possesses anti-inflammatory properties that can protect against stress-induced health problems–in mediating the effect of executive function on the link between stress and health. While the DHEA assays are still underway, we predict that people with better executive function under stress will have a greater DHEA response to an acute stressor, which will ultimately moderate the effects of executive function in its association between stress exposure and health.

Perceived Quality and Sustainability in Additive Manufacturing

Myron A. Lam
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Mechanical & Aerospace Engineering

Additive manufacturing is a trending topic in sustainability because of its versatility in creating complex parts with a quality that resembles that of a traditionally manufactured part, potentially with lower resource and energy demands. While there are ways to quantify the quality of a workpiece, such as surface roughness measurements, it is difficult to understand what constitutes a part with good aesthetics and strength. The question in the scope of this project is the required build quality setting in a 3D printer for a customer to deem a part to be finished. Experiments are being conducted through surveying different people's opinions of parts with identical features but different build qualities through a tactile and visual inspection. In addition to conducting surveys, the energy required to make the parts is measured using a power meter. By understanding the desirable surface characteristics of parts created through additive manufacturing, it will be possible to reduce the energy required to make them while maintaining a level of quality that is acceptable to a customer.

Derivation of Functionally Mature Human Embryonic Stem Cell Derived Hepatocytes by Organ-Matched Mesenchyme

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In the US, liver disease is the 12*th* leading cause of death each year and currently affects 8 million people. In many cases, the only viable treatment is a liver transplant. As the availability of transplantable livers is limited, researchers all over are working on alternative sources. Human embryonic stem (ES) cells could provide an inexhaustible supply of hepatocytes, but current methods yield immature hepatocytes. To improve the methods of differentiating ES cells into hepatocytes, our study aims to test the ability of mouse hepatic mesenchymal cells to facilitate the generation of functionally mature ES-derived hepatocytes. To this end, we employ a co-culture system in conjunction with stage-specific growth factors to induce functional maturation. Results of our qPCR, immunofluorescence, albumin ELISA, urea assays and flow cytometry analysis show that our co-culture system generates functionally mature hepatocytes. Ongoing experiments are aimed at understanding the underlying mechanism by which the co-culture system improves differentiation and will ultimately provide a targeted approach in deriving clinically transplantable hepatocytes.

The Effects of Religious and Spiritual Identity on Gendered Language and Gender Ideology

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Linguistics

In recent history there has been a rise of social activism related to gender (e.g. gender identity and gender equality). In light of this overarching picture, language plays a crucial but unnoticed role. Language is a universal tool that interacts with every aspect of human life – especially our identity. Particularly, the language one uses to identify one's self and to convey his or her ideologies is influenced by one's spiritual identity. Together, linguists, psychologists, sociologists, and religious educators have attempted to understand why the concept of gender and the distinction between genders are crucial in not only a few religions but the vast majority. This paper will primarily focus on the Abrahamic faiths: Judaism, Christianity, and Islam. This phenomenon will be studied on the UC Davis population. The following methods will be used: archival research, interview, first-hand observation, and survey. From the surveys and interviews, the linguistic resources subjects use to construct their identities will be analyzed for gendered language and spiritual influence. I hypothesize that religious groups implement gender identification via sacred texts and gender roles. Thus, by identifying by a certain faith, one assumes its ideologies and utilizes gendered language reflective of such.

Dog Behavior in Dog Parks: A Correlative Study Between Observed Patterns and Owner Perception of Aggression and Anxiety in Dogs

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Medicine & Epidemiology
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Dog parks are a place for dog owners to bring their pets to interact with other dogs and their owners. However, there have been few studies exploring the correlation between definite aggression and anxiety related dog behavior and their respective owners' perception. To examine this correlation, we developed behavioral ethograms to score dog aggression and anxiety and used a standardized canine behavior questionnaire (C-BARQ(R)) to rate the dog behaviors as perceived by the owner. We performed non-parametric tests of hypothesis, with significance set at < 0.05. Utilizing a Spearman's Rank correlation, there was no correlation between mean aggressive or anxiety scores and scores from the survey in dog directed aggression, dog directed fear, nonsocial fear, separation related problems, stranger-directed aggression, or stranger-directed fear (Spearman's rho range: -0.2217 to 0.2868; all $p \geq 0.27$). These results indicate that there may be a lack of owner awareness in regards to their dogs' aggressive or anxious behaviors, which could be a large contributor to canine misbehaviors.

Towards Epigenetic Targeting in Neurological Diseases

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School of Medicine

The use of RNA-guided nuclease, in particular CRISPR-Cas9, has made precise gene targeting easily accessible and has a potential for advancing therapy of genetic diseases. The T-box brain 1 (*TBR1*) gene is involved in the regulation of cortical development and plays a role in neurological diseases such as Parkinson's Disease and Alzheimer's Disease. In this study, nuclease inactive Cas9 protein was fused with effector domains to down-regulate *TBR1* by modifying histone marks. The domains used were attained from the following epigenetic repressors: histone methyltransferases G9A and SUV39h and histone demethylase LSD1. To examine the effects of these epigenetic modifiers, a neuroblastoma cell line was co-transfected to express the Cas9 fusion proteins and guide RNAs that specifically target the *TBR1* gene. The modification of the histone marks and the down-regulation of *TBR1* are detected by the chromatin immunoprecipitation (CHIP) assay and quantitative polymerase chain reaction (qPCR), respectively. The ultimate goal of this study is to design a successful tool to regulate genes that are abundant in neurological disorders.

Terror in the Text: Biblical Intertextuality, Familial Violence and Isolation

Brian Leach
Sponsor: Claire Waters, Ph.D.
English

In this paper, I examine *East of Eden*, *Rosemary's Baby*, *The Road*, and *The Girl with the Dragon Tattoo*, all of which create moments of terror by appropriating biblical themes and emphasizing extreme violence. However, I argue that these novels use violence not for its mere aesthetic effect, but to produce a critical discussion concerning the essence of the original biblical violence. For its disciples, the Bible functions principally as a moral doctrine, and orthodox interpretations justify its ubiquitous violent imagery as working toward moral ends and teachings. By engaging with theories of intertextuality–which allow the novels to be examined alongside the appropriated biblical texts and orthodox interpretations–I illustrate how these novels expose the horror of biblical violence by taking themes and stories out of context and away from their doctrinal justification. Further, I argue that the crux of horror is the isolation that internal familial violence imposes on certain members: *Rosemary's Baby* reimagines the Virgin Mary's "troubled" response to the Annunciation (Luke 1:29) as horror by having its Joseph sell Mary to the devil. This appropriation asks the reader to consider the original Mary's isolation: to whom could she have turned?

Increasing the Sialidase Activity and Altering the Regio-Specificity of *Pasteurella multocida* Sialyltransferase 1 (PmST1) by Mutagenesis

Christie M. Lee
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Chemistry

Sialic acids on glycoproteins play crucial roles in numerous biological and pathological processes including development, cancer, and infectious diseases. Treatment of glycoproteins with an α2–3-linkage specific sialidase is especially a powerful tool that helps with the structural elucidation of complex sialoglycans. However, similar enzymatic tools are unavailable for the analysis of glycans and glycoconjugates with other sialic linkages and various sialic acid forms. *Pasteurella multocida* sialyltransferase 1 (PmST1) is a multifunctional sialyltransferase with α2–3-sialyltransferase, α2–6-sialyltransferase, α2–3-sialidase, and α2–3-trans-sialidase activities. We are engineering PmST1 via structure-guided directed evolution, which utilizes polymerase chain reaction for mutagenesis, with the goal of discovering a panel of mutants with various desired activities: specific sialidase activity toward α2–6-sialosides, regio-specificity for either α2–3-sialyltransferase or α2–6-sialyltransferase activity, and cleavage activity of alternative but naturally occurring sialic acid forms such as KDN (deaminated neuraminic acid). The development of robust analytical methods for screening the desired activities is crucial to this project.

Functional Characterization of Potential Secondary Cell Wall Development Regulators

Gabriella X. Lee
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Plant Biology

Secondary cell walls (composed of lignin, cellulose and hemicellulose) reinforce xylem cell shape to transport water and minerals from root to shoot in plants and are a potential source of carbohydrates for biofuel. Secondary cell wall synthesis is regulated by webs of complex transcription factor interactions, as seen in the regulatory network of the *Arabidopsis thaliana* root described by the Brady lab. Transcription factors are proteins that regulate transcription of a gene by changing the affinity of RNA polymerase for the DNA promoter. The aforementioned network was deciphered using a yeast-1-hybrid assay and its interactions are being confirmed *in planta* through various methods. I will present the functional characterization of four transcription factors in this network (AT2G44730, MYB83, AT1G76880, and ERF9). Confocal microscopy will be used to confirm transcript level changes in transcription factor mutants crossed to GFP promoter reporter lines. I will also track other changes associated with xylem abnormalities, including root length, rosette size, inflorescence stem length and xylem structure, as well as changes in reaction to abiotic stress. This will help further our understanding of secondary cell wall development.

The Role of Toxicology and Public Health in Environmental Emergency Response and Recovery

Kelsey H. Lee
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Environmental Toxicology

Environmental disasters adversely affect the quality of California's natural resources and the health of its residents. The complex nature of these events requires knowledge of environmental science, chemistry, biology, public health, and toxicology. This project uses three past environmental disaster response projects completed by the California Environmental Protection Agency (CalEPA) as case studies that allow examination of how public health and toxicology knowledge is integrated into emergency response and recovery. The 2013 cleanup project in Stockton, California involving mercury-containing cosmetics will be used to discuss the toxicology of mercury and the various actions taken to increase consumer product safety. The Stanislaus County Rim Fire of 2013 will serve as a means of discussing the toxicology of particulate matter 2.5 and air quality. The 2013 diesel oil spill in Ventura Harbor will facilitate a discussion of the toxicity of the polycyclic aromatic hydrocarbons found in diesel fuels and the resulting water quality and food safety threats due to such contamination. Although emergencies vary in nature, a better understanding of how public health and toxicology play a role in the response and recovery processes serves to benefit both scientists and the public by increasing the effectiveness and preparedness of future disaster responses.

How the Middle Ages Ruined Our Love Lives: Internal Conflicts in Tristan and Other Medieval Romances

Michelle Lee
Sponsor: Claire Waters, Ph.D.
English

One important precept of courtly love was the idea that a romantic but unconsummated love could ennoble a knight and turn him towards higher pursuits such as bravery, piety, and honor. However, as many medieval romances illustrate, courtly love was idealistic, but unrealistic as it repressed human desire and sensibility. This repression of romance occurs in the famed *Tristan and Isolde* legend and in other popular works such as *Eliduc* and the *Chastelaine de Vergi*. This research will focus on the internal conflicts characters experience when they choose between following their individual will and conforming to social expectations. In order to cope with these differences, many characters engage in secrecy and deceit, or abide by a code of strict self-regulations that ultimately harm themselves or others. I will show how the courtly love genre negatively affects individuals and how these modes of thought are a prelude to the forbidden romance and unrequited love genres that are so popular today.

Genomic Analysis of the Seagrass Microbiome via Winogradsky Columns

Ruth D. Lee
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Evolution & Ecology

Seagrasses are foundation species that play large and significant roles in the marine environment, by providing habitats for aquatic organisms and preventing excessive erosion of the coastline. Seagrasses host a rich microbiome, and current research is aimed at understanding the relationship between these microbes and their host. In the current study, we aimed to isolate and culture a collection of bacteria associated with a model seagrass species, *Zostera marina,* by utilizing Winogradsky columns. The Winogradsky column is a traditional enrichment device that simultaneously provides oxygen and sulfur gradients, allowing us to cultivate a wider variety of organisms than many other microbial culturing techniques. Winogradsky columns separate these organisms by stratum, as dictated by their preferential environmental needs. Characterization and genomic sequencing of these isolates will provide insight into the seagrass microbiome, as well as provide a critical reference for other techniques, such as metagenomics, that are being applied to this system.

Molecular Dynamic Simulation of Organic Photovoltaics via Cross-Linking F8BT and Alkyl Halide

Yong H. Lee
Sponsor: Roland Faller, Ph.D.
Chemical Engineering & Materials Science

Organic photovoltaic cell is made out of organic polymers instead of the conventional inorganic metals. Because the organic polymers are much cheaper than expensive metals used in the current generation solar cells, organic photovoltaic cell promises low cost in high volume with mass production. One problem of organic photovoltaic is low efficiency. Over last decades, many researches helped to increase power conversion efficiency from 2.5% to 10% (Scharber and Sariciftci 2013). While current researchers' focus of designing organic photovoltaic at large scale such as morphology and bulk junctions, details of cross-linking sites of monomers remain unknown for most cases (Waters et al. 2013). In order to find frequency of cross-linking at different sites, I simulated cross-linking of F8BT(organic monomer) and 1,8-dichlorooctane using molecular dynamic at 1000K and 1 atm. The simulation result yields that most significant cross-linking occurs with outermost carbon of 1,8-dichlorooctane to nitrogen and sulfur of F8BT with carbon-sulfur bonding being three times more frequent than carbon-nitrogen bonding.

Characterization of an α-L-Fucosidase Derived From the Microbiome of an Aerial Root Exudate in Maize

Adrian A. Leelin
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Plant Sciences

Exploring maize biodiversity in regions near the center of domestication reveals unorthodox biological traits. One such phenomenon has been found in a Mexican landrace of maize that secretes a polysaccharide-rich gel matrix called mucilage via aerial roots. Using next-generation sequencing and techniques in bioinformatics, many microbial carbohydrate degrading enzymes were identified and compared to those of other species that produce proteins similar in structure. Among these sequences was one coding for a glycosyl hydrolase found to be similar to an α-L-Fucosidase from *Spirosoma linguale*. Based on the nature of the root secretion and microbial presence, we hypothesize that the mucilage may be the site for mutualistic interactions between the host and a complex microbiome. The Fucosidase was first characterized using methodical enzyme kinetics involving changes in temperature, pH, and substrate specificity. Once the optimal conditions for hydrolytic activity were identified, oligosaccharides from human milk were used as a model to find possible linkages for digestion. In addition to these assays, site directed mutagenesis was performed to produce nucleophile variants. The characterization of this α-L-Fucosidase will help confirm the structural composition of mucilage polysaccharides and understand the interactions within the microbiome of this maize landrace.

Moisture and Acid Uptake in Red Beets During *In Vitro* Gastric Digestion as Influenced by Processing Method

Camila F. Lemos
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Food Science & Technology

Red beets are a rich source of nutrients, but the release and absorption of their nutrients may be altered depending on the beet processing. The objective of this study was to compare moisture and acid uptake in canned, boiled, and raw red beets during *in vitro* gastric digestion. The influence of pH was investigated by comparing moisture uptake of red beets soaked in water. Red beets were cut into cubes (12x12x12 mm), 0.2mL/g of simulated saliva was added and mixed for 30 sec followed by addition of simulated gastric juice or water. The red beets were incubated in a shaking water bath (100 rpm, 37°C) for 9 time points (from 15 to 240 minutes, 24 hours). Digestions were completed in triplicate. Moisture content of canned beets increased from 90% to 96% during digestion with gastric juice; the increases were similar for soaking in water. This implies that acid does not play a significant role in red beet moisture uptake during digestion. Preliminary data indicate that acidity in red beets increases over digestion time. These results are important in understanding the role of food processing on the mechanisms of food digestion, such as moisture and acid diffusion into food matrices.

The Sounds of Complexity in Aquatic Ecosystems

Jordan Leung
Sponsor: Naoki Saito, Ph.D.
Mathematics

Understanding the complex behavior of an aquatic ecosystem is a challenging task requiring a large amount of measurements to be stored. As a first step, one must design a model to enable the systematic detection of short-term events and long-term trends in the measured data. Our approach is to model such data using sound, a process known as *sonification*. In this work, we take year-round temperature data recorded at 16 different depths of Lake Tahoe and model it as music. Our idea is to measure the frequencies of oscillatory behaviors in the data as they vary over time, which are known as *instantaneous frequencies*. Next, we provide a systematic way of scaling these instantaneous frequencies so that they fall within the frequency range of human hearing. We then select a different instrument for each oscillatory behavior, and include information about the strengths of the oscillatory behaviors (known as *instantaneous amplitudes*) to assign volume to each instrument. These instantaneous amplitudes and frequencies are extracted using a mathematical tool built for this purpose, the *Synchrosqueezing transform*. A musical composition is produced using basic rules from music theory. Finally, we demonstrate the advantage of a music-based representation of the data over visual alternatives.

Development of Multimodal PET/MRI Imaging Probes for Macrophages in Vulnerable Atherosclerotic Plaques

Kevin H. Leung
Sponsor: Angelique Y. Louie, Ph.D.
Biomedical Engineering

One in three people each year succumb to cardiovascular disease, a leading cause of death worldwide. Unfortunately, there is currently no method to sensitively detect vulnerable atherosclerotic plaques; these types of plaques can cause myocardial infarction and strokes when they rupture. Herein, we report a positron emission tomography (PET)/magnetic resonance imaging (MRI) probe to image macrophage accumulation in vulnerable atherosclerotic plaques. By combining PET and MRI we reap the benefits of both high resolution and high sensitivity. This probe has an iron oxide core that serves as a MRI contrast agent, a sulfated dextran coating to specifically target macrophages via scavenger receptor class A, and is conjugated to a ligand to chelate the PET tracer, ^{64}Cu. We have synthesized a series of particles with different surface sulfation levels to also investigate the surface charge effect on cellular uptake. The hydrodynamic diameter of the nanoparticles was approximately 60 nm and the zeta potential of the most highly sulfated nanoparticle was -45 mV. Cell uptake and competition studies demonstrate that the uptake of nanoparticles is a receptor-mediated response and that high sulfation levels greatly enhance the uptake efficiency. The nanoparticles show promise as an effective imaging probe for noninvasive detection of atherosclerosis.

What Gender Would Jesus Do?: A Discourse Analysis on Evangelical Christianity and Its Navigation of the Gender Binary

Amanda Leventhal
Sponsor: Meaghan M. O'Keefe, Ph.D.
Religious Studies

Within contemporary American Evangelical Christianity, there are two growing movements divided by their understandings of gender: one that advocates a strict neo-traditional binary with specific gendered roles, and one that advocates a non-binary gender spectrum with influences from third wave feminism and the LGBT rights movement. I investigate each movement by performing discourse analysis on popular Evangelical educational texts from both sides. My analysis focuses on binarist Christian counselor John Eldredge's *Wild at Heart*: Discovering the *Secrets of a Man's Soul* and a self-conducted case study on Reverend Megan Rohrer, a transgender pastor, and their ministry as well as a close reading of their book *Queerly Lutheran*. I examine the use of pronouns, verbs, and rebel imagery in both sources to determine their exact gender ideology and how that ideology affects their theology as a whole. Based on my findings, I argue that each side speaks about gender in a way that creates naturalized thought structures within their followers that actively negate oppositional arguments.

Bim1 Contributes to the Resolution of Chromosomes During Anaphase via Spindle Forces

Nichole A. Lewis
Sponsor: Kenneth B. Kaplan, Ph.D.
Molecular & Cellular Biology

Genome stability is maintained through a combination of accurate DNA replication in S phase and chromosome segregation in mitosis. To ensure stability, chromosome replication and resolution of topologically linked sister chromatids must be completed before chromatid resolution in anaphase. Our lab has found that the protein Bim1, required for maximal spindle forces during anaphase, becomes essential when cells are treated with drugs (i.e., hydroxyurea, HU) that increase topologically linked sister chromatids. We therefore hypothesize that spindle forces directly contribute to the resolution of topologically linked sister chromatids in anaphase. To test this hypothesis, we plan to identify genes that function with Bim1 in this pathway by isolating suppressors of HU sensitivity in *bim1*Δ, or HUssies (HU-sensitive-suppressor). We have shown that the HUssies we isolated did not arise due to being insensitive to HU and are not associated with single chromosome aneuploidies. We conclude that the HUssies we isolated are due to discrete gene mutations. We are now creating careful pedigrees of the HUssies and plan to subject them to whole genome sequencing analysis to identify genetic changes that can lead to HU resistance.

Fitness Effects of MHC Class IIB Heterozygosity in a Leach's Storm-Petrel (*Oceanodroma leucorhoa*) Colony

Logan Lewis-Mummert
Sponsor: Gabrielle Nevitt, Ph.D.
Neurobiology, Physiology & Behavior

Leach's storm-petrels (*Oceanodroma leucorhoa*) are long-lived, highly pelagic seabirds with a well-developed sense of smell. This burrow-nesting species mates for life and produces one chick per breeding season. Since 2006, our lab has studied a colony of Leach's storm-petrels on Bon Portage Island, Nova Scotia. As part of this study, we make yearly measurements of hatch success, morphometrics, and genotype birds for the Major Histocompatability Complex (MHC) for the Class IIB region. The MHC Class IIB genes are thought to contribute to the adaptive immune response. We have previously characterized two MHC Class IIB gene loci in petrels (DAB1; DAB2), and we found that DAB2 is under positive selection. In other taxa, it has been suggested that there are fitness advantages associated with being heterozygous at the MHC Class IIB loci. Therefore, we hypothesize that heterozygous adults will be more fit than homozygous adults at DAB2. Based on this hypothesis, we tested three predictions: 1. Heterozygous adults will be larger than homozygous adults. 2. Heterozygous adults will hatch more chicks across multiple years than homozygous adults. 3. Heterozygous adults will hatch chicks earlier in the breeding season than homozygous adults. This research is still in progress.

Effect of Aging on Viral Co-Infection in HIV Patients

Tyler Lewy
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Medical Microbiology & Immunology
School of Medicine

Approximately 1.2 million people in the US are infected with Human Immunodeficiency Virus (HIV). The CDC estimates over 50% of these individuals are over 50 years old. This places significant strain on national healthcare systems, as these individuals require Highly Active Anti-Retroviral Therapy, and in some cases, treatment for opportunistic infections. More importantly, these secondary infections lead to co-morbidities that may contribute to more rapid disease progression in aging HIV-infected patients. Therefore, it is important to identify the relationship between age and occurrence of opportunistic infections from viral pathogens. To examine this relationship, the amounts of several viral and fungal pathogens in saliva were quantified using quantitative PCR, a technique that counts copies of DNA using fluorescence labeling. The Women's Interagency HIV Study, a consortium that studies HIV infection in American women, supplied all saliva samples. While not all viruses have been analyzed, the current data illustrates older individuals have less Epstein-Barr Virus (EBV) in their saliva, contrary to expected results. Older women may have lower levels of EBV due to reduced availability of competent cells and lower rates of shedding. Understanding HIV co-infection in aging individuals can enable healthcare systems to better monitor patients' health and disease progression.

Identity Theft: Satisfying Differentiation and Belongingness Needs Through Appropriation

Erica Li
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Two fundamental and competing needs profoundly shape human behavior: the desire to be unique and the desire to belong. I propose that one flexible strategy for both differentiating oneself and gaining acceptance is to associate with a group that possesses a desirable stereotypical trait. In particular, I hypothesized that appropriation, or the claiming of another group's symbol, allows an individual to selectively adopt another group's stereotypical trait in order to satisfy the needs for uniqueness and belonging. Ongoing research tests the appropriation hypothesis across two sets of studies. First, among Asian men, I explored how personal masculinity perceptions shape preferences for stereotypically masculine music and recreational activities commonly associated with White and Black men. In particular, this study provided evidence that individual differences in needing to feel unique as well as to belong are associated with appropriative behavior. Importantly, these patterns of association differed based on generational status, suggesting recently immigrated Asian men and later generations engage in appropriative behavior because of different acculturative pressures. Second, among White women, I am further investigating the hypothesis that the desire for uniqueness motivates the adoption of symbols of Black womanhood.

Understanding the Effects of Disinfectants on Microbial Diversity and Resistance in Animal Shelters

Leesa Li
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Evolution & Ecology

Buildings such as hospitals and animal shelters face the challenge of disinfectant choice and usage in order to maintain a sanitary environment for essential care. In both settings, inhabitants are vaccinated and treated with antibiotics, and housing units are disinfected daily. Such heavily cleaned buildings have a high-density of microbial diversity that must be well understood to ensure proper protection of human and animal health. It has been previously discovered that intensive care units' use of disinfectants selected for strongly antibiotic-resistant bacteria. The purpose of this study is to characterize and analyze bacterial and fungal communities, as well as develop educational materials and tools for collegiate-level research of building microbiomes. Specifically, this study will focus on antibiotic and disinfectant resistant microbes on the floors in animal shelters based on the effects of hydrogen peroxide. The over-arching goals of this project are to promote student research of the microbiology of built environments through reproducible protocols, and to better select and utilize disinfectants through examining their effects on microbial communities.

Color Theory and Storybooks

Magdalen Li
Sponsor: Gale Okumura, B.F.A.
Design

Color is one of the first subjects introduced to children. It leads to the identification of shapes and is one of the key factors in making sense of the world. Recognizing the variations of color, such as its differing tones and hues, is an observational skill that promotes the understanding of patterns. A large part of learning as a child involves storybooks. Color in storybooks is one of the main ways children distinguish between the content they see in the books with the world they see outside. To study the affect of color, I will be writing and illustrating a publication that follows a fictional character and her interaction with the environment. The focus of the project will be on creating a story that will attract viewers between the ages of 5 and 12. The purpose of the book is for readers to observe and experience the importance of color through a storybook.

Wettability Comparison of Hydrophobic Surfaces: Fluorocarbons vs. Hydrocarbons

Tony T. Li
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering & Materials Science

Although hydrophobic interactions are well-known, long-range attraction of hydrophobic surfaces in water is uncertain. This project focused on making smooth and stable hydrophobic films for measuring surface interactions with water. Three different approaches were studied: (i) chemically bound layers from deposition on thin-films from the air-water interface; (ii) chemical vapor deposition; and (iii) polymer spin coating which may or may not be chemically grafted to the surface. The presentation will discuss the molecules investigated, the best deposition method, the optimal conditions for each method, and the resulting quality of the final hydrophobic thin-film. Experiments were performed on different substrates - mica, silica, and e-beam deposited silica on mica to produce an optimal sample for surface force apparatus experiments. Results were based on contact angle goniometry and stability tests, as well as atomic force microscopy of the thin-film. Overall, the highest contact angles were produced from the deposition of silanes from the air-water interface with an acidic subphase on a silica-coated mica substrate. Silica coated mica substrates were the best substrates due to lower hysteresis. This higher stability of silanes could be due to chemical grafting to the silica coated surface. A fluorinated silane provided the highest contact angle overall.

A Peptide Targeting MARCKS Activity Reduces Tobacco Smoke-Mediated Inflammatory Cytokine Expression and Lung Cancer Cell Motility

Ashley T. Lim
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Internal Medicine
School of Medicine

Exposure to tobacco smoke is a major risk factor for lung cancer development and progression. In particular, many inflammatory pathways are activated by tobacco smoke and contribute to lung cancer malignancy. Previously, we identified up-regulation of phosphorylated myristoylated alanine-rich C kinase substrate (phospho-MARCKS) as a biomarker for predicting lung cancer progression. A novel inhibitor for MARCKS activity, termed MPS peptide, has been developed and tested in suppressing lung cancer metastasis and enhancing drug sensitivity. This study demonstrates that elevation in both inflammatory cytokines and cancer cell migration was noted in the smoke extracttreated lung cancer cells. Through treatment with the MPS peptide, we find that smoketriggered phospho-MARCKS was decreased in parallel with reduction of inflammatory cytokines including IL-8, IL-6 and VEGF-A. Importantly, the results from wound healing assays reveal that MPS peptide treatment impaired smoke-mediated cancer cell migration. These results suggest that a pharmacological inhibition of MARCKS activity by the MPS peptide can be used to reduce smoke-enhanced the malignant progression of lung cancer.

News Media Influence on New York State Residents' Views on Hydraulic Fracturing

David H. Lim
Sponsor: Gwen Arnold, Ph.D.
Environmental Science & Policy

This research investigates whether people respond differently to different kinds of news coverage about high-volume hydraulic fracturing (HVHF). We examine the connection between levels of citizen participation in local government discussions of HVHF and type of local news coverage. HVHF is new method of extracting natural gas from underground shale rock. Not enough research has been done about its effects. This research explores how coverage in nine local newspapers influence residents' response to HVHF in 2005-2007 in the Southern Tier, a shale-rich area of New York that had drilling exploration during this period. We searched the newspapers for keywords related HVHF and extracted article that contained them. Any name of a municipality mentioned in the articles was coded into categories based on context content. We are examining public meeting minutes from 40 local governments in the newspapers' coverage areas and counting the references to HVHF. The expectation is that municipalities linked in the articles to particular themes related to HVHF, like accidents and complaints, will have more discussion about HVHF in local government meetings. Responsive local government is important for a strong democracy.

Generative Art, Installation, and Appropriation: Sculpture in a Research Setting

Jason Lin
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Art & Art History

Art thrives in an environment where knowledge is abundant; it is interdisciplinary and has the power to connect the various subjects addressed at a research university. When research is being conducted, it is the results of a previous study that often provokes the next question. Likewise, art moves in a fashion where a previous piece will spawn multiple new questions for the artist to investigate. My work specifically addresses the idea of authorship and the role of the viewer. I generate my art using existing knowledge and ideas to govern the craft of the piece. It is this idea of appropriating other ideas and using some outside source to determine my art that I try to explore. Some scientific topics I have pulled ideas from include perceptual disabilities, Brodmann areas, hexadecimal systems, and mold growth. These topics create a set of rules for me to follow such that even I may not know how the final piece will look because the form is already predetermined.

Applying Music and Neuroscience to Landscape Design

Kristi M. Lin
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Human Ecology

Landscape architects seek to design unified and aesthetically pleasing spaces much like music composers seek to compose emotionally appealing music. By mimicking patterns in a musical composition, a landscape architect might be able to design a space that inspires the same emotions experienced in that musical composition. I seek to test this hypothesis by designing a landscape that follows the pattern of tones and dynamics in Claude Debussy's "Clair de Lune". In an effort to design an aesthetically pleasing space, my landscape design will also be guided by neuroscience research on forms favored by the human brain's visual cortex. According to neuroscientist Dr. Semir Zeki, cells in the human brain are particularly excited by forms such as straight vertical and horizontal lines, squares, and voids. I have assigned patterns in "Clair de Lune" to such forms and thereby represented the music as lines varying in width, orientation, and color. Due to the piece's soft dynamics and harmonies, the resulting landscape is composed of many straight lines. Using music and neuroscience to inform landscape design has the potential to help landscape architects design spaces that appeal to humans through both their emotions and visual cortex.

Good Until the Last Drop: Engaging Ecology in Stormwater Management

Danica Liongson
Sponsor: David de la Peña, Ph.D.
Human Ecology

Seventy percent of natural disasters occur in East Asia and climate change is predicted to exacerbate the frequency, duration, and magnitude of extreme weather events. Since developing nations in Asia are the least equipped to absorb the impacts of climate change, they need international support in order to strengthen their ability to respond. The Philippines in particular has a unique climate that swings between monsoon season and dry spells, with the imminent effects of climate change predicted to intensify these two extremes. This research project responds to these circumstances through the creation of a stormwater runoff management system with ecological considerations in Los Baños, Philippines. This study will compile principles of ecology through literature review and case studies. Combined with a site analysis, this knowledge will then inform the design of a stormwater management system that can provide multiple ecosystem services. The two main components will be a rainwater harvesting system for monsoon rains and a water-saving irrigation set-up during dry conditions. This project will establish a solid foundation for environmental best practices for the site to continue in later phases of development and as the Los Baños community evolves its relationship with water as a finite resource.

Classifying 1-Lattice Maximal Polytopes

Megan Liska
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Mathematics

A polytope is a geometric object whose sides are flat and three-dimensional lattice polytopes are polytopes with integer coordinates. These special shapes are useful in a number of mathematical fields including integer optimization, where they oftentimes represent solutions to optimizing problems, convex geometry, and number theory. In this study, we found what all possible 1-lattice maximal pyramids and prisms look like. To do this, we defined a canonical position for polytopes to limit the search area. We then analyzed the base of the polytopes to determine which are too big to be the bases for 1-lattice maximal polytopes and found limits on the height of the polytopes. This creates a bounding box where all such polytopes live. The bounding box found has dimensions $(30+(31\sqrt{2}))$ *by* 31 *by* 18. Using these bounds, we will create two computer algorithms, one that searches through the bounding box to find all the possible polytopes inside and another that analyzes the results and deletes equivalent polytopes.

Genetic Investigation of Limbal Squamous Cell Carcinoma in Haflinger Horses

Jiayin Liu
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Population Health & Reproduction
School of Veterinary Medicine

Ocular Squamous cell carcinoma (SCC) is the second most common cancer of the horse and frequently originates in the limbus (LSCC) with potential to invade the cornea and impair vision. The Haflinger breed is overrepresented for LSCC and these horses are typically diagnosed at younger age. Pedigree analysis of 34 LSCC affected horses supports a recessive mode of inheritance. We performed a genome wide association study using 13 cases and 11 controls, and identified two loci for further investigation. Three single nucleotide polymorphism (SNPs) on ECA 4 were the most significantly associated ($P = 5.79 \times 10^{-5}$), but were negated after further testing (11 cases and 12 controls, $P = 0.47$). Additionally, four SNPs spanning a 1 Mb interval on ECA12, were also associated ($P= 5.80 \times 10^{-4}$) and two SNPs were confirmed in the replication sample set ($P = 3.79 \times 10^{-6}$). DNA sequencing of a candidate gene from this region identified a missense mutation (p.Thr338Met) in an affected sample. To determine if this is the causative risk allele for LSCC in Haflingers additional samples are being tested. We aim to identify a causative DNA variant for earlier detection and thus a better prognosis for affected horses.

Development of an Assay to Detect the Physiological State of the Cells

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This application note describes the use of cell fluorescence assays on the Agilent 2100 Bioanalyzer. The Agilent 2100 Bioanalyzer is the first commercially available instrument capable of measuring cell fluorescence for cell sorting. This instrument uses two-color fluorescence detection–the red laser diode and blue LED. The cell assay makes use of microfluidic chip-based flow cytometry to quantify and detect the physiological state of the cells during infection. *Salmonella enterica* spp. *enterica* serovar *Typhimurium* ST14028 and Madin-Darby Canine Kidney (MDCK) epithelial cells were quantified using the Agilent 2100 Bioanalyzer. The physiological states of the cells were detected using SYTO62 and SYTOX dyes for live and dead cells, respectively. Numbers determined by this method were similar to those obtained by CFU counts from plates and microscopic count using a hemocytometer, respectively. With low cell and reagent consumption and running up to six samples at a time, data analysis using the software on the Agilent 2100 Bioanalyzer is quick and simple.

Genetic Interactions Between Decatenase Top3-Rmi1 and Chromosome Structure Maintaining Complex SMC5/6

Natalie S. Liu
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Microbiology & Molecular Genetics

During meiosis, diploid parental chromosomes advance through one round of DNA replication and two successive cell divisions, producing haploid gametes. In meiosis I, recombination ensures at least one cross over (CO) between each homolog pair, ergo required for accurate segregation. The completion of crossing over requires appropriate resolution of recombination joint molecule (JM) intermediates. The major pathway involved in JM resolution is endonuclease complex MutLγ-Exo1. Furthermore, chromosome structure maintenance complex SMC5/6 regulates a secondary pathway of three putative resolvase complexes: Mus81-Mms4, Yen1, and Slx1-Slx4. Recently, the STR complex, helicase Sgs1/decatenase-Top3/Rmi1, was identified as a central regulator of meiotic recombination through chaperoning aberrant JM intermediates in the major resolution pathway, promoting CO and non-crossover formation. Top3-Rmi1 hones a distinct function in promoting chromosome segregation upon the conclusion of meiosis I. Although there is proper spore formation in the absence of either Smc5/6 or Top3-Rmi1, DNA segregation is blocked, leading to meiotic catastrophe. We aim to manipulate distinct conditional alleles and employ physical analysis of recombination intermediates to examine genetic interactions between Top3-Rmi1 and Smc5/6. Our preliminary data suggest that these two complexes work in parallel, promoting meiotic JM resolution and facilitating chromosome segregation.

Investigating the Light-Sensitive Ferroelectric Behavior of Nanoscale Chromium-Doped Strontium Titanate Using Surface Photovoltage Spectroscopy

Sarah E. Lloyd
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Chemistry

One promising method for producing clean, renewable fuel (hydrogen gas) from plentiful sunlight is photocatalytic water splitting using semiconductor nanoparticles. Alternative energy sources have become a necessary goal for many researchers across several fields. Splitting water using nanomaterials and visible light allows us to harness solar energy and convert it into hydrogen fuel. Several semiconductors have shown catalytic properties for water splitting, such as strontium titanate (STO). The large band gap of STO (3.2 eV) prevents its absorption of visible light so, here metal dopants have been added in small amounts (3-5%) to create visible-light active Cr^{3+} midgap states. Doped STO has previously been shown to demonstrate ferroelectric behavior at room temperature. This project will investigate how the ferroelectric effect is exhibited in Cr-STO. The nanoparticles will be created via hydrothermal synthesis and their structures will be verified using x-ray diffraction (XRD). Surface photovoltage spectroscopy (SPV) will be used to determine the energy threshold (eV) for photo-activating the ferrroelectric behavior. This analytical technique will also allow us to examine how the ferroelectric photovoltage can be tuned using redox-active charge acceptors.

Consequences of Variation in Female Behavior During the Initial Stages of Courtship in the Greater Sage-Grouse

Kira M. Long
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Evolution & Ecology

Courtship in many species includes complex interactions between the sexes. The relationship between these interactions and mate choice has been primarily investigated in male displays, with female signals indicating preference or interest in mating receiving comparatively little study. In the Greater Sage-grouse, males display in groups on leks and females actively choose mates. Females visiting leks perform two common behaviors: foraging on the ground or low shrubs and standing upright near displaying males. Preliminary data from experiments with robotic females suggest that males may adjust their display effort in response to these behaviors by increasing their rate of display for upright females. We tested the hypothesis that females' behaviors indicate their level of interest in copulating, predicting that foraging females are less likely to copulate than females standing upright. We collected data from videos of female visits on three leks, quantifying the proportion of time spent upright versus foraging, and counting solicitation and mating events. This study provides important context for experiments using robotic females that vary in behavior. Furthermore, by examining female signaling on the lek, in addition to male displays, we will gain a better understanding of the dynamics of courtship and its importance for sexual selection.

How Sensitive Is the Accuracy of 3-Dimensional Knee Models to an Increase of Computed Tomography Slice Thickness and Change in Reformatting Plane?

Rocio Lozano
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Mechanical & Aerospace Engineering

In total knee arthroplasty (TKA), the importance of 3D bone models has increased due to the recent implementation of patient-specific instruments (PSI). PSI are cutting blocks that guide bone resections in TKA and are the result of virtual preoperative planning. Preoperative planning uses 3D bone models of the patient's knee obtained with CT or MRI, to decide the ideal size and placement of the femoral and tibial components and to design the PSI that transfer the virtual placement of the components decided during planning in the actual placement of the component on the patient. The accuracy of the 3D femur and tibia models may affect the accuracy of the planning (the ideal placement of the component) and of the PSI (location of the PSI on the patient's knee). CT scanning is an imaging modality used to perform the preoperative planning; however, each company develops its own CT imaging protocol, which typically differs in slice thickness and orientations relative to the CT scanning plane. Hence, the objective of this study is to determine how the CT slice thickness and the CT reformatting plane affect the morphological accuracy of the femur and tibia models to use in TKA preoperative planning.

Computational Design of an Archaea-Derived Enzyme to Replace a Fundamental Winemaking Process

James E. Lucas
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Chemistry

Malolactic fermentation by lactic acid bacterium is an expensive, time-consuming process conventionally implemented during the production of red wine to remove malic acid, an undesirable flavor compound. We are developing an inexpensive cell-free process which utilizes fumarase (EC 4.2.1.2) and aspartase (EC 4.3.1.1) enzymes to convert malic acid into a viable carbon source for *Saccharomyces cerevisiae*, the organism responsible for alcoholic fermentation. While there is no known fumarase or aspartase which can catalyze these reactions in the acidic pH of wine, the Archaea *Picrophilus torridus* maintains an intracellular pH similar to wine and possesses a cytosolic fumarase which has yet to be characterized. Although an aspartase has not been identified in the *P. torridus* genome, there exists a high level of structural homology within the fumarase/aspartase family. In this work, we characterize the activity of P. torridus fumarase in winemaking conditions. In addition, we attempt to impart aspartase activity into *P. torridus* fumarase through the use of computational modeling tools informed by established catalytic mechanisms. While engineering product profiles of existing archaeal enzymes has been attempted, a complete reengineering of catalytic function such as this has not been performed.

Simulation of the Collision of Neutrinos in Cosmic Ray and Nucleon in the Atmosphere

Shengqiao Luo
Sponsor: John S. Conway, Ph.D.
Physics

We have developed a simulation of collisions of ultra-high-energy cosmic ray neutrinos with nucleons (protons and neutrons) in the upper atmosphere. Such high energy neutrinos are expected up to energies exceeding 10^{21} eV. The simulation calculates the probability of collisions from the density of the atmosphere as a function of altitude, using the latest available theoretical neutrino-nucleon interaction cross sections. For simulating the nucleons in the atmosphere, we mainly consider the nucleons in oxygen atoms, nitrogen atoms and argon atoms. The simulation is implemented in the Python computer language. The program simulates 100k incoming neutrinos, with varying incidence angles, at energies ranging from 10^{18} - 10^{22} eV, starting at an altitude of 100 km. The result of the simulation is that the probability of interaction is very low, even at the highest energies simulated. The probability increases exponentially with energy, reaching only about 0.002 for the highest energy events. This result precludes observing neutrinos via high energy air shower events.

[GAR+] Bacterial Induction on *Saccharomyces cerevisiae*: In Search of the Inducer Compound(s)

Peter Luong
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Viticulture & Enology

Stuck fermentation is a problem readily known in the wine industry. Fermentation can become arrested if the fermenting yeast is somehow inhibited, whether by alcohol content, other microbes, temperature, or lack of nutrients. Samples from wineries experiencing stuck fermentations show the presence of various bacteria species. Previous work demonstrates that bacteria can induce formation of the [GAR+] prion, a heritable protein complex that decreases yeast fermentation rates. Therefore, bacteria isolated from arrested wines were tested for [GAR+] induction from wild-type[gar-] on wine yeast, *Saccharomyces cerevisiae*. Bacteria are screened across various control media and GGM to see [GAR+] induction zone effects. Observations suggest that genus Gluconobacter bacteria in contrast to other Acetic Acid Bacteria induces both yeast strains 932[gar-] and EC1118[gar-]. A particular specie of interest from observations was Gluconobacter cerinus; all but one strain were shown to express induction patterns on dilution plates. Further investigation of the manner of induction will necessitate identifying the inducer compound(s). An analysis of the exo-metabolome from isolated bacterial inducers will enable identification of metabolites that lead to [GAR+] induction. Findings will prove useful in preventing stuck fermentations, microbial instability during and post fermentation, and identifying problem microbes for wineries.

Factors of Success Beyond the Student

Kristie Ly
Sponsor: Kali Trzesniewski, Ph.D.
Human Ecology

Although it is well accepted that students' academic success is related to socioemotional factors (Gross et al., 2014), there is little research linking daily emotional factors (e.g., mood) with students' perceptions of their classroom environment. The present study sought to understand factors influencing a student's mood during class across an academic quarter and to test whether mood during class relates to motivation. We hypothesized that positive perceptions of the professor would impact a student's mood during class, which in turn would improve achievement and learning. We found that a student's general positive emotions across a week predicted later class value, $\beta = .40$, $p < .05$, intrinsic motivation, $\beta = .44$, $p < .05$, and grades on the final $\beta = .14$, $p < .05$. In addition, students' positive perceptions of their professors (e.g., encouragement) predicted later studying with graded homework, $\beta = .34$, $p < .05$, motivation to learn material, $\beta = .27$, $p < .05$, and motivation to perform well in the course, $\beta = .28$, $p < .05$. These findings suggest that students' impressions of their instructor can be an important factor in their motivation.

Investigation Into the Contributions of Intermetallic Phases on the Mechanical Strength of Aluminum-Iron Binary Alloys

Benjamin E. MacDonald
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Chemical Engineering & Materials Science

The aluminum-iron binary system is of great interest for applications in the aerospace and automotive industries due to the alloy's high strength to weight ratio. Conventionally processed Al-Fe alloys are known to contain $Al_{13}Fe_4$, an equilibrium intermetallic phase that promotes failure in bulk specimens due to its needle-like morphology. Recent studies have shown that the parameters of synthesis and subsequent processing steps can alter the phase formation sequence and mechanical behavior of a novel Al-Fe binary alloy. The present study utilized gas atomization, cold isostatic pressing and high-pressure torsion to synthesize and consolidate Al-2at% Fe powder. By optimizing the parameters of each processing step, the Al-2at%Fe alloy was successfully consolidated with the formation of only the metastable intermetallic Al_6Fe phase; absence of the intermetallic $Al_{13}Fe_4$ phase was confirmed through X-ray diffraction and electron backscatter diffraction. The individual contributions of the two precipitated phases, stable $Al_{13}Fe_4$ and metastable Al_6Fe, to the macroscopic mechanical behavior of the alloy were investigated via tensile testing and fractography. The influence of the interfaces between the intermetallic phase and the matrix on the crack initiation and propagation was studied.

Proximal Biotinylation Assay to Test Effects of Mechanical Forces on Cell-Cell Adhesion

Katherine G. Macway
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Individual cells must respond constantly to mechanical stresses applied to tissues and organs throughout the body. Yet, we know little about how cells respond to mechanical stimulations at molecular levels. In my research, I will investigate force-sensitive proteins located at cell-cell junctions that play pivotal roles in the regulation of cell-cell adhesion and communication. I will use epithelial cells expressing the cell adhesion protein α-catenin tagged with a promiscuous biotin ligase BirA, which biotinylates proximal proteins in the presence of biotin-containing media. Using this proximal biotinylation technique, we will test which proteins are adjacent to α-catenin under mechanical stimulation. Through purification of biotinylated proteins and Western Blotting analysis, I will analyze protein binding, location, and varying levels existing at cell-cell junctions for stretched versus non-stretched cells. Using this approach, we have shown that myosin IIA concentration at cell-cell junctions is stretch dependent, increasing up to two-fold in cells with high stretch ratio versus control. My goal is to maximize force-dependent biotinylation by systematically altering mechanical stretch and comparing the degree to which myosin IIA is biotinylated. Understanding force-sensitive protein complexes is beneficial to research related to treatment of diseases such as metastasizing cancer, in which cell adhesion is dramatically altered.

Investigating the Prevalence of Density-Dependent Diversification

Andrew Magee
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Evolution & Ecology

In the past decade, various phylogenetic methods have been developed to detect tree-wide changes in the rate of lineage diversification (speciation minus extinction). Application of these methods to empirical data has revealed a pervasive pattern of diversity-dependent diversification, where diversification rates decrease through time. The apparent prevalence of this pattern is generally accepted as *prima facie* evidence of a biological cause for temporal decreases in diversification rate. Specifically, ecological interactions among species are thought to intensify as the number of species in a growing lineage accumulates, causing the rate of speciation to decrease and/or the rate of extinction to increase. Surprisingly, the empirical prevalence of diversity-dependent diversification and the impact of alternative methods used to detect it have not been carefully studied. In this study, we performed a comprehensive meta-analysis to assess the prevalence of diversity-dependent diversification: we collected a comprehensive sample of datasets (including every previously published study of temporal variation in diversification rates), and subjected these datasets to an exhaustive series of analyses (using all available statistical methods developed to study this problem). We discuss inconsistencies in the prevalence of diversity-dependent diversification detected by the methods, and consider possible biases that may partly explain these discrepancies.

MALDI Biotyper-Based Identification of Cultured Bacteria Isolated From Plant Root Exudates

San Ming Mak
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Population Health & Reproduction
School of Veterinary Medicine

MALDI Biotyper System from Bruker is a fast approach to identify isolated microbes down to the species level from environmental samples. The method is based on the analysis of the conserved, low-molecular-mass ribosomal proteins, in the range of 2000 to 14000 *m/z*. The spectrum obtained from an analyzed isolate is compared to spectra of microbes from a reference database. Colonies of an isolate can be used for direct analysis or their extracted proteins could be spotted. We implement a protein extraction method, using formic acid and acetonitrile, that allows us to get reliable mass spectral signals even from recalcitrant bacteria. Maize root exudates were inoculated on a M9 modified nitrogen-free medium containing 1% fucose and incubated at 28 and 37°C. Isolates were subcultured and identified using MALDI Biotyper method. The identifications were validated by PCR 16S rRNA analysis. Subsequently, the bacteria identified belong to the following genera: *Sphingomonas, Enterobacter, Rhizobium, Pseudomonas, Agrobacterium, Sphingomonas, Flavobacterium, Acinetobacter, Stenotrophomonas, Janthinobacterium,* and *Variovorax*. After verifying the effectiveness of the MALDI Biotyper System, we have refined a cost effective method to identify microbes isolated from plant samples. This approach will enhance our capacity to identify in a higher throughput environmental microbes.

Characterizing Stress-Induced Arrhythmia in Mice

Boguslav Mandzyuk
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Pharmacology
School of Medicine

Stress is associated with increased chance of heart attacks and sudden death. It is estimated that at least 20% of episodes of serious ventricular arrhythmias or sudden cardiac death are precipitated by stress. The purpose of this study was to determine the types of arrhythmias evoked by stress and their intensities. C57BL6 mice were implanted with electrocardiogram (ECG) transmitters. After recovery from the surgery, the ECGs were recorded at rest, during a two hour restraint stress and during recovery. We quantified premature ventricular contractions (PVCs), AV blocks, and skipped beats. Restraint stress significantly ($p<0.05$) increased PVC occurrence (0.6 ± 0.3 & 7.7 ± 2.1, rest & restraint, respectively, $n=10$). The AV block is significantly higher ($p<0.05$) during recovery period (2.3 ± 1.5 & 5.1 ± 1.7, restraint & recovery, respectively). There is no significant difference in skipped beats. The data suggest that arrhythmia originated from cardiac myocytes (PVCs) was manifested during presence of stress and arrhythmia originated from cardiac electrical conduction system came after the stress was removed. Future investigation will determine the interplay of stress and other factors, such as air pollution, that reduce autonomic regulation of the heart and predispose individuals to cardiac events triggered by stress.

Genetic Control of Sexually Dimorphic Chemosensory Structures in *Drosophila melanogaster*

Alexander C. Manela
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

Many animals use chemical communication for directing behaviors such as aggregate defense, food collection, and mate selection. The fruit fly *Drosophila melanogaster* detects pheromones involved in courtship and mate selection with chemosensory bristles on their forelimbs, some of which are only present in males. The gene *doublesex*, known to function in the specification of sexually dimorphic structures, contains an intronic sequence that drives gene expression to these sex- specific chemosensory bristles. Preliminary transgenic enhancer analysis indicates this noncoding region drives reporter gene expression in the cells that develop into these chemosensory bristles. I aim to find the core region of the *doublesex* gene that produces this expression by dissecting enhancer activity with transgenic Gal4-UAS enhancer reporter constructs. Once this enhancer is defined, we will investigate homologous noncoding regions in other related species that display a drastic expansion of these male-specific chemosensory bristles, to determine if mutations in this region contribute to this shift. This enhancer could also be used for further studies of genes involved in courtship and communication.

Affects of Fragile X Syndrome on Numerical Processing

Sydney Maniscalco
Sponsor: Susan Rivera, Ph.D.
Psychology

Fragile X syndrome (FXS) is a genetic developmental disorder caused by a mutation on the Fragile X Mental Retardation 1 gene on the X chromosome that is essential to basic neuronal development and cortical network functioning. FXS results in a distinct cognitive phenotype, which includes developmental delay, along with a specific cognitive profile of deficit that suggests attentional dysfunction in distributed neurocognitive brain regions (Gallego, Burris, & Rivera, 2014). The current research project seeks to characterize numerical processing abilities in different-age groups of typically developing infants and infants with FXS. Contemporary cognitive developmental literature theorizes an integral role for attention in the development of higher-level cognitive skills such as number processing. Through the use of infrared eye-tracking methods, preferential looking time to large and small number sets will be recorded to obtain group averages, which will be further analyzed to extrapolate and compare attention-mediated cognitive outcomes. The looking time to the numerical stimuli will be compared between-subjects by age and diagnostic group as well as within-subject variables based on frequency and duration of fixation on the numerical stimuli. Results from this research can be used in evidence-based design of behavioral and educational interventions for individuals with FXS.

Be There and Be Square: Making the Most of Instagram

Tracy J. Manuel
Sponsor: James Housefield, Ph.D.
Design

How might social media like Instagram impact how contemporary society sees and shares the world? Though often dismissed as a mere fad, Instagram deserves a closer look as a potential pathway to creative participation. In my research, I evaluate Instagram through the lenses of art history, media theory, sociology, and folk art. These inquiries reveal Instagram's sociological richness and suggest that the app might help us better understand our evolving relationship with the image writ large. Instagram's database of photos exposes a complex interplay of content, time, and place in which clichés emerge, identities develop, and communities change. However, in order to harness whatever social, creative, or utilitarian promise Instagram might hold, users must better understand its strengths and pitfalls, as well as their rights, roles, and responsibilities as image-making citizens. In this multimedia project, I use art and design practice to turn Instagram's lens back on itself, both critically and constructively. Through expressive and practical explorations of photography and self-documentation, I bring the Instagram photo into new experiential contexts that let us consider and reconsider the ways we use internet media to craft the narratives of our lives.

Life History and Weaning Age at an Archaeological Site in the San Francisco Bay Area

Marcos C. Martinez
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Anthropology

Human behavioral ecology theories suggest that parents invest more heavily in offspring who are members of the sex whose reproductive success is more sensitive to investment. These predictions have been used to explain observed cross-cultural differences in investment between male and female offspring. Because breastfeeding and food provisioning are reliable stand-ins for parental investment, sex-based differences are testable in the archaeological record through the reconstruction of the weaning process and early childhood diet using stable isotope analysis on human remains. Collagen is a structural protein found in human bone and teeth. Analysis of carbon and nitrogen in collagen allows archaeologists to reconstruct certain aspects of an organism's diet. Sections taken from the dentin in human molars can be used to study dietary behaviors during the time those teeth formed. I examine the possibility of sex-based differences in parental investment in individuals from an archaeological site in the San Francisco Bay Area.

Identification of Genes Involved in Chromosome Organization in the Nucleus of Budding Yeast

Travis J. Martinez
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Molecular & Cellular Biology

Chromosomes contain the hereditary information for life to occur. Chromosomes are organized in specific domains within the nucleus and interact with one another in ways such as through homologous recombination during meiosis and the repair of DNA double strand breaks. In recombination events, allelic portions of chromosomes interact. Aberrant, or non-allelic, chromosome interactions should not occur. Non-allelic interactions are common in human cancers and can result in aneuploidy or translocations. Proteins within the nucleus may play a role in organizing and segregating chromosomes to their respective domains to prevent aberrant loci interactions. We screened for mutations that disrupt chromosome organization by quantifying aberrant interactions, or collisions, between two reporter chromosomes. To quantify aberrant chromosome collisions GFP is expressed from a reporter chromosome when two non-allelic chromosomes interact. When compared to rates of collisions in wild type strains, strains mutated by ultra-violet radiation are of interest if they display high collision rates. Strains displaying high collision rates are isolated and studied further for UV mutagenized genes involved in chromosome segregation and organization.

The Role of Parental Mental State Language in the Early Development of Uncertainty Monitoring

Noelle M. Mastrili
Sponsor: Simona Ghetti, Ph.D.
Psychology

Uncertainty monitoring refers to the ability to assess one's confidence in one's current knowledge states. During development, it is an important skill that enables children to guide their learning and responding. Parents' verbal input may play a role in this development as it may convey information that supports children's understanding of mental states. The current study examines how parental mental state language relates to the development of 2-year-olds' uncertainty monitoring. Parents were asked to "read" a picture storybook to their children. Parents' narratives were coded for use of mental state language referring to perception, cognition, physiological state and affect (Bretherton & Beeghly, 1982). To assess uncertainty monitoring, the 2-year-olds completed a perceptual discrimination task in which they had to identify an occluded object out of two options on the screen (e.g., "where's the bunny?") on an eye-tracking monitor. Children were considered to have better uncertainty monitoring if they demonstrated a greater number of gaze transitions between response options and greater response latencies on difficult or inaccurate trials, which are reflective of appropriate behavioral hesitation. Ongoing analyses will test our prediction that more frequent use of mental state language by parents will result in improved uncertainty monitoring in toddlers.

The Representation of British Victorian Religious Doubts Through the Portrayal of Gothic Buildings in Bram Stoker's *Dracula*

Jordyn H. May
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English

Bram Stoker's *Dracula*, a popular Gothic novel during the Victorian era, contains a variety of dilapidated Gothic chapels, castles and dwellings which reflect a Victorian perspective on Catholicism. By analyzing *Dracula*, literary criticism about the novel, and commentaries of Gothic architecture, I argue that British Victorians had a complicated yet negative view of the Catholic community in Britain. Gothic architecture originated in the 13th century and was used prominently by the Catholic Church for its cathedrals. The descriptions of Gothic buildings within the novel do not emphasize the ornamentation that is typical of Gothic architecture, but rather many of the characters comment on the darkness, smelliness and utter creepiness of these ruins. Stoker wrote *Dracula* during a time when the status of Irish Catholics was being hotly debated in Parliament, and when the Catholic Church reestablished itself in England against the will of the majority. For this reason, Stoker's decision to incorporate ruined Gothic chapels and buildings within the novel is a comment on the religious disputes and anti-Catholic feelings in England during the Victorian era.

Determining the Effect of Population Density on Rates of Encystation for *Giardia lamblia*

Brendan McCarthy-Sinclair
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Microbiology & Molecular Genetics

Giardia lamblia is an intestinal parasite that infects millions of people a year in developing countries, as well as infecting thousands every year in the USA. *Giardia* has two stages in its life cycle. The cyst is the infectious form and is environmentally resistant. After ingestion, the cyst can become the trophozoite, which is responsible for colonizing the lumen of the small intestine. The current paradigm for encystation (going from trophozoite to cyst) is that the trophozoites encyst in the distal small intestine or colon after induction by local environmental factors. However, recent studies in our lab have shown encystation throughout the entire intestine, contradicting the predominate framework. We hypothesize that *Giardia* encystation is density-dependent. To test this hypothesis, we are employing a *Giardia* strain expressing firefly luciferase backed by an encystation specific reporter that will luminesce in the presence of luciferin only when encystation is induced. Preliminary results suggest a density 'sweet-spot' in which encystation signal is observed to be greatest. What triggers *Giardia* to encyst is integral to treating and understanding it due to the fact the organism cannot infect the host unless encysted.

African Women in Tanganyika and the Rise of First Wave Feminism in Europe

Debra M. McCracken
Sponsor: Corrie Decker, Ph.D.
History

This thesis challenges conventional notions that first wave feminism in Europe was a driving force behind the liberation of African women in the 1920s and 30s. Important social transformations and case studies shed light on how Wachagga women in Tanganyika, a League of Nations' mandated territory under British rule starting in 1920, retained and enacted agency in the face of state-sponsored patriarchy and colonial rule. These instances of African women's agency were well publicized and later appropriated by European feminists and reformers for the promotion of British social and political platforms. European women, missionaries, and educators publicly criticized African cultural practices, such as girls' initiation into womanhood, pre- and post-marital exchanges of bridewealth, and other matrimonial rites and ceremonies, as detrimental to African girls and women. To situate the Chagga of Mount Kilimanjaro within broader historical narratives concerning African women and the colonial state, my paper examines ethnographies, colonial records, and newspapers produced in and about Tanganyika in order to explicate the tenacious debates that erupted surrounding the status and welfare of African women and children throughout the colonies.

Optimizing Collection of Juvenile Play Behavior in C57BL6/J Mice

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Psychiatry & Behavioral Sciences
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Juvenile play behaviors are one of the most characteristic and recognizable forms of social interaction in rodents. These behaviors are quantifiable and can be used to characterize social development in an animal model. Laboratory mice are weaned between postnatal days (PND) 19-21. Juvenile behaviors are collected between postnatal days 21-28. The objective of this study is to determine if there are differences in parameters of social behavior between the early (PND 19-22) versus late (PND 26-28) stages of the juvenile period (PND 26-28). Early and late aged dyads of juvenile C57BL6/J mice were tested in an established behavioral assay of reciprocal social interaction with simultaneous collection of ultrasonic vocalizations (USVs). We quantified discrete play parameters, time in contact, as well as USVs. Data has been collected. Video and audio files are currently being scored. Results will inform future research focused on juvenile social behavior with optimized time points for data collection.

Stacking the Deck: A Problem in Card Shuffling

Gweneth McKinley
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Mathematics

You are given a deck of cards labeled 1 though n, arranged in an arbitrary permutation (shuffling). Perform the following sequence of moves. At each stage, move the card on the top of the deck to the position in the deck corresponding to its number. For example, if we started with 4231 (top is on the left and bottom on the right), we would subsequently get 2314, 3214, 2134, and 1234, at which point we would not be able to move. We ask the following questions: for a given n, what is the longest sequence of moves possible? Does every sequence of moves terminate? Considering all n! possible permutations, what is the average number of moves? In my research so far, I have proven that every sequence of moves does terminate, and have found the longest sequence of moves for any given n. However, the question of the average number of moves has proven much more difficult, and from the cases I have examined for small n, it appears unlikely that the average will be given by a simple formula. This is an interesting and accessible problem, whose solution is surprisingly complex given the simplicity of its statement.

The Effects of Aging on the Oral Microbiome of HIV Positive Individuals

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Human immunodeficiency virus (HIV), the causative agent of acquired immune deficiency syndrome (AIDS), causes degradation of the immune system, allowing infection by opportunistic pathogens. Today, treatment with Antiretroviral Therapy (ART) has greatly improved the prognosis for people living with HIV. However, aging (over 50 years old) HIV positive individuals have a higher risk of secondary infections and rapid disease progression than young adults with HIV infection. As HIV positive individuals now have a longer life expectancy, these are issues that must be addressed. Previous studies have shown a marked difference in the composition of the oral microbiome of HIV negative and HIV positive individuals that may contribute to the chronic inflammation associated with disease progression. In the current study, we compare the salivary microbiome of aging HIV infected women to that of young adult HIV patients. By extracting RNA from saliva samples, we are able to quantify HIV using a polymerase chain reaction (PCR) assay. Ultimately, we will examine the relationship between HIV burden in the oral cavity, the changes we see in the microbiome, and the clinical markers of disease progression.

Selective Attention in Infancy

Jessica Mehrsaz
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Psychology

Infants entering a room with new toys, people, furniture, and so on are bombarded with visual information. To learn about the most important information present (e.g., people), infants must focus on that information and ignore the irrelevant information (e.g., furniture, windows, etc.) In this on-going study, we attempt to understand how these attentional processes develop. Using a procedure that measures infants' responses to two visually competing stimuli, we manipulate infants' attention by inducing them to fixate on the central stimulus- a face- and then presenting a distracting stimulus in the periphery- a novel toy. By presenting the peripheral and central stimuli together, we require infants to deliberately choose one stimulus to attend to. Using an eyetracking system, we measure infants' saccades, or planned eye movements, between the two stimuli. We expect that infants will be slower to shift their attention away from relatively novel stimuli than from relatively familiar ones, thus we predict longer saccade latencies for novel faces as compared to familiar faces. This hypothesized result pattern suggests that experience-mediated factors influence capture and focus of infants' self-directed attention to faces. This study will provide important understanding of the effects of social stimuli on infants' attentional processes.

Stimulation of the Medial Septum Drives Hippocampal Theta Oscilation Leading to Increased Exploration Activity in Rodents

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Neurological Surgery
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The US Centers for Disease Control reports that over 5.3 million Traumatic Brain Injury (TBI) patients report chronic deficits related to their injury. One frequently reported deficit is related to impaired learning and memory. For example, it has been well documented that hippocampal theta oscillations play a critical role in cognitive processes. Recently, we demonstrated in a rodent model, that after a TBI, hippocampal oscillations become abnormal. We also demonstrated that 7.7 Hz of stimulation to the medial septum for one minute prior to the Barnes Maze task drives hippocampal theta, and improves spatial learning in injured rats. Our next goal was to investigate whether 1 min of stimulation was optimal level for improvement. In the following study, we analyzed EEG and exploration behavior following 15, 30, and 60 seconds of stimulation with no stimulation in TBI rats, using each animal for each condition. Our results indicate that stimulation, regardless of duration, increased theta oscillations and exploratory activity. To further optimize the stimulation condition, we hope to assess shorter durations including 0.5, 1 and 5 seconds. Ultimately, we are trying to best understand how TBI alters brain activity, and whether we can use stimulation to restore function in TBI patients.

Relationships Between Anti-Recombination Helicases (*SRS2, MHP-1*) and Rad51 Mediators

Fatemeh Memar
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Microbiology & Molecular Genetics

A cell has many mechanisms to repair its chromosomal DNA. These damages can be caused by both endogenous and exogenous factors. One of these repair mechanisms is homologous recombination (HR), which is a type of high fidelity genetic recombination pathway using homologous templates. This repair mechanism can be dangerous if improperly regulated. *SRS2* is an anti-recombinase that limits HR activity by dismantling Rad51 filament and dissociating D-Loops made by Rad51 protein. *MPH-1* is also another gene involved in DNA repair by HR *via* dissociation of D-Loops. In previous studies, we have shown that mutations of the Shu complex, paralogs of Rad51, do not suppress *RAD55* mutation by using MMS, HU, and CPT survival/growth assays. In this study, we are interested in phenotypic behavior of *SRS2* mutant combined with *RAD55* and Shu complex mutants. In combined survival/growth assays, we are also testing phenotypic suppression of the combined *MPH-1* mutants with *RAD55* and Shu mutants in pursuit of finding a genetic relationship between mediator proteins and anti- recombination helicases. Additionally, we would like to examine if the mutation of either *SRS2* or *MPH-1* would have any effect on the slow recovery of the Shu complex and *RAD55* mutant strains.

Language Diversity in California Public Schools

Zion Mengesha
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Linguistics

In the aftermath of the Oakland Ebonics controversy (1996), African American Vernacular English gained national recognition, but questions about dialect discrimination remain. Have public schools encouraged social-linguistic inclusion for children of African American descent or speakers of African American Vernacular English? My study examines educators' language attitudes towards African American Vernacular English in three Bay Area, California high schools. I chose these schools to control for diversity; one has a total of 37% African American students, another 20%, and the third 8%, distinguishable standardized test scores (e.g. SAT), and varying reports of college readiness. Disproportional levels of diversity in these schools coincide with disproportional academic performance indexes. If educators have negative sentiment towards African American vernacular English, then students' coursework incorporating vernacular will be negatively received. Therefore students' low performance can indicate pedagogical bias. There is a paradox in this. While we think we are living in a colorblind society, there are subtle ways in which race appears. Bias can be structurally enforced, and this has significant consequences for the Equal Educational Opportunity Act of 1974. If teachers have language biases, then students are being improperly evaluated. Therefore, changing bias could change students performance.

Phenotypic Analysis of Distinct Subpopulations in Fall River Rainbow Trout

Kayla A. Meza
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Animal Science

The Fall River in Northern California has intriguing geological characteristics and a unique rainbow trout (*Oncorhynchus mykiss*) population that supports a world-class sport fishery. In addition to snow melt tributaries, this watershed is also supplied by several significant springs that buffer variability in temperature and volume, unlike most other rivers. We hypothesize that these special characteristics of the Fall River allow the trout to have an unusually long spawning season that lasts nine months instead of the usual two or three. Using preliminary genetic analysis, we have discovered interesting patterns of subpopulation structure and adaptive genetic variation that correspond to the spawning location water source. To understand if the distinct subpopulations have unique phenotypic characteristics, we will observe and analyze pictures, migration patterns, growth rate, fork length, and capture locations. This study will provide critical information for conservation and management regulations of Fall River rainbow trout to help ensure their persistence into the future.

Investigation of Two Potential Single Nucleotide Polymorphism Markers Associated With Equine Maxillary Prognathism

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Maxillary prognathism colloquially referred to as parrot mouth, is a fairly common malocclusion in horses. The phenotype is characterized by a pronounced overbite that may cause dentition problems due to improper alignment. Previous research on this disorder in Franches Montagne horses found a genome-wide association of two single nucleotide polymorphisms (SNPs) on chromosome 13 at 40,775,412 bp and 40,821,697 bp. The overall hypothesis of this study was that the same SNPs would show an association with the parrot mouth phenotype in two different breeds of horses, Quarter Horses (QHs) and Thoroughbreds (TBs). Using two PCR assays and Sanger sequencing, 5 QHs (n= 2 affected; n= 3 unaffected) and 7 TBs (n= 6 affected; n= 1 unaffected) were genotyped. Alignments were performed to EquCab 2.0 using Sequencher. Both SNPs were not statistically associated with the parrot mouth phenotype (P=1.00). In this population of QH and TBs, the two previously identified SNP markers on chromosome 13 were not associated with the parrot mouth phenotype.

Microstructure and Thermal Stability of Nanocrystalline Al Powders Produced by Cryomilling

Xuan Mo
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Chemical Engineering & Materials Science

The study of the thermal stability of nanocrystalline (NC) materials against significant grain growth is both scientifically interesting and technologically significant. From a technological aspect, thermal stability is crucial for the consolidation of NC powders without coarsening the microstructure. From a scientific aspect, understanding the nature of stability and grain growth in a NC microstructure allows the development of strategies to minimize grain growth. Here, we aim to understand the microstructure and thermal stability of NC Al powders produced by cryomilling. The microstructures of the cryomilled powders were characterized using scanning and transmission electron microscopy, and X-ray diffraction techniques. Moreover, to determine thermal stability, differential scanning calorimetry was used to detect the heat release during grain growth of NC and coarse-grain (CG) powders. Nano-indentation was performed on the NC and CG powders heat treated at various temperatures between 190 and 500°C for 2 hours to evaluate the change in mechanical behavior. The results indicate that for the NC powders, heat treatment at 500°C leads to severe grain growth and a corresponding decrease in hardness (~80%). For the CG powders, however, the same heat treatment leads to limited grain growth and minimal variability in hardness.

Localization of a Divergent Filamin Protein, Fln-2 in *C. elegans* Larval Hypodermal P-Cells via CRISPR Technology

Robert E. Monroy
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Molecular & Cellular Biology

During development in *C. elegans*, P-cells and their nuclei migrate from the lateral side into the ventral cord and give rise to the hypodermis, vulva, and motor neurons. Mutations in KASH (UNC-83) and SUN (UNC-84) proteins, which reside in the nuclear envelope, disrupt nuclear migration by altering interactions between the nucleoskeleton and cytoskeleton. Genetic screens for enhancers of the nuclear migration defect of *unc-83/84* mutants have identified two genes, *toca-1* and *fln-2*; here I will focus on the large divergent filamin, *fln-2*, which may be involved in actin organization. The morphology of cytoplasmic actin in P-cells appears normal prior to nuclear migration in *unc-84/fln-2* worms; however, the actin cytoskeleton is disorganized during nuclear migration. Thus, we hypothesize that Fln-2 may be involved in actin regulation during P-cell nuclear migration. To localize Fln-2, I am using CRISPR-Cas9 technology to insert a GFP tag at the C-terminus of the *fln-2* gene for live imaging to see where fln-2 localizes. This will allow us to see where Fln-2 is localizing throughout the worm and to use this construct as a template to insert the P-cell specific promoter to localize Fln-2 in larval hypodermal P-cell.

The Effect of Genetic Variation of *Fusarium circinatum* on Virulence

Annie M. Montes
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Plant Pathology

Fusarium circinatum is the pathogenic fungus responsible for pitch canker disease in pines. Many pine species are susceptible, including Monterey pine (*Pinus radiata*), which is native only on the coast of California, and Guadalupe and Cedros Islands, Mexico. Recent work has shown that *F. circinatum* can also infect corn and other members of the grass family, and evidence suggests that the pitch canker pathogen may have originated following a host-jump from a grass species. A requirement for infection of pines is tolerance of the monoterpene components of pine resin. To better understand the role of tolerance of monoterpenes as a factor influencing virulence on pines, 30 progeny of a cross between wild type isolates of *F. circinatum* were tested for genetic variance in the impact of monoterpenes on growth. Analysis of variance showed genetic variance for tolerance of monoterpenes (β-pinene, myrcene, and limonene) among progeny to be significant ($P < 0.0001$). Experiments with an additional monoterpene, α-pinene, are currently in progress. Progeny differing in sensitivity to monoterpenes *in vitro* will be inoculated into pines to determine if there is a correlation with virulence.

The Neural Correlates of Willed Attention

Alexander B. Morales
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Psychology

The everyday decisions that people make have two core aspects: what to pay attention to and what to ignore. We refer to this process as willed attention. The neural mechanisms underlying willed attention are not fully understood. It differs from other types of attention because it is based on internal intentions and does not involve any external cues. We are currently investigating the mechanisms of willed attention in vision by measuring behavioral performance and brain activity via electroencephalogram (EEG) recording. The participants are told to randomly choose where to focus attention on each trial (willed attention) and are directed to make a button press after they commit their attention (but not their eyes) to a region of space. These methods demonstrate the ability of the subject to focus attention without directions and provide an opportunity to potentially decode participant's endogenous decisions by analysis of the ongoing EEG in the absence of observable explicit behavior. Such an ability offers data that is valuable to the understanding of how human attention is initiated and will potentially be used in applications of learning, human performance, and medicine.

Interactions Between Glyphosate and Foliar Micronutrient Applications in Minimizing Corn Injury

Oscar Morales
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Plant Sciences

The use of herbicides and herbicide-resistant crops increases the risk of drift injury for farmers who grow non-glyphosate-resistant plants nearby. The aim of this experiment was to investigate whether micronutrients (zinc, nickel, and manganese) would prevent drift injury when applied prior to simulated glyphosate drift or reduce injury symptoms when applied after. This greenhouse experiment used sweet corn (*Zea mays* cv. Precious Gem) as a model plant. Nine days after sowing, pots were sprayed with 3 glyphosate doses: 0, 1.5 or 3 % of a recommended glyphosate dosage (100% = 1 lb ae/A). Either two days before or after glyphosate application, plants were treated with foliar applications of water, Mn, Ni, or Zn. Height measurements were taken during the experiment and plants were harvested 14 DAS for dry weight. It was found that neither pre- nor applications of these micronutrients had a significant beneficial effect on glyphosate drift injury in corn. However, it was observed that post-glyphosate applications of micronutrients actually aggravated injury. Although more trials need to be conducted to verify these observations, the timing of micronutrient sprays seems to be critical.

Understanding the Risk of *Salmonella* Enteritidis in Backyard Chickens in Davis

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Salmonella Enteritidis (SE) is the primary pathogen associated with commercial table eggs. The prevalence of SE has been well studied in commercial hens. However, there is little understanding regarding the risk of SE in backyard chickens. Since the majority of backyard chickens are raised for the purpose of providing fresh eggs, it is important for owners of backyard chickens to have similar information. This research project assesses the prevalence of SE within backyard chickens in the city of Davis. Specifically, environmental swabs and blood samples were collected from backyard coops and chickens in order to assess the prevalence of SE in the coop environment and to measure the presence of antibodies against pathogenic Group D *Salmonella* (which includes SE) in the birds themselves. This parallel sampling allows a comprehensive analysis of current (i.e. environmental swabs) and historical (i.e. blood samples) exposure to SE. In addition, a survey was administered to participants. Results of the survey will be used to identify risk factors that may contribute to SE presence. Results will be presented to the community in order to help promote proper poultry husbandry practices within the Davis backyard poultry community.

The Controlled Release of Doxorubicin Through Alginate-Chitosan Microspheres

Ryan Morgan
Sponsor: Eduardo A. Silva, Ph.D.
Biomedical Engineering

Both new cancer cases as well as cancer related mortalities continue to reach astounding numbers each year. Cancer treatment typically involves chemotherapy, which has many harmful side effects due to its systemic delivery. There is a need for engineering precision and safety into the methods of delivering chemotherapeutics. Biomaterials have proven to be able to provide a means for delivering chemotherapeutics in a controlled spatial and temporal manner. In my particular study, I will be developing a material platform combining alginate microspheres with a variable chitosan coating to create controlled delivery of the chemotherapeutic Doxorubicin. Alginate has previously been used as a vehicle for the delivery of Doxorubicin, however I aim to enhance the control of Doxorubicin's release. By modifying alginate using a layer-by-layer application of chitosan, I hypothesize that I can alter the permeability of the outer coating of the microsphere to control the outward diffusion of the Doxorubicin providing a means to spatially and temporally control its introduction in the body.

The Middle East and North Africa in U.S. Media Representation: Algeria, the Territorial Property of France

Sohail Z. Morrar
Sponsor: Suad Joseph, Ph.D.
Anthropology

My research analyzes the representation of the Middle East and North Africa using textual sources from the New York Times (NYT) in the decade 1940-1949. As the NYT is considered a leading liberal news source, my research explores whether or not the NYT gives an accurate representation of the region during this period by focusing on one country--Algeria. I searched the term "Algeri*" in the ProQuest search engine and analyzed 1666 articles to investigate the pattern of representation of Algeria and the Algerian people during that time. My initial finding is that the NYT often portrayed the inhabitants of Algeria- and North Africa as a whole- in unfavorable ways. For example, Algeria's Arabs were represented as ragged people, Berbers as ruthless warriors, and leaders as sneaky despots. In the context of World War II, the NYT also represented Algeria exclusively as an Allied front for the liberation of France. I argue that the NYT portrayed Algeria, under these circumstances, largely as an extension of France and assumed that it ought to remain under French control. This research is part of a larger project analyzing 150 years of the New York Times conducted in the lab of Dr. Suad Joseph.

Increasing the Reliability of ACCs by Mitigating Negative Wind Effects

David P. Moyers
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Mechanical & Aerospace Engineering

Atmospheric turbulent air flow is difficult to model using first principle mathematics. Additionally, to reduce water consumption, some large-scale power plants employ air cooled condensers (ACCs). Because ACCs–made from arrays of large fans–interact with environmental winds, turbulent airflow affects their performance. In the UC Davis atmospheric boundary layer wind tunnel (ABLWT) laboratory, a scale ABLWT model of a New York Power Plant's ACC is subjected to a variety of model wind conditions. The resulting air flow is then measured in and around the ACC system. The data are compared with measured on-site data, as well as computational fluid dynamic (CFD) modeling. The flowfield is measured using a hot-wire anemometer system. The data are analyzed with respect to the components in existing and plausible configurations. Currently, wind screens are used in an attempt to mitigate negative wind effects such as cross winds that may â€˜choke off' cooling air flow as well as cause a negative recirculation, thus reducing efficiency. Experiments with these wind screens are expected to result in a better understanding of how of the ACCs interact with the approach of atmospheric wind. Improving these water-free systems may lead to dramatic future savings of fresh water.

Growth Optimization and Characterization of Lung Cancer Cells From a Patient Sample

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Internal Medicine
School of Medicine

Growth of cancer cells in laboratory conditions is important for characterization of different cancer types and development of treatments. The purpose of this experiment is to grow lung cancer cells from a patient sample in a variety of enriched media formulas to determine which growth factors are important for cell proliferation, and to do initial characterization of the cells. Cells were cultured in MEGM, a media formulated for human cell growth, with hydrocortisone, insulin, basic fibroblast growth factor, and epidermal growth factor (EGF) added. Cells were then placed in depleted forms of the enriched media, each condition lacking one of the additional factors, and cell growth was compared to growth in the complete enriched media. Measuring cell survival over time using a colorimetric MTS assay and observing cell morphology showed significantly decreased survival of the cells grown in conditions lacking hydrocortisone ($p=.0095$) and EGF ($p=.0007$), but not the other conditions. This demonstrates that cell proliferation in these cells is dependent on the EGF and hydrocortisone added to the media. Further, these results suggest that the cells may have receptors for the factors tested, and additional research characterizing and targeting these receptors could lead to possible treatments for this cancer.

Comparing Latino/a Aspirations for Pursuing Doctoral Programs in STEM

Yvonne Munoz
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School of Education

In order to remain innovative and globally competitive, the American workforce must reflect its diverse population, especially in the Science, Technology, Engineering, and Math (STEM) fields. The participation of Latino/a students in STEM is concerning because of their minimal representation within the field and at the most advanced educational levels. In 2012, Latino/a's earned 2703 PhD degrees, representing 5.98% of all doctoral degrees awarded. This represents the lowest percentage of all racial groups in the United States. Of those 2703 degrees awarded, 777 were to STEM field students, representing just 28.7% of all Latino/a doctoral degrees (National Science Foundation, 2012). In addition, more than half of these advanced STEM degrees were awarded to Latino males. Using the University of California Undergraduate Experience Survey (UCUES) data set for 2012, this study will examine gender differences between Latino/a's aspirations for pursuing doctoral programs in STEM. In order to identify and address the disparities of women and minorities in STEM, it is important to examine the aspirations of undergraduate UC students to understand if the university is producing a diverse pool for the graduate school pipeline.

The Legion of Honor: Re-Creator of the Louvre?

Larissa V. Murray
Sponsor: Diana V. Strazdes, Ph.D.
Art & Art History

The Legion of Honor has become a defining museum of San Francisco, widely visited by foreigners and locals alike. It is without doubt that the Legion of Honor possesses many comparisons with the original French version in Paris, however it is its specific architectural and organizational references to the Louvre that are remarkable. I wish to present such similarities that would not be immediately evident to the casual visitor. First, I conduct a historical and architectural exploration of both the Legion of Honor and the Louvre that highlights the museums' differences. Second, I highlight the specific architectural and organizational elements that have been evoked in the Legion of Honor from the Louvre, such as the Pyramid and the display of masterpieces in the Salle des Etats. After having highlighted these similarities, I conclude that the reasons for such are to elevate the works located within the Legion of Honor, for their quality is incomparable to the quality of works located within the Louvre. As a result, the Legion of Honor has called upon the canon of museums, the Louvre, to elevate their status, but we must ask ourselves if this is to the Legion of Honor's benefit or detriment.

Gentle Recovery: Stepping Into Nature in an American Healthcare Setting

Vanvisa Musigapala
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Human Ecology

The purpose of the project is to provide an alternative of nature-oriented environment to the sterile landscape of Sutter Rehabilitation Center in Roseville, California; it aims to redesign an existing garden at the rehabilitation facility for patients recovering from brain injury and stroke. The methods will involve evidence-based design research and specific functional design, which will help develop a comprehensive plan for the target group. The project is advanced through an inductive research approach: data collection, literature review, site analyses, design guidelines development from theoretical framework, and program application to site. By using appropriate theories and literature research, a healing garden could be created with effective functions and layout to help facilitate the recovery process. The garden will be examined to help convey weaknesses and strengths and necessary information in order to yield the desired design outcomes as an evidence-based health design – providing tools essential to succeed gentle recovery. It is hypothesized that the proposed nature-oriented garden design will help yield better recovery result: improving patients' emotional, physical, and psychological well-being.

Understanding the Influence of Peer Relationships on the College Aspirations of African-American High School Students in an Urban School District

Stephanie X. Myers
Sponsor: Gloria M. Rodriguez, Ph.D.
Chicana/Chicano Studies

While previous research (Dyce, Albold & Long, 2012) has suggested that many African-American high school students aspire to earn college and graduate degrees, some studies (Wimberley, 2002; Buttaro, Battle & Pastrana, 2010) reveal disparities between the college aspirations and college graduation trends of African-American youth. One of the objectives of the Leadership for Real Impact (LRI) project is to investigate the influence of peer relationships on the college aspirations and college-preparatory behaviors of African-American teens attending public high schools within a medium-sized urban school district in Northern California. It will accomplish this by conducting focus groups and analyzing individual, detailed interviews on the perspectives and experiences of African-American high school students who aim to pursue higher education. Additionally, LRI seeks to understand the ways that these students' college-related decisions, beliefs, and behaviors are influenced by their peers. Results from this study will be useful to teachers, school administrators, as well as local district and statewide school board members who are charged with ameliorating widespread disparities in college enrollment, persistence, and attainment affecting African-American students from low socioeconomic backgrounds.

Analysis of Factors Affecting NAD+/NADH Metabolism and Their Relationship to Lifespan Extension in *Saccharomyces cerevisiae*

Victoria Myers
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Microbiology & Molecular Genetics

The Ssy1-Ptr3-Ssy5 (SPS) amino acid sensing pathway in the yeast *Saccharomyces cerevisiae* is a novel longevity factor. The replicative lifespan of yeast cells containing a null mutation of *SSY5* (*ssy5*Δ) significantly increases, however, the mechanisms behind this effect are not fully understood. Our previous research suggested that NAD^+/NADH metabolism is involved via increased levels of nicotinamide riboside (NR, an NAD^+ intermediate). In order to further support our hypothesis that *ssy5*Δ-mediated lifespan extension is due to NAD+ metabolic factors, we are creating yeast strains containing factors known to either increase or decrease lifespan in the *ssy5*Δ background and measure their effects on NR and NAD+/NADH levels as well as lifespan. One factor studied is Pho8, a vacuolar phosphatase that we discovered as a required component of the NR increase in *ssy5*Δ cells. Another factor is Npt1 whose deletion causes reduced NAD^+ levels that can be rescued with NR supplementation. *GCN4* and several factors functioning in the TOR (target of rapamycin) mediated amino acid sensing pathway will also be studied. Through this study we hope to advance our understanding of the regulation of NAD^+ metabolism and lifespan, and to provide insight into the mechanisms of age-related diseases.

Investigating the Role of Transcription Factor E2F5 in Bladder Cancer

Rachel M. Nakagawa
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Medical Microbiology & Immunology
School of Medicine

Bladder cancer is the fifth most common cancer in the United States and approximately 16,000 people will die from this disease in 2015. Urothelial cell carcinoma of the bladder (UCCB) is the most common subtype of bladder cancer and accounts for approximately sixty thousand new cancer diagnoses annually. Since there are few treatments currently available to fight this disease, death rates of UCCB have remained constant, making the development of novel treatments imperative to reduce mortality. Studies have shown that the family of E2F transcription factors, E2F1-8, play a crucial role in cell cycle progression by controlling the Rb pathway and are often deregulated in cancerous cells. Currently, there are no published studies on the role of E2F5 in UCCB. The experiments presented demonstrate that E2F5 is pivotal to UCCB progression. Proliferation and colony formation assays demonstrate that depleting UCCB cells of E2F5 reduces cell growth when compared to control. E2F5 depletion also results in significant reduction of the levels of p107 and E2F4, suggesting E2F5 plays a regulatory role in the Rb pathway. These data indicate that upregulated E2F5 is oncogenic in UCCB and may represent a promising potential therapeutic target.

Impacts of Individual Variation in Infectiousness on Disease Persistence

Anna M. Naranjo
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Evolution & Ecology

Mathematical models of infectious diseases can provide insights into the interplay between epidemiological and population processes. Evidence from previous research shows that individuals in a population exhibit different degrees of infectiousness; some individuals do not infect others, while others are highly infectious. Despite this evidence, it is not known how this variability affects the persistence of pathogen circulation within populations, or how this persistence depends on population size. Here, we explore variability in individual infectiveness using a stochastic discrete-time model. By incorporating different distributions for infectiousness, we can characterize the relationship between the duration that the pathogen can persist, individual variation and population size. In smaller populations we expect greater variation among individuals, where the disease will exhibit greater fluctuations, and the disease will not persist as long. This variation can also affect the frequency of fade-outs and reintroduction of disease. However, for large populations, the variation in individual infectiousness will have less of an impact, and persistence times should look similar to models that use the same value of infectivity for the entire population. By comparing the new model with individual variability to the homogeneous model, we can identify when individual variation has a significant impact on disease persistence.

A Thulian Prince in King Arthur's Court: An Analysis of Mark Twain's Influence on "Prince Valiant" and the Creation of the "American Arthurian Legend"

Tirumular Narayanan
Sponsor: Carlee Arnett, Ph.D.
German

When Mark Twain wrote *A Connecticut Yankee in King Arthur's Court*, he changed the way Americans perceived the Arthurian legend forever. Twain opened the floodgates by changing the medieval romance to a narrative about social criticism. For nearly fifty years, the Arthurian legend remained relatively untouched until American cartoonist Hal Foster created his colorful Sunday comic *Prince Valiant*. Foster presented a fantastic new Camelot that not only reflected Twain's interpretation but also incorporated the same American values into his story. Foster clearly took many queues from Twain including the displaced adventurer, the integration of foreign lands, the objectification of the Knights of the Round Table, the replacement of magic with science, and a liberal king. At the same time Foster continued Twain's over-arching motif of using the Arthurian legend as a basis for social criticism. Between the Twain and Foster, a particular American brand of this immortal story was born and continues to influence culture and media today.

Horizontal Gene Transfer in the Environment: A Review of Controlling Factors

Arjun S. Natarajan
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Civil & Environmental Engineering

The introduction of anthropogenic chemical stressors into the environment through industrial, mining, and agricultural routes is important for its potential impact on microbial communities through horizontal gene transfer. Horizontal gene transfer involves cell-to-cell transfer of genes that, in the presence of chemical stressors, can convey resistance among other species in the ecosystem. This can dramatically change the fitness of microbes residing in harsh environments such as heavy metal contaminated ecosystems, mercury-laden soil or lake sediments, and feedlot waste lagoons carrying antibiotics. Through selective pressure and horizontal gene transfer, these reservoirs are potential hotspots for accelerated microbial community dynamics and adaptation. The ultimate impact depends on selection pressure, intensity/frequency of stressor occurrence, and bacterial growth, senescence, physiology, transport, and biofilm formation. Here, we review likely hotpots for gene transfer in the environment with particular focus on animal husbandry, aquaculture, and feedlot operations. We examine recent data on gene transfer in stressor-impacted soils, aquaculture sites, and laboratory studies, with a view toward identifying bottlenecks that modulate the spread, stability and transfer of antibiotic /metal resistance genes. These studies are providing data useful for both conceptual and mathematical models of gene transfer impacts integrated with microbial population dynamics.

The Role of *Zostera marina* Seagrass Beds in Mitigating Ccean Acidification

Mackenzie Nelson
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Earth & Planetary Sciences

The pH of ocean water is expected to decrease by 0.14-0.43 pH units by 2100 (IPCC, 2014) as a result of anthropogenic CO_2 production. Ocean acidification is a problem for marine organisms that precipitate shells made of calcium carbonate ($CaCO_3$). As ocean pH decreases, the availability of carbonate (CO_3^{2-}) in the form of $CaCO_3$ also decreases, and calcareous organisms either cannot form or have weakened external skeletons. Seagrass may provide a less acidic environment favorable to calcareous organisms by utilizing CO_2 and HCO_3^- through photosynthesis, which reduces H^+ production and results in an environment with a higher pH. This study focuses on how water chemistry differs at locations inside and outside a seagrass bed of *Zostera marina* located at Tom's Point in Tomales Bay, CA. I compared water chemistry at these sites through the use of sensors recording pH, temperature, salinity, and oxygen over six weeks. The results show a greater variability of pH within the seagrass bed (0.45-0.5 pH units) than outside (0.19-0.33 pH units). While pH was, on average, higher within the seagrass bed, there is the possibility that the large fluctuations of pH levels within the seagrass bed are too extreme for the calcareous invertebrates.

Oxytocin: A Potential Weight Loss Regulator

Julie Ngo
Sponsor: Karen L. Bales, Ph.D.
Psychology

While the hormone oxytocin (OT) is known for its role in child-birth and maternal bonding, recently studies have suggested that OT can play a role in body weight regulation through several different circuits. Obesity and other metabolic disorders are an important chronic health issue, and OT could have an exciting potential use as a therapy. The relationship between OT and reduced feeding is thought to be mediated through OT receptors in brainstem areas linked to the regulation of meal size (e.g. nucleus of the solitary tract (NTS)). To further evaluate the relationship between OT and body weight, we used a diet-induced obesity model in adult male rats, which were given unlimited water and either a high-fat diet or rodent chow, and received chronic infusions of either vehicle (saline) or OT (16 nmol/day) into the third ventricle. Our goal is to identify the extent to which alterations in OT receptor binding in the NTS may contribute to OT's anorexigenic effects in diet-induced obese (DIO) rats. We expect higher binding in DIO animals than lean animals, and lower binding in those treated with OT than in those treated with saline. The method used to assess binding will be receptor autoradiography.

Reactive Molecular Dynamics Simulations of Self-Assembly of Alkyltrimethoxysilanes on Silica Substrates: The Effects of Head Group Length and Surface

Thuy-Quynh Ngo
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Chemical Engineering & Materials Science

We perform reactive molecular dynamics simulations of monolayer formation of alkoxysilanes to hydroxylated silica substrates. Solutions of alkylmethoxysilanes and hexane in contact with a hydroxylated silica surface are simulated using a reactive force field (ReaxFF). In particular, we have modeled the deposition of butyl-, octyl-, and dodecyltrimethoxysilane to observe the dependence of the hydrocarbon headgroup length on the monolayer contact angle. Additionally, in order to characterize the effect of surface moisture on silica, we have modeled the condensation of octyl-trimethoxysilane using both wet and dehydrated substrates. In order to emulate a infinite reservoir of alkoxysilanes far away from the silica surface, we have used a procedure in which new precursor molecules are periodically added to a region of the simulation box away from the surface. The kinetics of alkoxysilanes adsorbing and chemisorbing to the surface are characterized by analyzing the bond topology of chemicals in the simulation. The behavior of the self-assembly of monolayers onto silica surfaces is modeled and and compared with past experimental studies. It is determined that the ordering between neighboring silane alkyl tails is dependent on the length of their carbon chains.

Addressing the Issue of the Scarcity of Millipede (Diplopoda) Researchers on the West Coast of the United States

Alexander A. Nguyen
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Entomology & Nematology

There is a scarcity of millipede (Diplopoda) researchers on the West Coast of the United States. As detritivores, the arthropod class Diplopoda contributes significantly to the soil ecology by recycling nutrients and much remains unknown regarding global diplopod phylogeny, diversity, morphology, and distribution compared to other arthropod classes. Given the geographic diversity within and between the states on the West Coast and low numbers of diplopodologists, numerous localities go unexplored. The potential for new diplopod research based on the West Coast is immense. Millipedes are generally nonvagile and susceptible to desiccation; therefore, they are often microdistributed within restricted ranges. We present examples of new enigmatic diplopod characteristics recently described by researchers operating on the West Coast as well as estimate the number of current researchers in the United States. Here we propose new methods to encourage future biologists to devote research time to the Diplopoda, through scientific outreach that engages the public with current developments in the world of diplopodology.

The Role of Histone Methyltransferase MET-2 in Sex Chromosome Transmission in *Caenorhabditis* Species With Different Modes of Reproduction

Anh Tuyet N. Nguyen
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Molecular & Cellular Biology

Meiosis is a specialized form of cellular division that results in the precise halving of the genome to produce gametes for sexual reproduction. Checkpoints function during meiosis to detect errors and subsequently to activate a signaling cascade that prevents the formation of aneuploid gametes. Previous studies in *Caenorhabditis elegans* revealed that the SET domain histone H3 lysine 9 histone methyltransferase MET-2 shielded the male X from checkpoint machinery and mediates the transcriptional silencing program of meiotic sex chromosome inactivation (MSCI). As *C. elegans* is a hermaphroditic species, males are dispensable for reproduction. To determine whether MET-2 plays a similar role in an obligate male-female species, I am examining meiosis in *Caenorhabditis remanei*, which exists as obligate females and males. I constructed a *C. remanei met-2* RNAi feeding vector and am examining the consequence of MET-2 depletion on the *C. remanei* germ line. As the X chromosome of *C. remanei* males is also enriched for H3K9me2, I hypothesize that MET-2 in *C. remanei* mediates transcriptional silencing and checkpoint shielding on the single X chromosome of males.

Identification of a Candidate Gene for a High Temperature Germination Trait in Lettuce

Bao T. Nguyen
Sponsor: Kent J. Bradford, Ph.D.
Plant Sciences

Lettuce seed germination, particularly *Lactuca sativa* cultivar Salinas, is inhibited when seeds are imbibed at temperatures above 28°C (termed thermoinhibition). This results in poor stand establishment when temperatures at planting exceed the permissive temperature. Identifying genes responsible for this type of dormancy can potentially help breed varieties that are not subject to thermoinhibition. A large-effect quantitative trait locus (*Htg9.1*) was identified using a recombinant inbred line (RIL) mapping population derived from an intraspecific cross between a thermotolerant genotype (PI251246) and a thermosensitive cultivar (Salinas). An F_2 population was generated to fine map the *Htg9.1* interval, which has been refined to a single genomic scaffold encoding 44 genes. Based on lettuce seed transcriptome data, only a single gene among these showed differential expression between PI 251246 and Salinas seeds germinated at 30°C. The gene encodes an ethylene-response-factor (ERF) gene that is involved in the ethylene signaling pathway, which is known to affect lettuce seed thermoinhibition. Both physiological and gene expression data in the presence of exogenous ethylene strongly support the role of *LsERF1* as a candidate gene for *Htg9.1*.

Effects of Wrack Composition, Age, and Cover on the Spatial Distribution of Beach Arthropods

Bryan N. Nguyen
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Environmental Science & Policy

To test for resource partitioning in wrack-associated sandy beach macrofauna, I examined the effects of wrack pile age, composition, cover, and distance from the swash zone on Diptera (flies) and talitrid amphipod (*Megalorchestia* spp.) distributions on a Northern California sandy beach using a factorial experiment and observational surveys. Ephydrid flies were correlated with local wrack pile size while *Fucellia rufitibia* flies appeared to be correlated with broader algal cover on the beach. While both presumably feed on algae, the spatial distribution of these flies was determined by algal cover on different scales. The effect of wrack pile age on animal abundances depended on the type of wrack, with the older piles of certain algae harboring more flies. Amphipods were found closer to the swash zone, where fresher, moister wrack tends to be. These differences in animal distribution patterns imply that talitrid amphipods and beach flies exhibit resource partitioning as a result of how their natural histories and traits interact with tidal and diurnal cycles. Spatial distributions of sandy beach macrofauna appear to be determined by many various abiotic and biotic factors.

Improving Rosetta's Energy Scoring Function for Membrane Protein Prediction

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Physiology & Membrane Biology
School of Medicine

Alpha helical transmembrane proteins (TMPs) act as membrane gatekeepers and facilitate communication between the external and internal cellular environments ensuring proper physiological signaling and ion transport. Understanding their structures is crucial to deduce their functions for rational drug design. The Rosetta Membrane method (RMM) is a computational approach developed to predict and design the three-dimensional structures of proteins from their primary sequence using de novo and homology modeling approaches. The RMM predicts amino acid packing in membrane proteins using a statistically derived energy function based on known TMP structures. I aim to improve the accuracy of TMP prediction by refining the environment, pair and density terms in the RMM energy function. After I have compiled a dataset of unique TMPs from the expanded database on TMPs in the Protein Data Bank, RMM will score each TMP and locate the position where the protein will be at its lowest energy within the lipid bilayer. My findings reveal profiles of the environment and pairwise interactions for all amino acids in hydrophobic, interface, and water environments. Next I will evaluate the accuracy of the new RMM with an improved energy function of known TMP structures.

Effects of PKC Agonists on Transcriptional Signaling Pathways During HIV Latency Reactivation

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Medical Microbiology & Immunology
School of Medicine

The development of Antiretroviral Therapy (ART) has saved millions of lives by successfully targeting and eliminating active HIV infection in patients. However, there is currently no cure for this disease due to HIV's ability to establish dormant reservoirs in host immune cells. "Shock-and-kill" strategy is proposed to target latency by using latency reversing agents (LRAs), which induce reactivation of these reservoirs, and allowing ART and immunotherapy to eradicate them. PKC agonists are known LRAs that can potently reactivate dormant HIV; however, the underlying mechanism for its potency is unclear. In this study, I am investigating whether a newly identified PKC agonist, Ingenol X, modulates multiple signaling pathways known to control HIV transcription, such as Sp1 and p-TEFb(CDK9/ Cyclin T1) pathway. Preliminary data indicates that Ingenol X is able to stimulate protein expression of CDK9, but not Sp1, during its reactivation of latency. Although Ingenol X cannot stimulate Sp1 protein expression, it may facilitate Sp1 protein recruitment into HIV LTR(promoter) to drive HIV transcription. Our study supports a model that Ingenol X is able to modulate multiple signaling pathways, which explains why Ingenol X is more effective than other LRAs in reactivating latent HIV reservoirs.

The Role of DNA Polymerases in Meiotic Recombination

Emerald L. Nguyen
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Microbiology & Molecular Genetics

Meiotic recombination is initiated by forming ~200 DNA double-stranded breaks (DSBs). Meiotic DSB repair involves new DNA synthesis using either homolog or sister chromosomes as templates. Defects in DSB repair can result in genome instability, sterility and cancerous diseases. Despite the significance of meiotic DSB repair, the identity of DNA polymerases involved in this process remains unclear. Previous research shows that defects in the replicative polymerase, polδ (Pol3), alters recombination and gene conversion in mitotic and meiotic DSB repair. In contrast, low levels of Pol1 (catalytic subunit of polymerase α) result in hyper-recombination in the rDNA region. The caveat of this data is that they are based on analysis of conditional alleles, or reduced polymerase activity, which may also alter bulk DNA synthesis during S phase. Also, the high temperature required to inactivate temperature sensitive (*ts*) conditional alleles has negative effects on meiosis. To overcome the disadvantages of *ts* alleles, I will use the auxin-induced degron system in budding yeast to study the function of DNA polymerases in meiotic recombination. The degron system can rapidly and efficiently degrade target proteins during meiosis. My preliminary data indicate that cells with degron-tagged DNA polymerases grow normally, indicating full functionality of degron-tagged polymerases.

Implicit Measurements of Mind-Wandering Using Ocular Motor Measures

Jessica Nguyen
Sponsor: Joy Geng, Ph.D.
Psychology

Mind-wandering is a phenomenon that occurs in everyone. The purpose of this study is to examine the saccade metrics that are correlated with mind-wandering or task-unrelated thoughts (TUTs) during an attentional-demanding task. Other than the use of self-report, there are few reliable physiological measures that can implicitly identify when someone is mind-wandering. To find these metrics, subjects were tasked with finding a target object from a category (e.g. the category is land mammals). In order to maximize our ability to detect mind-wandering, we used a visual search task with low frequency targets (e.g. TSA personnel examining luggage for prohibited items) that probed individuals explicitly about TUTs every 15-30 seconds. The preliminary results have shown that error rates increase positively with TUT duration, which is consistent with past research (Smallwood et al., 2004) and verifies the experimental validity of our paradigm. We will next examine the relationship between eye-metrics during the visual search task and self-reported mind-wandering (i.e., TUTs). Reliable saccade metrics of mind-wandering would be beneficial in developing technology to monitor and reduce mind-wandering during real-world tasks.

Intermittent vs. Chronic Effects of Oxytocin

Kenny T. Nguyen
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Psychology

Oxytocin (OT) is a hormone that is produced in the hypothalamus of the brain. It acts as a neurotransmitter in the brain, and plays a significant role in social bonding in animal models. Clinical evidence suggests that oxytocin treatment may improve social deficits and repetitive behavior in autism spectrum disorders (ASDs). In this experiment, we examined the long-term effects of OT in the prairie vole (*Microtus ochrogaster*), a socially monogamous rodent. Prairie voles are often used as an animal model to screen drugs that have therapeutic potential for social disorders. While chronic dosing can cause negative long-term effects on social behavior, we hypothesized that intermittent dosing during development would up-regulate the oxytocin system and improve social behavior; we included intranasal (IN) OT because it is the mode of administration used therapeutically, and intraperitoneal (IP) OT in order to compare with previous studies. The experiment consists of four different groups that received one of four different treatments: IP Saline, IP Oxytocin, IN Saline, and IN Oxytocin. Each group consists of twenty voles (ten males and ten females, n=80 voles total). We examined both social behavior immediately following administration, as well as long-term changes in social and anxiety behavior after treatment ceased.

Fibroblast Growth Factor Signaling is Required for Skeletal Development in Zebrafish

Lan-Uyen T. Nguyen
Sponsor: Bruce W. Draper, Ph.D.
Molecular & Cellular Biology

We are interested in understanding the molecular mechanisms that control skeletal growth in vertebrate animals. Defects in skeletal growth can result in body structure abnormalities and body function impairment in humans. One pathway that is known to affect skeletal growth in vertebrates is the fibroblast growth factor (Fgf) pathway, as mutations in an Fgf receptor (Fgfr) can result in dwarfism. To elucidate the role of Fgf signaling in skeletal growth, we utilize the zebrafish, an organism with an easily modified genome and similar skeletal developments as humans. Interestingly, we found that mutations in the Fgf receptor, *fgfr4*, result in growth defects in zebrafish. My ongoing research aims to identify the corresponding ligand(s) that activates Fgfr4, and thus, its signaling cascade. A likely candidate is Fgf18, as mouse *fgf18* mutants have similar skeletal abnormalities. Using a CRISPR/Cas9 genome editing system, I have isolated several loss-of-function mutant alleles in the zebrafish *fgf18* ortholog. I am currently in the process of crossing these fish to produce homozygous *fgf18* mutants to determine if loss of *fgf18* function results in skeletal growth defects. Overall, our results will improve our understanding of the factors that control skeletal growth in humans.

Dog Behavior in Dog Parks: A Correlative Study Between Observed Patterns and Owner Perception of Aggression and Anxiety in Dogs

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Medicine & Epidemiology
School of Veterinary Medicine

Dog parks are a place for dog owners to bring their pets to interact with other dogs and their owners. However, there have been few studies exploring the correlation between definite aggression and anxiety related dog behavior and their respective owners' perception. To examine this correlation, we developed behavioral ethograms to score dog aggression and anxiety and used a standardized canine behavior questionnaire (C-BARQ(R)) to rate the dog behaviors as perceived by the owner. We performed non-parametric tests of hypothesis, with significance set at < 0.05. Utilizing a Spearman's Rank correlation, there was no correlation between mean aggressive or anxiety scores and scores from the survey in dog directed aggression, dog directed fear, nonsocial fear, separation related problems, stranger-directed aggression, or stranger-directed fear (Spearman's rho range: -0.2217 to 0.2868; all $p \geq 0.27$). These results indicate that there may be a lack of owner awareness in regards to their dogs' aggressive or anxious behaviors, which could be a large contributor to canine misbehaviors.

Understanding Plastid Stromule Biogenesis

Lynh D. Nguyen
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Stromules, tubular extensions that form from plastids, were discovered decades ago; however, their biogenesis and function remained elusive. Recent observation of stromule induction during plant immune response to pathogens suggests the possible roles for stromules in plant defense. Due to inadequate molecular information on stromule biogenesis, a survey of specific proteins that associate with stromules is necessary to understand stromule contribution in plant immunity and other biological responses. Therefore, we are developing markers that will facilitate stromule proteome isolation *in vivo*. Recent data shows that a 42-amino-acids domain (PAL) from one member of class XI myosin fused to green fluorescent protein (GFP) localizes on stromules. Detailed analyses of amino acid sequences in PAL domains from different plant species revealed that XIF-PAL has two distinct amino acids. We are investigating whether these two amino acids are critical for XIF-PAL domain localization to stromules. We will use XIF-PAL domain fused with yellow fluorescent protein (YFP) to confirm the published report on localization to stromules, and to isolate plastids under stromule-induced conditions and compare their proteomes with the control to determine the putative proteins that associate with stromules. These studies should provide insights on components involved in stromule biogenesis.

Facebook Versus LinkedIn: The Personal and Professional Faces of Social Media and Its Relevance to Job Search

Natalie Nguyen
Sponsor: Jorge Peña, Ph.D.
Communication

As of 2014, job seekers between the ages of 18 and 29 were the largest group of individuals using social media. Though young job seekers use social media to share their personal stories and develop a professional image to appear as attractive job candidates to recruiters, these efforts may not work as intended and can cause a boomerang effect in the job search. Moreover, social media users are unfortunately unaware of what cues they are expressing on their profiles that can cause negative feedback. To explore this paradox, this study compares research regarding various instances in which different cues worked as intended or backfired in the impression formation process. The two forms of social media that will be examined in this study are: Facebook and LinkedIn. These findings can assist social media users achieve their goals of landing a job by enhancing our knowledge of how people express and (mis)perceive social media information.

Fermentation of Ionic Liquid-Pretreated Switch Grass Hydrolysate by Ionic Liquid-Tolerant Yeasts

Valerie K. Nguyen
Sponsor: Christopher Simmons, Ph.D.
Food Science & Technology

Lignocellulosic plant biomass is a promising renewable feedstock for production of alternative fuels. Since it is difficult to hydrolyze lignocellulose into fermentable sugars, ionic liquid (IL) pretreatment is used to help liberate the sugars needed for ethanol production. Even though the resulting product is washed post-treatment, measurable levels of IL still remain. The presence of IL can be toxic to conventional fermentative yeasts, inhibiting their growth and fermentation. The goal of this study was to find yeast strains that can grow and ferment on IL-pretreated switch grass hydrolysate. We previously screened 180 yeast strains from the Phaff Yeast Culture Collection for tolerance of ionic liquids. Yeast strains that have previously shown IL tolerance, as well as additional strains related to IL tolerant species, were checked for growth and ethanol fermentation on switch grass hydrolysate containing <1% residual IL. Growth rate, substrate consumption, and ethanol production were measured during culture and these metrics were compared to identify yeasts compatible with lignocellulosic biofuel production from IL-pretreated biomass.

Acidosis Development During First Burn Excision Increases Mortality

Vincent Nguyen
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Surgery
School of Medicine

In burn care early tangential excision of nonviable tissue decreases mortality, but causes substantial derangements in acid/base status due to blood loss. Purpose: Investigate the association between acidosis incurred in the initial surgical burn excision and outcomes. Hypothesis: Acidosis during initial tangential excision independently predicts mortality. Methods: Children aged 0-18 years admitted to a pediatric burn center for acute burn injuries requiring excision and grafting from 2007-14 were analyzed. Data collected included demographics, outcomes, and surgical data. Multivariate logistic regression was used to investigate predictors of mortality. Results: A total of 189 patients, 66.1% male, with a mean age of 7.3 years, TBSA of 41.8%, and 28.0% with inhalation injury were studied. Compared to survivors, non-survivors had higher TBSA (64.5 vs. 39.1%), greater inhalation injury incidence (75.0 vs. 22.5%), and lower mean intraoperative pH (7.32 vs. 7.37) during the first excision and grafting. In multivariate logistic regression analysis, factors independently predictive of survival included: intraoperative acidosis during the first operation ($p = 0.03$), TBSA ($p = 0.0002$), and inhalation injury ($p = 0.02$). Conclusions: Acidosis during initial burn excision is associated with increased mortality. Further investigation into aggressive pH control during initial burn excision may improve patient outcomes.

Investigating Nucleoporin Mislocalization in *C. elegans*

Vinh Q. Nguyen
Sponsor: Lesilee S. Rose, Ph.D.
Molecular & Cellular Biology

OOC-5 is a Torsin family AAA+ ATPase required for cell polarity and normal embryonic development in *C. elegans*. Torsins localize to the endoplasmic reticulum and nuclear envelope, and mutations in human TorsinA lead to a neuromuscular disease. Previous studies in *C. elegans* showed that depletion of a subset of components of the nuclear pore complex (the NPP-1 group of nucleoporins) leads to an *ooc-5* like phenotype. Our lab found that nucleoporins were mislocalized into plaques in *ooc-5* mutant germlines. Depletion of NPP-1 also led to nucleoporin plaques. We asked whether this germline phenotype is restricted to loss of the NPP-1 group of nucleoporins, or can be caused by depletion of other nucleoporins. To investigate this, I analyzed the localization of a nucleoporin::GFP reporter in germ cells after knockdown of certain nucleoporins. I found that *npp-3(RNAi)*, another member of the NPP-1 group, and *npp-22(RNAi)*, which is part of a different group, both caused mislocalization of nucleoporins. Interestingly, the plaque phenotypes were not identical between RNA*i* of NPP-3 and NPP-22. I am currently investigating the effects of depletion of other nucleoporins. In the future, we will test for correlations between the germline plaques and the *occ-5* embryonic defect.

The Effects of Water Stresses on Tomato Roots

Niba A. Nirmal
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Plant Biology

In the past few decades, climate change has negatively impacted food production by increasing irrigation requirements, decreasing arability, and causing fluctuations in planting and harvesting. Changing water levels dramatically influence crop plant growth, especially of root systems. Waterlogging severely impacts plant growth by blocking the diffusion of air-borne oxygen into the soil, halting respiration in roots. In response, some plants develop aerenchyma in their root cortex layer to provide an internal pathway for oxygen diffusion. In my project, I analyze the morphological responses to flooding in root systems of the model crop species, *Solanum lycopersicum*, (domesticated tomato) cultivar M82, and the more drought tolerant wild tomato species, *Solanum pennellii*. Aerenchyma development in adventitious roots of these divergent tomato species will be characterized in well watered, flooded, and drought conditions. Furthermore, I am characterizing whether *Agrobacterium rhizogenes*-induced hairy root cultures can develop aerenchyma in response to flooding. Since aerenchyma develops from cortex cells, I will later determine genetic differences in cortex cell type between the species, as implied by variances in the number and morphology of the cortex layers. I have genotyped and characterized transgenic tomato lines with cortex-specific nuclear and ribosomal tags, allowing for data collection on the genetic level.

The Role of the Androgen Regulated Transcript FAM111A in Castrate Resistant Prostate Cancer

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Medical Microbiology & Immunology
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80-90% of prostate carcinoma (PCa) patients are initially treated with chemical castration which results in a marked reduction of cancer cells. However, in many of these cases, this does not remain effective as PCa progresses into castrate resistant prostate cancer (CRPC). In such cases, CRPC remains reliant on the androgen receptor (AR) for survival despite castrate levels of androgen. Those AR dependent transcripts essential in regulating apoptotic responses and driving proliferation in CRPC's have yet to be fully uncovered. Findings have identified one promising AR regulated transcript, FAM111A. Known repression of FAM111A levels in castrate resistant tumors and further decreased FAM111A levels in metastatic tumors suggests a relationship between lowered FAM111A expression and castrate resistance and metastasis. Thus far, I've successfully developed an effective overexpression vector for FAM111A which will allow us to observe how it affects viability, proliferation, and apoptosis in CRPC cells. Identifying these effects could elucidate a potential new therapeutic target that may be used to improve treatment of CRPC's.

The Stress-Induced Plastidial Metabolite MEcPP Controls Plant Growth

Jacob R. North
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Plant Biology

Our lab has shown that a plastidial metabolite called MEcPP accumulates in response to stress and acts as a stress sensor relaying the unfavorable conditions from plastid to nucleus and as such modifying expression of nuclear stress responsive genes. Plants with high MEcPP, termed ceh1, exhibit a shortened hypocotyl, the stem of the germinating plant. Specifically, fluorescent microscopy showed diminished cell elongation in the hypocotyl of ceh1. Furthermore, metabolic profiling using gas chromatography mass spectrometry showed that ceh1 plants have reduced levels of two key growth and development hormones, ethylene and auxin. These observations have raised the question of how MEcPP can control cell elongation in developing seedlings. To address this, we employed a combination of genetic and pharmacological methods and showed that the low ethylene level is due to decreased expression levels of ethylene biosynthesis genes. Furthermore, we show that auxin and ethylene compensate ceh1 short hypocotyl phenotype, and that ethylene function is dependent upon auxin transport and signaling. We are currently investigating the molecular mechanism by which MEcPP represses expression of ethylene biosynthesis genes. Thus far, our project reveals the complexity and significance of metabolic balance and stress-mediated signaling pathways for optimal plant responses to environmental perturbations.

Children's Recall of a Neutral Event: Social Support and Child Maltreatment

Julie M. Olomi
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Psychology

In an effort to maximize interview accuracy and limit further trauma to child victims, the legal system has undertaken a concerted effort to introduce more child-friendly and socially supportive interview techniques. Although research reveals that more supportive interview styles are related to greater accuracy (Goodman, Bottoms, Rudy, & Schwartz-Kenney, 1991; Davis, Bottoms, Nysse-Carris, Haegerich, & Conway, 2000), little is understood about whether these findings would hold for a maltreated sample and how the relation between maltreatment and social support interacts with age. The present study attempts to close this gap in the literature and examines interviewer social support, age, and maltreatment status in relation to children's recall of a neutral event. One hour after participating in a beanbag game with an adult, 4 to 12-year-olds (N = 51) were interviewed about the game in an either socially supportive or business-like manner. Analyses to determine whether social support during the interview increased the accuracy of memory will be conducted. Potential interactions with age and maltreatment will also be considered. Implications for legal proceedings involving maltreated children will be discussed.

Characterizing the Differential Expression of Transcript Isoforms

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Plant Biology

RNA-Seq and modern computational techniques have allowed for the development of gene regulatory networks in many species. Although these networks have helped improve our understanding of biological processes, they provide an incomplete picture because many genes in eukaryotes produce multiple gene products. When genes are expressed in eukaryotes RNA splicing occurs, which can lead to different RNA isoforms and eventually different gene products. RNA-Seq produces short reads, most of which come from a single exon. When a sample is sequenced deeply enough, we find some reads that span RNA splice junctions. From these reads that the fraction of a gene's expression that an isoform is responsible for can be approximated. Expression patterns can then be established for gene products and we can determine how frequently the gene products from the same gene are differentially expressed. Once we establish which genes have isoforms that are differentially expressed we can apply that knowledge to gene regulatory networks. To test this method we used data from an RNA-Seq experiment from soybean seed development that deeply sequenced many tissues from several stages of development. We were able to show that many genes produced gene products that were differentially expressed in different tissues.

"No, Where Are You REALLY From?" The Implications of Racial Microaggressions on Asian American Self-Esteem

Matthew C. Olson
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Psychology

Racism has gradually transformed from overt practices to more subtle forms that are embedded in cultural values, institutional policies and practices, and deeper psychological processes. People of Color report racial microaggressions as the most common form of racism. Racial microaggressions are defined as "commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (D.W. Sue, 2010). Research indicates that microaggressions act as a significant physiological stressor, and more frequent exposure can result in greater physiological stress (D.W., 2010). Some researchers theorize that certain personality traits may exacerbate the negative effects of discrimination on psychological and physiological well-being. Using a sample of Asian Americans, this study investigated the aspects of social, performance, and appearance self-esteem and their moderation on the effect of a microaggression. Of these aspects, performance self-esteem was the only significant moderator (b = .145, SEb = .067, β = .143, $p < .05$). Those who had more confidence in their performance experienced greater physiological stress from the microaggression than those who had little confidence in their performance. We interpret these findings by discussing how pathways to positive self-regard may vary among individuals from different cultures.

Anopheles gambiae Larval Study

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Anopheles gambiae is a vector of *Plasmodium falciparum*, the causative agent of human malaria. Vector control, the most effective form of malaria prevention, requires an understanding of vector biology. Studies show that *A. gambiae* exists as M and S molecular forms, now recognized as two species; *A. coluzzii* and *A. gambiae*, respectively. These species are distinguished by genetic markers located in the centromeric region of each of these mosquitoes' three chromosomes. Although these species are typically reproductively isolated, F1 hybrids do occur. The lack of these hybrids in collections soon after a hybridization event suggests that hybrids are unfit. However, hybrids may be viable but underrepresented in typical indoor collection of adult mosquitoes. Studies suggest that hybrid populations--potentially more susceptible to P. falciparum--may be resting outdoors are therefore avoid detection. To study this possibility, *A. gambiae* s.s. larvae from different habitats will be analyzed using an IPLEX genotyping assay, which detects insecticide resistance genes and distinguishes between M and S molecular forms. The species composition and genotype data will be compared to a matching adult collection. This information can help identify whether hybridization is occurring in certain African sites and also which habitats are likely to contain hybrid larvae.

MeCP2 Function in Olfactory Mitral Cell Dendritic Morphology: A Confetti Approach

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Cell Biology & Human Anatomy
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Epigenetic regulation plays a critical role in the development and plasticity of the nervous system. The epigenetic regulator Methyl-CpG binding protein 2 (MeCP2) has been discovered to affect the differentiation of neurons as well as neurophysiological functions inducing Rett Syndrome, an autism spectrum disorder. To characterize the effects of MeCP2 on neuronal morphology and plasticity, we investigated mitral and tufted cell dendrites in the mouse olfactory bulb and compared wild-type with that of the *Mecp2* knockout. The Confetti transgenic strain is used to illuminate mitral cells with a tissue specific conditional Cre line. Confetti genes are thereby induced to express multiple fluorescent proteins, resulting in mitral cells being labeled and identified at the single cell level. To better characterize the effects of the lack of MeCP2 with the Confetti gene we are optimizing the dosage of tamoxifen to induce the expression of fluorescent proteins, testing the efficacy of the Cux1 antibody as a specific marker for tufted cells, and characterizing the tufted cell distribution and morphology in preparation for longer term MeCP2 knock-out studies with the Confetti gene. This investigation serves to enhance our visualization of the structural defect resulted by *Mecp2* deficiency on neural development in mammals.

The Affect of Drying on the Control of Concealed Damage in Almond

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Food Science & Technology

Almond is one of the top commodities in California. Approximately 70% of the almond produced in California are exported internationally which make almond the U.S top specialty crop exports. The almond industry in California values $4.8 billion and responsible for 82% of the world almond production. Thus, studying almond can help the industry gain a better understanding of almond's chemical properties and the effect of processing which may help improving the yield and quality of the almond. Concealed damage is a discoloration of the interior of the almond kernel due to high heat processing such as roasting. The development of concealed damage is linked to the high moisture content of the kernel. Almond with concealed damage cannot be detected by examine the exterior of the kernel. The development of concealed damage might be minimized by drying the kernel at low temperature before high heat processing. The purpose of this study is to determine the optimum drying time and temperature of the almond kernel by comparing the NIR spectrum, total acidity, and the amount of reducing sugar of concealed damaged kernel at different drying time and temperature to the non-concealed damage kernel.

Light Activation of Spiropyran Molecular Switches

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Biomedical Engineering

Current MRI contrast agents are unable to report on biochemical processes. Conjugation of molecular switches to an MRI contrast agent could be used to introduce sensitivity to biochemical processes. Spiropyrans are an attractive class of molecular switches that can reversibly isomerize between the closed spiropyran (SP) form and open merocyanine (MC) form in response to a variety of external stimuli such as visible light. Sensitive photoswitching in response to low levels of visible light is necessary for coupling switches and contrast agents with bioluminescent reporter systems, a potential method to evaluate levels of gene expression in the body. Coupling with bioluminescence has been attempted but the switch tested was not sensitive enough to respond. However, a variety of substituents can be attached to phenyl rings at indoline or chromene ends of the spiropyran, making these switches structurally diverse. To guide further synthesis for an optimal structure, a library of spiropyrans was tested for their visible light response and assessed by using UV-vis spectroscopy to measure changes in the MC absorbance peak intensity. A trend was found that light-activation favored spiropyrans functionalized with electron withdrawing groups on both phenyl rings.

Social-Defeat Stress Leads to Activation of Kappa-Opioid Receptors and Results Suggest Potential Sex-Differences

Evelyn Ordones Sanchez
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Psychology

Stress is often a precursor to many psychological disorders such as anxiety, which can be comorbid with depression. One mechanism by which stress triggers depressive-like behaviors is by activation of kappa opioid receptors (KOR). New evidence supports KOR involvement in the long-term effects of stress and that there are possible sex-differences. In a previous study, we made the surprising discovery that KOR activation had antidepressant effects in female California mice (*Peromyscus californicus*) exposed to social stress. Hence we tested whether KOR activation would have a similar effect in stressed males. Males were randomly assigned to three episodes of social defeat stress or control conditions. Two weeks later each mouse was treated with either 10 mg/kg i.p. injection of KOR agonist U50,488 or vehicle. Preliminary data suggest that treatment with U50,488 reduced social interaction behavior in stressed males but not control conditions. Stressed males appeared more sensitive to U50,488 and possible sex differences may exist affecting the antidepressant potential of KOR agonists. Further studies are being conducted to test the effects of KOR activation in the brain and on behavior in both sexes. The data suggests KOR agonists should be studied further to examine their properties in treating stress-related disorders.

Understanding Seed Germination Process in *Cuscuta* Plant Parasites

Shakevia Orozco-Carpenter
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Plant Biology

Cuscuta species are plant parasites that acquire nutrients from the phloem sap of host plants. The ability to parasitize a wide variety of hosts has made them very problematic in agriculture, causing millions of dollars in damage to crops. Their hard coats allow *Cuscuta* seeds to stay dormant for a long time, making eradication of *Cuscuta* from infested fields very difficult. In the laboratory, germination can only be induced after treatment of seeds with concentrated sulfuric acid. The mechanism by which this is accomplished in nature is not yet fully understood. The objective of my research is to better understand the seed germination process in nature and the factors that enhance it. Seeds will be germinated in different conditions such as varying light qualities and day-length, temperature, seed depth, soil type, and the presence or absence of a host. Seeds treated with sulfuric acid will be used as control. Preliminary results have shown that non-sulfuric acid treated seeds do not germinate in sterile soil, either alone or in the presence of a tomato host, under specific artificial light conditions. This research might provide ways of controlling this devastating parasite before it germinates, saving money and increasing crop yield.

Is SynDIG4 a Brain-Specific Type I or Type II Transmembrane Protein?

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Pharmacology
School of Medicine

Synapses are structures that allow neurons to communicate with each other. Each synapse is composed of the presynaptic cell, which converts electrical information to chemical information, and the postsynaptic cell, which receives the chemical signal via neurotransmitter receptors. AMPARs are ionotropic glutamate receptors present in vertebrate nervous systems. The number of AMPARs present at the synapse can vary, and thus affect synaptic strength. Previously, the Díaz lab identified SynDIG1 (Synapse Differentiation Induced Gene 1), a brain-specific type II transmembrane protein found to regulate AMPAR content at synapses (Kalashnikova et al., 2010). SynDIG4, a protein with sequence similarity to SynDIG1, has been shown to interact with AMPARs (Schwenk et al., 2012; Shanks et al., 2012; Schwenk et al., 2014). To further understand this integral membrane protein it is important to determine its site of function and its position in the membrane. Based on SynDIG4's sequence similarity to SynDIG1, we hypothesize it is also a brain-specific type II transmembrane protein. We generated SynDIG4 constructs with HA tags at its N-terminus, C-terminus, and loop region to conduct a live labeling experiment and test its topology. Utilizing immunoblotting, we probed for SynDIG4 in rat tissues to determine if SynDIG4 is restricted to the brain.

The Comorbidity of Alcohol Abuse and Internalizing Problems in Mexican-Origin Families

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Psychology

Latinos are the largest ethnic minority group in the United States and are projected to double in size to one-third of the population by 2060. Despite their rapid growth, state and federal programs lack proper preventative and intervention assistance that promote the well-being of these families. We construct culturally appropriate evidence-based programs based on the needs of this community. The present study uses data from a longitudinal study of Mexican-origin children, who were assessed annually from age 10 to 16. Our study analyzed the comorbidity between alcohol abuse and internalizing problems. Previous studies have found contrasting results. Some find that alcohol abuse follows from internalizing problems while others find that it leads to internalizing problems. To better understand this complex relationship in Mexican-origin youth, we studied the association between problem drinking (4 or more drinks within a few hours) and internalizing problems . Our analyses revealed that adolescents with higher levels of internalizing problems (on all four scales, anhedonic depression, generalized distress, anxious arousal, and anxiety) were more likely to be abusing alcohol at age 16. Our future research will use earlier reports of alcohol use and internalizing problems to analyze whether alcoholism precedes or follows internalizing problems.

Mechanisms of Probiotic *Lactobacillus casei* Tolerance to Oxidative Stress

Alina M. Osterlund
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Food Science & Technology

Lactobacillus casei is a member of lactic acid bacteria (LAB), a group of bacteria recognized for their important roles in food fermentations. Certain strains of *L. casei* are also probiotic and, hence, should benefit human health when consumed in foods and beverages. *L. casei* is unique among probiotic *Lactobacillus* species, because it contains the gene for superoxide dismutase (Sod), an enzyme that combats oxidative stress by converting superoxide, a reactive oxygen species, into hydrogen peroxide. To determine the importance of Sod for *L. casei* growth in aerobic environments, *L. casei* strain BL23 *sod* was inactivated by insertional mutagenesis. Wild-type *L. casei* and the Sod^- mutant were then grown, with and without aeration, in laboratory culture medium containing different concentrations of paraquat, a chemical that produces superoxide. In the presence of 5 mM paraquat, Sod^- mutant exhibited significant reductions in growth rate compared to wild-type with and without aeration. In contrast, the growth rate was similar for both wild-type and mutant *L. casei* in the absence of paraquat (μ=0.28 hours-1). These findings indicate that superoxide dismutase is active in *L. casei* and production of this enzyme likely confers a growth advantage to *L. casei* relative to other LAB in aerobic environments.

Identification of Candidate Genes Required for Xa21-Mediated Immunity

Danielle N. Owyoung
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Plant Pathology

Many crops are affected by diseases that negatively impact food production around the world. Rice, the most widely planted cereal crop, is no exception. Rice is a staple food for half the world's population and a genetic model for grass species. Using the genetic toolkits available for rice, my research focuses on the fundamental factors required for plant innate immunity. Specifically, I am researching the Xa21-mediated pathway that confers resistance to bacterial blight disease caused by *Xanthomonas oryzae* pv *oryzae (Xoo).* Xa21 was isolated from a wild relative of rice and confers resistance to many strains of *Xoo.* In order to identify the genetic components involved in this resistance, a reverse genetic screen was performed on a population of rice mutants carrying deleted regions of the genome. Through this screen, 2 mutants were identified that exhibited an increased susceptibility to *Xoo* despite the presence of Xa21. I will perform DNA extractions on a segregated population, design PCR primers targeting the candidate deletions and analyze the phenotypic data. Through genetic, genomic, and PCR analysis, I will determine the co-segregation between the candidate deletion and compromised immune responses, thus identifying a region required for Xa21-mediated immunity.

3D Visualization of *Brassica rapa* Using Computer Vision

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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. Because its entire genome has been sequenced, *B. rapa* can be studied to determine interactions between genotype and phenotype. Measuring morphological characteristics of plants using 2 dimensions can be time-consuming and destructive to plants. In order to accelerate this process, we are developing accurate 3-dimensional representations of the *B. rapa* plants using computer vision. To validate the 3D representations, we manually collected data on the number of leaves, pods, and stems per plant. We will use ImageJ software to take measurements of leaf surface area and leaf length. After collecting data, we will use R software to determine the correlations between the 3D representations and the manual measurements. This will efficiently help make a more accurate 3D image of each plant. Ultimately, the images can be used to correlate variations in the data with the genotypes to see which sections of the genome contribute to that variation. Once this high-throughput system is developed, we will be able to study many more genotypes of *B. rapa* to understand the interactions between genotype and phenotype.

Overexpression and Purification of BAK1 - A Co-Receptor Kinase Involved in Plant Immunity

Gloria Pai
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Chemistry

Our ecosystem relies on plants; they are responsible for oxygen production and serve as the main source of energy for all living things. As such, plants are nutrient-rich targets for pathogenic organism from bacteria to fungi to insects. Plants have evolved a way to detect a pathogenic infection that is based on the recognition of highly conserved, evolutionarily essential factors known as pathogen-associated molecular patterns (PAMPs). PAMPs are recognized by membrane-bound proteins comprised of an extracellular leucine-rich repeat, a transmembrane helix, and an intracellular kinase domain known as pattern-recognition receptors (PRR). A co-receptor, BRI1 associated kinase 1 (BAK1), has been identified to be involved in three different signaling pathways, specifically the EFR pathway which initiates the plant immune response. Our research focuses on the overexpression and purification of BAK1 from *E. coli*. Techniques for purification include affinity chromatography and fast protein liquid chromatography. We have been able to purify BAK1 with a tag, confirming the molecular weight using western blot. Future research includes further purification steps and crystallization of the structure at a high resolution in complex with the co-receptor EFR. Success in this research will provide us with a better understanding of how the plant immune system is activated.

Translocation Properties of Arrythmogenic Calmodulin Mutants in Cardiac Myocytes

Ian P. Palmer
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School of Medicine

Calmodulin (CaM) is a key 2nd messenger. It is essential in contractile regulation in myocytes by directly effecting ion-channels and acting as an intermediary Ca^{+2} signal transducer with a low spatial range of action. Alterations in calcium binding affinity of the CaM EF-hand motifs affect CaM interactions with ryanodine receptors (RYR2) and L-type calcium channels. Recently, mutations in CaM have been identified and linked to catecholaminergic polymorphic ventricular tachycardia (CPVT) and long QT syndrome (LQT), both life threatening arrhythmogenic diseases. Although evidence exists to support mutations in CaM causing arrythmogenic deficiencies, it is not known how they affect CaM targeting and translocation upon stimulation. Here we created and used GFP-tagged CaM mutants N54I, N98S, D96V, D130G, F142L, and F90L to determine if these disease-associated CaM mutations affect CaM targeting in cardiac myocytes. Confocal microscopy was used to monitor co-localization with RyR2 and CaMKII, and to track CaM translocation following stimulation with hypertrophic agonists. This data will provide new mechanistic insight into these arrhythmogenic CaM mutations.

Comparison of Wildtype and Laminopathy Mutant Lamin Proteins Distribution *In Vivo* Using *C. elegans*

Lira Palmer
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Molecular & Cellular Biology

Lamin is a protein found below the nuclear envelope that gives strength and structure to the nucleus. It is essential for nuclear migration and positioning. Researchers have found mutations in the genes encoding lamin proteins are found in several genetic disorders including premature aging diseases and muscular dystrophies. Diseases linked to mutations in lamin have been termed laminopathies. The nematode *Caenorhabditis elegans* provides a simplistic model to study lamin proteins *in vivo* as it contains only one lamin protein, LMN-1, compared to the multiple found in other eukaryotic species. By introducing fluorescently tagged lamin proteins into *C. elegans*, I compare wild type LMN-1 organization with LMN-1 proteins containing single point mutations homologous to laminopathy mutations. I am making genetic constructs of *lmn-1* with the sequence to add the fluorescent tags GFP and mCherry to the endogenous protein. These constructs will produce the LMN-1 proteins with their respective fluorescent maker. Since *C. elegans* is transparent, I will visualize the distribution of each LMN-1 fluorescent construct *in vivo*. I will use the CRISPR-cas9 gene editing system to introduce these constructs into the *C. elegans's* genome. As such, I hope to gain an understanding on the cellular basis for several laminopathy mutations.

Arginine Vasopressin Receptor Binding in Developmentally Fluoxetine Exposed Prairie Voles (*Microtus ochrogaster*)

Michelle C. Palumbo
Sponsor: Karen L. Bales, Ph.D.
Psychology

The neuropeptide hormone arginine vasopressin (AVP) plays an important role in social behavior, pair bonding, and maternal responses to stress in the socially monogamous prairie vole (*Microtus ochrogaster*). Developmental selective serotonin reuptake inhibitor (SSRI) exposure in pregnant women may be linked to the prevalence of Autism Spectrum Disorder (ASD). AVP has been indicated as dysregulated in individuals diagnosed with ASD, though the etiology and consequences of differences in AVP remain unclear. As a translational model of developmental pre- and postnatal SSRI exposure, twenty female prairie voles were treated with 5mg/kg subcutaneous fluoxetine or saline solution daily throughout pregnancy to weaning. The SSRI exposed pups were behaviorally assayed to examine anxiety-like behavior and social deficits using the open field, elevated plus maze, partner preference, and alloparental care tests. Brains were collected 24 hours after completion of behavioral testing, as either periadolescents or adults, and quantitative autoradiography was used to measure vasopressin 1a receptor (V1aR) binding. Results will be used to quantify V1aR density and distribution changes caused by SSRI exposure, which will further clarify the relationship between SSRI exposure, V1aR binding, and social behavior in relation to ASD.

Developing an Artificial Host System for Studying Haustoria Development in *Cuscuta*

Thomas C. Parker
Sponsor: Stacey L. Harmer, Ph.D.
Plant Biology

Dodder, *Cuscata* species, is a widely distributed plant parasite that costs farmers millions of dollars' worth of lost produce and indeterminate amounts of ecological damage. The parasite wraps around the host and, through structures called haustoria, grows its way into the stem to feed on host xylem and phloem sap. Haustoria formation can be initiated upon the parasite coming in contact with a nonliving stick or rod, but does not continue past the prehaustoria stage of development. Our goal is to recreate the infection process in a controlled artificial system to aid the identification of haustoria-inducing stimuli. Hollow agar rods will be created to mimic host stems. Sap from 3 week old tomato plants will be collected at different times and placed into the agar rods, and then dodder will be allowed to wrap around the mimicked host with the hope that the sap will induce complete haustoria formation. Agar rods with water will be used as controls. Being able to observe and replicate full haustoria development *in vitro* should help us better understand the interaction between parasite and host by identifying the possible signals that the parasite need to complete its life cycle.

Interactive Effects of Nitrogen Deposition, Precipitation, and Herbivory on Tissue Quality and Performance of Native and Invasive Grasses

Kirsten A. Pearsons
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Plant Sciences

Under anthropogenic influence, increased nitrogen deposition and shifts in climate patterns may have significant effects on invaded grasslands through changes in plant performance and response to herbivore damage. A greenhouse study was undertaken to simultaneously investigate the effect of increased nitrogen inputs and altered precipitation patterns – low, high, and "flashy" – on foliar tissue quality (C:N) and herbivory compensation (biomass and seed mass response to simulated herbivory) of the native grass *Stipa pulchra* and the invasive grass *Aegilops triuncialis*. Invasive species may be able to outperform native species by capitalizing on nitrogen and water additions, but this advantage may be limited if natives are better prepared to compensate for herbivore damage. We hypothesize that with increased nitrogen and water, *S. pulchra* will show little biomass response but will respond with lower foliar C:N, which will provide for better herbivory compensation. *A. triuncialis* is hypothesized to have the opposite response with a greater change in biomass, more consistent foliar C:N across treatments, and less herbivory compensation. Differences in native versus invasive grass compensation for herbivory, as well as differences in their response to altered nitrogen and water availability, may play a role in slowing or facilitating exotic plant invasion.

A Simple and Educational Means for Investigating Nanophytotoxcity

Brian P. Pedersen
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Chemistry

Nanotechnology has become an important field of research and development in recent decades. With increasing production of nanomaterials, the toxicity to environmental and human health are important subjects for investigation and will continue to become more important in the years to come. This poster reports a simple and educational method to study nanophytotoxcicity that students in high school, junior college, and university can perform. This is done by monitoring the growth of Chia, *Salvia hispanica*, via the input of carbon nanotubes, metal oxides, and silica in comparison with regular "waterings" using MilliQ water. Simple readouts provided insight of the nanoparticles effect on the shoot length of the chia and the rate of survival for the chia growth. The results are analyzed using average and standard deviation, as trained in analytical chemistry and the trends were compiled to determine, objectively, the positive or harmful effects of the nanoparticles on plant growth.

Sustainable Feed for Poultry: The Use of a Broccoli By-Product to Feed Laying Hens

Gabriela H. Pedroza
Sponsor: Annie J. King, Ph.D.
Animal Science

Horticultural by-products are defined as materials from vegetables, fruits, seeds, grains, and nuts that are lost during processing. Results of previous research with broccoli (*Brassica oleracea*) by-products, broccoli stems and leaves meal (BSLM) indicated that when added at 3 %, 6% and 9% in diets of 42-week-old laying hens, there was an increase in darker yolk pigmentation, lowered yolk cholesterol and maintenance of other production measurements compared to a corn and soy diet. Due to the abundance of broccoli stems and leaves, it is important to determine if more BSLM can be added to diets of laying hens. Thus, BSLM will be added to diets of 35-week-old laying hens at 15% and fed for four weeks. Data for body weight, feed consumption, egg weight, albumen height, Haugh units, shell thickness and yolk pigmentation will be recorded and analyzed. Based on results of previous research, anticipated outcomes for a BSLM diet are significantly lower yolk cholesterol, darker yolk pigmentation, and similar egg production as compared to a corn and soy control basal diet. Using more horticultural by-products to agriculturally significant animals could lower feed costs as well as reduce deposition of by-products in landfills.

Sustainable Feed for Poultry: Use of Horticultural By-Products From California

Guadalupe Peña Gomez
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Animal Science

Poultry production in the U.S. is increasing rapidly but current feed production cannot meet projected demands. The need for alternative feed products calls for more research on the potential use of horticultural by-products (food that is discarded during harvest and processing of fruits, vegetables, grains, nut and seeds) as feed ingredients. Though not a novel idea, in previous years the use of horticultural by-products as poultry feedstuffs has been hindered by lack of advanced technology to develop nutritious alternative diets. Thus, animal scientists at the University of California, Davis are conducting research on the nutritional content of horticultural by-products produced in California. The nutritional content of these by-products, as well as commercial feedstuffs, will be added to a Microsoft Access Relational Database, which will allow large and small scale poultry producers to easily create alternative diets with all available by-products. Ultimately, successful use of the Microsoft Access Relational Database for use of by-products in California would promote its use throughout the world, especially in under-developed countries. This could bolster the use of their already limited resources.

Indirect Toxicity of the Herbicides Diuron and Hexazinone to the Cladoceran Freshwater Water Flea, *Daphnia magna*

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Anatomy, Physiology & Cell Biology
School of Veterinary Medicine

Diuron and hexazinone are two commonly used herbicides prevalent in surface waters in California. They are toxic to a range of algal and invertebrate species. In a 21-day exposure, we determined the effects of diuron and hexazinone, individually and as a mixture, on reproduction of the water flea, *Daphnia magna*. Exposure treatments were based on effective concentrations (EC) that are known to inhibit the growth of *Pseudokirchneriella subcapitata*, an algal food source of *D. magna*. Average number of neonates produced over the course of the exposure and survival at the end of the 21-day exposure were compared to the control. The average number of neonates was significantly decreased in the EC50 and EC90 exposures, suggesting long term population impairment following exposure. Further research is required to distinguish between potential direct impact following exposure to *D. magna*, and indirect impacts through toxicity of *P. subcapitata*, which would result in less food source to *D. magna*. These findings suggest that diuron and hexazinone cause effects on *D. magna* population growth rates, which in combination with other stressors present in the environment, could cause trophic cascade effects.

Do Hibernating Hamsters Lose Their Capacity to Generate Hippocampal LTP?

Iris G. Perez
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Neurobiology, Physiology & Behavior

In winter, maintaining homeothermy requires substantially greater energy utilization despite the fact that food may be scarce. Thus, some mammalian species have evolved mechanisms that allow them to lower their body temperature and enter deep torpor, during which time energy utilization is minimized. I hypothesized that energy saving mechanisms are present in specific brain regions whose functions are not essential during bouts of torpor, one example of which is enhancement in neural efficacy known as long term potentiation (LTP), a model for functional plasticity of learning and memory. Specifically, I tested the hypothesis that hibernating Syrian hamsters (HH) reduce their capacity to generate LTP when in hibernation (torpor). For this, I evaluated LTP in hippocampal slices from three groups of hamsters: HH (in torpor), WH (housed in winter-like conditions but not in torpor), and SH (housed in summer-like conditions and not in torpor). I recorded field potentials in CA1 pyramidal neurons at 30°C. Records taken before and after tetanic stimulation of Schaffer collaterals (for up to 60 min post tetanus) are in the process of being compared to determine if LTP was greater in SH compared to WH and/or HH.

Shaping a Story: Age-Related Differences in Narrative Ability

Jessica Perez
Sponsor: Simona Ghetti, Ph.D.
Psychology

Narrative ability, the capacity to create a clear and coherent story, contributes to social and academic success. Research on the development of this important ability has focused on early childhood despite the fact that several cognitive constructs related to narrative construction (e.g., vocabulary, organizational skill, and recognition of others' emotions) improve during middle and late childhood. The current study addresses this gap in the literature by examining age-related differences in narrative ability in 5- to 11-year-olds and adults (N=150). Participants were asked to look at sequence of six pictures depicting an event and to tell a story about what is happening in the sequence of pictures (Geers, Tobey, Moog, & Brenner, 2008). Narratives were videotaped, transcribed, and coded for narrative competence. Sex and SES were also assessed given theoretical support for a relation between these variables and narrative ability. Preliminary results show age-related differences in narrative ability across middle and late childhood. Although SES was not related to narrative ability, female participants tended to score higher than male participants on some indices of narrative ability. Results support a protracted development of narrative ability across childhood and provide insight for educational practices during middle and late childhood.

Is SynDIG4 a Brain-Specific Type I or Type II Transmembrane Protein?

Michelle Pham
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Pharmacology
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Synapses are structures that allow neurons to communicate with each other. Each synapse is composed of the presynaptic cell, which converts electrical information to chemical information, and the postsynaptic cell, which receives the chemical signal via neurotransmitter receptors. AMPARs are ionotropic glutamate receptors present in vertebrate nervous systems. The number of AMPARs present at the synapse can vary, and thus affect synaptic strength. Previously, the DÃ_ az lab identified SynDIG1 (Synapse Differentiation Induced Gene 1), a brain-specific type II transmembrane protein found to regulate AMPAR content at synapses (Kalashnikova et al., 2010). SynDIG4, a protein with sequence similarity to SynDIG1, has been shown to interact with AMPARs (Schwenk et al., 2012; Shanks et al., 2012; Schwenk et al., 2014). To further understand this integral membrane protein it is important to determine its site of function and its position in the membrane. Based on SynDIG4's sequence similarity to SynDIG1, we hypothesize it is also a brain-specific type II transmembrane protein. We generated SynDIG4 constructs with HA tags at its N-terminus, C-terminus, and loop region to conduct a live labeling experiment and test its topology. Utilizing immunoblotting, we probed for SynDIG4 in rat tissues to determine if SynDIG4 is restricted to the brain.

Iron-Hydroxytyrosol Complexing Induces Color Changes in Black Ripe Olives

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Food Science & Technology

Consumers expect a particular shade of black in California-style black ripe olives [CBROs] indicative of olive quality. The color of CBROs is due to the complexation of ferrous gluconate (iron) with hydroxytyrosol. The iron complex that is formed is not stable over time, and storage conditions may influence the half-life of this complex. As the complex degrades, the color of CBROs changes and can lead to consumer rejection of the product. We are studying the stability of the iron-hydroxytyrosol complex during canned storage at ambient temperature. The color of CBRO is monitored using a Hunter Lab colorimeter. The level of free hydroxytyrosol is quantified using Ultra High Performance Liquid Chromatography (UHPLC) electrospray mass spectrometry (ESI/MS). Correlations between color and free hydroxytyrosol will be used to develop a predictive model for color stability in CBROs. Preliminary data indicates fresh processed olives are darker with shades of red and yellow which diminish in intensity during prolonged storage time. The results of this research will focus on distinguishing iron-hydroxytyrosol stability in relation to storage conditions. This will allow for understanding the color transformation of CBROs during storage, and will help to create a better consumer product.

How Non-Governmental Organizations Alleviate the Education Gap for Youths in Egypt

To Lan M. Phin
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Anthropology

Egypt has succeeded in increasing the number of students attending schools. The education reforms have given access to free education to Egyptians who could not previously afford schools. Although the number of students enrolled has expanded, the quality of education has remained low. The ratio of students to teachers has increased and the classrooms have failed to match the increase in students. Since the Egyptian Revolution in 2011, the volatile political landscape has also caused uncertainty in education reforms. Yet there are a number of non-governmental organizations helping youths, in spite of the restrictions. In this paper, I will present a case study of the role of non-governmental organizations in education for Egypt. I argue that non-governmental organizations have managed to improve the education for youths. I will analyze the obstacles non-governmental organizations face when implementing educational programs and assess similarities and differences in the types of programs offered by various organizations. I will give a comparative analysis of the non-governmental programs. By understanding how non-profits attempt to improve the quality of education for youths, I argue we can find pathways to educational improvements.

The Effects of *Staphylococcus aureus* on Neutrophil Mobilization and Wound Healing

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Biomedical Engineering

Staphylococcus aureus is among the leading causes of skin and soft tissue infections and is responsible for nearly 14 million outpatient visits and 500,000 hospital admissions per year and more fatalities annually than any other infectious agent in the United States. Host immunity to *S. aureus* relies heavily on the ability of neutrophils, as first-line effector cells of the innate immune system, to recruit rapidly and efficiently to sites of infection. Using an *in vivo* mouse model of skin wounding and infection that allows simultaneous, real-time quantification of fluorescently-tagged neutrophils and bioluminescent *S. aureus*, we've found that significantly fewer neutrophils accumulate at wound sites inoculated with a high bacterial load than in control wounds inoculated with sterile saline. We hypothesize that this is due to a decrease in recruitment efficiency from the circulation into the wound bed. Current efforts are focused on determining whether the impaired neutrophil response is mediated by increased cell death within the wound or if the presence of *S. aureus* interferes with the ability of neutrophils to migrate from inflamed blood vessels into the tissue space.

Cdc48: An AAA+ ATPase's Role in Meiotic Recombination

Philip Poa
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Microbiology & Molecular Genetics

Meiosis is the process by which diploid cells divide to form haploid gametes. In meiosis, chromosomes must be segregated accurately to produce viable offspring. Improper segregation can lead to trisomy diseases such as Down Syndrome, infertility, and cancer. In order for successful segregation to occur, the amount of recombination must be regulated. SUMO (Small Ubiquitin like Modifier) is a protein modification that has been linked to meiotic recombination, and is one of the focuses of our lab's research using the model *Saccharomyces cerevisiae*, also known as budding yeast. We identified several meiotic proteins that are SUMOylated. These include Cdc48, an AAA+ (ATPase Associated with diverse cellular Activities) that extracts ubiquitylated and SUMOylated proteins from multi-protein complexes and has a known role in mitotic recombination. I will create a mutant yeast strain that cannot express Cdc48 during meiosis. The background strain I will use is engineered so that recombination data can be gathered for multiple loci in the yeast genome. After inducing the cells to undergo meiosis, I will gather data and calculate recombination frequencies. These values will confirm whether or not Cdc48 is involved in meiotic crossing over.

Maternal Autoantibody Reactivity to the Developing Brain in Mothers of Children with Autism

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Autism Spectrum Disorder (ASD) is a group of heterogeneous, neurodevelopmental disabilities affecting an estimated 1 in 68 children in the U.S. The exact causes of ASD remain unknown, although strong associations with genetic and environmental factors have been demonstrated. There is a great need to identify biomarkers of ASD in order to facilitate earlier diagnosis and behavioral intervention, which currently remains the best treatment option. We previously identified maternal autoantibodies specific to ASD that recognize targets highly expressed in the fetal brain in a retrospective study. Using plasma samples from mothers collected prospectively through the MARBLES (Markers of Autism Risk in Babies, Learning Early Signs) study, we are now characterizing autoantibody reactivity to the target autoantigens by Western blot. We are currently screening 150 third trimester samples, as immunity is being conferred to the fetus through passive transfer of antibodies across the placenta during this period. The autoantibody profile will be linked to diagnostic information to determine if there are any particular behaviors associated with these highly specific autoantibodies. It is anticipated that these studies will aid in the search for biomarkers of ASD with clinical relevance.

Development of Blood-Brain Barrier in SJL Mice

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Pathology, Microbiology & Immunology
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Multiple sclerosis (MS) is an autoimmune disease in which leukocytes attack myelinated sheets, which are necessary for the quick propagation of nerve action potentials. Interestingly, the MS incidence is much high among woman than men. In addition, women more often experience the relapsing-remitting MS (RRMS) form, however, the reason for this bias is unknown. We hypothesize that the Blood Brain Barrier (BBB) is a key contributor to a woman's predisposition to RRMS. The SJL mouse strain is the only murine model that matches RRMS. An *in vitro* BBB model has been developed using the C57BL/6 mouse strain. My study focuses on the developing an artificial BBB model in SJL mice to elucidate its putative sexual dimorphism. To test this I will grow the microvasculature of the mouse tissue, specifically, the endothelial cells and astrocytes to create an artificial BBB. Proper development of the model can be used in future studies to modulate sexual bias (epigenetic, development, hormones, etc.) involving BBB physiology. Ultimately we hope to use the results to develop better treatments for MS patients.

Forming Spatial Care Paths in Conjunction with Point-of-Care Technologies in Rural Regions of the Philippines

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Heath access modeling is a powerful tool that allows for the evaluation of healthcare networks and suggestion of improvements. Point-of-care technology (POCT), which is defined as diagnostic information at the point of need, can facilitate immediate diagnosis, monitoring, and treatment to patients. This project focuses on determining the more healthcare-deprived, rural regions of the Philippines in order to ascertain purposeful placement of these POCT technologies. Data was obtained from Philippine Department of Health and used to illustrate how remote populations are constrained in accessing healthcare in terms of travel time and resource availability. Using ArcGIS Network Analyst 10.2, a health access model was created from data representing populations, roads, and health facilities. Additionally, we adapted the GIS to understand POCT placement within spatial care paths (SCPs), defined as the most efficient travel route for patients to receive care. This hope for this model is to have POCT adopted into the health network, which may enable faster diagnoses and treatment to be attained, improving economic and medical outcomes. Furthermore, this information empowers the people within the health network to make evidence-based evaluations when determining the costs and benefits of adopting POCT.

Misplaced Development in Ghana: Challenging Assumptions of Medical Aid on the Undergraduate Campus

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Anthropology

Undergraduate medical aid serves many purposes: to pad resumes, allow for guilt free international travel, and to get the overachieving, affluent Westerner into medical school. This highly cynical view of the many aid organizations that pepper our halls of higher learning is countered by the theory that these travel experiences teach the donor, that recipients have a say in the aid they receive, and that this aid is an agent of positive change. An ethnographic study of the University of California chapter of Global Medical Brigades was used to dissect the question of international aid effectiveness in the undergraduate context. A combination of literature review and interviews was used to look at the effect this organization has on its members and the communities it serves, specifically in Ghana. This aid apparatus strives for a more personal, sustainable model than that of governmental foreign aid, but still falls into dependency creation instead of job development, miscommunication amongst donors and recipients leading to ineffective projects, and the need to sell an experience to receive the aid money that flies carry-on with our medical school hopefuls.

Assigning TAs to Sections: A Stable Marriage Problem

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Mathematics

Every year, teaching assistants are chosen to teach classes. Initially, this is done by emailing graduate students for their preferences of classes for the coming quarter, with which a student affairs officer will match the graduate students to their preferred classes. Unfortunately, this process takes upwards of 8 hours to complete by hand and the designated human assignments generally fail to produce an optimal solution. In order to remedy this issue, we examined a mathematical model which incorporates integer programming to matching theory in order to pair graduate students to courses while attempting to maximize the satisfaction of the graduate students. Creating such a model required that we considered certain constraints, such as teaching assistant seniority, time conflicts, teaching ability, and happiness of each teaching assistant (as provided by their preferences of classes to teach). We also created a website interface for our model that gathers preference data from the graduate students and allows the staff to easily perform the matching.

Elucidating the Functional Difference Between Sost and Its Paralog Sostdc1 in Tissue Development

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Sclerostin (Sost) plays an important role in skeletal development and homeostasis as a Wnt and bone morphogenetic protein (BMP) antagonist. Its paralog Sostdc1 is also a dual BMP/Wnt inhibitor, but the functional difference between Sost and Sostdc1 in tissue development is unknown. Our collaborator, Dr. Gabriella Loots, has demonstrated that while Sost expression is predominately in the skeleton, Sostdc1 is expressed in the periosteum, connective tissues, smooth and skeletal muscles, and vasculature. To examine the contribution of Sost and Sostdc1 to cellular migration, I employed the Boyden chamber assay to test the chemotactic effect of Sost and Sostdc1 on endothelial colony forming cells (ECFCs). Preliminary data shows that while Sostdc1 had no effect, Sost induced cell migration of ECFCs. Other Wnt antagonists can increase ECFC angiogenesis suggesting that while Sost is an angiogenic chemokine, Sostdc1 might promote ECFC angiogenic potential via inhibition of the Wnt pathway. To evaluate this possibility, I will treat ECFCs with Sost and Sostdc1 followed by gene expression analysis of various endothelial markers and Wnt target genes. Further, a similar *in vitro* approach can be used to dissect the role of Sost and Sostdc1 in muscle development using C2C12 cells, a myoblast cell line.

The Monitoring of Na^+ Sequestration Using Coro/Na^+ and SNARF-1 Stain in Pistachio Seedlings

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Plant Sciences

Salinization of soil is a problem that affects more than half of the cropland in California. With the expected increase in soil salinity in the future, understanding the mechanism of sodium uptake, transportation, and sequestration becomes a major factor in adapting our agricultural methods. Pistachio trees contribute a significant portion to the California economy and are highly tolerant to saline soils. However, the coping strategy of pistachio under salt stress at the cellular and sub-cellular levels is largely unknown. Furthermore, tools with which to observe and track sodium throughout the plant are lacking. Using a protocol developed in the lab we can specifically label Na^+ in root cells of pistachio. Root samples are labeled with sodium specific stain, CoroNa-Green, and examined with confocal microscopy to track sodium uptake and sequestration. Additionally other fluorescent markers labeling specific sub-cellular compartments (SNARF-1 labeling of the vacuole for example) are compared to CoroNa-Green staining to correlate the Na^+ signal with a specific sub-cellular compartment. We hypothesize that excess sodium is sequestered in the vacuole. Further characterization of high salinity coping mechanisms could lead to manipulation of Na^+ pathways to increase saline tolerance in pistachio as well as other economically important California crops.

Circumventing Economic and Financial Sanctions: The Case Study of the Islamic Republic of Iran

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Political Science

Economic and financial sanctions are soft power instruments used by policy makers to change the behavior of noncomplying states. Iran is a country that has been sanctioned since 1979 as consequence of seizing the US Embassy in Tehran. Since 1979, the United States and its allies have progressively assigned additional sanctions to curb the Islamic Republic of Iran's agenda in building nuclear facilities. Iran as a prosperous oil exporter has maintained a relative economic stability that Western States and their allies have tried to undermine by enforcing sanctions. Iranian businesses have adopted circumspect and roundabout tactics and partnerships abroad to sidestep the internationally instituted legal statutes against their economic and financial activity. Often times these measures are costly in terms of both time and monetary resources. However, these methods are crucial for economic stability. As the United States and its allies tighten their sanctions, they eliminate loopholes that have rendered the economy of Iran increasingly desperate. This paper navigates the Iran case study through historical, theoretical and empirical discourse in order to analyze the true effectiveness of the Economic and Financial Sanctions that are gradually imposed on Iran and the legal and illegal channels that Iran uses to circumvent them.

Localized Sanitation Campaign to Affect Behavioral Change in the Rural Population of Kameshwaram, India

Sahana Rajan
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Land, Air & Water Resources

Project RISHI (Rural India Social and Health Improvement) at UC Davis aims to provide sustainable and financially sound solutions to various disparities in rural India. Through our partnership with FIN-SWAM, it has come to our attention that the population of Kameshwaram, Tamil Nadu faces persisting hygiene and toilet accessibility issues. Although the sanitation infrastructure is growing as part of FIN-SWAM's toilet installation efforts, the usage of such facilities has not met its full efficiency. We aim to address this problem in two ways: I. Provide specifically targeted sanitation education projects that cause measurable behavioral change. Our sanitation campaign will be targeted at especially women and children, and the material will address both social and health needs. II. Train a local task force in Kameshwaram to continue our campaign through the duration of the year to ensure project sustainability. III. Upon the administration of the campaign, the toilet usage, the villagers' opinion on the accessibility of the toilets, and rates of sanitation related disease will be measured.

Determining the Function of a Zinc Binding Site in the DNA Glycosylase MUTYH

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Chemistry

Defects in the repair of damaged DNA can lead to persistent mutations in the genetic code and the onset of oncogenesis. DNA glycosylases are responsible for locating and initiating repair of damaged DNA. One glycosylase known as MUTYH, catalyzes the base removal of adenine when mispaired opposite of a product of oxidized guanine. Variants of MUTYH that have reduced repair activity have been associated with the onset of a type of colorectal cancer (MUTYH Associated Polyposis or MAP). Several MAP variants contain amino acid changes in the Interdomain Connector (IDC) that links the N-terminal catalytic domain to the C-terminal OG recognition domain. Some of these variants are adjacent to three highly conserved cysteine residues that coordinate Zn^{2+}. Coordination to this Zn^{2+} binding site was shown to be important for base excision both *in vivo* and *in vitro.* However, the reason for necessity of Zn^{2+} binding is unclear; is Zn^{2+}coordination simply structural, or does this cofactor have a greater significance for MUTYH in overall DNA repair? In this study, we used circular dichroism spectroscopy to determine the extent that Zn^{2+} coordination plays in protein structure.

Computational Analysis of R-Loops and Origins of Replication in the Human Genome

Aparna Rajpurkar
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Molecular & Cellular Biology

The duplication of chromosomal DNA is a fundamental process in all life forms. DNA replication does not initiate randomly along chromosomes but instead, initiates at loci termed replication origins. Identifying human replication origins and the mechanisms by which they function is a fundamental goal of modern biology. Utilizing genome-wide next generation sequencing datasets of replication origins, replication timing profiles, and global R-loop maps, I computationally investigated the association between R-loops and origins of replication. My work supports a role for R-loops, non-B DNA structures formed by annealing of an RNA strand to one strand of the DNA duplex, in replication origin function. Analysis of base-pair overlap of R-loops peaks and specific origin loci show that R-loop peaks overlap significantly with early origins, more so than other candidate loci such as CpG islands and genes. R-loop signal is found to correlate significantly with well-known origin-associated proteins and epigenetic modifications. Furthermore, origins of replication which colocalize with R-loops show significantly higher replication protein signal and replication-associated histone modification signal than those that do not. These results show strong correlation between R-loop structures and origins of replication, which suggests a role in origin licensing and replication protein recruitment by R-loops.

Memory CD4+ T Lymphocytes Against OspC as a Diagnostic Marker for Lyme Disease

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Prolonged infection with the zoonotic, tick-borne bacterium *Borrelia burgdorferi*, the causative agent of Lyme disease, can cause neurological, cardiovascular, and arthritic symptoms. To avoid these long-term consequences, rapid diagnosis and antibiotic treatment are crucial; however, current tests for Lyme disease lack sensitivity. Here, we aimed to determine whether measurement of Borrelia-specific T lymphocytes might be a better diagnostic. Upon activation, T lymphocytes proliferate and differentiate into subsets that help clear intracellular pathogens, activate B lymphocytes, and secrete cytokines such as interleukin (IL)-2, which regulates the immune response. Using an enzyme-linked immunosorbent assay (ELISA), we established that outer surface protein C (OspC) is an antigen of *B. burgdorferi* against which mice generate T cell responses. Since T cells recognize only a small fragment of each antigen, we used overlapping peptide fragments of OspC to determine next the exact T cell immunogenic peptide sequence. For that, purified T lymphocytes from *B. burgdorferi* infected or OspC immunized mice were stimulated in tissue culture with individual OspC peptides. T cell activation in response to each peptide was analyzed for their ability to secrete IL-2. Our data suggest that measurement of IL-2 responses might be a useful diagnostic for detection of *B. burgdorferi* infection.

The Market Viability and Environmental Impact of Electric Power Assist Scooters: EcoReco M3

Jordan Ramalingam
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Environmental Science & Policy

Electric power assist technologies in bicycles and scooters are fairly new to the market and are beginning to make headway around the world. However, these technologies have not yet gained popularity in the United States. Portable electric scooters have the potential to decrease vehicle miles traveled (VMT) from automobiles and other fossil fuel dependent modes of transport. However, it is possible that these scooters might instead replace emission free modes of transportation, such as bicycling or walking. The goals of our study are twofold: to analyze the level of interest in electric scooter ridership and a scooter-share program, and to quantify the net Greenhouse Gas (GHG) emissions associated with growing scooter popularity. We focus our study on students of the University of California, Davis, who will be surveyed before and after test riding the EcoReco M3 scooter. Participants will be surveyed on their current transportation patterns, monetary interest in the scooter and their projected uses for it. Because this project is conducted in a bike friendly town, we expect the scooter to increase net life cycle emissions of GHG emissions from transportation by displacing bicycle trips. Barriers to adoption may include the high sticker price and concerns about safety.

Groundwater Age and Sustainability

Madison P. Rasmus
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Civil & Environmental Engineering

Climate change, pollution, and other anthropogenic factors threaten groundwater supplies worldwide. California agriculture is hugely dependent on groundwater, and impacts from human activities have already had a detrimental effect on groundwater. One key feature of hydrologic cycles, including groundwater components, is the residence time distribution, otherwise known as age distribution. The age distribution is useful because it is indicative of the renewal time for groundwater, and also is correlated with water quality. In addition, transience in the age distribution can reflect the way that climate change is affecting groundwater renewability and water quality, and thus sustainability, which is at the core of recent state legislation AB1739. In this research we approximate groundwater age distributions in the Central Valley of CA. We collect data on radioactive and non-radioactive environmental tracers in order to determine groundwater age distributions by application of conceptual and mathematical models of groundwater flow, involving deconvolution processing using tools provided by the USGS.

Examining the Intestinal Physiology of *E. coli* Infected Pigs Fed Human Lysozyme-Containing Milk

Maire Rayburn
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Animal Science

Bacterial intestinal infections in children are the second leading cause of death in developing countries. Human lysozyme (hLZ), an enzyme capable of neutralizing bacteria such as *E. coli*, protects breastfed infants against such diseases. In a previous experiment, goats were genetically modified to express hLZ in their milk. In this experiment, the hLZ milk from these goats was fed to six-week-old pigs as a model for human children in order to study its protective effects. The pigs were fed twice daily for 17 days with milk from either non-transgenic goats or hLZ transgenic goats. On days 14-15, they were dosed four times with *E. coli* that specifically infects pigs. Clinical signs of the disease were monitored until day 18 when they were necropsied. Pigs fed hLZ milk displayed significantly less severe diarrhea. Samples from the small intestine, including the duodenum and ileum, were collected and examined using histology. Differences in the morphology of intestinal structures such as villi height, crypt depth, and thickness of the lamina propria were quantified to investigate the effects of consuming hLZ goat milk. Lysozyme-transgenic goat milk may be a promising treatment for decreasing the severity and duration of intestinal bacterial infections in children.

Risk Assessment of the University of California's Divestment From Fossil Fuels

Matthew Remick
Sponsor: James Chalfant, Ph.D.
Agricultural & Resource Economics

Recently, there has been pressure on the regents of the University of California from organizations such as Fossil Fuel UC to divest from fossil fuels. Activists argue that as a leading public university system, the University of California should not invest in companies it knows are negatively impacting the environment. One of the most important financial questions regarding divestment from fossil fuels is how it impacts the returns from and volatility on the University of California's investment portfolio. In my thesis, I investigate the potential changes on the University of California's investment portfolio if the University implements the divestment policy by reviewing current literature and by creating a mock portfolio of investments that mimics the University of California's portfolio. The results of my research are important in collecting the financial implications of divestment in a clear, concise project that can be used as a reference for a future decision on divestment from fossil fuels in the University of California's investment portfolio.

Texture Changes of Fuji and Granny Smith Apples During *In Vitro* Gastric Digestion

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Food Science & Technology

Apples are a rich source of polyphenols and have many varieties that are commonly consumed. However, the breakdown of different apple varieties during digestion may vary. This study aims to analyze the texture changes of Fuji and Granny Smith apples during *in vitro* gastric digestion. Apples were cut into 12.7 mm cubes. 10 cubes were mixed with 0.2mL/g of simulated saliva for 30 sec. 100mL simulated gastric juice (pH 1.8) was added to the apple cubes and they were incubated in a shaking water bath (37°C, 100 rpm) for six times (15, 30, 60, 120, 180, and 240 min). Triplicate digestions were complete. Mass, volume, Â°Brix, and texture were measured before and after digestion. Apple texture was measured by compressing individual cubes to 50% strain with a TA.XT2 Texture Analyzer. Peak force during compression decreased as digestion time increased (from 55.1N to 7.4N for Fuji and 67.6N to 19.5N for Granny Smith during 240 min digestion). Fuji apples had higher initial °Brix (16.5°) than Granny Smith apples (11.8°). Â°Brix decreased with digestion time up to 120 min, then remained constant. These results demonstrate the influence of apple variety in texture changes and solid loss during *in vitro* gastric digestion.

Rigged Configurations and Catalan Objects

Ryan Reynolds
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Mathematics

A special case of a bijection given by Kerov, Kirillov, and Reshetikhin gives a bijection between combinatorial objects called rigged configurations and Dyck paths. There is another combinatorial object known as rooted planar trees, which has a well known bijection with Dyck paths. We explicitly construct a direct bijection between rigged configurations and rooted planar trees, which conjecturally is the composition of the two previously mentioned bijections. In 1996, Garsia and Haiman gave an algebraic description of a two-variable analogue of the Catalan numbers called the q, t-Catalan numbers. In 2001, Garsia and Haglund described combinatorially the q, t-Catalan numbers by using Dyck paths and showed algebraically that the q, t-Catalan numbers are symmetric in q and t. Haglund has shown that two statistics on Dyck paths, area and bounce, to describe these q, t-Catalan numbers. One possible application of this research is that the bijection between rigged configurations and rooted planar trees will help in answering the open problem to give an explicit bijection on Dyck paths which interchanges area and bounce.

RGD Modified Alginate Scaffolds for Lentiviral Transduction

Sabah Rezvani
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Biomedical Engineering

Cell-based therapies have widespread use in regenerative medicine, while recently utilization of biopolymers to deliver genes has been used to modify cellular environment and promote tissue regeneration. However, low transduction efficiency, the process of DNA introduction into another cell by a viral vector, within biopolymers has been a challenge due to a lack of temporal and spatial control of gene expression. In this report we investigated the surface modification of alginate (a natural biocompatible polysaccharide isolated from algae) scaffolds with the cationic polysaccharide chitosan. We hypothesize that the direct conjugation of chitosan onto the alginate scaffolds will increase the transduction efficiency of cells within the scaffold. Two primary motivations exist for the incorporation of chitosan: the positively charged chitosan shields the repulsion between negatively charged membranes of both the cells and lentivirus coating, while simultaneously delaying the release of lentivirus to ensure transduction within the scaffold and minimal release to surrounding tissue. Preliminary research has shown the ability for transduction to occur within the alginate scaffolds, with further research aiming to increase transduction efficiency. These studies aim to support gene-delivering alginate scaffolds for eventual *in vivo* regenerative medicine applications.

Role of Chaotropes on Xenogeneic Scaffold Structure-Function for Heart Valve Tissue Engineering

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Medicine & Epidemiology
School of Veterinary Medicine

Animal-derived tissues, such as bovine pericardium, are used in the manufacturing of biological replacement heart valves. Current biological heart valve replacements are subject to calcification leading to loss of function after approximately 10 years. Calcification is attributed to foreign antigens that trigger attack of the tissue by the immune system. Antigens are markers in the body which help the body to differentiate between self and non-self. Our lab has shown that promotion of antigen solubility and removal from tissue can substantially reduce calcification *in vivo*. Chaotropes, specifically urea and thiourea, have been used to promote the solubilization of proteins from homogenized tissue; however, strong binding of chaotropes to proteins leads to their denaturation. A balance of effective antigen removal and maintained extracellular matrix will be essential to ensure proper biomaterial functionality. By adjusting the concentration of these chaotropes, we aim to identify a novel antigen removal process for bovine pericardium scaffold generation to be used for heart valve replacements.

The Intersection of Art and Science

Rachael F. Richards
Sponsor: Robin Hill, B.F.A.
Art & Art History

My research focuses on the intersection of the polar opposites between art and science. This involves the exploration of various materials and synesthesia. It is the unexpected possibilities, unpredictability, and the spontaneity of the manipulating traditional and non-traditional material that inspires my art. The bold manipulation and transformation requires a methodical approach to alter a material from its original form in order to make original artwork in the 21st Century. To do so requires pushing the material component beyond the normal use threshold in a scientific manner to create a new medium. In addition, it is based on the practical consideration of the material's physicality, scale, color, light, and chemical components that is required to alter and transform the material into a new medium and context. One example of this is the transformation of an every-day adhesive into a three-dimensional form that serves to stimulate the viewers' senses, imagination, and curiosity. This process of material exploration may include an integration of my synesthetic response such as smocking aluminum screen into a three-dimensional form. This may consist of the denial of one or more of my sensory inputs or the combination of them to stimulate my imagination to generate new ideas

Ancient Obsidian Trade in Eastern California: A Household Perspective

John Roberts
Sponsor: Jelmer W. Eerkens, Ph.D.
Anthropology

Obsidian was an important commodity in pre-contact California and was widely traded. We examine changes over the last 2000 years in how different households in the Owens Valley of eastern California accessed and used obsidian. Obsidian tools and debitage associated with multiple households from five sites, CA-INYO-3806, CA-INYO-5207, CA-INYO-5208, CA-INYO-7448, and CA-INYO-8768 were analyzed for their geographic source by X-Ray Fluorescence and were measured for functional attributes. These sites are located within 15km of each other. The evidence suggests (1) an increasing heterogeneity between household units in terms of non-local obsidian indicating unequal access to exchange networks and (2) a correlation between house size and obsidian source diversity further suggesting household units had different strategies to access the exotic commodity of obsidian. Together the patterns suggest that access to exotic material goods shifted from a system where these materials were widely shared within communities, to one where they were increasingly privatized by family units.

Pork, the Fountain of Youth: Okinawan Foodways as Cultural Preservation

Rachel M. Rockholt
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Native American Studies

Okinawan people are the indigenous people from the southernmost islands of what is now known as the Japanese archipelago. Beginning in the late nineteenth century, however, some of the Okinawan population was forcibly relocated due to an encroaching Japanese settler occupation. Okinawans migrated both by force and choice to places throughout the Pacific, as well as the mainlands of Southern, Central and North America. Despite such dislocations, the Okinawan community has retained important traditional cultural practices. My research explores how traditional foodways, primarily diet and food preparation practices are an essential to this cultural expression, and diet is greatly a cultural practice as well as the accompanying food preparations that Okinawan people exercise. Though the Okinawan diet is heavily reliant on pork as a protein source, Okinawan people are the longest-lived people with the most centurions globally; and second, while they come from a landscape and environment that many would consider harsh or unforgiving, Okinawan people have thrived for centuries in the face of such perceived adversities.

Studying Pain and Itch Through Optogenetics

Javier A. Rodriguez
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology & Behavior

The objective of this study is to investigate brainstem modulation of itch and pain using optogenetics. Chronic itch and pain are costly and significant medical problems that reduce the quality of life. Current treatments for chronic itch and pain are highly limited and generally ineffective. It is important to better understand the biological mechanisms of itch and pain, and their modulation, in order to develop more effective treatments. Little is currently known about how itch signals are modulated in the central nervous system. Our study will use optogenetics to investigate how selective activation of neurons in the locus coeruleus (LC) and rostral ventromedial medulla (RVM) containing the neurotransmitters serotonin or noradrenaline affects itch-related scratching or pain-related behavior in mice. The lab's current working hypothesis is that pain and itch transmission in the spinal cord are under opposing inhibitory and facilitatory descending modulatory influences, respectively. Our current data supports this hypothesis, in that optical stimulation of noradrenergic neurons in the region of the LC inhibits a pain-related response (hindpaw withdrawal from a heat stimulus) but increases chloroquine-evoked scratching behavior. A better understanding of the neurocircuitry for modulation of itch and pain is essential to develop more effective treatments.

Can Biochar Decrease Carbon and Nitrate Leaching in a Sandy Loam Soil?

Michael V. Rodriguez
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Land, Air & Water Resources

Sandy soils easily lose nutrients due to leaching. Biochar has been proposed as a soil amendment to reduce leaching of soil nutrients by increasing the retention of organic carbon and nitrate (NO_3^-). In this study, a series of saturated soil column experiments were conducted to determine if 900°C pine char increases the retention of total organic carbon (TOC) and nitrate (NO_3^-) in a sandy loam soil. Soil columns were packed with 200 g of sandy loam soil and leached with 1 L of a 0.01 M sodium chloride (NaCl) solution and 1 L of a 25 mg/L carbon solution made from forest floor duff materials and amended with 20 mg/L NO_3^-. The column leachate was collected and analyzed for TOC and NO_3^-. On average, additions of 2% 900°C pine char to the sandy loam soil increased NO_3^- retention to 4.66 mg from the 0.19 mg seen in the control. However, TOC retention in the 900°C pine char treatments did not differ from the control. Further research should be conducted with soils of diverse mineralogy and biochar from various feedstocks and production temperatures to evaluate the potential of biochar to increase retention of carbon stocks and NO_3^-.

Comparison of *De Novo* Transcriptome Assembly Methods and Software in a Non-Model Species, *Clypeaster rosaceus*

Eric J. Ronne
Sponsor: Richard K. Grosberg, Ph.D.
Evolution & Ecology

Analyzing gene expression in organisms for which no reference genome or transcriptome exists requires the *de novo* assembly of a transcriptome (the set of expressed RNA transcripts). These transcripts are reconstructed by the serial overlapping of short RNA reads generated by high-throughput sequencing of extracted mRNA. A transcriptome, once assembled and filtered, serves as the basis for downstream analyses of gene expression patterns. However, the computationally intensive process of assembling and filtering a transcriptome poses a complex set of challenges for which there is no perfect solution. Several methods exist to accomplish these tasks, each with their own strengths. Here, we test the two most prominent *de novo* assemblers (Oases and Trinity), three downstream read mapping programs (RSEM, eXpress, and Sailfish), and two differential gene expression packages (edgeR and DESeq). We will use metrics such as read coverage, N50, transcriptome size, and annotation to a reference transcriptome to contrast the outputs of each tested assembly, filtering, and differential gene expression pipeline. By comparing these results, we will quantify the efficacy of each competing pipeline in *de novo*assembly and transcriptome processing.

Marijuana Legalization: Media Narratives and Policy Outcomes

Ruth A. Rothstein
Sponsor: Ryan Finnigan, Ph.D.
Sociology

For more than four decades, the War on Drugs has maintained harsh yet largely ineffective policies to deter marijuana usage. Numerous studies demonstrate how "get-tough" rhetoric supports such harshly punitive drug policies, yet research largely excludes narratives surrounding policies that *reverse* the degree of restriction. This study examines media narratives surrounding propositions to legalize marijuana in Oregon, California, and Colorado. Qualitative content analysis of 92 newspaper articles captured detailed descriptions of the various thematic narratives in each state. Newspaper coverage of the ultimately approved proposition in Colorado largely focused on practical considerations, such as the political challenges of implementation and regulation. In contrast, coverage related to California's ultimately rejected proposition often described conflicts around legalization between social groups, as well as the potential negative consequences for public safety. Finally, newspaper coverage of Oregon's similarly rejected proposition was diverse, with no dominant narrative emerging either to support or undermine the proposition directly. This project contributes to sociological understandings of the relationship between media portrayals and policy outcomes, specifically documenting variation in newspaper narratives connected to three recent state-level propositions to lessen harsh anti-marijuana policies.

Victorian Haunting: Physicality, Control, and the Male Gaze

Elizabeth Rowan
Sponsor: Frances Dolan, Ph.D.
English

What is a ghost? What does it mean to be haunted? In my project I will be focusing on three Victorian texts: *Wuthering Heights* by Emily Brontë, *Great Expectations* by Charles Dickens, and "Ligeia" by Edgar Allen Poe. Each story contains a relationship between a female ghost and a male she haunts who narrates the story. These relationships all boil down to a battle over control, the locus of the war being the female body. Though critics argue that it is a ghost's invasion of the physical world and retention of its human body that give it power and frightens the haunted, I argue that it is this exact invasion that the haunted desires. When ghosts have bodies, the haunted can still gaze at them and define them as their bodies rather than their souls. It is only when a ghost does not have a body, like in *Wuthering Heights*, that the ghost is truly free and has agency. If a ghost is only free when she loses her body, does this mean that the only liberation from the male gaze for the Victorian woman is in death?

Narrative Ability and Episodic Thinking: Children's Ability to Mentalize Specific Moments in Their Own Life Story

Susan E. Rowe
Sponsor: Simona Ghetti, Ph.D.
Psychology

Episodic thinking, which includes the mentalization of personal past and future events, is often measured in children using narrative tasks. It is thus possible that observed age-related differences in episodic thinking are due, in part, to improvements in narrative ability. This project examines whether narrative ability relates to episodic thinking in 5- to 11-year-olds when age is controlled for (total *N*=121). Narrative ability was measured by having participants tell a story about an event depicted in a sequence of pictures; stories were video recorded, transcribed and then coded according to Geers et al. (2008). Episodic thinking was assessed in two ways: (1) participants' narratives of personal past and future thinking coded for episodicity and (2) participants' subjective ratings of the mentalized clarity of these same events (using visual scales thought to be independent of narrative ability). We predicted that narrative ability would relate to the episodicity of participants' event narratives, but less so to their subjective ratings of event clarity. Preliminary results support a relation between some dimensions of narrative ability and both measures of episodic thinking. Possible theoretical reasons for the observed relation between narrative ability and episodic thinking in children are discussed.

Diffusion Tensor Imaging: Comparison Among Tensor Estimators

Luyao Ruan
Sponsor: Jie Peng, Ph.D.
Statistics

Diffusion tensor imaging (DTI) is a magnetic resonance imaging technology to probe the architectures of biological samples through measuring water diffusion and to produce neural fiber tracts. DTI is widely used to study neuro-degenerative diseases, brain functionality and segmentation or connectivity of brain. The most commonly used DTI model is the single tensor model where a tensor is used to represent water diffusion at each voxel. This work focuses on developing and comparing various tensor estimators based on linear regression, nonlinear regression without positive definite constraint. The leading eigenvector at each voxel is then extracted and used as input of fiber tracking algorithms. We compare different estimators using both simulation experiments and real data sets. From both scenarios, we find that tensor estimation based on nonlinear methods is superior to the commonly used linear regression estimator. In addition, tensor estimation based on nonlinear methods also leads to better fiber tracking results.

Accuracy of Food Choice Healthfulness is Limited Among College Students

Elizabeth A. Ruano
Sponsor: Lisa S. Miller, Ph.D.
Human Ecology

Little is known about how consumers decide which foods are more healthful. In this study, we examined the effects of choice difficulty on consumers' (n=34, M=19.6 years) accuracy of healthfulness decisions based on Nutrition Facts Panels (NFPs). We presented two matched NFPs that were either easy, medium, or difficult to choose between, based on the magnitude of the differences in their respective nutrient density scores. We expect to find that accuracy would increase for choices with larger nutrient density differences. Results confirms our hypothesis by showing that the pairs that differed more in nutrient density were easier than those that differed less. However, one sample t-tests showed that easy comparisons were the only comparisons for which participants answers were above chance. Findings suggest that consumers' ability to select more healthful foods is limited to choices that have large scale differences between them, indicating that nutrition education is lacking in this group of consumers.

Synthesis and Characterization of DIO Nanoparticles for Magnetic Particle Imaging

Mark Rupasinghe
Sponsor: Angelique Y. Louie, Ph.D.
Biomedical Engineering

Cardiovascular disease is one of the leading causes of death in the United States, yet current imaging methods such as X-ray angiography expose patients to harmful ionizing radiation. Magnetic particle imaging (MPI) is a novel imaging method that relies on the excitation and relaxation of magnetic nanoparticles to generate an image, and could be used to image cardiovascular disease, track stem cells within the body, and quantify inflammation. It has a higher theoretical and spatial resolution than magnetic resonance imaging, but utilizes a much less expensive system, and has the potential for portable use in third world settings. However, MPI is currently limited by the magnetic particle tracer used to generate an image. In this project, dextran coated iron oxide MPI tracers will be synthesized using microwave synthesis techniques. The nanoparticles will be doped with various metal dopants, particularly nickel, manganese, and cobalt, in order to determine how various metal combinations affect the size and relaxivity of the MPI tracer. Finally, the different MPI tracers will be used in an MPI device to determine whether there were any improvements in resolution.

Anatomy and Morphology of Tomato Roots in Elevated Atmospheric Carbon Dioxide

Sam Rusoff
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Plant Biology

Increasing atmospheric carbon dioxide (CO_2) concentration, one of the components of climate change, contributes to the greenhouse gas effect, but also influences plant development. Plants grown in increased CO_2 concentrations have been shown to fix more carbon and have larger above and below ground biomass. However, there remain unanswered questions relating to the effect of elevated CO_2 on root tissues that are vital for the uptake and transport of water. In order to investigate these effects of elevated CO_2, we used tomato as a model organism and grew domesticated and wild species in elevated and ambient CO_2 concentrations, then measured the plant morphology and anatomy for treatment effects. In the wild species *Solanum pennellii*, our results show a significant decrease in the angle of root growth ($p = 0.03$) and a trend of increased cross-sectional area of the metaxylem that becomes larger with developmental age ($p = .11$ to $.61$). Both the root angle and metaxylem dimensions are influential parameters on water use, so the observed change in root angle, in conjunction with changes to the dimensions of the root metaxylem vessels may affect the plant's water uptake, transport, and drought tolerance.

Design and Kinetic Characterization of a Family 1 Glycoside Hydrolase

Carolina Ryklansky
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Chemistry

The major goal of this project is to amass a standardized data set of genetically engineered enzymes to enable accurate predictions of catalytic efficiency from sequence. In this study, Michaelis-Menten kinetic constants were determined for mutants created by a systematic alanine scan as well as computationally-designed mutants. We chose beta-glucosidase B (BglB) for our model enzyme because of its robustness and high yield output. Sequence-verified plasmids constructed via Kunkel mutagenesis were transformed into *E. coli*. Small-scale cultures were grown to saturation, pelleted, resuspended in induction media, and expressed before harvesting. Proteins were purified via immobilized metal ion affinity chromatography and concentration was determined. Mutant enzymes were spectrophotometrically assayed and their kinetic constants for the substrate 4-nitrophenyl-beta-D-glucopyranoside were calculated using the the Michaelis-Menten equation. While many of the mutations, particularly those conserved catalytic residues, have readily predictable effects, some reveal surprises in how the structure of this enzyme determines function. At the conclusion of data compilation, over 100 different mutants were kinetically characterized. This large data set serves as the foundation for the prediction of enzyme kinetics based on sequence. The application of the knowledge gained could potentially span across all facets of human advancement: agriculture, biofuel, and therapeutic enzymatic usage.

Targeted Binding of Nanolipoprotein Particles to Phase Separated Lipid Domains

Alice Rystov
Sponsor: Marjorie Longo, Ph.D.
Chemical Engineering & Materials Science

Targeted binding of functional proteins and/or biomolecules to supported lipid bilayers has a variety of applications, including development of nano-array technologies, microfluidic channels, and biosensors. Use of Integral Membrane Proteins (IMPs) in such systems is difficult, as incorporation into planar bilayers is not straightforward and can result in protein inactivation. We intend to overcome this limitation by use of Nanolipoprotein Particles (NLPs), which are able to solubilize IMPs. NLPs are discoidal patches of lipid bilayer that have their hydrophobic faces covered by amphiphilic scaffold proteins. The scaffold proteins can bear polyhistadine tags, which are capable of chelating to Cu^{2+} metal ions. Phase specific, iminodiacetic acid functionalized lipids are also capable of chelating Cu^{2+}, providing a mechanism for targeted binding of NLPs. We investigate this binding via fluorescence microscopy and characterize interaction on supported bilayers and giant unilamellar vesicles (GUVs). The thermodynamics (enthalpy of lipid mixing and steric pressure of protein crowding) and morphology of binding are also examined.

Superinhibitory Phospholemman Mutants

Courtney Saeteurn
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Pharmacology
School of Medicine

In the heart, intracellular sodium levels affect Ca^+ handling and contractility via Na^+/Ca^+ exchange. Na/K ATPase is the primary Na^+ extrusion route in cardiomyocytes therefore understanding its function and regulation is of major importance. Phospholemman (PLM or FXYD1) is a member of the FXYD protein family of tissue-specific regulators of NKA and a major phosphorylation target in the heart. PLM interacts with and inhibits NKA by decreasing its affinity for Na+, which is alleviated by PLM phosphorylation. We previously showed that this regulatory PLM-NKA interaction and PLM-PLM oligomeric interactions can be monitored via FRET. Moreover PLM mutagenesis experiments revealed that mutations decreasing PLM oligomerization affinity also lead to increased NKA affinity (i.e. NKA inhibition). Single residue substitutions were insufficient to completely abolish PLM-PLM FRET so we used Rosetta modeling of the PLM oligomer to predict which combinations of residues would most efficiently reduce PLM interactions and create an NKA super-inhibitor. Candidate mutants were screened for correct membrane targeting and PLM-PLM vs. PLM-NKA FRET effects. These PLM superinhibitors may be an alternative therapeutic NKA modulation strategy for heart failure (vs. cardiac glycosides).

Varying Distribution of Attentional Control

Saba Saleem
Sponsor: Joy Geng, Ph.D.
Psychology

I am investigating differences in attention control in over thirty healthy individuals between the ages of 18-25. This is done through behavioral performance on a visual search task, which tests mechanisms of attention that balance the ability to select relevant information and suppress irrelevant distractors. The visual search task demonstrates a shorter reaction time and higher accuracy in identifying the target when the distractor is a salient item (DiQuattro and Geng 18033). Furthermore, I am administering an Adult ADHD Self-Report Scale to assess whether the individual, who is assumed to be in the normal distribution, possesses symptoms related to ADHD or problems with attentional control. The questionnaire will help analyze the results of the individual's visual search performance and provide information on whether a poor performance is due to their existing issues with attention. The results of an earlier study indicated that when the distractor was a non-salient item, performance gradually stopped improving. However, these results were not analyzed with respect to an Adult ADHD Self-Report Scale. Yet, this study will provide insight into how healthy individuals differ in their ability to focus on a visual search task with respect to an ADHD scale.

Arabic Poetry in Graffiti

Estevan M. Sanchez
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Comparative Literature

Arabic Graffiti in the Middle East has been a primary tool for youth to criticize their governments and voice their grievances. Over the past 10 years, in Lebanon, Jordan, and Tunisia, the work of Palestinian poet, Mahmoud Darwish, has appeared in Graffiti among other prominent Arab cultural figures. One of Beirut's most famous Graffiti artist, Yazan Halwani, has used Darwish and lebanese singer, Fairouz, in his work. Another Graffiti artist, Ali Rafii, has criticized the Lebanese government in his pieces. Through these two artist, the duality of Beirut's graffiti movement can be best understood by referencing Halifu Osumare's global Hip-Hop studies framework, *The Africanist Aesthetic in Global Hip-Hop, 2007*, utilizing Sociology and Cultural Studies. In addition to the Hip Hop studies framework, original Arabic news pieces and interviews are used. By combining these sources, Graffiti in the Middle East is a tool for self expression and criticism lead by the youth. However, at the same time it is an art form of preserving older iconic cultural figures and connecting their work to current youth. This research serves as a stepping stone on which Hip-Hop studies should expand upon, specifically in relevance to Graffiti.

New Consequences of nSMase2-Induced Ceramide Production in Lung Cells Chronically Exposed to Cigarette Smoke

Michelle Santoso
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Internal Medicine
School of Medicine

Although patients with chronic obstructive pulmonary disease (COPD) have been known to be at a higher risk of developing lung cancer, the molecular mechanisms leading from smoking-related lung injury to lung cancer is still unknown. Previously, our studies have shown that neutral sphingomyelinase 2 (nSMase2) is the only sphingomyelinase activated under cigarette smoke (CS) and is overexpressed during chronic exposure to CS in mice and emphysema patients. Subsequent generation of the pro-apoptotic lipid ceramide thus implicates nSMase2 in lung injury. Experiments in our lab demonstrate, however, that human airway epithelial (HAE) cells chronically exposed to CS adapt to nSMase2 overexpression and ceramide accumulation do not undergo apoptosis as expected but instead utilize the ceramide-generating machinery in pathways that promote proliferation, migration and resistance to apoptosis. Furthermore, we determined that inhibition of nSMase2 can reverse the enhanced proliferation and migration of HAE cells chronically exposed to CS. Therefore, we present nSMase2 as a possible bridge between the two distinctive sides of cell fate, apoptosis leading to lung injury and proliferation leading to lung cancer. Moreover, understanding the molecular mechanisms underlying this transition may be crucial as a possible target in treatment of lung diseases.

Role of RNF212 as a Checkpoint Protein in Mammalian Meiosis

Manali Sapre
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molecular Genetics

In newborn females, defective oocytes are lost through a quality-control process known as oocyte atresia. In this process, oocytes undergo apoptosis, or programmed cell death. We recently identified RNF212 as a novel component of the checkpoint pathway that signals oocyte apoptosis. My research aims to: (i) define the types of defects RNF212 responds to; and (ii) determine where RNF212 acts in the checkpoint pathway. To achieve these aims, I will quantify oocytes numbers in mice of various ages and from different genetic backgrounds; and examine the activation of various signaling factors in oocytes from *Rnf212* mutants. Immunohistochemistry staining methods are being used to analyze ovary sections. Preliminary findings show that *Rnf212* mutant mice have a higher number of oocytes compared to the wild type, constant with a role in physiological oocyte atresia. Also, *Rnf212* mutant mice exposed to irradiation do not show the severe loss of primordial oocytes seen in wild type mice, indicating a role for RNF212 in the DNA damage response in resting oocytes. Once complete, my data are expected to be broadly relevant for understanding factors that define oocyte reserve and female fecundity.

The Effects of Resource Abundance on Waterfowl Communities in the Yolo Bypass Wildlife Area

Gabriel A. Saron
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Wildlife, Fish & Conservation Biology

California Department of Fish and Wildlife (CDFW) manages the seasonal and permanent wetlands at the Yolo Bypass Wildlife Area for waterfowl abundance which may be affected by environmental pressures such as seasonal drought thus limiting potential food resources. If the CDFW had data on what effects diminishing food sources have on the migrating waterfowl, they would be able to manage them more efficiently. This scenario leads us to ask: is there a relationship between the change in food abundance for waterfowl and the change in observable waterfowl densities over time and what is the critical threshold of at which waterfowl density starts to decrease? To answer these questions, a series of weekly invertebrate, vegetation, and waterfowl surveys were completed at two managed permanent wetland sites in the Yolo Bypass Wildlife Area. Further analysis of our data will compare habitat structure, relative invertebrate abundance, and waterfowl community composition to comment on the degree of waterfowl success in response to environmental constraints.

The Effect of Wolbachia Titer on the Cytoplasmic Incompatibility Phenotype in *Drosophila simulans*

Federica Sartori
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Evolution & Ecology

Wolbachia is an alphaproteobacteria that infects 70% of arthropods worldwide as an intracellular maternally transmitted endosymbiont capable of manipulating its host's reproduction to favor their offspring. wRi, the strain that naturally infects Californian populations of *Drosophila simulans*, produces Cytoplasmic Incompatibility (CI) as one such reproductive manipulation. The CI phenotype penalizes crosses between infected males and uninfected females through a drastic decrease in egg hatch ratio compared to all other crosses. CI has previously been described in crosses only between infected and uninfected individuals Some studies have shown CI to be a function of host age. To take this approach to the next level, we investigate both CI and titer as varying over a continuous range to build a comprehensive model of phenotypic correlations. We measure titer as the qPCR ΔC_T values of suitable Wolbachia and *D. simulans* genes. We will determine the significance of relative ΔC_T magnitude between mates with respect to the egg hatch parameter in incompatible crosses. This will enable us to conclude whether there are varying degrees of CI and to determine whether CI intensity varies with infection titer. We will also establish if there is a threshold in relative titer for CI to occur.

Molecular Dynamics Simulations of Lipid Bilayer Morphology Modifications Induced by Hydroquinones

Cori Satkowski
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Chemical Engineering & Materials Science

Lipid bilayers constitute the majority of the cell membrane and are characterized by two lipid leaflets with hydrophilic heads facing out towards water and hydrophobic tails facing in towards the core of the bilayer. Quinones are molecules that take part in a wide range of processes in cell membranes. Atomistic Molecular Dynamics simulations were performed to understand how the morphology of model lipid membranes, consisting of DPPC, POPC, DPPE, or POPE, is modified when hydroquinone or benzene 1,4-diol, a type of quinone, is incorporated into the bilayer. Four hydroquinones were added outside the bilayers and simulations were performed for 50 nanoseconds. Since hydroquinone is hydrophobic, it wants to be solvated by the tails and, for entropic reasons, goes into the core. Subsequent to hydroquinone incorporation, the ordering of DPPC, POPC, and DPPE decreases and the space between the leaflets increases due to the disruption of the communication between the two layers. Hydroquinone did not incorporate into POPE due to the higher density of POPE compared to DPPC, POPC, and DPPE. This result is concurrent with experimentally observed results where at higher concentrations of hydroquinone, the bilayer is pulled apart and becomes a monolayer.

Diagnosis of Our Region: Recommending Treatment for Improved Health Care Access for a Vulnerable Population

Katarina Schmidt
Sponsor: Cristiana Giordano, Ph.D.
Anthropology

This project assesses the leading causes of lack in healthcare access for individuals of Mexican origin in Northern California and situates these causes in national and global frameworks of migration and health. Through the combination of ethnographic research among stakeholders and members of the Mexican national community in the Sacramento area, examination of recent immigration and health insurance policy, and review of the growing literature on migrant health issues, this project synthesizes several thoughtful recommendations for policy-makers during a critical policy-formation window. This project analyzed current access and asked questions about the community's healthcare needs by partnering with the health education and resource office, Ventanilla de Salud, which is hosted in the Mexican Consulate in Sacramento and run by the non-profit Health Education Council. VDS personnel name insurance as clients' number one barrier to health care, above other important barriers, such as language differences and discrimination. Literature reveals global migration factors and structural violence embedded in our produce industry as disproportionately harming this group's health. Finally, local recommendations include primary care insurance for the undocumented in our region via partnership with local hospitals and investment in capacity for educating and producing healthcare workers for sustainable provision of services.

Queer Politics in Southeast Europe

Mason L. Schmidt
Sponsor: Josephine Andrews, Ph.D.
Political Science

Southeast Europe has diverging views on LGBTQ+ issues: while some countries have progressive legislation on equal rights, others have strict bans that deny the rights of LGBTQ+ individuals. My research compares queer politics in the countries of the former Yugoslavia: Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, and Slovenia. I analyze recent events to examine their impact on LGBTQ+ related legislative directions and public opinions. Specifically, I juxtapose policies regarding same-sex marriage, civil unions, discrimination, adoption, gender identity and expression, as well as the influence of key political figures on public attitudes. I also review the steps that activist groups have been taking to expand LGBTQ+ rights in these countries, such as lobbying or pride parades. By using archival overview and analysis, I explore how the activities taking place in these countries might serve as a model for countries with more limited human rights and provide evidence for the global scope of queer rights movements. Finally, I identify emerging patterns of LGBTQ+ rights in these countries, such as the positive relations among ethno-cultural diversity, population, and openness to LGBTQ+ rights.

Allelic Variants of the Serotonin Transporter Gene Differentially Affect Learning/Memory

Ashley Schnider
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Psychology

The genotype of the serotonin transporter affects the rate at which it reuptakes serotonin from the synaptic cleft. There are essentially three genotypes for this transporter: S/S, S/L, and L/L. These allelic variations have long been associated with psychiatric disorders. More recently, however, researchers have explored the possibility that allelic variations in the 5-HTTLPR (serotonin transporter-linked polymorphic region) may also differentially affect learning and memory. In order to explore this topic further, the relationship between the 5-HTTLPR genotype of eight adult male rhesus macaques and the number of trials it took them to meet a standard performance criterion of 90% correct on a simple delayed nonmatch to sample (DNMS) task using the Wisconsin General Testing Apparatus was examined. A simple analysis of this relationship suggests that the more copies of the short allele a rhesus macaque has, the longer it takes him to meet criterion on the DNMS task. This result supports the popular belief in the animal research community that primates with the SS or SL genotype are easier to train than those with the LL genotype. Further research must be done to conclude whether the results of the present study are representative of the target population.

Social-Defeat Stress Causes Sex Differences in the BLA Due to Differential Activation of Synapsin I

Erica Schoefer
Sponsor: Brian C. Trainor, Ph.D.
Psychology

Stress plays a key role in developing psychiatric disorders, such as anxiety and depression. Depression is twice as likely to appear in females; however, most rodent models do not address the female stress response. In California mice (*Peromyscus californicus*), the female stress response can be examined. Stress affects brain derived neurotrophic factor (BDNF) which is one of the most active neurotrophins in the brain. BDNF has been shown to protect neurons during stress and maintain levels of synaptic activation. In turn, BDNF also regulates synapsin I expression. Synapsin I is associated with synaptogenesis and modulating neurotransmitter release. As such, preliminary data show differences in synapsin I expression in the anterior bed nucleus of the stria terminalis (BNST), a region that is a major output pathway of the amygdala. Social defeat stress correlates with a decrease in synapsin I expression. In turn, psychosocial stress produces sex differences within the basolateral amygdala (BLA). Female mice had comparatively lower levels of synapsin I in the BLA. Further studies are being conducted via western blots to quantify levels of synapsin I in the BLA. These data show a connection between Synapsin I and rodent stress response.

Cadherin-Mediated Traction Force Analysis Using a Deformable Substrate

Mary Sedarous
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Cancer is the second most common cause of death in the U.S. and accounts for nearly 1 in 4 deaths in the U.S. In women, breast cancer is the number one killer. Pancreatic cancer has the highest mortality rate of all major cancers due to its quick metastasis. Previous studies have suggested that N-cadherin, a cell-cell adhesion protein, is thought to play a fundamental role in the early steps of invasion and metastasis of carcinomas. The up-regulation of N-cadherin expression has been correlated amongst breast cancer and pancreatic tumors. N-cadherin is a single-pass transmembrane protein that interacts with opposing cadherins from neighboring cells at the extracellular domain, and catenins at the intracellular domain. Using the catenins to regulate force-generating actin filament network, N-cadherin is thought to play an important role in collective cell migration. In order to understand the role of N-cadherin in cell migration and tumor proliferation, we will conduct cell traction force experiments, using a particle-coated elastic polymer surface, to analyze the force-generation through N-cadherin bonds. Furthermore, we will compare how mutant N-cadherin will alter the generation of traction forces. Our study may help to improve our understanding of the mechanisms of tumor cell proliferation and identification.

It Takes Two to Sumo: SUMO Modification in Meiosis is Regulated Through Ubiquitin E3 Ligase HEI10 and SUMO E3 Ligase RNF212

Ajay N. Sharma
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molecular Genetics

Protein regulation is often mediated by post-translational modifications. A variety of chemical groups can act as post-translational regulators through different conjugation or de-conjugation processes, such as phosphorylation, SUMOylation, and ubiquitination. These effects are particularly vital in regulating meiosis, the cellular division that forms gametes (sperm and eggs), yet the mechanism behind how SUMOylation regulates meiosis is currently unknown. In this study, the localization patterns of a well-known class of posttranslational modifiers, SUMOs (small, ubiquitin related proteins), is explored. Conclusive data shows that two homologs of SUMO, SUMO1 and SUMO2/3 (SUMO2/3 are essentially identical), and the E2 conjugase for SUMO, UBC9, localize in a predictive pattern; these proteins begin to appear on chromosomal axes and synaptonemal complexes between chromosomes in early prophase (middle to late zygonema), before restricting themselves to heterochromatin in late prophase (pachynema). Furthermore, we found that in the absence of RNF212, a SUMO E3 ligase, SUMO localization decreases, while in the absence of HEI10, an ubiquitin E3 ligase, SUMO localization is increased. Consequently, these results suggest that two enzymes, an ubiquitin ligase and a SUMO ligase, work in opposition to successfully regulate SUMOylation in meiosis.

Release and Consumption of Milk Sugar Glycans by *Bacteroides thetaiotaomicron*

Claire A. Shaw
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Food Science & Technology

Bacteroides, a genus of commensal bacteria found in the gut of humans, are known for their ability to consume a wide variety of glycans. In doing so, they release extracellular monomers from these structures which supports the growth of pathogenic bacteria. To understand how this bacteria interacts with milk glycans, a strain of *Bacteroides* was first isolated from a nursing pig (*B. thetaiotaomicron* UCD3162). The strain's genome was sequenced and its growth characterized on milk sugars and constituent monomer sugars, including sialic acid (Neu5Ac). UCD3162 was then grown on a sialylated milk glycan mixture and consumption was analyzed by q-TOF mass spectrometry. Quantitative reverse transcriptase PCR (qRTPCR) was used to measure sialidase gene expression of UCD3162 grown on sialylated milk sugar. On these sugars, q-TOF showed a decrease in complex glycans and an increase in free sialic acid over time, which was corroborated by predictions from the genome sequence. *In vivo*, freed sialic acid has been shown to promote the growth of pathogenic bacteria, meaning *Bacteroides* may be conducive to the growth of harmful populations of bacteria. *Bacteroides* is generally classified as a commensal, but may be contributing to deadly gut infection by species such as *Salmonella* and *Clostridium difficile*.

Exploring Parasitic Plant Responses to Host Plant Signaling Through Parasitic Plant-Host Plant Interaction

Berrah Shere
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Plant Sciences

Parasitic plants cause extensive damage to a wide range of crop plants that are of agricultural importance. It is important to understand the parasitic signaling pathway in which parasites are able to identify nearby host plants by chemical signals released by roots into the soil. One gene identified to produce chemical signals is called TvQR1. TvQR1 encodes an enzyme that catalyzes one-electron quinine reductions that are essential for the development of haustoria in parasitic plants. My project is to understand the regulation of the TvQR1 promoter and how it is activated upon exposure to host root factors, notably dimethoxybenzoquinone (DMBQ). DMBQ is an oxidative stress agent that induces haustorium development. The TvQR1 promoter was cloned into a plasmid vector containing the GUS reporter gene and the fluorescent marker gene encoding yellow fluorescent protein (YFP), and transformed into *Arabidopsis*. Once the YFP positive plants were identified under a fluorescent microscope, they were then induced with DMBQ and stained for GUS activity. The GUS assay shows where the GUS reporter gene was expressed in the root by its characteristic blue color expressed in the roots. Understanding this signaling pathway will provide insight into how parasitic plants identify and invade non-parasitic plants.

Validation of MIZ Cofactors to Understand MYC Function

Kyumin Shim
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Cell Biology & Human Anatomy
School of Medicine

MYC is an important pluripotency gene that has been associated with a variety of cancers. Previous genomics level data has demonstrated the intermittent binding between MYC protein and MIZ-1 (Myc Interacting Zinc-finger protein-1); by looking at other cofactors that interact with the MIZ-1 protein, we hope to understand the role of MYC. Based on initial proteomics screening with a Maltose Binding Protein (MBP) bound MIZ-1 construct compounded with the human embryonic stem cell (hESC) line H9, we found through mass spectrometry several encouraging candidates such as NPM1 (a known interactor), PARP1, and Histone H1 to list a few. This project serves to validate cofactor interaction via MBP pull downs in order to understand the mechanisms by which MIZ-1 and MYC function. The results from this study will further cancer research by clarifying the complex functions of MYC as well as potentially impact the field of regenerative medicine. Future directions would include experiments of overexpression and knock-outs of these co-factors to understand their impact on MYC–MIZ-1 interactions.

Empathy as a Moderator for Persuasion

Megan M. Shope
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Human Ecology

Previous research has shown that empathetic people are more likely to connect with other individuals and understand their experiences (e.g., Hoffman, 2008). Interventions aimed at changing beliefs sometimes use people's real experiences to appeal to an individual (e.g., Singleton et al., 2014), thus empathy may be important to investigate for interventions because it may dictate how some individuals respond to the experiences of others. The current study tests the role of empathy in conforming to persuasive messages about a person's growth mindset (beliefs about the malleability of abilities). Growth mindset research has shown large benefits for academic outcomes and has led to many interventions. Thus, understanding who is most open to persuasive messages could help interventions be more effective. 59 college students reported their empathy and growth mindset before and after receiving a growth mindset persuasive message. Results showed that the message was most effective in changing mindset for students with a more fixed view and higher empathy prior to the persuasive message, but was less effective in changing mindset for individuals who already had a growth mindset. These findings suggest that individuals most in need of the persuasive message benefited the most only if they were empathetic.

Problematic Pedagogy: Examining Cultural Competency, Critical Race Theory and the Presence of Native American Studies Topics in 4th Grade Classrooms

Valentin Q. Sierra
Sponsor: Jessica Perea, Ph.D.
Native American Studies

Navigating topics of cultural competencies and identities in K-12 public school curricula is increasingly becoming common practice in California as more teachers are expected to address themes of multiculturalism and diversity. My research explores the particular complexities of Native American histories and cultures as they are presented in relation to such academic initiatives. More specifically, I focus on academic materials used in a 4th grade classroom in Davis, California, such as a Common Core aligned historical series titled *California Studies Weekly* and the book *Stone Fox* by John Gardiner, to name just two. In classrooms across the United States, public school lesson plans involving Native American topics unfold in a myriad of problematic scenarios that serve to perpetuate forms of oppression and the broader framework of institutionalized racism. In California public elementary schools, this is noticed and addressed by more culturally competent and relevant educational materials that speak to the narrative of oppression directed towards Native Americans. To further analyze and critique the effectiveness and cultural competency of these resources, I draw on related critical race theory frameworks grounded in pedagogy in an effort to better understand this study's implications in relation to student development and awareness.

Genetic Potential of Lettuce Downy Mildew in California

Ido Simon
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Plant Sciences

Lettuce downy mildew is the number one lettuce disease in the world, causing significant losses in yield every year. *Bremia lactucae*, the pathogen causing the disease, reproduces both asexually and sexually. Sexual reproduction only occurs when the two mating types from different individuals interact. *B. lactucae* populations in California are predominantly B2 mating type individuals that asexually reproduce with some somatic variation. As of 2010, opportunistic surveys indicate a rise in the B1 mating type and in novel virulence phenotypes compared to previously defined pathotypes in the Californian population. To determine the cause for this trend, we want to decide if the B1 sub-population affects variation via sexual recombination rather than somatic mutation. In this presentation, I will present data on the first cross between an isolate expressing the predominant virulence phenotype of the B1 sub-population and a B2 isolate found in the same field. The cross was performed following standard methodology which includes testing progeny for virulence phenotype and mating type. Results indicate that the progeny are fit for survival, such that variation within populations may increase due to sexual recombination. Consequentially, breeding efforts for durable resistance against *B. lactucae* may need to be altered to fit Californian populations.

Between Literary and Littoral: Non-Teleological Thinking and Phalanx Theory in *The Log From the Sea of Cortez*

Mitchell P. Snyder
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English

Steinbeck's *Log from the Sea of Cortez* is immersed in conversations across several disciplines, ranging from anthropology to zoology, mapping an intersection of Steinbeck's beliefs and those of his close friend, marine biologist Edward Ricketts. Past critics address the multifaceted nature of this text by slicing into portions of the book, but this study aims to chart the larger whole through moments where Steinbeck's views and Ricketts's influences converge. Using these nodes to bring the *Log* into focus, I rely upon primary and secondary sources including the text and critical essays to better understand how the book continues to elude genre. This method of inquiry reveals that the *Log* does not always function as a fixed, constituent organism, meaning that points of confluence often bundle together multiple concepts. Ricketts's contributions, especially non-teleological thinking, complement Steinbeck's central concept of Phalanx/Group theory, forming a thread that circulates within the text. Tracing this pairing through an otherwise Gordian combination of philosophical treatise, scientific text, and travel narrative reveals the *Log* as it truly is: a cross-disciplinary saga born of Steinbeck's creative mind and Ricketts's proto-ecological thought that documents, in their words, "something that happened."

The Interclinic Consortium and the UC Davis Student-Run Clinics: Understanding Health Disparities Through Demographic Data Collection

Marianne So
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Public Health Sciences
School of Medicine

In Sacramento County, 200,000 residents currently struggle to obtain medical care. In response to this need, the UC Davis-affiliated student-run clinics focuses in serving underserved populations who fall between the cracks of our healthcare system, which includes the undocumented, the uninsured, the recently- immigrated, and the low-income. Additionally, our team discovered very little is known about the student-run clinics and their patient populations- the very information necessary to accurately detect and understand the health disparities prevalent in the community. A three-pronged approach was developed: first, by establishing baseline patient demographic data, second, through empowerment by giving patients a voice in the community, and third, by encouraging collaboration between the student-run clinics. Since January 2014, our team has been collecting demographic data at the student-run clinics. It relies on participating patients to answer a questionnaire containing 18 questions, ranging from basic demographics to open-ended evaluations of the clinic services received. Overall, our goal is to determine what economic, social, and cultural factors affect an individual's ability to obtain health care. By surveying patients, we anticipate the student-run clinics and the UC Davis School of Medicine can then work together to better address the needs expressed by the community.

Comparison of Nutrient Intake Between Normal and Obese Mexican-Origin Children in Central California

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Internal Medicine
School of Medicine

Children in the United States are not meeting the recommendations set by the Dietary Guidelines for Americans. The Niños Sanos, Familia Sana (Healthy Children, Healthy Family) study is a multifaceted intervention that aims to reduce obesity rates and increase fruit and vegetable consumption in Mexican-origin children ages 3-8 in the Central Valley. The purpose of this study is to compare nutrients of concern (potassium, dietary fiber, calcium, and vitamin D) between normal weight and overweight/obese children. Trained researchers collected anthropometric measurements from the children at the school site. Bilingual researchers collected three 24-hour dietary recalls (24HDR) and a food frequency questionnaire (FFQ) in person and via telephone. Parents reported what the children ate on two weekdays and one weekend day for the three 24HDRs, as well as filled out the FFQ based on their child's consumption of select common foods consumed by the population. Using nutrition analysis software, 24HDR data was analyzed for nutrients of concern. Preliminary analysis demonstrates no significant difference in consumption of nutrients of concern by child's weight status.

Assessing Algal-Bacterial Gas Exchange for Enhanced Wastewater Treatment

Simon P. Staley
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Biological & Agricultural Engineering

Wastewater treatment is an increasingly important operation in the U.S., but generates more than 35 million metric tons of greenhouse gas emissions annually. Much of these emissions are generated via energy-intensive aeration to provide microorganisms with oxygen in the conversion of organic waste to carbon dioxide (CO_2). Microalgae may mitigate energy-intensive aeration by producing dissolved oxygen in situ. Furthermore, microalgae can sequester CO_2 into biofuels, reducing emissions from conventional petroleum fuels. Consequently, algal wastewater treatment may realize a "carbon negative" potential. On the basis of a documented symbiosis between algae and bacteria, we hypothesize that an algae-bacteria symbiosis can supplement costly aeration processes. Our work seeks to ascertain whether algae can satiate bacterial oxygen requirements without intensive aeration and the extent to which algae can sequester the CO_2 released by bacteria. This study quantifies the exchange of gases between microalgae and bacteria in a controlled parameter bioreactor. A gas transfer model is developed and calibrated using experimental measurements gathered using dissolved gas probes. The results of this study may provide a justification for algal wastewater treatment as an improved means of reclaiming water with reduced energy costs, greenhouse gas emissions, and the added benefit of biofuel production.

Biomotion Marker Materials: Visibility Aid Designs for Bikers at Night

Timothy Stapleton
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Design

Biomotion, or biological motion, refers to the natural movement of living organisms and can be used to increase the recognition of the human form. The purpose of this research is to identify what types of materials in clothing design–placed using biomotion–make bicyclists most conspicuous in the dark. Although existing research acknowledges the importance of biomotion and the significance of its effect on bicycle safety, the impact of the various clothing materials has yet to be studied, including lighting materials. After conducting a meta-review of existing literature, commonly used bicyclist biomotion markers and their materials were identified. Primary research includes a study wherein participants sat in a passenger seat of a car and determined when they first detected and recognized bikers wearing different biomotion marker materials: reflective bands, LED lights, and electroluminescent (EL) lights. A related experiment utilized 3D eye-tracking glasses to compare biomotion marker materials and their ideal configurations. By finding what particular materials are most effective at enhancing conspicuity at night, this project aims to increase visibility of bicyclists at nighttime for their safety.

Cultivating Community Development: How Kampot Pepper Can Sustainably Drive Alternative Community Development Programs in the Kingdom of Cambodia

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Human Ecology

Community development is a discipline that draws upon the social sciences to directly improve the agency and resiliency of all communities. But, the field is in great need of novel approaches and methodology to effectively address the wide-sweeping inequality that significantly impacts the resiliency of all communities in our modern, globalized world. In order to understand the nature of this evolving field as it applies to international development, one may turn to a nation heavily influenced by international aid programs. The Kingdom of Cambodia exhibits a rich cultural tradition and a more recent legacy of genocide, war, and corruption, the impacts of which are tangible and felt on a daily basis by the Khmer people. I believe there are untapped sources of capital that could be utilized to fund alternative development projects that serve to address the inadequacies of current development models applied to post-conflict zones. By investigating this nation from a holistic and interdisciplinary Community Development approach, I will identify why the Kampot Pepper Industry is ideally suited to empower and improve the lives of the Khmer population, and investigate the potential efficacy of alternative development projects aimed at addressing all aspects of human ecology.

Landslide Dams of the West Walker River

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Earth & Planetary Sciences

Dozens of relict Jeffery Pine stumps are rooted in the active channel of the West Walker River within a steep canyon in eastern California. The presence of these trees along with drowned stumps in other parts of the state has been associated with drought conditions during the Medieval Warm Period (MWP). Remnants of multiple landslide dams along with varved lake sediments exist within the Walker River Canyon, however, the relict tree stumps are only visible directly upstream of one such landslide. New ^{14}C ages of the lake sediments suggest the dam and trees existed contemporaneously and imply the landslide was influential in either the growth or preservation of the trees. Furthermore, active normal faults associated with the eastern California frontal fault zone are present immediately adjacent to both sides of the canyon. Age comparison between the two landslide dams, if possible, will provide evidence as to whether the landslides were triggered synchronously by an event such as an earthquake. Establishing the relative ages of the landslides and stumps will establish a timeline for the geomorphological history of the canyon as well as provide new insight into the region's paleoclimate.

Role of the Hippocampus in Remote Memory Recall

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Psychology

Memory formation involves encoding and storing information for recall. Recent studies suggest that memory retrieval involves reactivation of hippocampal and cortical networks that were active during learning, and that silencing reactivated hippocampal neurons could cause a deficit in memory recall. Previous lesion studies suggest that over time, memory retrieval becomes less susceptible to hippocampal damage. Therefore the role of hippocampal reactivation in the recall of remote memory (~14 days) remains unclear. To determine hippocampal function in remote memory recall, we will optogenetically silence CA1 pyramidal neurons involved in memory formation using ArchT. We hypothesize that silencing CA1 pyramidal neurons during remote memory recall will have no effect on remote memory. Using fos-TTA/tetO-H2BGFP reporter mice, we will tag hippocampal neurons that were active during learning when doxycycline (DOX) is absent. To initiate learning, mice will be fear-conditioned using contextual cues. The mice will be removed from the context and placed in their home cages for 14 days. After, they will be returned to the fear context where tagged hippocampal neurons will be silenced and freezing assessed. We expect mice with silenced hippocampal neurons to display no deficit in memory compared to the controls, which would support current models of systems consolidation.

Cut-Generating Functions for Integer Linear Programming

Masumi Sugiyama
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Mathematics

Optimization problems arise in many situations in everyday life. For example, business applications include maximizing the profit and minimizing the total production cost in a factory. In mathematics, linear programming (also called linear optimization) is an optimization method to achieve the best outcome subject to linear constrains. If, in addition, the unknown variables are required to be integers, then it is called integer liner programming. One method of obtaining integer solutions involves iteratively refining the feasible regions using so-called general purpose cutting planes (cuts). Since Gomory and Johnson's model was first introduced in the 1970s, it has played an important role in deriving general purpose cutting planes. In my project, I extend existing software for cut-generating functions in Gomory and Johnson's model to a more general model introduced recently by Yildiz and Cornuejols. I also develop a computational method for finding the exact parameter region of cut-generating functions.

Understanding Wood Duck Breeding Ecology Through Citizen Science

Young Ha Suh
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Wildlife, Fish & Conservation Biology

Wood Duck (*Aix sponsa*) nest box programs have been a successful conservation tool that involves citizen science and has increased our understanding of a cavity-nesting species. Numerous studies have found that habitat variables of nest boxes affect nest success and rates of nest parasitism. To understand the effect of environmental factors on nest success, I analyzed nest box data collected by the California Waterfowl Association from 1992 to 2010 of 30 wood duck programs across California. In the current phase of this project, I am analyzing the effects of site differences, rate of parasitism, and date of egg laying on the number of ducklings produced. Initial findings indicate that the different sites display different population dynamics among Wood Ducks while parasitism has a negative impact on nest success. This study will provide insight on the nesting behavior of Wood Ducks in response to habitat variables and brood parasitism and help in management practices.

Paleodietary Reconstruction Using Stable Isotopes at an Archaeological Site in Green Valley, CA

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Anthropology

Shellfish and other marine resource remains are often in archaeological sites located many kilometers from wetland environments. That people would carry these foods over such distances indicates their importance in human diets. This study examines the role of marine and brackish-water foods in the diets of Late Holocene hunter-gatherers living at the site of CA-SOL-11 in Green Valley, California. Although shells were noted at the site during excavations in the 1960s, they were not saved. We use stable isotope analysis of human third molar serial sections to examine the diets of individuals over half-year to 1-year intervals. Carbon isotopic signatures, in particular, can trace exploitation of foods gathered from Suisun Marsh estuary, upstream from San Francisco Bay. We predict that the isotopic signature will conform to one of three scenarios: 1) annual exploitation by everyone, indicating that brackish-water foods were a staple of the diet; 2) intermittent exploitation by everyone, indicating they were emergency or back-up resources; or 3) regular exploitation by some individuals, indicating that different family groups at the site may have exploited different foraging territories. Through this study we hope to gain further insight into ancient gathering and consumption of brackish water resources in Central California.

Prevalence of *Bartonella* in Stray Domestic Dogs in Southeastern Mexico

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Various species of *Bartonella*–a genus of Gram-negative, intracellular bacteria–are known zoonotic pathogens with a variety of animal hosts, capable of causing infections in humans such as cat scratch disease, endocarditis, and trench fever. In particular, most species of *Bartonella* infecting canines are known human pathogens. Blood samples were collected from 31 stray domestic dogs from the Tulancingo region of Mexico to determine whether these canines show evidence of *Bartonella* infection and could thus act as reservoirs with the potential to infect humans. Three distinct assays were used to determine a possible history of infection. Whole blood culture was utilized with the goal of isolating suspected *Bartonella* colonies and performing subcultures. In addition, a series of indirect immunofluorescent antibody (IFA) tests were used for each sample against antigens for *B. henselae, B. clarridgeiae,* and *B. vinsonii* subsp. *berkhoffii* to determine seroprevalence among the collected samples. Finally, PCR analysis will be conducted for all samples to further confirm the identity of suspected positives from the blood culture and IFA analyses. Initial findings indicate 42% seropositivity among the samples for *Bartonella* infection; more specifically, 29% for *B. henselae*, 26% for *B. clarridgeiae* and 22% for *B. v. berkhoffii*.

California Land Use Ballot Measures: Trends for 1995-2013 and Predicting Election Results

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Environmental Science & Policy

California voters have increasingly turned to the ballot box to determine land use policy, rather than leave the decisions to government officials. With these ballot measures, citizens are able to limit or facilitate development of their cities and counties through direct democracy. In *Trends in Local Land Use Ballot Measures 1986-2000*, Fulton et. al. analyzed 14 years of California land use ballot measures from 1986 to 2000 to identify trends in the number, passage rate, and the geographic distribution of these measures. I have conducted a similar analysis examining the period from 1995 through 2013, to analyze the trends for the time period after the Fulton study, with some overlap. Next, I have used regression analysis to create a predictive model for the success or failure of pro-growth and anti-growth measures. Land use decisions are central to the character of a community and can have long-lasting and wide-reaching impacts so it is important to understand where these measures are being voted on and how they are impacting land use in the state.

Effects of Non-Purified and Purified Diet With and Without Choline on Hepatic Steatosis and Methionine Metabolism in C3H Mice

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Internal Medicine
School of Medicine

Previous studies indicated that non-purified and purified murine diets have different metabolic effects with potential consequences on hepatic methionine metabolism and liver histology. We compared effects of non-purified and purified diets with or without choline supplementation administered to C3H mice with normal lipid and methionine metabolism. Three types of diets were studied: control non-purified, choline supplemented purified, and non-choline supplemented purified. Diets started 2 weeks before mating and continued through pregnancy and offspring until 24 weeks of age. At 24 weeks, we measured liver to body weight ratio, collected plasma for ALT levels, and harvested livers for histology and methionine metabolism related markers (S-adenosylmethionine and S-adenosylhomocysteine). The liver to body weight ratio was significantly higher in mice fed purified diet, which was further supported by evidence of hepatic steatosis and inflammation. Hepatic SAM/SAH ratio was higher in female mice fed purified compared to non-purified diet (4.7±1.1 vs 2.7±1.9; $p<0.05$). ALT plasma levels were higher in female mice on purified diet (20.7±4.3 vs 49±11.8 U/L; $p<0.05$). Choline supplementation was associated with limited improvement of hepatic steatosis. Non-purified and purified diets have significantly different effects on steatosis development in C3H mice. These findings can help in development of fatty liver animal models.

The Role of Gender in Sexual Harassment in the Workplace and Educational Settings in Entertainment Television Programming

Raha Tajrishi
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Communication

Television has been shown to influence viewers' attitudes, expectations, and behavior in various domains. Depictions of sexual encounters and harassment in environments of power relations, such as work and educational settings, can influence viewers' beliefs and behavior regarding sexual conduct as well as gender roles and norms in these contexts. To understand the likely impact of this content, it is important to know how sexual harassment in the workplace and educational settings is presented in entertainment television programming. However, research on this issue is limited in scope and outdated. This study aims to provide a more complete and current assessment of the state of sexual interactions in TV workplace and educational settings through a content analysis of 44 broadcast, cable, and made for Internet streaming TV shows in the 2014-2015 broadcast season. Differences in sexual behavior and its consequences across genres and gender of characters were examined. Results suggest that workplace sexual harassment is commonplace, though far from universal, in entertainment television, and that many traditional gender roles around sex are not reiterated. Knowing what is currently being depicted on TV will allow us to better understand how TV shows are influencing audiences' beliefs toward sexual harassment and gender roles.

Using Flow Cytometry to Measure Mitochondrial Transmembrane Potential Decline of Vascular Smooth Endothelial Cells Mitigated By Estrogen Treatment

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Pharmacology
School of Medicine

Mitochondria are responsible for generating most of the energy needed by the body to sustain life and support growth; yet when they, fail cell death may inevitably follow. Older cells experience more dysfunctional mitochondria, and we investigate if estrogen can potentially mitigate the deleterious changes brought by the progression of cellular aging. Mitochondrial Transmembrane Potential measures mitochondrial function, and a dysfunctional potential correlates with the release of Cytochrome-C into the cytosol, in turn, triggering a cascade of events leading to autophagy. Using the JC-1 Mitochondrial Membrane Potential Assay, we treated early and late passage human vascular smooth muscular cells with estrogen to discern if treated cells experience less mitophogy compared to their vehicle counterparts. JC-1 is a membrane permeable dye that can selectively enter the mitochondria where it reversibly changes color as membrane potentials increase. The colors can be detected using filters in flow cytometry. Thus far, our data has shown that cells treated with estrogen had more dysfunctional mitochondria. Understanding the mechanisms behind cellular aging can provide great contributions to clinical studies; as an example, our project can shed light on the benefits and drawbacks of estrogen treatment as estrogen has been known to exert powerful antioxidant effects.

Characterizing Classroom Learning Environments

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Mechanical & Aerospace Engineering

Low academic success and student retention in the STEM (Science, Technology, Engineering and Mathematics) disciplines has become a national challenge. Data from the entering class at the University of California, Davis in 2008 exemplified low retention, especially among minority students: "Of students from historically underrepresented ethnic groups (African American, Native American and Chicano/Latino) who started in a STEM major, 54 percent... left STEM fields within four years...." (UCD News 2013). The literature has shown that student-focused teaching, as opposed to instructor-focused teaching, has been successful in improving retention and student learning outcomes. The first step in bringing these changes to UC Davis is to characterize teaching practices in introductory STEM courses. This is accomplished through first-hand observations using the Classroom Observation Protocol for Undergraduate STEM (COPUS). I use COPUS data from introductory biology and chemistry courses to answer the questions: what does instruction look like at UC Davis? How does it compare with evidence-based instructional practices, such as active learning, which has been shown to be critical in student learning outcomes especially among minority students?

Finding Early Markers for Autism: Optimizing Primers for Assaying Global Methylation

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Medical Microbiology & Immunology
School of Medicine

Autism Spectrum Disorders (ASD) cause significant behavioral challenges and impairment in social communication. Currently there is no cure and the most important factor in the treatment of ASD is early detection. The MARBLES study is a prospective study following mothers and their children diagnosed with ASD that began in 2006 with the goal of finding early genetic and environmental factors that may be markers for ASD. As a part of the MARBLES study, epigenetic effects of folate intake by pregnant mothers were examined through the analysis of global methylation. Previous studies on global methylation used pyrosequencing to look at repetitive elements in the genome, such as LINE-1 and Alu, however available methylation assays are not robust. More reliable and cost efficient global methylation assays are needed for epidemiology studies such as MARBLES. This project focuses on optimizing primers for PCR amplification of repetitive elements as a first step in finding an alternative global methylation assay.

One Electron Oxidation of an Oxo-Centered Cobalt(III) Trimer

Jesse Tamayo
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Chemistry

In photosynthesis, water is split catalytically to produce O_2 and H_2 via absorption of sunlight. Artificial photosynthesis is a promising path towards the goal of achieving future energy demands. Recently, cobalt-oxide water-oxidation electrocatalysts have been developed but many questions remain about their structure and reaction mechanism. It has been determined that cobalt(IV) is present during the water oxidation process. To understand the role of cobalt(IV) in this process, a model compound for a trinuclear water-oxidation site $[(py)_3Co_3O(OAc)_5OCH_3][PF_6]$, was synthesized. The compound was investigated with voltammetric methods in conjunction with continuous-wave electron paramagnetic resonance (EPR) to determine its electronic structure. The oxidation of the cobalt trimer produced a reversible cyclic voltammogram with an E(1/2) of 1.198V vs. a silver quasireference electrode in acetonitrile. The oxidized cobalt trimer is a short-lived species that rapidly decomposes to free cobalt(II) in solution. To circumvent this decomposition, oxidation studies are performed within the EPR sample tube and frozen shortly after application of the oxidizing potential. Our goal is to gain insights into the role cobalt(IV) plays in water oxidation to better guide synthetic efforts for catalysts that will one day produce clean, cheap, and renewable energy.

Bacteria Manipulation of Plant Immunity by Targeting Key Transcriptional Reprogramming Events

Janet Tan
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Plant Biology

The plant immune response against pathogens is dependent on NOD-like receptor proteins (NLR), found in the cytoplasm. Bacteria modifies host environment by injecting effector proteins through type-III secretion system, to make it more amenable for the bacteria's survival. The NLR proteins recognize these effector to mount immune responses. This defense response depends on transcriptional reprogramming by a transcription regulator, Enhanced Disease Susceptibility 1 protein (EDS1). EDS1 accomplish this task by interacting with Phytoalexin Deficient 4 (PAD4) and Senescence Associate 101 (SAG101) proteins. Interestingly, recent studies have shown that an effector, AvrRPS4 also interacts with EDS1 during the course of infection. This observation is perplexing as it raises two possible scenarios 1) AvrRPS4 inhibit the transcription reprogramming mediated by EDS1 or 2) EDS1 recognize AvrRPS4 as a sign of bacterial infection to initiate transcriptional reprogramming. I propose to use biochemical approaches to purify and reconstitute AvrRPS4-EDS1 complex and understand the molecular basis of this interaction. Additionally, I will purify EDS1-PAD4 and EDS1-SAG101 complexes and see if these interactions are affected by the presence of AvrRPS4. To that end I have cloned AvrRPS4 and EDS1 in expression vectors and I am currently working towards purifying these proteins.

Academic Probation in UC Davis: What Are the Contributing Factors?

Jiahui Tan
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iAMSTEM Hub
Undergraduate Education

Approximately one thousand UC Davis students are placed on academic probation each quarter. Research suggests that not only does academic probation have a short term boost in performance that fades out over time (Fletcher & Tokmouline, 2010), but it may also discourages some students from returning to school (Lind, et al., 2008). The purpose of this study is to examine factors associated with getting placed on academic probation or dismissal from the university in order to identify characteristics of high-risk groups. I will analyze data on students who attended UC Davis between 2006 and 2013 from the UC Davis institutional databases, including data on students' prior academic achievement (SAT score, high school GPA, etc.), demographic characteristics, and academics at UC Davis. Logistic regression will be used to model the probability of students being placed on academic probation as a function of their demographic characteristics, academic achievement, and their experiences at UC Davis. The findings from this study will provide a better insight on characteristics associated with students on academic probation or dismissal from which preventive actions can be taken to help these students improve their academic performance.

Study of Phase Separation on AlInN Epitaxial Layers Grown by Metalorganic Chemical Vapor Deposition

Tianqi Tan
Sponsor: Subhash Mahajan, Ph.D.
Chemical Engineering & Materials Science

The AlInN epitaxial layers are very attractive for applications in high mobility electron transistors, laser diodes etc. They crystallize in the wurtzitic structure that consists of two interpenetrating hexagonal close packed sub-lattices. The Group III atoms reside on one sub-lattice, whereas the group V atoms occupy the second sub-lattice. A number of studies indicated that the group III atomic species are not distributed at random on their respective sub-lattice; they phase separate. Comparing the published results on AlInN and GaInN layers, it is apparent that the solid solution in AlInN layers can be maintained up to higher atomic concentrations of In. This aspect is not well understood. In this project, AlInN layers of different In concentrations will be grown on (000!) sapphire substrates. The growth will be carried out by metalorganic chemical deposition. Professor Mahajan has a facility to do that. High resolution X-ray diffraction, atomic force microscopy and electron microscopy to evaluate microstructures of the layers. The computational study will also be carried out to understand the influence of lattice rigidity on phase separation.

The Current Timeless Classics: A Study of the Change in Anthologies Over the Past Half Century

Audrey D. Tang
Sponsor: Margaret W. Ferguson, Ph.D.
English

Many readers know the Western literary canon as a historical compilation of works that both reflect and sustain culture. Some recent critics maintain that these classics connect literature across centuries and genres by a shared level of excellence. Other modern critics, however, have termed the canon an imaginary totality of works, meaning that canonical literature suggests an endless archive, not a closed list. Anthologies, in contrast, represent a limited selection of works from the canon. These books preserve culture as a historical document; their contents can be argued to portray the current idea of the canon. From this standpoint, my research will analyze how the criteria in building anthologies have changed over the past half century. By tracking the contents of three 20th century English anthologies through different editions, I will explore their modification, and in many ways, diversification, and how they represent both contemporary scholarship and the college market industry. Previous research with prominent anthologies has indicated that they set the leading agenda for college literature courses in America and abroad. My research will survey the standards of these composed books that have influenced the education of over 20 million students over the past fifty years.

An Investigation on Reaction Mechanism Between Citric Acid and Cotton Cellulose

Peixin Tang
Sponsor: Gang Sun, Ph.D.
Textiles & Clothing

Polycarboxylic acids can react with cellulose to form ester bonds and crosslink cellulose in cotton to produce wrinkle resistant fabrics. Citric acid (CA) is one of the polycarboxylic acids, which can potentially crosslink cotton fabrics. CA is naturally based, environmental friendly and non-toxic. When it reacts with cellulose, CA forms active intermediate anhydride firstly, and then esterifies with cellulose to achieve crosslinking effect and anti-wrinkle property. In this research, different alkaline salts are added as catalysts into the finishing baths in order to understand catalytic mechanism. The anti-wrinkle property of the treated fabrics is measured by wrinkle recovery angel (WRA) test, and the higher WRA means the better wrinkle resistant property. Thermo gravimetric analysis (TGA) and Fourier transform infrared spectroscopy (FT-IR) were employed to analyze the anhydride formation and esterification between CA and cotton cellulose, respectively. Based on the acquired results, alkali metal hydroxides accelerated the formation of anhydride, and the optimal mole ratio of CA to catalyst is 0.5. This research discovered the real role of catalyst in the reaction between CA and cotton cellulose, providing a clue to find more efficient catalysts.

Hibernating Hamsters Have Enhanced Capacity to Recovery From Ischemic Conditions

Ekaterina A. Tangog
Sponsor: Barbara A. Horwitz, Ph.D.
Neurobiology, Physiology & Behavior

Neurons in mammalian hibernators are less damaged by oxygen glucose deprivation (OGD), a model simulating stroke, than those in mammals not capable of hibernation. We previously compared tolerance to OGD in hippocampal slices from hibernating Syrian hamsters (HH), rats (non-hibernators), and hamsters exposed to summer-like conditions (SH; 14:10 h light: dark, 22± 2°C). Tolerance to OGD was greatest in neurons from HH, followed by SH, and then rats. To examine the role that preparation for hibernation [more than three weeks in 8:16 h light:dark and cold exposure (6 ± 2°C) but no entrance into hibernation (WH)] versus being in the state of hibernation might play in OGD tolerance, I compared WH to HH and SH. This comparison tested the hypothesis that recovery from OGD would be greater in neurons from HH than WH and least in neurons from SH. For this, I placed hippocampal slices into a recording chamber perfused with artificial cerebrospinal fluid and positioned stimulating electrodes into the nerve bundle innervating CA1 pyramidal neurons. Evoked responses were recorded in the CA1 cell layer. Results suggest that both environmental cues (cold and photoperiod) as well as being in hibernation influence tolerance to OGD.

The Middle East and North Africa in U.S. Media Representation: Sticks and Stones: Constructing a Narrative for the Middle East in The New York Times

Brittney Tapia-Nunez
Sponsor: Suad Joseph, Ph.D.
Anthropology

My research examines the representation of Middle Eastern ethnic and religious identities in Western print media via The New York Times, in which I analyze the way ethnic and religious terminology was used over a 10-year period, 1900-1909. This paper addresses the following questions: Was a particular term portrayed positively or negatively? Did the portrayal change over time? Was the terminology used to produce narratives such as "us" versus "them", the "West" versus the "East", or the "other" versus the "same"? I consider how the articles construct a broader narrative of people, places, and events, and how these narratives were used to justify certain actions. During the decade of 1900-1900 C.E. the NYT provided accounts of Western colonial expansion in Africa, Asia, and the Middle East. I argue that the depiction of selected ethnic and religious identities reflected and reinforced Western cultural, economic and political interest. While a number of publications analyze the portrayal of Middle Easterners in contemporary media, there has yet to be a comprehensive study of The New York Times. The content of this paper presents a small portion of the results of an ongoing, comprehensive project covering the New York Times, from 1850-the present.

The Influence of Pre-Existing Brain States on Decisions to Attend

Manvita Tatavarthy
Sponsor: George R. Mangun, Ph.D.
Psychology

Visuospatial attention refers to our ability to direct attention to something particular in our visual field, without the distraction of its surroundings. While previous studies have attempted to study visuospatial attention using a presented cue, our experiments study the process of deciding to direct one's attention without a visual cue, something we have called willed attention. This study specifically investigates whether any pre-existing neural correlates bias a person's decision to attend to a certain hemi-field. Specifically, we record participants' electroencephalogram (EEG) while they perform a task in which they are asked to make a spontaneous decision to attend to one of the two hemi-fields, or not attend at all. The EEG is a popular clinical research study method that measures the electrophysiological voltage in the brain through the scalp, by measuring neuronal ion flow triggered by neurotransmitters. By allowing the subject to make a decision whether to attend or not, we identify the EEG signatures that are important to directing willed attention and the pre-existing neural states that may bias a decision to attend. Identifying these EEG signatures may prove useful in future study of pathologies such as ADHD.

Development of Yac128 - NSG, an Immunodeficient Huntington's Disease Mouse Model

Jack C. Taylor
Sponsor: Jan A. Nolta, Ph.D.
Cell Biology & Human Anatomy
School of Medicine

Huntington's disease (HD) is an autosomal dominant neurodegenerative disease linked to expanded trinucleotide repeats in the huntingtin gene, which causes death in 100% of those afflicted. An accumulation of protein aggregate and aberrant gene regulation results in striatal atrophy leading to a multitude of psychological and behavioral symptoms. Development of cell therapies for HD is ongoing, utilizing various therapeutics designed to ameliorate or halt future disease progression. Human cell based therapies have shown an ability to deliver crucial neuronal repair proteins. Without a potentially toxic immunosuppressant regiment however, efficacy testing of these therapies in small animal models is impeded by a xenogeneic immune response resulting in rejection of human cells. To overcome this impediment, the full-length human HD transgene of the Yac128 mouse model of HD is currently being introduced onto the xeno-tolerant NSG to create a new inbred strain through 20 generations of backcrossing. To select the appropriate mice, HD transgene presence, transcription, and translation will be monitored through genotyping, qPCR, and western blotting respectively. Immune system components and inflammatory cytokine levels will be monitored through flow cytometry. Additionally, these mice may yield some insight into the interaction of HD and the immune system.

Experiences of First-Generation Latina/o Transfer Students: Challenges and Resources Needed Not To Be Pushed Out

Norma Tellez
Sponsor: Natalia Deeb-Sossa, Ph.D.
Chicana/Chicano Studies

The current research stemmed from my experience as a transfer and first-generation college student who struggled to come and succeed at a four-year institution immediately after graduating from high school. The research focus is on the challenges first-generation Latina/o students face when transferring from community college to a four-year institution. I will focus on two groups specifically: transfer senior students at a four-year institution and third-year current community college students –interchangeably referred to as transfer students and community college students respectively. I will be conducting 5 semi-structured interviews on transfer students and 5 semi-structured interviews on community college students. I will be exploring the resources, support and advice students have received in community college by counselors and teachers to attend a four-year institution. In addition, I will be exploring the impact family members and friends have in their educational trajectories. This research will outline the difficulties and barriers students encounter that make it difficult for them transfer to a four-year institution and obtain a degree.

Use of CRISPR to Edit the *Arabidopsis* Na^+/H^+ Antiporter *NHX1* Gene

Huy Thai
Sponsor: Elias Bassil, Ph.D.
Plant Sciences

Recently the use of CRISPR/Cas (Clustered Regularly Interspaced Short Palindromic Repeats) and the associated RNA guided endonuclease Cas (CRISPR-associated) has been used successfully as a novel gene-editing technique but in limited studies in plants. Here we applied this technique to edit two specific sequences (termed protospacers) of the *Arabidopsis* vacuolar Na^+/H^+ anitporter (NHX1), and generate a knockout for use in reverse genetic studies. We generated two Gateway™ entry vectors containing each protospacer and recombined into a binary Gateway destination vectors to obtain pDe-Cas9 expression vectors. The expression vectors were transformed to *Agrobacterium tumafaciens* strain GV3101 for plant transformation using the floral dip method. Transformation of both wild type plants and another triple knockout *nhx2nhx3nhx4* will be transformed to generate a single and quadruple knockout plant. Both plants will be selected by antibiotic resistance and genotyped by PCR to confirm the lack of the full length wild type copy of NHX1. Phenotyping experiments, including sensitivity to salt tolerance will be conducted in homozygous lines.

Characterizing the Mechanism of Atg1-Atg8 Complex in the Autophagy Pathway

Burinrutt Thanasuwat
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Autophagy is the process of lysosomal degradation of cellular components. This process is essential for homeostasis and defends against pathogens or diseases. Atg1 (autophagy-related 1) is a protein in autophagy signaling pathway. Atg1 oligomerizes with other Atg proteins to form Atg1 complex, which guides the formation of the pre-autophagosomal structure (PAS) and in turn, initiates autophagy. In autophagy, a double membrane (called an isolation membrane) is formed into a vesicle, enclosing target cellular components to be transported to the lysosome for degradation. Atg8 is a protein located in the isolation membrane and is responsible for recognizing the autophagy target. Recent studies have shown that Atg1 interacts with Atg8, and that the disruption of this interaction terminates autophagy, but the mechanism of this interaction is not well understood. The goal of this study is to explore the relationship between Atg1 and Atg8 using purified proteins. I have cloned Atg1 and Atg8 and am now in the process of expressing and purifying the proteins. I will use a biochemical approach to reconstitute the Atg1- Atg8 complex and to understand the mechanism of this interaction at the molecular level.

Mobile Sensing Platform for Data Driven Strawberry Farming

Jackson Thomas
Sponsor: Andre Knoesen, Ph.D.
Electrical & Computer Engineering

Crop health is of utmost importance in the production of modern agricultural goods. Historically, crop health has been entirely judged by visual inspection and farmer intuition while more recently, growers have begun using advanced soil analysis and field imaging techniques to determine current growth patterns and predict future problems. This technical analysis, however, is typically done at a macroscopic, field level view. The goal of our design team is to build a functional field rover capable of capturing technical field condition data at an individual plant level to provide a more comprehensive and spatially dependent map of field conditions. To do this we have designed a durable chassis fitted with PSoC microcontrollers and accompanying self-designed printed circuit boards, an electronically deployable soil probe, and several cameras. The soil probe will measure volumetric water content and soil salinity, while the cameras will capture both visual and Normalized Difference Vegetation Index, or NDVI, images. Using a Beaglebone Black programmable microcontroller and a Nexus 7 tablet, this data will be wirelessly transmitted, stored, and displayed in real time to form a comprehensive analysis of localized field conditions and individual plant health.

Biochar a Potential Solution to the Water Availability Challenges Faced by Farmers

Emily J. Tibbett
Sponsor: Sanjai J. Parikh, Ph.D.
Land, Air & Water Resources

The California drought is one of the worst droughts faced by the state in decades and is projected to have substantial impacts on agriculture. With no end in sight, farmers are concerned about the impacts of the drought on crop production. Potting soil is presently used to provide moisture and nutrients to plants at the critical point of transplanting. Improving water availability to young plants at this point could be important in increasing transplant survival rates. Biochar, a material produced from the pyrolysis of biomass, has been proposed as an amendment to improve water availability to plants. Two biochars made from almond and softwood feedstocks was obtained from a commercial manufacturer and characterized for physical and chemical properties. Water retention of potting soil and varying ratios of potting soil amended with biochar were then investigated through water loss over a period of 72 hrs. Preliminary results suggest biochar may considerably improve water retention of potting soil which would have significant implications for drought plagued farmers in the state of California.

Thermal Conductivity Tester

Kirk K. Tolfa
Sponsor: Maxwell Chertok, Ph.D.
Physics

The Large Hadron Collider is the largest particle accelerator in the world, it is used in particle physics research. It is currently in the process of undergoing a series of upgrades that will support the future high luminosity runs. One of these upgrades is the introduction of new silicon wafers in the outer tracker of the CMS detector. For these wafers to behave properly however, they must be under very strict temperature control. This was the motivation for the project that I am working on. My project was to help characterize and tune a device that was designed to measure the thermal resistance of different samples. Once it is fully calibrated the device will be used to calculate the thermal conductivity of different combinations of samples that will be used in the CMS Tracker upgrade; this is important due to the fact that the thermal conductivities of the different materials must be known if an accurate model of the heat dissipation behavior is to be developed. In this presentation I will go over the design and calibration process of the device. I will also discuss the results of the most recent trials that we have run.

Modeling Gravity Anomalies for the Medicine Lake Highland Volcano, California

Danielle D. Torres
Sponsor: James S. McClain, Ph.D.
Earth & Planetary Sciences

The Medicine Lake Highland is a basaltic shield volcano in northeastern California that was active as recently as 950 years ago. A key question about Medicine Lake is whether models of regional gravity variations can explain how magma is delivered to the Earth's surface during volcanic eruptions. Previous studies suggest that eruptions are supplied with magma through fracture systems, not pipe structures. These proposed fracture systems could explain why the Medicine Lake Highland exhibits anomalous distributions of gravitational highs and lows. Regional anomalies could be attributed to the location of magmatic intrusions beneath the Medicine Lake volcano. Analyses of gravity distributions in relation to subsurface structures are conducted utilizing local anomalies, which are dependent on the densities of underlying rocks. Gravitational fluctuations from a number of studies are compiled, gridded, and used to test geophysical forward-models. Forward-models constrain possible subsurface structures by computing spatial variations of gravity based on densities from theoretical models. Comparisons of model results to surficial geology of vent locations should confirm the localities of conduits. The resulting density models should indicate whether magma ascends along fractures or pipe structures to volcanic eruption sites. Analyses are still in progress and will be presented at the conference.

Biomarkers of Cellular and Mitochondrial Dysfunction in Huntington's Disease Fibroblasts

Audrey Torrest
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Cell Biology & Human Anatomy
School of Medicine

Huntington's disease (HD) is a fatal autosomal dominant neurodegenerative disorder caused by an abnormal expansion of cytosine-adenine-guanine repeats in the huntingtin gene, which leads to the formation of a protein known as mutant huntingtin. Although pathogenesis has been attributed to this expansion, the underlying mechanism through which the huntingtin protein functions has yet to be fully elucidated. Nonetheless, it has become increasingly clear that altered mitochondrial function plays a key role in HD pathogenesis. In this study, the presence and effects of cellular and oxidative dysfunction in human HD fibroblast cell lines were examined through the quantification of population doubling rates, reactive oxygen species (ROS) accumulation and ROS-induced DNA damage in the mitochondrial genome. These biomarkers were used to establish baseline differences in the cellular health of HD gene carrier and non-gene carrier cell lines. Findings from this study will play a critical role in evaluating the efficacy of future gene modification strategies and will enable researchers to confirm restoration of normal downstream cellular functioning following a reduction in mutant protein or mutant gene silencing.

Regulation of Malaria Parasite Infection in a Mosquito: Crossing Kingdoms for New Strategies for Disease Control

Brandi K. Torrevillas
Sponsor: Shirley Luckhart, Ph.D.
Medical Microbiology & Immunology
School of Medicine

Malaria is the leading cause of vector-borne parasitic deaths worldwide. Drug and insecticide resistance have created an urgent need for new control methods, including genetic strategies to reduce parasite transmission by mosquitoes. Previous data indicated that abscisic acid (ABA) – first discovered as a plant hormone, but now known to be produced by all animal species – is produced during infection in the mammalian host and in the mosquito, apparently to regulate parasite infection and transmission. ABA induces the expression of nitric oxide synthase (NOS) in the mosquito, resulting in NO-mediated parasite killing. Inhibition of NOS reduces parasite killing in the mosquito, but the mechanism(s) whereby ABA regulates NOS have remained elusive. Studies in mammals have connected ABA to insulin synthesis, which can regulate NOS expression. Given that mosquitoes produce insulin-like peptides (ILPs) that also regulate NOS, we hypothesized that ABA regulates mosquito NOS via changes in ILP expression. We found that addition of ABA to a parasite-infected bloodmeal decreased ILP transcript expression, suggesting a conserved mechanism that, with continued analysis, will likely yield novel gene targets that can be manipulated to reduce malaria parasite transmission.

Using a GFP Reporter Gene Construct to Identify *Drosophila's* Cis-Regulatory Elements

Hong Tran
Sponsor: Artyom Kopp, Ph.D.
Evolution & Ecology

Many organisms display sex-specific characteristics, yet the molecular basis underlying the development of these phenotypes is not well understood. We seek to understand how nucleotide change can lead to the modification of gene expression, thereby resulting in the development of new traits. In the fruit fly *Drosophila*, the sex comb is a male-specific trait that exhibits vast morphological diversity among different species of *Drosophila*. Diversification of the sex comb may be due to mutations in the regulatory regions of the genome called cis-regulatory elements (CREs). CREs are sites where transcription factors bind to modify gene expression, thus mutations in these regions may produce altered expression patterns. In our experiment, we hypothesize that differences in the CREs of two candidate genes, *doublesex (dsx)* and *sex combs reduced (Scr)*, are sufficient to account for the morphological diversification of the sex comb. I am creating a GFP reporter construct with a specialized synthetic promoter that will enable us to identify the genetic sequences required to activate expression of *dsx* and *Scr*. This GFP reporter construct will provide a powerful tool for identifying changes in the regulatory regions of *dsx* and *Scr* that may explain the differential expression of these two genes in *Drosophila*.

Role of the DNA Damage Sensor, ATR in Meiotic Chromosome Segregation in *C. elegans*

Lisa Truong
Sponsor: JoAnne Engebrecht, Ph.D.
Molecular & Cellular Biology

The ataxia telangiectasia and Rad3 related (ATR) kinase is an essential DNA damage sensor in eukaryotes. While mammalian ATR mutations are lethal, *Caenorhabditis elegans* ATR (ATL-1) mutants are viable but infertile facilitating study of ATR meiotic function in a multicellular organism. A key event during meiosis is the formation of chiasmata, where genetic information is exchanged between homologous non-sister chromatids; defects in chiasmata lead to chromosome errors, resulting in aneuploid gametes. To test the hypothesis that ATL-1 functions in chiasmata formation, the number of chromosomes in meiotic nuclei from wild-type and *atl-1* mutants was analyzed. A significant increase in the mean number of chromosomes in *atl-1* mutants compared to wild-type worms was observed, suggesting that ATL-1 contributes to meiotic chromosome segregation. To determine whether ATL-1 mediates recombinational repair through homologs versus sister chromatids, the function of ATL-1 was reduced in wild-type and *syp-1* mutants, which blocks repair through the homolog. A significant increase in the mean number of chromosomes was observed in *syp-1;atl-1* double mutants compared to *syp-1* mutants, suggesting that ATL-1 plays a role in recombinational repair through sister chromatids. The results from these studies provide insight into ATR meiotic function with implication for human reproduction.

Dairy Cows Change Head Posture When Walking Through Cooling Sprinklers

Alex M. Tsai
Sponsor: Cassandra B. Tucker, Ph.D.
Animal Science

In hot weather, dairy cows can accumulate excessive body heat, which decreases milk production. Water sprinklers (commonly installed in the feeding area) can reduce body heat, but previous studies suggest that cows may avoid spray by changing their head posture. Two experiments were conducted to determine whether cows duck their heads when walking into water spray, and whether this is affected by flow rate, since higher flow rates have larger droplets that may be more perceptible to cows. In experiment 1, cows were pushed through a fenced runway 10x and exposed to 1 of 3 treatments: 0 (n=25), 0.4 (n=15), or 4.5 L/min (n=17). In experiment 2, cows (n=9 pairs) were housed 24 h/d in a pen with sprinklers (either 0, 1.3, or 4.9 L/min) in the feeding area. In experiment 1, cows ducked their heads at least 4 times more frequently when walking through 4.5 L/min compared to 0.4 or 0 L/min. In experiment 2, cows ducked their heads about twice as often when walking through both 4.9 and 1.3 L/min compared to 0 L/min. In conclusion, cows duck their heads more when walking through flow rates of 1.3 L/min or more, compared to 0.4 L/min or no spray.

Thermodynamic Analysis of Interaction in Ternary Mixed Monolayers Containing Cholesterol

Christy M. Turcios
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering & Materials Science

Biological membranes are a complex mixture of different phospholipids, cholesterol, and proteins. Cholesterol, in particular, helps maintain membrane integrity and plays an important role in regulating cell membrane function and signaling. The regulation of the membrane properties is known to be dictated by the composite interactions and thermodynamics of cholesterol and the myriad of different lipids in biological membranes. In this work, we investigated and quantified the thermodynamics of cholesterol-lipid membrane interactions in a simplified, ternary system of a saturated and unsaturated lipid with cholesterol that captures the essential properties of real biological membranes. Surface pressure – area per molecule (π-A) isotherms were obtained on a Langmuir-Blodgett trough and used to determine the phase coexistence and Gibbs free energy of the mixtures. Isotherms were obtained for pure saturated, unsaturated lipids, cholesterol and for the binary and ternary mixtures under an inert argon environment using experimental parameters that mimic the physiological conditions of mammalian cells. The Gibbs free energy of mixing enables a quantitative determination of whether lipid-lipid and lipid-cholesterol interactions are favorable (attractive) or unfavorable (repulsive). The fundamental information obtained from these studies is then put into context with other literature on the behavior and properties of complex lipid cholesterol mixtures.

Nitrogen Mineralization of Triticale and Bell Bean Cover Crop Residue in Agricultural Soil

Carly Tyer
Sponsor: William Horwath, Ph.D.
Land, Air & Water Resources

To thrive, plants need substantial amounts of nitrogen (N). Mineralization is an important process of the nitrogen cycle that converts organic nitrogen back into plant accessible forms, such as ammonium and nitrate. After cover crops grown during the rainy season are incorporated into the soil, they can provide N nutrition to cash crops. The objective of this research was to examine the N mineralization kinetics of different cover crops. We incubated Triticale or Bell Bean residue that was isotopically labeled with ^{15}N with soil from the long-term research site at Russell Ranch at a rate of 3,000 kg of residue per hectare soil. All the treatments were incubated in specimen cups in the laboratory at 55% of soil water holding capacity for 14 weeks. Mineralized N was measured 9 times. The ^{15}N in the mineralized N was measured by the UC Davis Stable Isotope Facility after a standard diffusion procedure. Preliminary results indicate that inorganic N from the bell bean residue started to become available within 3-4 weeks, but there was no net N mineralization of Triticale residue over the entire 14 weeks, suggesting that Triticale residue does not become available to a summer crop.

Determining the Role of Wnt Signaling in Primary Female Sex Determination in Zebrafish

Anastasia Utkina
Sponsor: Bruce W. Draper, Ph.D.
Molecular & Cellular Biology

Sex determination in the zebrafish is not fully understood, but occurs in the absence of sex chromosomes. It has been found that early stage oocytes are necessary for primary female sex determination. It has therefore been hypothesized that early stage oocytes produce a signal that acts on the somatic gonad to influence sex determination. However, the identity of this factor has not been determined. I am testing the hypothesis that the Wnt ligand, *wnt4a*, is required for primary female sex determination. I have so far determined that animals homozygous for the allele, *wnt4a(fh295)*, develop as mostly males, suggesting that *wnt4a* is required for female development. This analysis is complicated by the possibility that *wnt4a(fh295)* may be acting as a dominant negative, and not a null allele. To better understand the role of *wnt4a* in sex determination, I have induced a frame-shift mutation in *wnt4a* using the CRISPR/Cas9 genome editing system. I am currently breeding the mutants to determine if it has an effect on sex determination. The results of this project can shed a light on the complex mechanism of the sex determination in zebrafish.

Women's Rights and Its Effects on Civil War Onset

Helen Phuong Van
Sponsor: Kyle Joyce, Ph.D.
Political Science

Civil wars occur as a result of various factors, such as the presence of rebel groups or regime type. However, an important cause of civil wars that have not been as widely studied is the degree of women's rights within a state. A decrease of overall women's rights is correlated to an increased occurrence of civil wars. Societies with misogynistic characteristics and practice discrimination against women are more prone to experience civil war. Could it be that a country that upholds and implements women's rights engages in less civil wars? I will be exploring the link between the onset of intrastate violence and women's rights. Research and data supporting my argument comes from published academic journals, United Nations reports, and the Women's Human Rights Resources Database. Gender equality, or the lack of, reflects certain fundamental implications upon the government and the inclination towards the use of violence. When men and women in a society enjoy the same rights, benefits, and social status, intrastate conflict is less likely to occur. Understanding this connection between civil war and women's rights can give further insight into how gender equality reflects an actor's decisions and the outcome of peace.

Examining the Effects of Depression, Stress, and Self-efficacy on General Health in Elderly Asian Immigrants

Lay Vang
Sponsor: Nolan Zane, Ph.D.
Psychology

Research demonstrates that improving self-efficacy may lead to better mental and general health in the elderly population. Despite the established relationships between depression, stress, and self-efficacy on health, no studies have examined this relationship in the elderly Asian immigrant population. This study examined these relationships in a sample of 45 Vietnamese elderly immigrants (*M* age = 66.5 years). Participants reported on their levels of stress, depression, self-efficacy, and health outcomes. Hierarchical linear regressions indicated that higher levels of self-efficacy were significantly associated with higher ratings of general health ($\beta = .46$, $p < .01$), as well as stress on general health ($\beta = .49$, $p < .01$). Conversely, higher levels of depression were significantly associated with lower ratings of general health ($\beta = -.51$, $p < .01$). Results about self-efficacy and depression on general health supported two of our hypotheses, but indicated the opposite from our hypothesis of stress on general health. This may be due to the way immigrants adapt and cope with stress. Findings suggest that prevention programs focused on building self-efficacy and depression may aid in mental health services for elderly Asian immigrants.

Meiotic and Mitotic Correction in *Caenorhabditis elegans*

Elizabeth Vargas
Sponsor: Frank J. McNally, Ph.D.
Molecular & Cellular Biology

In mitosis, a parent cell divides into two identical daughter cells that have the same number of chromosomes as the parent cell. My lab previously found that the extra chromosome of trisomic zygotes, 1 celled embryos with an extra copy of one chromosome, is sometimes lost during early mitotic divisions in *Caenorhabditis elegans*. This loss suggests a possible correction mechanism that eliminates the extra chromosome, thus preventing aneuploidy. To further study this, I conducted fluorescence in situ hybridization (FISH) on wild type worms and counted the copy number of chromosome V in 1 and 2 celled embryos. I found that the majority of wild type mitotic embryos were euploid. After obtaining sufficient data, I will be conducting FISH on triploid worms and will be counting the number of chromosomes in 1 and 2 celled embryos to observe if a mitotic correction mechanism is occurring in triploid worms. I also counted the number of F1, F2, and F3 hatched larva and unhatched eggs of triploid worms. From these counts, we expect to see more than the 1.5% euploid worms expected from random meiotic segregation, thus demonstrating a correction mechanism in triploid worms.

Visualizing Socioeconomic Differences in Los Angeles

Evelyn G. Vasquez
Sponsor: Matthew Stratton, Ph.D.
English

In Los Angeles there are differences between what the lower and the upper-middle classes see when they step out of their homes. In central Los Angeles, there are an abundance of lower income housing units that are built within freeways, factories, and train tracks. On the other hand, the upper-middle classes typically live in more residential spaces characterized by grass areas and trees. For my research question I ask, "What is the relationship between visuals and socioeconomic mobility?" My particular interest is the visual perspective of the lower income housing communities that can function as enclaves. For my evidence, I will measure the distance on how close the lower income housing units are from industrial structures in comparison to living in places where there is more nature and then use photographs to show the visual impact that industrialization has on people in lower income housing. I will also use historical material, scholarly articles, and statistics as evidence for other factors, such as physical and emotional health and linguistic and ethnic isolation that people living in lower income housing are likely to experience, which can possibly result in limited resources for social mobility.

Explorations Through Found Abstractions

Patricia Velazquez
Sponsor: Young Suh, M.F.A.
Art & Art History

Pablo Picasso once said, "There is no abstract art. You must always start with something. Afterward you can remove all traces of reality." This quote is reminiscent of an interesting conflict between reality and abstraction that I am experiencing with my work as it develops. I am inspired by the simplicity and randomness of the things I encounter in my daily life. The potential for discovery is what drives me to make art. My current body of work examines forms, patterns and textures found within man-made objects. I am exploring through different mediums such as photography, painting and sculpture. I explore the unique properties of these mediums to find the one that best suits a given inspiration. This inevitably happens by choice and chance. I strive to create compelling work from close observation. Like Picasso, I then abstract an observation to engage the viewer and take them to places and incite the imagination.

Albert Bierstadt and the California Capriccio

Diana Vera
Sponsor: Diana V. Strazdes, Ph.D.
Art & Art History

Tourism to Italy in the 1700s made popular a painting type called a *Capriccio.* This type of painting fancifully combined the scenic views and architecture that tourists expected to see. The *Capriccio* was an imaginary scene in which recognizable details of sites were given a new and usually grander context; the type was exemplified by the paintings of the Italian Giovanni Paolo Panini (1691-1765). This project examines the unexpected afterlife of the *Capriccio* in the landscapes of American painter Albert Bierstadt (1830-1902). It proposes a connection, not previously recognized, between these two leading artists who worked over a century apart. Exhibition catalogs, biographies, academic articles, historical texts, and the paintings themselves form the basis for this speculation. Until now, the writers on Bierstadt have generally overlooked both his time in Italy and the effect that earlier art there had on him. Yet, a comparison of Bierstadt's paintings with Panini's reveals many parallels: in the construction of the scenes, significance of the landmarks depicted, and in the paintings' basic purpose. These similarities hint at an influence on Bierstadt that may shed new light on his travels through Italy and the motives behind the grand landscapes that he ultimately painted.

Maternal Iron Status is Associated with Fetal Alcohol Spectrum Disorder Abnormalities

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Fetal Alcohol Spectrum Disorder encompasses a group of adverse neurodevelopmental and physical abnormalities associated with prenatal alcohol exposure. Optimal maternal nutritional status may play a role in attenuating the teratogenic effects of alcohol on the growing fetus. This study explored the relationship between maternal iron status and FASD-related growth abnormalities. This study included 250 Ukranian pregnant women from the Collaborative Initiative on Fetal Alcohol Spectrum Disorders (CIFASD). Blood samples were drawn for measurement of iron status. Linear regression analysis was used to test the association of iron measures on infant-related growth abnormalities. Women who consumed alcohol during pregnancy were less educated, had lower socio-economic status, higher parity, lower use of multivitamins, and lower serum iron compared to their non-exposed counterparts. Lower serum iron was significantly associated with lower birth weight, shorter birth length, and smaller head circumference. Lower serum transferrin receptor levels were significantly associated with higher birth weight, longer birth length, and larger head circumference, only among those consuming alcohol. No associations were found in non-drinkers. Altered maternal iron status as a result of alcohol consumption may explain at least part of the FASD-related growth abnormalities. Improved maternal iron intake may improve growth outcomes related to FASD.

The Mating Frequency of Female Titi Monkeys

King Paul Deo Villegas
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Psychology

In most mammals, mating behavior occurs exclusively during the female's estrus. New World monkeys are unusual in that mating has been observed outside of estrus, however, little is known regarding patterns of mating across the cycle and particularly, during pregnancy. Titi monkeys (*Callicebus cupreus*) are a monogamous New World monkey which has an estrus cycle that lasts 17.7 days. Gestation is approximately 128 days. One infant is born per year, and in postpartum, the mother titi monkey undergoes lactation amenorrhea that lasts 6.5 months. Investigating the frequency of mating before and during pregnancy of female titi monkeys not only furthers our understanding of the effects of pregnancy on the pattern of mating behavior, but also provides a comparison to non-monogamous species. Video data from five female titi monkeys, housed at the California National Primate Research Center, are being examined for mating (mounting) frequency before and during pregnancy, and during the postpartum anovulatory period.

A Computational Modeling Investigation Into the Cellular Mechanisms of *SCN10A*-Linked Brugada Syndrome

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Brugada syndrome is an inherited disease that increases the likelihood of cardiac arrest and is one of the most common causes of sudden death in men without a known cardiac disease. The effects of Brugada syndrome are arrhythmias, fluttering/pounding of the heart, and shortness of breath. Recently, single nucleotide polymorphisms, SNPs, and missense mutations on the *SCN10A* gene on chromosome 3 have been shown to contribute to Brugada Syndrome. *SCN10A* encodes a neuronal Na^+ channel protein, $Na_V1.8$ that has recently been shown to affect electrical function in the heart. Two mutations in *SCN10A*, R14L and R1268Q, have been shown to result in a loss of $Na_V1.8$ function. We hypothesize that a loss of function in the $Na_V1.8$ sodium channel will disrupt cardiac cellular level excitability by causing premature repolarization. In this study we will develop and use a computer model to predict the effects of the R14L and R1268Q mutations on cardiac cellular excitability at fast and slow heart rates. By identifying the cellular mechanism of the disease, we expect this study to help inform appropriate therapy for patients.

Cost Analysis of Angioplasty Versus Stenting in the Treatment of Peripheral Arterial Disease

Margarita Vinogradova
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Peripheral Arterial Disease (PAD) is the result of arterial narrowing from plaque within arteries causing reduced blood flow. The most common symptom of PAD in the legs is pain with walking, known as claudication. Endovascular treatment with balloon angioplasty (BA) or primary stenting (PS) is first-line therapy; however, debate continues about long-term results in the femoropopliteal vessels for these procedures. This study aimed to compare costs associated with BA versus PS for patients with claudication. A retrospective analysis was performed on 24 claudicants (PS=15; BA=9) with complete cost data identified through the UCDMC Vascular Center PAD database. Demographic, procedural, and cost data associated with the index procedures, radiologic surveillance, clinical follow-up, and reinterventions was collected. Mean costs of PS were $14,019 more than BA. BA resulted in a median net loss of $1,372, while PS resulted in median net revenue of $4,301 (p-value: 0.30). More BA patients (56%) than PS patients (40%) had a negative cost margin for the initial procedure (p-value: 0.47). This study demonstrated cost differences and the associated cost margin that may drive selection of one procedure over another. Larger future studies with better cost accounting are essential for understanding the driving forces behind these interventions.

Heritability of Ovarian Adiposity in White Sturgeon

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Animal Science

Sturgeon aquaculture has developed to alleviate reproductive pressures on vulnerable wild populations. However, the large size, slow growth, and late maturation of sturgeon hinder rapid progress. One particular problem faced by sturgeon farmers is highly variable caviar yield due to ovarian adiposity. As part of a multifaceted study that looks at aspects including diet, age, and location/farm, we examine the contribution of genetics to fat accumulation in white sturgeon (*Acipenser transmontanus*) ovaries. In this project, we use parentage analysis to identify families among sturgeon of unknown relatedness so that heritability analysis can be performed. Approximately 1000 individual sturgeon have been genotyped using fragment analysis on an ABI 3730 DNA Analyzer at twelve microsatellite loci (Actm 2, Actm 15, Actm 35, Actm 52, Actm 53, Atr 105, Atr 107, Atr 109, Actm 110, Atr 117, Actm 177, and Atr 1173). These markers were used to identify half-sibling families and perform narrow sense heritability analysis to understand whether selective breeding will influence ovarian adiposity in white sturgeon aquaculture.

Lipoprotein(a) and Apolipoprotein(a) in Women with Polycystic Ovary Syndrome

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Internal Medicine
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Lipoproteins, which deliver cholesterol throughout the body, are risk factors for cardiovascular disease (CVD). Increased levels of Lipoprotein(a) [Lp(a)], a type of plasma lipoprotein, are associated with higher risk for CVD. Lp(a) levels are genetically regulated through the apolipoprotein(a) [apo(a)] gene where a size polymorphism plays a major role. Lp(a) levels are not appreciably affected by lifestyle changes or lipid-lowering drugs, but are impacted by sex hormones. Polycystic ovary syndrome (PCOS) is the most common endocrine disease in young women and is associated with an imbalance of sex hormones. PCOS women are at significantly increased CVD risk, however the role of Lp(a) in PCOS-related CVD remains elusive. To investigate the impact of PCOS-related hormonal changes on plasma Lp(a) levels in relation to apo(a) genetic variability, we assessed: 1) Lp(a) levels, 2) apo(a) size polymorphism, 3) isoform-specific apo(a) levels, assessing the amount of Lp(a) carried by a defined apo(a) isoform, and 4) sex hormones in 41 Caucasian women with PCOS. Although there was a trend towards negative correlations between levels of Lp(a) or allele-specific apo(a) with hormonal levels, these trends were not statistically significant. We conclude that the apo(a) gene remains the major regulator of plasma Lp(a) levels in PCOS women.

The Synapse Is the Most OGD-Sensitive Portion of the Hamster CA3 to CA1 Hippocampal Neural Circuit

Nicholas L. Vitagliano
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Neurobiology, Physiology & Behavior

Exposure of the mammalian hippocampus to oxygen glucose deprivation (OGD), a model simulating stroke-like conditions, results in decreased hippocampal signal transmission. Compared to the rat, a non-hibernating species, hippocampi from Syrian hamsters (a hibernating species) demonstrated greater tolerance to OGD, consistent with greater neuroprotection. This experiment was designed to determine which component of the hamster hippocampal neural circuit was most sensitive to OGD: the incoming signal from axons of CA3 neurons, the CA3 to CA1 dendritic tree synapse, or the CA1 soma. I hypothesized that the CA3 axons synapsing onto CA1 dendritic trees would be the most OGD sensitive and thus fail first with respect to signal transmission. To test this hypothesis, I first measured CA1 population spikes evoked by orthodromic stimulation of CA3 axons and compared response disappearance during OGD to that elicited by antidromic stimulation of axons exiting CA1 neurons. I found that antidromic stimulation was more OGD tolerant. I then placed the recording electrode into the CA1 dendritic tree, measuring fEPSPs from the CA3 to CA1 synapse and CA3 axon fiber volley. The CA3 axon proved to be more tolerant, indicating that the CA3 to CA1 synapse is the most OGD-sensitive portion of the pathway.

Identifying Cancer Mutations as Chemotherapeutic Targets

Kim H. Vo
Sponsor: Ken Kaplan, Ph.D.
Molecular & Cellular Biology

The high rate of chemotherapeutic drug resistance that leads to cancer relapse in patients continues to be one of the major challenges in treating cancer. Tumors possess a complex mutational landscape, thus identifying the relevant changes associated with drug resistance is rather challenging. Our strategy includes taking advantage of the much more facile genetics in the budding yeast, Saccharomyces cerevisiae. We focused on a class of chemotherapeutics that delay DNA replication (i.e., hydroxyurea, HU) since this pathway is highly conserved between yeast and mammalian cells. Our lab chose strains that contain mutations in pathways that also exist in cancer cells to mimic how the cancer cells respond to HU. We selected mutations that affect DNA repair (rad52Δ), cytoskeletal dynamic (bim1Δ) and chromosome segregation (skp1-4), all of which are sensitive to HU and therefore mimic cancer cell mutations. These strains are used to investigate the hypothesis that inhibition of the Hsp90 chaperone pathway, an essential pathway for cell adaptation, will affect the frequency of drug "resistance" in these strains. We conclude that strains with mutations in cytoskeletal dynamic show a higher rate of resistance to the drugs compared to mutations in DNA repair and chromosome segregation.

The Interclinic Consortium and the UC Davis Student-Run Clinics: Understanding Health Disparities Through Demographic Data Collection

ThanhThanh Vo
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Public Health Sciences
School of Medicine

According to the Centers for Disease Control, chronic disease is the leading cause for 70% of all deaths, which is 1.7 million each year. However, rates of chronic diseases are much higher in underserved communities, where patients do not have adequate access to health services and resources to manage their symptoms. Despite the UC Davis student-run clinics' effort to manage chronic diseases, health disparities are widely recognized as challenging problems to eradicate. In May 2013, the Interclinic Consortium was established to understand our student-run clinics' targeted populations and to optimize resources and health quality. With two branches, Interclinic Research and Interclinic Affairs, we aim to create baseline patient demographic data and encourage collaboration among the student-run clinics. A standardized, anonymous survey was formed to study the relationships between the social determinants and chronic diseases. With 18 questions ranging from basic demographics to self-disclosed chronic conditions, a total of 780 patients were surveyed since January 2014. By using quantitative and qualitative analyses, the research study demonstrated a statistically significant correlation between the most prevalent chronic diseases and the social determinants—insurance, ethnicity, income, education, and nativity.

Infant's Scanning of Dynamic Faces

Tina T. Vo
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Psychology

Infants spend a majority of their early life interacting with human faces. Thus, recognizing faces, learning facial features and expressions are important skills. An important question is how do infants learn about faces. We asked how the expressiveness of the dynamic faces influence the strategies infants use when learning about faces. In an on-going study, we are showing infants videos of women reciting a nursery rhyme. We recorded each woman reciting the rhyme in a neutral adult-directed manner and in an animated infant-directed manner (characterized by exaggerated facial expressions and increased movement of the head/facial features). We are measuring infants' eye gaze (using an eye-tracking device) as they watch these videos, and we predict a difference in how infants scan neutral faces in comparison to expressive ones. This is an important point since infants are more likely to experience animated dynamic faces (infant directed speech), rather than neutral dynamic faces in their daily lives.

Inhibition of Inflammatory Tendinitis by Resveratrol in 3D Engineered Tendon

Whitney Vuong
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Neurobiology, Physiology & Behavior

Tendonitis is a common inflammatory disease that causes chronic pain if left untreated. Tumor necrosis factor alpha (TNF-α) is an inflammatory cytokine thought to play a role in tendonitis. Resveratrol is a natural product found in red grape skin that inhibits TNF-α in many cell types, but resveratrol's influence on connective tissue function remains uncertain. The goal of this study was to investigate the effects of TNF-α on tendon function and determine whether resveratrol could reverse any negative effects. Cells isolated from human ACL remnants were used to form 3D engineered tendons. Tendons were treated for 8 days with a vehicle; 10ng/ml TNF-α; 50nM Resveratrol; or both factors. At the end of the treatment period, maximal tensile load (MTL), ultimate tensile strength (UTS), modulus, and collagen content were determined. We found that TNF-α decreases the modulus, MTL, UTS, and collagen by ~50% relative to the vehicle. However, the addition of resveratrol to TNF-α treated tendons returned tendon function and collagen content to vehicle levels. This study demonstrates that TNF-α negatively effects tendon function and that resveratrol can prevent this impairment, suggesting that resveratrol may be effective in treating tendonitis. We are currently investigating the molecular pathway underlying this effect.

The More the Merrier? Investigating the Effects of Elevated Levels of Rnf212 in Meiosis

Alex Wang
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Microbiology & Molecular Genetics

Rnf212 is a dosage dependent pro-crossover factor, and lower levels of RNF212 may be a risk factor for miscarriages and other genetic disorders. In this project, I will explore the effects of elevated RNF212 using different transgenic Bacterial Artificial Chromosome (BAC) mouse lines. These lines, specifically B, C, H, I, O, and Q have already been stabilized, and can be easily manipulated to produce offspring of differing genotypes. Quantitative PCR along with Western blots will be utilized to measure copy numbers and protein levels respectively for each line using favorable genotypes such as Transgenic Wild-type mice. Once RNF212 levels have been accurately quantified within each line, MLH1 foci and chiasmata structures will be repeatedly counted and compared to demonstrate the cytological manifestations of excess RNF212. These findings will help investigate the dosage dependent nature of RNF212 in crossover formation and the effects of increased RNF212 during certain stages of meiosis.

Seagrass Beds: Can *Zostera marina* Beds Provide Refuge for Calcifiers in the Face of Ocean Acidification?

Bonnie Wang
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Earth & Planetary Sciences

Recent global climate change, caused by the increase of carbon dioxide (CO_2), from anthropogenic sources, is negatively impacting the ocean. The equilibrium of ions in the ocean is shifted to favor the production of hydrogen (H^+) ions and bicarbonate (HCO_3^-). These ions decrease the pH in the ocean, causing ocean acidification. Acidification impacts calcareous organisms negatively by changing the equilibrium to disfavor the production of carbonate ions (CO_3^{2-}), a main component in shells and skeletons. However, the utilization of CO_2 through photosynthesis in the seagrass beds (*Zostera marina*) creates a buffer zone from uniformed acidification. This project examines how the buffer zone effects calcification by quantifying the complete microfossil assemblage (foraminifera, ostracods, and bivalves) of a seagrass bed located at Chicken Ranch Beach, Tomales Bay, California. I investigated 6 push cores (4 inside the seagrass bed, 2 outside), each 14-16cm in length and subsampled at 4 cm resolutions. In addition to the complete microfossil assemblage, I investigated the ratio of agglutinated to calcareous foraminifera and percent of calcium carbonate ($CaCO_3$). Preliminary results show that there are more calcareous foraminifera outside the seagrass bed, which can be accounted for due to the higher variability in percent $CaCO_3$.

Alzheimer's Disease Neuroimaging Initiative: Subjective Memory Complaint Has Measurable Biological and Clinical Features

Cathy Wang
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Public Health Sciences
School of Medicine

Patients with Alzheimer's disease typically report having memory problems years before clinical diagnosis. We examine baseline cognitive and clinical test profiles for 100 participants with subjective memory complaint (SMC) and compare them with 186 normal controls (NC). Logistic regression and classification trees are used to predict the likelihood of SMC. Unsupervised clustering based on MRI and CSF markers identifies three clusters for both the NC and SMC groups. There is considerable heterogeneity in both groups and overlap between the two; there is, however, a significant difference in means of test scores, especially those related to memory. Cluster analysis reveals that SMC parallels NC across all MRI and CSF markers. NC2 and SMC2 are characterized as the healthy clusters with high brain volume and amyloid-beta (1-42). NC1 and SMC1 differ significantly on all MRI but not CSF measures, whereas NC3 and SMC3 have significantly worse CSF measures but good MRI. Although NC and SMC have similar biological and genetic profiles, we can, to some extent, distinguish them based on clinical measures. Both groups contain a cluster of participants who are clearly normal as well as a cluster of participants who may have prodromal signs of AD.

Abracadabra, Hexes, and Process Thought: Realizing Magick in Feminist Wicca

Deyu Wang
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Religious Studies

America's mainstream society considers magic as a combination of supernatural nonsense, themes of entertainment, and an umbrella word to describe indescribable events. However, Wicca, the counter-cultural Neo-Pagan religion, adopts the word as a form of resistance against a predominantly male-driven culture. By transforming socially devalued words such as magic into *magick*, Wiccans attempt to salvage and validate their practices. Hence, *magick* reclassifies and revives ancient traditions. This allows Wiccans to create their culture within the society that rejects them, and provides the freedom of interpreting *magick*. For instance, Constance Wise, a Wiccan priestess and professor of theology, uses the metaphysical philosophy of process thought to explain Wiccan ritual and thought. By applying this philosophy, *magick* becomes a metaphysical event. The practice of spells such as *abracadabra* and the Black Art hexing spell exemplifies how process thought can be used to explain and salvage socially devalued, magical terms. Furthermore, it demonstrates a defense and resistance against the dominant culture. The Wiccan status as a subcultural feminist group serves as an agenda in their salvation of *magick*. From these instances, *magick* becomes a tool and mediator for Wiccans against their social environment.

Performance Variability Due to Job Placement on Edison

Dylan Wang
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Computer Science

Some applications running on machines like the Edison Supercomputer can suffer from high variability in run-time. This leads to debugging and optimization difficulties and less accurate reservation times resulting in lower efficiency of the supercomputing facility. The objective of this research is to characterize the application run-time performance and identify the root cause of the variability on machines with the Aries interconnect. We approach this problem by running the scientific application, MIMD Lattice Computation (MILC), while collecting the set of logical coordinates for every job's nodes in the system and hardware counters on routers connected to our application's nodes. Running these applications at various sizes once per day gives us many unique allocations and system states with corresponding execution times. We then use statistical analysis on the gathered data to correlate performance with placement and interference. Our results show interesting insight on the effects of MPI collectives and minimal routing, as well as the lack of impact from node placement, on performance variation.

Differences in RE Array Profiles Between Cats and Dogs Suggest Their Contribution to Species-Specific Phenotypes

Zhuolin Wang
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The remarkable level of sequence homology of genes between cats and dogs has failed to explain the apparent phenotypic discrepancies between the two species. Repetitive elements (REs) make up the majority of genomes, in contrast to genes which ostensibly account for 3% of the entire genome. Genes have been the focus of extensive research in the past several decades, whereas REs have received less attention. We want to understand the potential biological significance of REs in phenotype determination. Using REMiner, a computer program that implements an unbiased sequence self-alignment protocol and dot-matrix algorithm, we visualized and explored the complex arrangement structures of REs, called the RE array. When comparing RE arrays of cats and dogs, drastically different combinations of repeats with various densities, sizes, and orientations were found. These differences in RE array profiles suggest their contribution to to the species-specific phenotypes in cats and dogs.

Mobile Sensing Platform for Data Driven Strawberry Farming

Jeffrey Ware
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Mechanical & Aerospace Engineering

Monitoring field conditions is crucial for high crop yields; accurate information about soil moisture, salinity and overall plant health can allow farmers to optimally adjust watering patterns and plant treatment, while misinformation or a lack of information can result in arbitrary and unfavorable action. My senior design group sought to design and build a mobile sensing platform that can assess strawberry field conditions at the plant by plant level. This was achieved through the use of an agricultural robot which is equipped with a suite of sensors, a probe and cameras for image processing. As a mechanical engineering problem this project presented many challenges in the form of stability, steerability, adjustability, driving, vibration mitigation and controlled actuation. The result was an aluminum welded frame, equipped with pneumatic wheels, steel axles, a probe to be plunged using a linear actuator, a weather proof box and other supporting hardware. The unusual "outrigger style" frame structure that the final project bears was implemented to overcome the furrowed cross-section geometries of a strawberry field, while an emphasis on placement of the center of gravity was used to optimize steering ergonomics.

Determining the Function of T-DNA *rol* Genes in *Agrobacterium rhizogenes* Pathogenicity

Barbara M. Waring
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Plant Biology

Agrobacterium rhizogenes is a Gram negative soil bacteria with the ability to induce hairy root disease upon interaction with wounded plant tissue. The mechanism of infection occurs through passage of genetic material from the bacteria to the plant, where the transfer-DNA (T-DNA) is then inserted and expressed as a part of the plant genome. Expression of these genes within the plant leads to hairy root disease which is defined by development of a thick, multi-branching root system. In an attempt to understand the pathogenesis of *A. rhizogenes* strain ATCC15834, I have identified the T-DNA and a series of *rol* genes within it which are believed to be responsible for induction and maintenance of hairy root growth. Further exploration will be done using molecular cloning techniques and targeted genome editing to determine whether each one of these *rol* genes is sufficient and necessary for inducing and maintaining hairy root growth. Furthermore, I will be quantifying levels of expression and determining in which root cell types *rol* genes are expressed using *Solanum lycopersicum* cv. M82 as the model plant organism.

Establishing a Detectable Protein Phenotype for the SNORD116 Deletion Mouse Model of Prader-Willi Syndrome

Joanna B. Watterson
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Biochemistry & Molecular Medicine
School of Medicine

Prader-Willi Syndrome is a rare and complex genetic neurodevelopmental disorder caused by the mutation of a paternally-inherited gene cluster on human chromosome 15. There are a number of knockout animal models of this disorder that demonstrate elements of the human phenotype with varying degrees of severity. Animal models are useful for basic and applied science questions; pathological mechanisms are investigated using them and novel treatment attempts utilize them for preliminary tests of efficacy and safety. Therefore, it is important to accurately characterize the phenotype of these animals versus wild-type controls. This project utilized one particular model that involves a complete deletion of a particular snoRNA, SNORD116. Because this model relies on the absence of a noncoding RNA transcript and not the knockout of a coding gene, protein detection cannot be used as a direct comparison. However, this snoRNA transcript is thought to affect the metabolic phenotype of these animals in a similar way to the human mutation, likely via interactions with metabolic proteins. This project attempted to establish a reliable protein phenotype in blood plasma and brain tissue in the SNORD116 deletion model. Western blots were used to compare levels of three circulating hormones in model PWS and wild-type animals.

Investigating Phenotypic Plasticity in *Drosophila suzukii*, the Spotted Wing Drosophila

Jessica D. West
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Entomology & Nematology

Drosophila suzukii is native to Japan, but has recently become a major invasive pest of a wide variety of fruit crops. This vinegar fly uses an enlarged, serrated ovipositor to slice into the skin of fresh fruit and lay its eggs inside, where the larvae feed until maturation. Since its introduction to California in 2008, this fly has been rapidly spreading and is now found in over 35 US states, Canada, South America, and Europe. In Oregon, where *Drosophila suzukii* populations must face harsher winters, we have observed that flies collected in winter are larger and darker than those collected in summer. We hypothesized that these phenotypic differences are associated with higher fitness during the winter. Results show that flies reared in simulated winter conditions were larger and darker than flies reared in simulated summer conditions. The winter morph was also able to survive colder temperatures for much longer than the summer morph. My goal is to determine differences in gene expression between the summer and winter morphs using transcriptome analysis. Understanding phenotypic plasticity in this species will lead to improved population models that will allow better management of this pest.

Agrobacterium-Mediated Transient Expression of Genes in Plant Shoot Apical Meristems

Eric Wetzel
Sponsor: Stacey L. Harmer, Ph.D.
Plant Biology

One powerful way to characterize gene function in plants involves inducing expression of foreign or endogenous genes in specific regions or tissues. This can be done by generating stable transgenic lines or by using transient expression system, with the former being time consuming. In contrast, transient gene expression, which involves non-permanent introduction of genes into a plant, is a much more rapid process. All above ground organs, and hence all progeny, of a plant spawn from the small but versatile shoot apical meristem (SAM). Genes that control the function of the SAM were first cloned in 1989, and since then our knowledge of its mechanisms has expanded vastly. Roles for genes expressed in SAM have been identified in the model plant *Arabidopsis thaliana* through stable expression lines. In addition, transient gene expression in SAMs of sugarbeet, wheat, rice and pear has been achieved using particle bombardment approaches in excised tissues. This project will attempt to express a GUS reporter gene under a SAM-specific promoter via an *Agrobacterium*-mediated transient gene expression system in the SAMs of intact *Arabidopsis*, tomato, *Nicotiana benthamiana*, and sunflower plants. Success of this approach might provide an inexpensive and fast method for characterization of SAM genes.

Autism Risk in Children Born to Women With Pre- or Perinatal Psychiatric Diagnoses

Bridget M. Wieckowski
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MIND Institute
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We sought to determine the extent to which maternal psychiatric diagnoses during pre- or perinatal hospitalizations were associated with offspring autism risk. This retrospective cohort study linked hospital records for 8,951,763 California singleton births occurring 1/1/91-12/31/08 from the Office of Statewide Health Planning and Development (OSHPD) with diagnostic and service records from the Department of Developmental Services (DDS). Pre- or perinatal inpatient maternal mood and anxiety disorders and schizophrenia ICD-9 codes were identified, and 42,423 children were diagnosed with autism. Through adjusted analyses it was found that mothers diagnosed with *any* individual psychiatric condition were 1.4-2.2 times more likely to have a child who developed autism. Mothers diagnosed with *any* mental health disorder during pregnancy were 80% more likely to have a child with autism compared with women without these conditions (RR= 1.79; 95% CI 1.66-1.92). These findings highlight the need for routine prenatal screening for and treatment of psychiatric conditions, as well as enhanced neurobehavioral assessment of children born to these mothers to detect early signs of autism and optimize intervention timeliness.

Paris's Second Empire Transformation Parallels

Emily C. Wikle
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Art & Art History

During France's Second Empire (1852-1870), Emperor Napoleon III sponsored many public works projects within Paris. In an address to the citizens of Paris, Napoleon III declared his intentions to *aérer, unifier, et embellir* the city: to give it air and open space, to build new streets to connect the different parts of the city, and to make it more beautiful. Over the course of Napoleon III's reign, Prefect of the Seine Georges Eugène Haussmann, architect Hector Lefuel, and Director of Fine Arts Émilien de Nieuwerkerke each lead projects to modernize Paris and bring it to the glory that Napoleon III envisioned. At first glance, these men and their projects have nothing more in common than their patron. Looking deeper, the total renovation of Paris's urban plan, the completion of the magnificent Louvre, and the modernization of the imperial museums share several common principles. Although these men in very different positions never worked together, their public works projects all echoed the vision that Napoleon III had for Paris: *aérer, unifier, et embellir.* The contributions made by these men, perfected by the emperor's vision, remain emblematic of the great city to this day.

Effects of Topical Application of Zinc on Testicular and Epididymal Development in Pigs

Adrianna C. Wimenta
Sponsor: Trish Berger, Ph.D.
Animal Science

In recent decades, a decline in the sperm count of human males has been reported. Studies have suggested that a single zinc injection directly into the testicle induces sterility in dogs and cats, although the mechanism of action currently remains unclear. This knowledge, coupled with knowledge from other studies that indicate some absorption of zinc through the skin via application of sunscreen, raises the idea of a possible correlation between topical application of zinc and male sterility. The research project involves the daily application of zinc oxide to scrotums of very young pigs. The purpose of the project is to understand the effects that topical application of zinc ointment may have on testicular and epididymal development in these animals. Currently the project is ongoing, but preliminary findings suggest a greater epididymal weight in the treated piglets compared with the control piglets. Information gathered from this study may be useful to consider in regards to sterility.

The Middle East and North Africa in U.S. Media Representation: In the Eyes of the West: Exploring U.S. Media Portrayals of Ottomans

Joshua Wizman
Sponsor: Suad Joseph, Ph.D.
Anthropology

My research investigates the *New York Times*' portrayal of the Middle East through textual and visual data from the years 1920-1929. I examined 1263 articles under the term "Ottoman" in the *NYT*. Through in-depth analyses of 97 relevant articles I document aforementioned reoccurring patterns. The preliminary findings suggest a pattern of misrepresentation and a notion of linear modernity are imposed on the subjects within the *New York Times*. Ottomans were represented as medieval, violent, and incapable. I argue that the representations of the Ottoman Empire during this period reinforced the notion that ideas of progress belong to secular European values and that European's assistance was required to transition the Ottoman Islamic Empire to the Turkish secular republic. Analysis of the *New York Times*' representations of Ottomans leads us to question the liberal and progressive posture of the newspaper. This research is a part of a larger project analyzing 150 years of The New York Times conducted in the Lab of Dr. Suad Joseph.

Olfactory Bulb Mitral Cell Dendritic Morphogenesis and Plasticity

Gary Wong
Sponsor: Qizhi Gong, Ph.D.
Cell Biology & Human Anatomy
School of Medicine

The mutation of the MECP2 gene in humans is responsible for the Rett syndrome. MECP2 is located on the X chromosome. Typically, females can survive with this mutation leading to a neurological disorder called Rett syndrome which have symptoms very similar to those of autism. MECP2 knockout mice resembles Rett phenotypes and therefore are good models to study MECP2 function. We aim to determine MECP2 function in mitral cell dendritic morphogenesis in the olfactory system. The design of this experiment is to use confetti transgenic mice and mitral cell specific CRE to visualize the mitral cell dendrites in both male and female mice. Confetti transgenic strain allows generation of multiple color labeled cells dependent upon tissue specific CRE function. Mitral cell specific tamoxifen dependent CRE will recombine the Confetti locus and allow visualization of single cell morphology. To visualize mitral cell during embryonic development, we will administer tamoxifen by intraperitoneal injection at embryonic day 14. Mitral cell morphology will be evaluated at embryonic day 18 and postnatal day 0. Mice carrying Confetti, mitral cell CRE-er and MECP2 KO alleles are being used. The results will help us understand more about the MECP2 gene and further the research of Rett syndrome.

Alternative Epitope Recognition for ATM/ATR Substrate Antibody

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Molecular & Cellular Biology

ATM and ATR damage signal kinases are both required for checkpoint responses to DNA damage. They have ubiquitous roles with more than 700 protein targets as monitored by labeling with an ATM/ATR substrate antibody. However, the ATM/ATR substrate antibody in *C. elegans* germ lines unexpectedly displays staining in *atm; atr* double mutants, suggesting that this antibody is binding to different epitopes in meiotic cells. The staining in *C. elegans* occurs on the nuclear envelope, where chromosomes are brought to the nuclear envelope for homologous pairing during Prophase I. To test the hypothesis that this antibody is recognizing substrates for PLK-2, a polo-like kinase known to phosphorylate SUN-1, a nuclear transmembrane protein required for homologous pairing, I analyzed staining in wild type and *plk-2* depleted worms. I observed significantly less staining in *plk-2* depleted worms than in wild-type worms, suggesting that PLK-2 substrates are recognized by ATM/ATR substrate antibody in *C. elegans* germ lines. I am conducting further analysis by depleting *sun-1* in wild type and in *atm; atr* double mutants to determine whether the staining observed is dependent on the PLK-2 substrate SUN-1. These studies will contribute to usage of the ATM/ATR substrate antibody in meiotic experiments.

Counteracting Strychnine With Peptide Built From Solid Phase Peptide Synthesis From Structure Determined by OBOC Library to Bind With High Affinity

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Biochemistry & Molecular Medicine
School of Medicine

From the seeds of Strychnos nux-vomica tree, strychnine is a toxic crystalline alkaloid that when exposed, leads to muscular convulsions and asphyxia in merely hours. The one-bead-one-compound (OBOC) combinatorial library method is applicable for the determination of high affinity strychnine capturing agents. This library consists of hundreds of thousands to millions of arbitrary compounds constructed on polystyrene beads. Building the peptide on Tentagel polystyrene beads allows for OBOC compound screening. After screening OBOC libraries for strychnine capturing using autoradiography, we revealed the compound through sequencing. From previous research, we believe a peptide with a turn, branch, or macrocyclic structure is responsible for capturing strychnine with high affinity. Through solid phase peptide synthesis (SPPS), we will build the capturing agent on Rink polystyrene beads that allow acid cleavable access to a free peptide for *in vivo* experimentation. Such capturing agents can be used as antidotes for the treatment of strychnine poisoning or for strychnine detection.

The Development of a Dual-Modal Iron-Oxide Nanoparticle Contrast Agent Targeting VCAM-1 for *In Vivo* PET/MRI Imaging of Atherosclerotic Plaques

Winnie W. Wong
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Biomedical Engineering

Cardiovascular Disease is the leading cause of deaths worldwide and is expected to increase in the future. Atherosclerotic disease is demonstrated to be most significantly responsible for most of the major cardiovascular events that occur. In particular, vulnerable atherosclerotic plaques can result in the rupture of plaques hindering the circulation and thrombosis. With the rise in atherosclerotic disease, the demands for early detection strategies are crucial. The employment of Positron Emission Tomography and Magnetic Resonance Imaging are leading noninvasive *in vivo* imaging modalities for the detection of atherosclerotic plaques. Currently, a dual-modal iron-oxide nanoparticle contrast agent has been synthesized for targeting vascular adhesion molecule-1 (VCAM-1) for *in vivo* PET/MR imaging of atherosclerotic plaques. The dextran coated iron oxide nanoparticles specifically accumulates at plaques as a result of VCAM-1 recognition. Further assistance in the synthesis of the dextran coated iron oxide nanoparticle as well as with *in vitro* cell studies on human aortic endothelial cells to identify its ability to uptake the nanoparticle were conducted. Additional physical property characterization includes hydrodynamic diameter/core size of the nanoparticle. The future work will be focused on the toxicity and *in vivo* animal studies.

Allocentric and Egocentric Spatial Representations: Restricted View Map Learning in Virtual Environments

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Psychology

The extent to which human participants utilize exclusively allocentric (environmentally-referenced) or egocentric (view-centered) representations is unclear (Ekstrom et al. 2014). We attempt to "force" the utilization of one type of spatial processing. The game engine Unity is used to build virtual environments for participants to navigate. To emphasize egocentric representations, we use conditions that restrict view by virtual "blinders," which restrict movement by using built-in rails and only allow participants to look towards their destination. We compare this with free navigation. The scene and orientation dependent pointing task (SOP) is used to assess primarily egocentric representations, while the judgments of relative direction task (JRD) is used to assess primarily allocentric representations. We predict a significant 2x2 interaction effect, where the restricted view condition performance will be greater in the SOP task than the JRD task, with free navigation showing the opposite pattern. It is also possible that restricting view will increase performance on the JRD task, with a main effect of pointing in the SOP task. We will also employ a map-drawing task to measure memory for locations. These effects will help to better understand how we form and represent egocentric and allocentric reference frames during navigation.

Elucidating the Cluster II *Frankia* Dependency on Its Host Plants - A Qualitative Approach

Jannah A. Wren
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Plant Sciences

The nitrogen-fixing bacterial genus *Frankia*, is found in symbiosis with its host plants in root nodules and independently in soil. In symbiosis, *Frankia* facilitate the host plants' survival by providing nitrogen, an essential nutrient. A sub-group of *Frankia* (Cluster II), unlike others, has yet to be cultured. This suggests a degree of dependency on the specialized environment provided by the host plant nodules. Therefore, it can be hypothesized that Cluster II *Frankia* is in soils near their hosts rather than in soils lacking the host plant. McLaughlin Natural Reserve sustains some of the California native host plants for Cluster II *Frankia*. To test the correlation between the presence of Cluster II *Frankia* and their hosts, soil samples were collected near the plants' roots and analyzed. Additionally, leaf samples were collected to confirm the nitrogen-fixing status of these host plants. So far, Cluster II *Frankia* are present in all soil samples from sites where the host plants are present. All samples that tested negative are from sites where the host plants are absent. Results suggest that Cluster II *Frankia* prefer to coexist with a host plant, possibly because they are influenced by host-derived chemical signals or other environmental factors.

Microcontact Printing for the Study of Adhesion Molecule Interaction With Ligand

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Biomedical Engineering

During an inflammatory response, leukocytes in blood utilize surface adhesion molecules to bind to endothelial cell ligands and recruit to sites of injury. Microcontact printing (MP) combined with a vascular mimetic microfluidic device were used to investigate how density and spatial arrangement of ligands affect leukocyte capture under shear. MP consists of production, preparation, and application steps. A micropillar stamp was made with polydimethylsiloxane (PDMS) via soft lithography. In the preparation step, the stamps were plasma treated to make the stamp surfaces hydrophilic. The ligands were applied using an apparatus specifically designed to consistently bring the stamp and the glass substrate together. The presence of ligand on the patterned surface was confirmed by stamping both the ligand and quantum dot 655 labeled donkey anti-mouse IgG (Qdot655) on glass. Quantitative analysis revealed a linear relationship between Qdot655 fluorescence and ligand concentration. Capture of leukocytes was shown to be specific to the regions where ligand was patterned. With further development, this technique can be used to characterize the effects of ligand density and spatial arrangement with respect to cellular capture.

Assessing Pathogen Survival in Vermicompost Digestate and Impacts of Temperature on Earthworm Survival

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Population Health & Reproduction
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A large amount of agricultural waste, especially food waste, is produced on a daily bases. As an example, the Food and Agriculture Organization (FAO) estimates that approximately 33% of the food aimed for human consumption is wasted every year i.e., 95-115 kg/person-year. Identifying the recycling methods for converting food waste into soil amendment can enhance agricultural sustainability by supplying food waste derived soil nutrients for improving the crop yield. Vermicomposting is one option; vermicomposts have been shown to promote the germination, growth and crop yields. Recently, recycling of food wastes through an effective and sustainable method such as vermicomposting has become more and more relevant. To improve understanding of vermicomposting, we carried out multiple batch-scale tests exploring the impacts of temperature on earthworm survivals, and effects of vermicomposting on food-borne pathogen inactivation. We tested the activity of earthworms at 31, 35, and 39°C. Pathogen survival in vermicompost bins was tested at room temperature (≈22 – 25°C). Results showed that increase in temperature reduces earthworm activity drastically and lead to earthworm's death. We anticipate that the study will help in improving the understanding of vermicomposting processes at various temperatures and feedstock, hence recycling the food waste for sustainable agriculture.

The Influence of Difficulty Level on Decision Awareness and Its Neural Basis

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Psychology

When it comes to making decisions, some are easier than others. But how does the difficulty level affect the perceived moment of decision? One might intuitively assume that an easier decision would induce a quick decisional awareness and implementation of said decision, yet our results do not support this view. In the first part of our study, participants were to respond to a series of statements, indicating whether they agreed or disagreed, report their conscious moment of decision and then rate the statement's level of difficulty. Our behavioral data suggests that the easier the decision, the earlier the moment of decision occurs relative to the physical execution; meaning that there is a larger time gap between when the decision was made to when it was physically executed. To further examine this process, we tested whether these decision times reflected formerly reported ERP components of decision making (e.g., the early and late components of the N170), (Philiastides and Sajda, 2006).

The Effects of Environmental and Genetic Perturbations on the Size of *Drosophila* Segments

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Evolution & Ecology

Body size in multicellular organisms is determined through a complex interplay of genetic and environmental factors. In *Drosophila*, both poor nutrition and specific genetic mutations, such as those involved in the insulin-signaling pathway, result in reduced body size. However, perturbations causing small body size do not affect all parts of the fly equally. Some organs reduce greatly in size, while others remain relatively unchanged. Here, I compare and contrast the effects of environmental and genetic perturbations on organ size, using a high-throughput imaging screen to characterize relative segment size in *Drosophila* larvae. Larval segments contain organ primordia called imaginal discs, thus relative segment size is predictive of the proportion of the body dedicated to the formation of a particular organ system. To test the effect of an environmental perturbation, I raised *Drosophila melanogaster* adults on food of varying nutritional content, and measured segment size in their offspring. To test the effects of genetic perturbations, I characterized segment size in mutant fly lines with a small body size phenotype. This research will demonstrate how bodies decrease in size, and whether the genetic and environmental causes of reduced body size act in the same or different ways.

Quantified Improvement on the Efficiency of a Fast Algorithm for Stokes Flow

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Mathematics

The method of regularized Stokeslets is a well-established numerical approach for solving the equation of low Reynolds number flow. The method has been applied to problems such as bacterial swimming and cell migration. A straightforward method for finding the fluid velocity involves intensive and expensive calculation, but more efficient methods involve sophisticated numerical methods and approximation. In our research study, we implement and investigate the efficiency of a fast algorithm proposed in "Spectrally accurate fast summation for periodic Stokes potentials" by Lindbo and Tornberg (*J. Comput. Phys.* 2011). We investigate the application of the algorithm to models that arise in the study of 3D cell migration to study to the performance of the method for different sized cell meshes and algorithm parameters. We quantify the expected speed-up over the straightforward approach on problems related to models of cells. This study is an important step towards developing efficient methods for simulating the movement of cancer cells.

Discovery of New Small Molecule Inhibitors of the Bacterial Cell Division Protein FtsZ

Zi Yao
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Chemistry

FtsZ is the prokaryotic homologue of tubulin and plays an important role in mediating bacterial cytokinesis. Any compound that inhibits the activity of FtsZ can effectively disrupt cell division in bacteria and act as an antibiotic. Despite the existence of reported FtsZ inhibitors, many of these compounds were found to have irreproducible activities or formed drug aggregates in standard guanosine triphosphatase assays. To circumvent this problem, Escherichia coli FtsZ was mutated to install a cysteine moiety near a potential binding pocket on the protein. A tethering assay was then employed to discover small chemical fragments that bind to through a reversible covalent disulfide linkage. The FtsZ mutant was incubated with a library of >1,200 thiol-containing compounds in the presence of beta-mercaptoethanol. A few lead fragments, each from distinct chemical classes, have been identified by mass spectrometry. Crystallographic analyses are currently underway to interrogate the binding interactions between these fragments and FtsZ. The information provided by the screen will ultimately guide us to rationally design more potent inhibitors of FtsZ that can be further developed into potential antibiotic candidates.

Irreversible Changes Following Long-Term Smoking Cessation in Rats

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With tobacco smoke killing 1 in every 5 people, the question of how smoking affects the body even after smoking cessation and recovery is of great importance. In order to examine the effects of smoke cessation, male Spontaneously Hypertensive rats (SHR) were exposed to increasing periods of tobacco smoke (TS) and examined immediately following or after prolonged periods post-exposure. Histological analysis of the lungs demonstrated differences in SHR exposed to TS and given recovery times of 0, 13 and 52 weeks. Despite differing ages and TS exposure regimens, we conclude a number of morphological changes due to TS are irreversible and can be noted in both young and senescent rats following exposure. Furthermore, compared to filtered air (FA) controls, TS exposure resulted in significantly greater mortality, marked signs of inflammatory markers, and abnormal cellular morphology. The findings of this study demonstrate irreversible effects of tobacco smoke on the lungs to negatively impact quality of life, as well as confirm the devastating effects of smoking such as COPD and lung cancer. Observations of increased collagen levels in alveolar septal walls and hemosiderin-laden macrophages associated with possible organ dysfunction may also further reflect underlying mechanisms of persistent disease.

Symplasmata Formation as a Bet-Hedging Strategy

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Plant Pathology

The conditions microorganisms experience while colonizing leaf surfaces shift with time and space, for example in the amounts of water or nutrients available. Bacteria of *Pantoea agglomerans* are common leaf dwellers and known to form so-called symplasmata--clusters of hundreds of bacteria originating from a single progenitor cell and enveloped in a membrane and capsule. The fitness advantage of symplasmata is still unknown, but compared to free-living cells, the cells inside these clusters upregulate genes involved in utilization of less-preferred sugars. This led us to hypothesize that symplasmata formation prepares some individuals for a future of alternative nutrient availability. To investigate the potential of bet-hedging, we compared growth curves of strains of *Pantoea agglomeranss*–that either harbored the ability to form symplasmata or lacked it--on a combination of carbon sources, consisting of glucose, a preferred substrate, and galactose, a less favorable source of carbon. We expect strains lacking symplasmata to have a longer lag phase than symplasmata-forming strains. So far, we have found that both strains show a lag when grown with the combination of carbons. Understanding the role of symplasmata and the cues and consequences of its development will provide deeper understanding of microbial ecology on plant surfaces.

Exploring the Mannoside Hydrolase Biodiversity in the Glycobiome of Maize

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Plant Sciences

Reaching out to diverse landrace varieties of maize can lead to the discovery of biomolecules that alleviate human demands for energy. Our studies focus on glycosyl hydrolase enzymes that derive from mucilage, a gelatinous substance composed of complex carbohydrates. Annotation of genomic data from the glycobiome has implicated the microorganism *Agrobacterium tumefaciens* C58 as a key player in the degradation and modification of the secreted polysaccharides. Amino acid sequence homology alignments through NCBI database BLAST revealed that one β-mannosidase was highly expressed within the mucilage. This enzyme has a substrate specificity for terminal β-1,4-linked mannose residues at the non-reducing end of β- linked mannan substrates of varied length and complexity. Our aim is to study how this enzyme functions and use that information to study the structure of the polysaccharide comprised within the mucilage. Using techniques in protein biochemistry, the enzyme was subjected to a series of kinetic assays that involved the monitoring of activity on model substrates in response to differences in enzyme concentration, pH, temperature and substrate specificity. Exposing the biological role and function of this enzyme holds potential for its incorporation into enzyme cocktails that target lignocellulosic biomass for biofuel production.

Effects of DBS on Neuroanatomy of Pilocarpine-Treated Epileptic Rats

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Epilepsy is a chronic neurological condition affecting 2.3 million adults and nearly 500,000 children. Epileptic individuals experience spontaneous recurring seizures (SRSs) that are, in many cases, associated with impaired cognition. The rodent model of pilocarpine-induced epilepsy reproduces many of the features observed in patients with temporal lobe epilepsy including spontaneous generalized seizures, hippocampal damage and cognitive impairment. Recently we demonstrated that deep brain stimulation (DBS) of the medial septum in pilocarpine-treated epileptic rats both reduced seizures and improved cognitive performance. However, it is unclear whether stimulation resulted in significant long-term changes in neuroanatomy that might promote recovery or, alternatively, worsened outcome. In this study we quantified neuronal number across the hippocampus using an unbiased, random, systematic approach (stereology) in sham and epileptic rats that had received either no stimulation or 7.7 Hz stimulation. Our preliminary data demonstrates that DBS represents an exciting and innovative treatment paradigm to treat patients with epilepsy and cognitive disorders. However it is critical to insure that short-term benefits of stimulating the injured brain do not result in long-term worsened outcome prior to moving our research from the bench-to-bedside.

Dog Behavior in Dog Parks: A Correlative Study Between Observed Patterns and Owner Perception of Aggression and Anxiety in Dogs

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Medicine & Epidemiology
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Dog parks are a place for dog owners to bring their pets to interact with other dogs and their owners. However, there have been few studies exploring the correlation between definite aggression and anxiety related dog behavior and their respective owners' perception. To examine this correlation, we developed behavioral ethograms to score dog aggression and anxiety and used a standardized canine behavior questionnaire (C-BARQ(R)) to rate the dog behaviors as perceived by the owner. We performed non-parametric tests of hypothesis, with significance set at < 0.05. Utilizing a Spearman's Rank correlation, there was no correlation between mean aggressive or anxiety scores and scores from the survey in dog directed aggression, dog directed fear, nonsocial fear, separation related problems, stranger-directed aggression, or stranger-directed fear (Spearman's rho range: -0.2217 to 0.2868; all $p \geq 0.27$). These results indicate that there may be a lack of owner awareness in regards to their dogs' aggressive or anxious behaviors, which could be a large contributor to canine misbehaviors.

Spiropyran-Based Glutathione Nanosensors

Jason H. Yun
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Biomedical Engineering

Glutathione (GSH) levels are correlated with several pathologies including cardiovascular diseases, cancer, asthma, and neurophotological disorders. Therefore, determining *in vivo* GSH levels are critical for early diagnosis and accurate detection of diseases. Current methods in determining GSH concentrations are limited by resolution, and the GSH levels are not acquired in real time. Spiropyrans have demonstrated good sensitivity towards glutathione, and attaching these spiropyrans to the surface of iron oxide nanoparticles could allow high-resolution mapping of *in vivo* GSH levels using magnetic resonance imaging. To test this hypothesis, we synthesized a series of functionalized spiropyrans and investigated their sensitivity and selectivity towards GSH and other biologically relevant thiols using UV-visible spectroscopy. Here, we report the preparation and characterization of spiropyran-based aminated iron oxide nanoparticles. Among the spiropyrans tested, the 1'-(5-iodopentyl)-3',3'-dimethylspiro[chromene-2,2'-indoline] had shown the best selectivity (no response to cysteine) and sensitivity (50 µM) for GSH. Also, spectroscopy data suggest possible activation of the spiropyrans containing methoxy groups towards thiol sensing. These studies will not only help in designing spiropyran-based thiol sensors, but also provide a better understanding of the properties of these sensors.

Horticultural By-Products as Novel Feedstuffs for Poultry

Tatiana Zacarias
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Animal Science

Tomato pomace (TP) is an especially abundant by-product in California and disposal of TP is a growing environmental concern. Utilization of by-products as animal feedstuff has become increasingly popular due to their competitive prices relative to other commodities. However, the fibrous components in TP make it a marginal feedstuff for monogastric animals (e.g., poultry and pigs). Previous research has shown that poultry fed diets with 10% TP often have diarrhea and weight loss. Results of a proprietary treatment revealed that the complex carbohydrates in TP could be reduced by nearly 50% without significantly affecting protein content. We intend to feed laying hens treated TP at 10% of the diet and observe effects on feed consumption, weight retention, egg numbers, and several egg quality measurements. Improvements of TP digestibility as a result of this study could potentially provide a novel method to convert discarded nutritious resources into economically efficient and high quality food (meat and eggs). The long-term goal of this project is to promote the use of by-products from processing or horticultural products as alternative feedstuff(s) in the poultry industry.

Phenotypic and Gene Expression Responses of Cultivated and Wild Tomatoes to Water Stresses

Jiawen Zeng
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Plant Biology

Extreme weather conditions such as flooding and drought exist globally. Phenotypic plasticity of roots allows plants to adapt to the extreme environment. When a plant is grown in a drought environment, surface roots tend to grow deeper away from the surface in order to compete for water. When the roots are exposed to a flooding environment, aerenchyma develops to allow exchange of gases. In order to characterize in detail how tomato roots develop under flooding and drought water conditions, I am mapping the changes in both phenotype and gene expression of cultivated tomato *Solanum lycopersicum* cv. M82 and wild and drought tolerant tomato *S. pennellii*. These two species are grown in three conditions: well-watered, drought, and flooded. For phenotype, I will look at root biomass distribution and anatomy, including the cortex layer number, cell size, and formation of aerenchyma. For gene expression, quantitative PCR will be done to look at expression of known stress-responsive genes.

Studying the Effects of Dextran Sodium Sulfate Induced Colitis in the Large Intestines of Young Pigs

Ricardo Zermeno
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Animal Science

Ulcerative Colitis and Crohn's Disease are inflammatory bowel diseases (IBD) commonly found in people in the United States. Crohn's and colitis cause acute or chronic inflammation in the small and large intestine, with symptoms including bloody stool, diarrhea, ulcerations, fatigue, and loss of appetite. In order to study IBD, we created a pig model of colitis. Pigs were used due to the similarities of the digestive tracts between pigs and humans, allowing us to interpret and predict similar results in the human digestive tract. Dextran Sodium Sulfate (DSS) was used to chemically induce colitis in pigs, because it causes irritation and inflammation in the colon, similar to that seen in people diagnosed with colitis. Eight eight-week old pigs were fed DSS in their diet for duration of 7 days to observe if inflammation of the intestine occurred, and to what extent. We necropsied 4 pigs on day 7 and 4 pigs on day 10, allowing us to study the persistent effects of feeding DSS after a three-day recovery period. Tissues from colon and rectum were collected from each pig to look at differences in intestinal morphology and gene expression between the two groups.

Analysis of Embryo-Rescued Seeding Arrest oep80 Mutants

Lu Zhang
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Plant Sciences

OEP80 is a chloroplast outer membrane protein of unknown function. In the model plant *Arabidopsis*, homozygous for T-DNA insertion into the OEP80 gene leads to embryo-lethality. In order to examine the functionality of OEP80 at post-embryonic stage, former members of the Inoue laboratory had decided to test if expressing OEP80 only in seeds could rescue the embryo-lethal homozygous oep80 mutants, and if so, how the rescued plants look like. To this end, they had introduced a construct encoding the seed-specific ABI3 promoter followed by OEP80 cDNA into heterozygous oep80 mutants. Among the progenies of the resultant transgenic plants were albino seedlings, showing growth arrest after developing the first pair of true leaves. These plants were confirmed to be homozygous for oep80 and named embryo-rescued seedling arrest (ERSA) mutants. My original goal was to confirm these results and conduct detailed examination of the ERSA mutants. However, I could not find an albino seedling in my initial screening. Instead, 12-24% of the progenies showed apparent ERSA phenotype with green cotyledons and while true leaves. I am currently testing if these plants are indeed homozygous for oep80, and if these phenotypes are due to the growth conditions or the insertion of the transgene.

Mechanisms of Catalytic Esterification of Cellulose with Polycarboxylic Acids

Zengwei Zheng
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Textiles & Clothing

3,3',4,4'-benzophenone tetracarboxylic acid (BPTCA), a polycarboxylic acid, could directly react with cotton cellulose via forming ester bonds with sodium hypophosphite (NaH_2PO_2) as a catalyst. The multiple ester bonds formed between the polycarboxylic acid and cellulose established a crosslinked structure which provides wrinkle free functions to cotton fabrics and is an environmentally friendly approach without using formaldehyde. However, the catalytic mechanism about this reaction has never been studied in previous research. In this study, we investigated the mechanism of this catalyst and compared it with various other salts to understand the catalytic mechanism of the reaction and therefore find the most efficient and alternative catalyst. The preliminary results indicated that the amount of ester bonds formed within cellulose was directly related to the PH value and strength of bronsted base and that several other sodium salts were also effective in catalyzing the reaction. The special catalytic effect of sodium hypophosphite will be discussed in the presentation. By finding the most efficient catalyst, the temperature can be lower so more energy will be saved in industrial process. Fourier transform infrared spectroscopy (FTIR), wrinkle recovery angle (WRA) and thermogravimetric analyzer (TGA) are used to analyze the cellulose treated by BPTCA with catalysts.

Surface Functional Modifications of Fibers With Xylan Derivatives

Yiwen Zhu
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Textiles & Clothing

Xylan, a hemicellulose compound and a major component of plant cells, is also the second most abundant polysaccharides after cellulose in nature. It is a waste of cellulose extraction from plants but can potentially play an important role to serve as a resource of materials because of its biodegradability, biocompatibility, and physico-chemical properties. Considerable research activities have been done to explore the use of xylan for biomedical purpose in recent decades. Textile fibers, if chemically modified by Xylan, can improve their biocompatibility when used in medical devices. As a demonstration of the potential functions, in this research, I prepared a reactive Xylan derivative, acrylic xylan, and employed it in surface modification of cotton fibers. The modification process is carried out by running a light-induced polymerization on cotton fabric. Cotton fibers dyed with a photo sensitizer, 2-ethylanthraquinone, are dipped into the xylan derivative solution then exposed to UVA (365 nm) to initiate the surface radical graft polymerization. The chemical and morphological structures and thermal properties of the grafted cotton fibers are characterized by Fourier transform infrared spectrometer (FTIR), scanning electron microscope (SEM) and thermal gravimetric analysis (TGA). Hydrophilicity and biocompatibility of the modified fibers will be evaluated as well.

Cell-Manufactured Biomaterials Protect Osteogenic Commitment of Adult-Derived Stem Cells

Christopher A. Zikry
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Biomedical Engineering

Cell-secreted decellularized extracellular matrices (DMs) provide a structural architecture for cellular adhesion and signaling. DMs also enhance mesenchymal stem cell (MSC) osteogenic differentiation via interactions with cell surface proteins. Soluble osteogenic cues are consistently used as a means to differentiate MSCs toward bone-forming osteoblasts. However, there is little evidence that MSCs directly participate in bone formation *in vivo*, perhaps due to the removal of osteogenic stimuli. We hypothesized that DMs would preserve MSC osteogenic commitment after soluble cue withdrawal. MSCs were seeded on DMs and treated with growth media (GM), osteogenic media (OM), or osteogenic media switched to growth media (OM/GM) to examine osteogenic commitment upon cue withdrawal *in vitro*. When cultured in the absence of soluble cues over 5 days, OM/GM MSCs on DM secreted more calcium (Ca) and exhibited increased bone sialoprotein (*IBSP*) gene expression compared to cells on tissue culture plastic without DM. These data demonstrate the promise of materials-based strategies for providing continued osteogenic stimuli of MSCs for bone formation.