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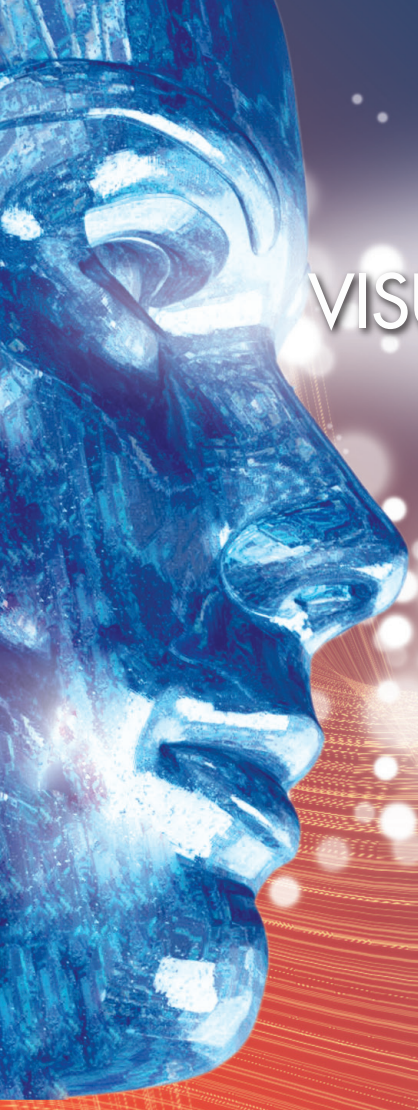

23rd Undergraduate Research, Scholarship & Creative Activities Conference

Poster Presentations
Friday, April 27, 2012
3-5:30 p.m., Freeborn Hall

Art Exhibit
Friday, April 27, 2012
5:30-7 p.m., MU II

Oral Presentations
Saturday, April 28, 2012
9 a.m.-12:30 p.m., Wellman Hall

Sponsored by:
Office of the Provost &
Office of the Vice Chancellor, Student Affairs

23rd Undergraduate Research, Scholarship & Creative Activities Conference

WELCOME 2012

Welcome to the 23rd Annual UC Davis Undergraduate Research, Scholarship & Creative Activities Conference, co-sponsored by the Office of the Provost and the Office of the Vice Chancellor for Student Affairs. This year we are proud to showcase the research endeavors of 431 undergraduate students from all academic fields.

The conference is designed to acquaint undergraduates with the process and rigors of presenting research in a scholarly manner in an academic setting. This opportunity allows for stimulating interaction between students and an audience of faculty, administrators, peers and family. An added goal is to encourage undergraduates to pursue advanced degrees that will lead to opportunities in research and teaching.

At UC Davis, many students have been participating in research that is part of a larger grant where faculty sponsors have given them substantial levels of responsibility to carry out specific components, either individually or collaboratively. Other students have initiated their own projects and have been conducting their research independently under faculty guidance. While many students are reporting on completed projects, some are presenting the latest data on research still in progress.

Students present their work at the conference orally, in poster format, or, for the first time this year, as part of an art exhibit. In the oral sessions, students are divided into groups; each student gives a 15-minute presentation that includes a question-and-answer period. A faculty member, who may also serve as a faculty sponsor for one or more of the student-presenters, moderates the session. In the poster sessions, students present a visual representation of their research and discuss the content with circulating conference attendees. The art exhibit highlights creative activity and affords an opportunity to interact with the student scholars who will discuss their creative work with those attending this session.

Each student presenter is recognized for his/her contribution to University research by being awarded a certificate as an Undergraduate Research Scholar. We congratulate these students for their accomplishments and hope that this experience helps to launch productive and satisfying academic and professional careers.

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23rd Undergraduate Research, Scholarship & Creative Activities Conference

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 in Science, Engineering, and Mathematics (CAMP); Center for Biophotonics Science & Technology (CBST); Davis Honor's Challenge; Integrated Studies Honors Program; 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); President's Undergraduate Fellowship; Undergraduate Research Center; UC Davis Washington Center and UC Leadership Excellence Through Advanced Degrees (UC LEADS).

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Office of the Vice Chancellor for Student Affairs

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AGENDA

Poster Sessions: Friday, April 27, 2012

3:00–5:30 p.m., Freeborn Hall

3:00–4:10 p.m. ..... Poster Session A
Freeborn Hall

4:20–5:30 p.m. ..... Poster Session B
Freeborn Hall

Art Exhibit: Friday, April 27, 2012

5:30–7:00 p.m., Memorial Union II

5:30–7:00 p.m. ..... Art Exhibit C
Memorial Union II

Oral Sessions: Saturday, April 28, 2012

9:00 a.m.–12:30 p.m., Wellman Hall

8:00–9:00 a.m. ..... Continental Breakfast
Wellman Hall Lounge

9:00–10:30 a.m. ..... Session 1 (Oral Presentations)
Wellman Hall

10:45–12:15 p.m. ..... Session 2 (Oral Presentations)
Wellman Hall

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Masood, Imran.....Session B..... Poster 211 .... 4:20 p.m. ..... Freeborn

PRESENTERS (CONTINUED)

Mattos, William ..... Session B ..... Poster 170 .... 4:20 p.m. ..... Freeborn

Mattos, Renee ..... Session 2 ..... Oral .. 11:30 a.m. ..... 6 Wellman

McCarthy, Lloyd ..... Session A ..... Poster 68 .... 3:00 p.m. ..... Freeborn

McFall, Alexander ..... Session A ..... Poster 23 .... 3:00 p.m. ..... Freeborn

McGehee, James ..... Session B ..... Poster 190 .... 4:20 p.m. ..... Freeborn

McKenna, Anna ..... Session 2 ..... Oral .. 11:15 a.m. ... 106 Wellman

McMahon, Tara ..... Session 1 ..... Oral .. 10:00 a.m. ... 115 Wellman

Mele, Emma ..... Session A ..... Poster 6 .... 3:00 p.m. ..... Freeborn

Mendoza, Natalie ..... Session B ..... Poster 228 .... 4:20 p.m. ..... Freeborn

Mendoza, Emmanuel ..... Session 1 ..... Oral .. 10:00 a.m. ... 126 Wellman

Merk, Robert ..... Session A ..... Poster 24 .... 3:00 p.m. ..... Freeborn

Meyers, Frederick ..... Session 2 ..... Oral .. 11:30 a.m. ... 106 Wellman

Michelson, Rebecca ..... Session 1 ..... Oral .... 9:45 a.m. ..... 6 Wellman

Middleton, Meighan ..... Session 1 ..... Oral .... 9:30 a.m. ..... 2 Wellman

Min, Helen ..... Session 1 ..... Oral .. 10:00 a.m. ... 230 Wellman

Moscoso, Mariana ..... Session 2 ..... Oral .. 11:00 a.m. ... 115 Wellman

Moser, Karen ..... Session 1 ..... Oral .... 9:30 a.m. ... 233 Wellman

Moses, Daniella ..... Session 2 ..... Oral .. 11:00 a.m. ... 230 Wellman

Mu, Andrew ..... Session A ..... Poster 69 .... 3:00 p.m. ..... Freeborn

Mut, Leng ..... Session 1 ..... Oral .. 10:15 a.m. ... 212 Wellman

Napan, Nancy-Jaime ..... Session 1 ..... Oral .. 10:15 a.m. ... 126 Wellman

Narayan, Rajiv ..... Session 1 ..... Oral .. 10:00 a.m. ..... 6 Wellman

Navea, Frances ..... Session A ..... Poster 49 .... 3:00 p.m. ..... Freeborn

Ngo, Minh ..... Session B ..... Poster 191 .... 4:20 p.m. ..... Freeborn

Nguyen, Karin ..... Session A ..... Poster 25 .... 3:00 p.m. ..... Freeborn

Nguyen, Samantha ..... Session A ..... Poster 96 .... 3:00 p.m. ..... Freeborn

Nguyen, An ..... Session B ..... Poster 150 .... 4:20 p.m. ..... Freeborn

Nguyen, Andrew ..... Session B ..... Poster 203 .... 4:20 p.m. ..... Freeborn

Nguyen, Minh-Chau ..... Exhbit C ....Art Exhibit 6 .... 5:30 p.m. ..... MU II

Noel, Alicia ..... Session B ..... Poster 151 .... 4:20 p.m. ..... Freeborn

Novakov-Ritchey, Christina ... Session 2 ..... Oral .. 11:15 a.m. ... 115 Wellman

Noyon, Tamanna ..... Session A ..... Poster 70 .... 3:00 p.m. ..... Freeborn

Oberoi, Angad ..... Session A ..... Poster 109 .... 3:00 p.m. ..... Freeborn

Olkowski, Sandy ..... Session B ..... Poster 142 .... 4:20 p.m. ..... Freeborn

Olliff, Rachael ..... Session A ..... Poster 26 .... 3:00 p.m. ..... Freeborn

Ono, Tyler ..... Session A ..... Poster 50 .... 3:00 p.m. ..... Freeborn

Opfell, Mark ..... Session B ..... Poster 171 .... 4:20 p.m. ..... Freeborn

Orey, Vanessa ..... Session 1 ..... Oral .... 9:45 a.m. ..... 2 Wellman

Ozdemir, Ahmet ..... Session B ..... Poster 192 .... 4:20 p.m. ..... Freeborn

Palmer, Daniela ..... Session A ..... Poster 60 .... 3:00 p.m. ..... Freeborn

Paquet, Stefan ..... Session 1 ..... Oral .. 10:15 a.m. ... 115 Wellman

Parsons, Alyssa ..... Session B ..... Poster 219 .... 4:20 p.m. ..... Freeborn

Pasner, Jacob ..... Session B ..... Poster 158 .... 4:20 p.m. ..... Freeborn

Paul, Carly ..... Session B ..... Poster 126 .... 4:20 p.m. ..... Freeborn

Pearson, Diana ..... Session 1 ..... Oral .... 9:45 a.m. ... 107 Wellman

Pearsons, Kirsten ..... Exhbit C ....Art Exhibit 2 .... 5:30 p.m. ..... MU II

Perera, Sharon ..... Session B ..... Poster 143 .... 4:20 p.m. ..... Freeborn

Pham, Catherine ..... Session B ..... Poster 152 .... 4:20 p.m. ..... Freeborn

Pietrzyk, Alexandra ..... Session B ..... Poster 144 .... 4:20 p.m. ..... Freeborn

Plotts, Julia ..... Session 2 ..... Oral .. 11:45 a.m. ... 230 Wellman

Prada, Maria ..... Session B ..... Poster 131 .... 4:20 p.m. ..... Freeborn

Prado, Kimberly ..... Session 1 ..... Oral .. 10:00 a.m. ... 216 Wellman

Pramanick, Shreya ..... Session B ..... Poster 204 .... 4:20 p.m. ..... Freeborn

Ramirez, Adriana ..... Session 1 ..... Oral .. 10:00 a.m. ..... 2 Wellman

Ramsay, Steven ..... Session 2 ..... Oral .. 11:15 a.m. ... 229 Wellman

Randazzo, Dominica ..... Session A ..... Poster 97 .... 3:00 p.m. ..... Freeborn

Rangan, Priya ..... Session A ..... Poster 98 .... 3:00 p.m. ..... Freeborn

Rascon-Ramos, Habid ..... Session B ..... Poster 172 .... 4:20 p.m. ..... Freeborn

Raza, Ahmad ..... Session 2 ..... Oral .. 11:30 a.m. ... 226 Wellman

Rees, Kelley ..... Session 2 ..... Oral .. 11:45 a.m. ..... 6 Wellman

Rehal, Richinder ..... Session B ..... Poster 173 .... 4:20 p.m. ..... Freeborn

Reis, Marissa ..... Session B ..... Poster 153 .... 4:20 p.m. ..... Freeborn

Rieger, Rachel ..... Session A ..... Poster 51 .... 3:00 p.m. ..... Freeborn

Robbins, Arielle..... Session 1 ..... Oral .... 9:45 a.m. ... 233 Wellman

Rodd, Rebecca ..... Session B ..... Poster 154 .... 4:20 p.m. ..... Freeborn

Rodrigues, Laura..... Session A ..... Poster 52 .... 3:00 p.m. ..... Freeborn

Romano, Juliana..... Session 2 ..... Oral .. 11:30 a.m. ... 234 Wellman

Rouse, Kayla..... Session 2 ..... Oral .. 11:45 a.m. ... 226 Wellman

Royer, Brittany ..... Session 2 ..... Oral .. 11:30 a.m. ... 115 Wellman

Ruble, Julia..... Session 2 ..... Oral .. 11:30 a.m. ..... 2 Wellman

Ruecker, Corey ..... Session 1 ..... Oral .. 10:00 a.m. ... 233 Wellman

Rushakoff, Joshua..... Session B ..... Poster 205 .... 4:20 p.m. ..... Freeborn

Rusli, Francisca..... Session A ..... Poster 7 .... 3:00 p.m. ..... Freeborn

Saba, Sheeda ..... Session B ..... Poster 186 .... 4:20 p.m. ..... Freeborn

Sabir, Nazeela..... Session B ..... Poster 212 .... 4:20 p.m. ..... Freeborn

Sachdev, Ridhi..... Session A ..... Poster 87 .... 3:00 p.m. ..... Freeborn

Saenz, Marissa..... Session B ..... Poster 206 .... 4:20 p.m. ..... Freeborn

Saggal, Darpanjit..... Session A ..... Poster 110 .... 3:00 p.m. ..... Freeborn

Saluschev, Sergey..... Session 2 ..... Oral .. 12:00 p.m. ... 226 Wellman

Sanchez-Ramos, Emmanuel.. Session B ..... Poster 178 .... 4:20 p.m. ..... Freeborn

Saunders, Jessie..... Session A ..... Poster 36 .... 3:00 p.m. ..... Freeborn

Sauthoff, Wilson..... Session A ..... Poster 37 .... 3:00 p.m. ..... Freeborn

Schatz, Emma..... Session A ..... Poster 88 .... 3:00 p.m. ..... Freeborn

Schlenz, Alicia..... Session 2 ..... Oral .. 11:30 a.m. ... 107 Wellman

Schoch, Sara..... Session 2 ..... Oral .. 11:15 a.m. ... 233 Wellman

Sek, Albert ..... Session B ..... Poster 187 .... 4:20 p.m. ..... Freeborn

Serrato, Sebastian ..... Session A ..... Poster 8 .... 3:00 p.m. ..... Freeborn

Severson, Ashley ..... Session 1 ..... Oral .. 10:15 a.m. ..... 2 Wellman

Shafer, Garrett..... Session B ..... Poster 137 .... 4:20 p.m. ..... Freeborn

Sharma, Harsh ..... Session A ..... Poster 89 .... 3:00 p.m. ..... Freeborn

Sheth, Dominique..... Session A ..... Poster 118 .... 3:00 p.m. ..... Freeborn

Shevchenko, Bogdan..... Session A ..... Poster 99 .... 3:00 p.m. ..... Freeborn

Shilengudwa, Emerald..... Session 1 ..... Oral .. 10:15 a.m. ... 230 Wellman

Shontz, Harry..... Session 2 ..... Oral .. 12:00 p.m. ..... 6 Wellman

Shreve, Dean ..... Session 1 ..... Oral .... 9:30 a.m. ... 229 Wellman

Silva, Diego ..... Session A ..... Poster 53 .... 3:00 p.m. ..... Freeborn

Sitkin, Nicole..... Session A ..... Poster 18 .... 3:00 p.m. ..... Freeborn

Sloan, Claire ..... Session 1 ..... Oral .. 10:15 a.m. ..... 6 Wellman

Sloat, Kelsey..... Session A ..... Poster 111 .... 3:00 p.m. ..... Freeborn

Smith, Ashley..... Session 1 ..... Oral .. 10:15 a.m. ..... 26 Wellman

Smith, Justin..... Session 2 ..... Oral .. 11:30 a.m. ... 202 Wellman

Smythe, Kiah ..... Session 1 ..... Oral .. 10:00 a.m. ... 106 Wellman

Snyder, Kaileigh..... Session 2 ..... Oral .. 11:30 a.m. ... 233 Wellman

Solis, Ryan ..... Session A ..... Poster 75 .... 3:00 p.m. ..... Freeborn

Soudi, Laila..... Session B ..... Poster 220 .... 4:20 p.m. ..... Freeborn

Staley, Sarah ..... Session 2 ..... Oral .. 11:30 a.m. ... 229 Wellman

Stark, Marie..... Session A ..... Poster 76 .... 3:00 p.m. ..... Freeborn

Steele, Amanda..... Session 1 ..... Oral .. 10:15 a.m. ... 106 Wellman

Stoddard, Harry..... Session 1 ..... Oral .... 9:45 a.m. ... 229 Wellman

Stolitzka, Anna..... Session 2 ..... Oral .. 11:45 a.m. ... 234 Wellman

Stupaczuk, Monica ..... Session 2 ..... Oral .. 11:45 a.m. ... 229 Wellman

Suarez, Vanessa ..... Session A ..... Poster 119 .... 3:00 p.m. ..... Freeborn

Suen, Lok Ting Maria ..... Session A ..... Poster 9 .... 3:00 p.m. ..... Freeborn

Sun, Xiaolan ..... Session 2 ..... Oral .. 11:45 a.m. ... 202 Wellman

Suri, Riddhima..... Session A ..... Poster 77 .... 3:00 p.m. ..... Freeborn

Tam, Ka Yan Michelle ..... Session B ..... Poster 127 .... 4:20 p.m. ..... Freeborn

Tan, Justin ..... Session A ..... Poster 54 .... 3:00 p.m. ..... Freeborn

Tang, Jeff ..... Session 2 ..... Oral .. 11:45 a.m. ... 106 Wellman

Tavairez, L. Carolina ..... Session 2 ..... Oral .. 11:45 a.m. ..... 2 Wellman

Taylor, Alexandra ..... Session 2 ..... Oral .. 11:45 a.m. ... 216 Wellman

Teixeira, Lisa ..... Session A ..... Poster 61 .... 3:00 p.m. ..... Freeborn

Tejeda, Rolando..... Session A ..... Poster 55 .... 3:00 p.m. ..... Freeborn

Telis, Natalie ..... Session 1 ..... Oral .. 10:00 a.m. ... 119 Wellman

Thompson, Abbie ..... Session B ..... Poster 221 .... 4:20 p.m. ..... Freeborn

PRESENTERS (CONTINUED)

Thompson, Alycia.....Session B ..... Poster 232 .... 4:20 p.m. ..... Freeborn

Thorngren, Daniel .....Session 2 ..... Oral .. 12:00 p.m. ... 202 Wellman

Tigerschiold, Hannah .....Session 1 ..... Oral .. 10:00 a.m. ... 229 Wellman

Titone, Madison.....Session B ..... Poster 222 .... 4:20 p.m. ..... Freeborn

Tos, Kyle .....Session 2 ..... Oral .. 12:00 p.m. ... 216 Wellman

Tran, Huy.....Session 1 ..... Oral .. 10:15 a.m. ... 202 Wellman

Trejo, Helen .....Session 2 ..... Oral .. 11:30 a.m. ..... 26 Wellman

Trejo, Nidia .....Session 2 ..... Oral .. 11:45 a.m. ..... 26 Wellman

Tremain, Andrew.....Session B ..... Poster 179 .... 4:20 p.m. ..... Freeborn

Trotsyuk, Artem .....Session B ..... Poster 213 .... 4:20 p.m. ..... Freeborn

True, Aisha.....Session 2 ..... Oral .. 11:30 a.m. ... 119 Wellman

Truong, Sarah.....Session B ..... Poster 207 .... 4:20 p.m. ..... Freeborn

Tubbs, Alan .....Session 1 ..... Oral .. 10:15 a.m. ... 119 Wellman

Tubbs, Andrew.....Session B ..... Poster 223 .... 4:20 p.m. ..... Freeborn

Tzeng, Allison.....Exhbit C ....Art Exhibit 7 .... 5:30 p.m. .....MU II

Urrutia, Cristina .....Session 2 ..... Oral .. 12:00 p.m. ..... 26 Wellman

Van Cleave, Eric.....Session A ..... Poster 116 .... 3:00 p.m. ..... Freeborn

Van Dinh, Victoria .....Session A ..... Poster 100 .... 3:00 p.m. ..... Freeborn

VanLandingham, Mitchell ..Session 2 ..... Oral .. 11:45 a.m. ... 115 Wellman

Vergara, Jennifer .....Session B ..... Poster 138 .... 4:20 p.m. ..... Freeborn

Verma, Akshita.....Session B ..... Poster 214 .... 4:20 p.m. ..... Freeborn

Viswanath, Varsha .....Session 1 ..... Oral .. 10:00 a.m. ... 107 Wellman

Vo, Chi Hieu.....Session A ..... Poster 56 .... 3:00 p.m. ..... Freeborn

Vong, Erin.....Session 1 ..... Oral .. 10:15 a.m. ... 233 Wellman

Vu, Michael.....Session A ..... Poster 101 .... 3:00 p.m. ..... Freeborn

Vu, Thanh.....Session 1 ..... Oral .. 10:00 a.m. ... 226 Wellman

Vue, Choua.....Session A ..... Poster 27 .... 3:00 p.m. ..... Freeborn

Wagner, Robert .....Session 2 ..... Oral .. 12:00 p.m. ... 234 Wellman

Wagner, Winona.....Session B ..... Poster 238 .... 4:20 p.m. ..... Freeborn

Wahab, Alaha .....Session A ..... Poster 90 .... 3:00 p.m. ..... Freeborn

Walker, Jim.....Session B ..... Poster 233 .... 4:20 p.m. ..... Freeborn

Walters, Kelsey.....Session A ..... Poster 78 .... 3:00 p.m. ..... Freeborn

Wang, Jason .....Session 2 ..... Oral .. 12:00 p.m. ... 106 Wellman

Warmack, Rebeccah.....Session A ..... Poster 57 .... 3:00 p.m. ..... Freeborn

Warwick, Celsiana.....Session 2 ..... Oral .. 11:45 a.m. ... 233 Wellman

Weeks, Madeline .....Session B ..... Poster 234 .... 4:20 p.m. ..... Freeborn

Wilson, Monica .....Session 1 ..... Oral .. 10:00 a.m. ... 234 Wellman

Wittman, Margaret .....Session A ..... Poster 62 .... 3:00 p.m. ..... Freeborn

Womack, Rosana.....Session 2 ..... Oral .. 12:00 p.m. ..... 2 Wellman

Wong, Eric.....Session B ..... Poster 174 .... 4:20 p.m. ..... Freeborn

Wong, Karen.....Session 1 ..... Oral .. 10:15 a.m. ... 216 Wellman

Wong, Meilin .....Session A ..... Poster 19 .... 3:00 p.m. ..... Freeborn

Wong, Spencer.....Session 1 ..... Oral .. 10:15 a.m. ... 226 Wellman

Wu, Elizabeth.....Session A ..... Poster 120 .... 3:00 p.m. ..... Freeborn

Xiong, Susie .....Session B ..... Poster 224 .... 4:20 p.m. ..... Freeborn

Yeh, Timothy.....Session A ..... Poster 58 .... 3:00 p.m. ..... Freeborn

Yenigun, Onur .....Session 2 ..... Oral .. 11:45 a.m. ... 107 Wellman

Yim, Seun Seun .....Session B ..... Poster 128 .... 4:20 p.m. ..... Freeborn

Yu, Joseph.....Session 2 ..... Oral .. 11:45 a.m. ... 119 Wellman

Yu, Pai Hui.....Session B ..... Poster 146 .... 4:20 p.m. ..... Freeborn

Zackria, Rasiq.....Session B ..... Poster 215 .... 4:20 p.m. ..... Freeborn

Zavala, Gloria.....Session A ..... Poster 38 .... 3:00 p.m. ..... Freeborn

Zavala, Rosio .....Session B ..... Poster 155 .... 4:20 p.m. ..... Freeborn

Zegarski, Vincent .....Session 1 ..... Oral .. 10:15 a.m. ... 234 Wellman

Zhang, Huiui .....Session B ..... Poster 235 .... 4:20 p.m. ..... Freeborn

Zhao, Yufei .....Session B ..... Poster 175 .... 4:20 p.m. ..... Freeborn

Zieve, Jacob.....Session 2 ..... Oral .. 12:00 p.m. ... 212 Wellman

Zumpano, Danielle.....Session B ..... Poster 139 .... 4:20 p.m. ..... Freeborn

Zuskov, David.....Session A ..... Poster 10 .... 3:00 p.m. ..... Freeborn

2 Wellman · Moderator: Angie Chabram

9:00 Estrella A. Gamino – Chicana/Chicano Studies
Chicana/Latina Identity in Higher Education

9:15 Steve G. Juarez – Sociology
Early Signs of Assimilation in Middle School:The Concept of Belonging and Its Relationship to the Educational Experience of Mexican Immigrant Children

9:30 Meighan P. Middleton – Exercise Biology
A Study of Navy Reserve Officer Training Corps Students' Time Management and Lifestyle and Their Impact on GPA and Physical Readiness Test Scores

9:45 Vanessa J. Orey – International Relations
Language and Identity: A Closer Look at Korean and Chinese College Students

10:00 Adriana P. Ramirez – International Relations
Undocumented Minors Lone Journey to the U.S.

10:15 Ashley Severson – Sociology
Where Are All the Mexican Students?

6 Wellman · Moderator: James Marcin

9:00 Rebecca Garza – Religious Studies
From Sorcery to Western Medicine: The Growing Health Disparity of the Yolngu People

9:15 Nayla M. Hojman – Exercise Biology
Impact of Videoconferencing on Stress in Hospitalized Children

9:30 Amanda Lotspike – Women's Studies
(Un)making the Body: Monitoras de Salud and the 'Right to Health'

9:45 Rebecca E. Michelson – Anthropology
Barriers and Solutions to Reproductive Women's Health Access in California

10:00 Rajiv R. Narayan – Other
Choosing Fatness: Size Acceptance and Rational Choice Theory

10:15 Claire C. Sloan – Art Studio
Psychological Impact of Childbirth Experience on Mexican Women: An Observational Approach

26 Wellman · Moderator: Keith Watenpaugh

9:00 Gabrielle Baker – International Relations
Darfur Genocide: Economic Expansion vs. Regional Stability and Human Rights

9:15 Phoebe Bierly – International Relations
Genocide Denial and Australia's Stolen Generations

9:30 Geneva Brooks – International Relations
Barriers to Resistance in the Case of Genocide

9:45 Michael D. Hoye – Political Science - Public Service
The International Criminal Court and the Promotion of International Peace and Justice

10:00 Julia C. Lahl – History
Kristallnacht: The Catalyst that Began the Demise of the German American Bund

10:15 Ashley R. Smith – History
Genocide or Crime Against Humanity?

106 Wellman · Moderator: Soichiro Yamada

9:00 Elisma Botha – Biomedical Engineering
The Effect of Varus-Valgus Malalignment on the Envelopes of Passive Motion and the Balance of Contact Forces of the Tibio-femoral Joint Following TKA

9:15 Sarang Dave – Biological Systems Engineering
Conversion of Gluconate to Ethanol Using Escherichia Coli KO11

9:30 Destiny R. Garcia – Mechanical Engineering
Redesigning a Modern Mouse Head Holder Used in Magnetic Resonance Imaging (MRI) for a 25mm Coil to be Used in Biomedical Engineering Applications

9:45 Melissa Jorrisch – Biomedical Engineering
Role of Myosin IIA in Cell Migration

10:00 Kiah A. Smythe – Biomedical Engineering
Engineering Artificial sRNA for Conditional Gene Repression in Escherichia coli

10:15 Amanda N. Steele – Biochemical Engineering
Identifying a Mechano-sensing Module for Detecting Cancer Cell Invasion

107 Wellman · Moderator: David Hawkins

9:00 Samson I. Aghedo – Neurobiology, Physiology & Behavior
Modulating Brain Copper by Diet and Genetics Alters Neurobehavior

9:15 Eric D. Ashuckian – Biomedical Engineering
Quantification of the Temporal Response of Post-exercise Anterior Cruciate Ligament Stiffness

9:30 Jacqueline Hsieh – Cell Biology
The Effects of Different Cooking Methods on Shrimp Tropomyosin Allergenicity

9:45 Diana C. Pearson – Biological Sciences
Variation Between Cryptococcus gattii Strains in Crossing the Blood-Brain Barrier

10:00 Varsha Viswanath – Biomedical Engineering
Effects of Smoothing Methods on Diffusion Tensor Magnetic Resonance Imaging in Aging Brains

115 Wellman · Moderator: Richard Coss

9:00 Melody Chen – Animal Science
Tail Movement and Attention Shift in California Ground Squirrels

9:15 Dinah R. Davison – Animal Biology
The Evolution of Primate Locomotor Diversity: A Phylogenetic Analysis

9:30 Rachael E. Gwinn – Psychology
Confirmation Bias in Binary Choice

9:45 Jacob D. Herford – Biological Sciences
The Physiological and Behavioral Related Effects of Water Restriction on Rhesus Macaques (Macaca mulatta)

10:00 Tara L. McMahon – Anthropology
Social Development and Social Learning in Nonhuman Primates

10:15 Stefan Paquet – Psychology
The Neural Correlates of Willed Attention

119 Wellman · Moderator: Renee Tsolis

9:00 John Paul J. Aboubechara – Biochemistry & Molecular Biology
Origin of Mutations During Growth Under Selection

9:15 Spenser C. Alexander – Biochemistry & Molecular Biology
Biochemical Characterization of the Secretion Mechanism of the ESX-1 ATPase EccC

9:30 Isaac S. Horowitz – Biological Sciences
Determining the Limit of Detection (LoD) of a Novel LATE-PCR Assay for 16 Pathogens Associated with Septicemia

9:45 Samaan Mahmoudzadeh – Biological Sciences
Formation of Standard Curves Using Real-Time LATE-PCR for Semi-Quantitation of Bacterial Load for Ventilator Associated Pneumonia (VAP) Infections

10:00 Natalie Telis – Cell Biology
Evolutionary Patterns of Centromeric Tandem Repeats in 253 Plant and Animal Species

10:15 Alan Tubbs – Microbiology
Brucella flagellin Fails to Induce Pyroptotic Cell Death In Vitro

126 Wellman · Moderator: Bruce Draper

9:00 Daniel A. Friedman – Genetics
Visualizing the Integration of Sex-Specific Sensory Neurons into a Sex-Specific Central Nervous System Circuit in 3-D

9:15 Scott D. Hirsch – Neurobiology, Physiology & Behavior
Mapping an Oocyte-Specific Translational Regulatory Element in the nanos3 3'UTR

9:30 Christine L. Knox – Biochemistry & Molecular Biology
The BRIZ Heteromeric E3 Ligase and its Effects on Cell Division and Interaction with Other Genes

9:45 Irene Ly – Anthropology
Going with the Flow: How Endothelial Cells Are Regulated by Their Biophysical Environment

10:00 Emmanuel V. Mendoza – Cell Biology
Identifying the Developmental Role of nanos2 in Zebrafish Germline Stem Cells

10:15 Nancy-Jaime Napan – Neurobiology, Physiology & Behavior
The Co-option of the Genes Dachshund and Distal-less in the Evolution of Sex Combs

202 Wellman · Moderator: Neelima Sinha

9:00 Jeanice L. Jones – Genetics
Functional Characterization of PIN1a, b, and c in Tomato

9:15 Jeffrey S. Koble – Evolution, Ecology and Biodiversity
Identifying Genes Involved in the Regulation of Ovule Development in Arabidopsis thaliana via Mutagenesis with Fast Neutron Radiation

9:30 Noah Kojima – Biochemistry & Molecular Biology
Intron Mediated Enhancement in Arabidopsis thaliana

9:45 Warren Kwan – Biotechnology
Chloroplast and Thylakoid Division in Arabidopsis thaliana

10:00 Brenda I. Marin-Rodriguez – Neurobiology, Physiology & Behavior
Using Arabidopsis thaliana as a Genetic Toolbox

10:15 Huy D. Tran – Biochemistry & Molecular Biology
The Circadian Clock Regulates Plant Growth Response to High Temperature Pulses

212 Wellman · Moderator: Hwai-Jong Cheng

9:00 Justin O. Aflatooni – Biochemistry & Molecular Biology
Determining the Role of MeCP2-e1 in Neuronal Development

9:15 Juliana Campo Garcia – Biological Sciences
Identitying Sonic Hedgehog Pathway Activation in the Developing Mouse Brain

9:30 Jeremy M. Crane – Neurobiology, Physiology & Behavior
Regulatory Mechanisms of Stereotyped Axon Pruning in Primary Visual Cortex

9:45 Jason A. Estep – Cell Biology
Postnatal Requirement of Rac1 for Mitral Cell Dendritic Development

10:00 Anna King – Biochemistry & Molecular Biology
Developmental Integration of Adult-born Dentate Gyrus Granule Cell Mossy Fiber Boutons in Aged Mice

10:15 Leng K. Mut – Chemical Engineering
Characterization of the Aerosolization and Toxicity of Multi-Walled Carbon Nanotubes (MWCNTs)

216 Wellman · Moderator: TBA

9:00 Angela Beliveau – Neurobiology, Physiology & Behavior
Plasmic Lipid Profiling and Analysis of Potential Biomarkers that Track Insulin Sensitivity and Fitness

9:15 Jennifer C. Bockhold – Psychology
Autocorrecting Glucose Biosensors Improve the Quality of Care in Severely Burned Patients

9:30 Jonathan C. Danel – Biological Sciences
Clinical Assessment of Sustained-Release Oral Dalfampridine on Walking Ability in Multiple Sclerosis Patients

9:45 Jessica Lawrence – Neurobiology, Physiology & Behavior
Malaria-induced Damage to the Intestinal Barrier: How Does Increased L-arginine Bioavailability Reverse this Damage?

10:00 Kimberly Y. Prado – Clinical Nutrition
Dose Response Study: Fructose and Cardiovascular Disease

10:15 Karen Y. Wong – Neurobiology, Physiology & Behavior
Effects of Corneal Refractive Therapy on the Bulbar Conjunctival Microcirculation

226 Wellman · Moderator: Janine LaSalle

9:00 Samuel Chadwick – Neurobiology, Physiology & Behavior
Prader-Willi Syndrome: Investigating Neurodevelopmental Implications of the Genetic Loss of Non-coding RNAs on Chromosome 15q11-13

9:15 Florence K. Crary – Biochemistry & Molecular Biology
Determination of R-loop Presence in 15q11-13 by In Vitro Transcription

9:30 Danna Hong – Biochemistry & Molecular Biology
Assaying the Levels of DNA Methyltransferases in Tissues with and without Partially Methylated Domains

9:45 Stefanie Luu – Biological Sciences
The Effects of FoxG1 and MeCP2 on Neuronal Development

10:00 Thanh Vu – Biotechnology
In Vivo Cytotoxities of Novel Amiloride Congeners in Their Treatment of Intracerebral Glioma in a Xenograft Model

10:15 Spencer Wong – Genetics
Analysis of Nucleosome Occupancy at R-loop Forming Regions in 15q11-13

229 Wellman · Moderator: Richard Levin

9:00 Linh N. Banh – English
Shifting Cultural Production in the Dialectic of US-Japan Relations

9:15 Stephanie L. Galasso – English
Samuel Beckett's Ruins: Tracing Trauma Through the Rubble of Language

9:30 Dean Shreve – English
Modern Man: The Redefinition of Courage, Honor, and Masculinity in World War I Poetry

9:45 Harry E. Stoddard – English
Pronoun Change and Voice in Shakespeare's Sonnets

10:00 Hannah Tigerschiold – International Relations
"It Is Better to Light a Candle Than to Curse the Darkness:" How Has Amnesty International Transformed Grassroots Human Rights Advocacy?

230 Wellman · Moderator: Corrie Decker

9:00 Chantal Boctor – Political Science
Egypt and the Arab Spring: A Political and Economic Analysis of the Future of the Muslim Brotherhood in the Middle East

9:15 Gideon D. Cohn-Postar – History
The Treaties of Empire: An Analysis of the Treaties Enacted Between the British East India Company and the States of Southern India from 1790-1805

9:30 Melissa Freeman – English
Persuading the Public: Postmodernism and Propaganda During the Vietnam War

9:45 Dominique P. Gebru – International Relations
Peanuts, Islam, and Development: The Story of Senegal

10:00 Helen Min – History
Youth revolutions in Egypt

10:15 Emerald P. Shilengudwa – International Relations
China's Presence in Africa: Twenty-first Century Neocolonialism?

233 Wellman · Moderator: John Driscoll

9:00 Stephanie Goldman – American Studies
The Self-Made Romance: Self-Publishing's Effect on Romance E-books

9:15 Gabrielle Grinberg – Design
Davisville Remembered Website - Creating a Dynamic User Experience that Encapsulates a Century of Development in Davis

9:30 Karen R. Moser – Sociology
Prevention, Prosecution, Protection: The United States' Efforts in the Fight Against Human Trafficking

9:45 Arielle Robbins – English
Sighting Existential Poltergeists: Vision, Technology, and Horror in American Suburbia

10:00 Corey M. Ruecker – Philosophy
"The Google-powered "Art Project": Does it Diminish the Effect of Art?"

10:15 Erin Vong – Art History
Waiting for Technology: Futurism's Plans Examined Against Its Products

234 Wellman · Moderator: Andre Knoesen

9:00 Adiba Ali – Aerospace Science & Engineering
A Comparative Dynamic Analysis of Shuttle Robotic Arm Using Traditional and GATE Elements

9:15 Kentin M. Cantwell – Electrical Engineering
Pulse Oximeter Adaptive Control

9:30 Geovid K. Kali – Electrical Engineering
Pulse Oximeter Micro Design with PCB Shield

9:45 Andrew M. Marnell – Electrical Engineering
An Autonomous Pulse Oximetry System for Dynamic Measurement of Vital Signs

10:00 Monica Wilson – Aerospace Science & Engineering
Effects of Wall Thickness on Frequencies of Flat Plates and Cylindrical Shells

10:15 Vincent W. Zegarski – Electrical Engineering
Transient Optical Absorption Plant Spectrometer

ORAL SESSION 2
Saturday, 10:45 a.m. – 12:15 p.m.
Wellman Hall

2 Wellman · Moderator: Halifu Osumare

10:45 Alana M. Bjorkquist – English
Toni Morrison's Wayward Women: Evaluating the Queer Role of the Female Trickster

11:00 Mitchell Faust – African American & African Studies
Big Mama in the American Cultural Imagination

11:15 Kathryn S. Hempstead – English
Creating the Self: Identity and Authenticity in Caribbean Emigrant Fiction

11:30 Julia Ruble – Anthropology
The Social Life of the Beat

11:45 L. Carolina Tavárez – Spanish
"Ann Prepare Lavni" Haitian Creole for "Let Us Prepare the Future"

12:00 Rosana Womack – History
A Checkered Past: The "Disappeared" Afro-Argentines

6 Wellman · Moderator: Elizabeth Freeman

10:45 Clare Callahan – History
Perceptions of Women's Sexuality, Gender Construction, and the Ottoman Empire

11:00 Alexandra N. Casavant – English
Rebecca West and the Politics of Fluidity

11:15 Amineh Dibajzavareh – Japanese
A Hard Way to Make One's Living: Morality, Immorality, and Moralizing in Ihara Saikaku's The Life of an Amorous Woman

11:30 Renee Mattos – English
Female Sexuality in Faulkner

11:45 Kelley Rees – English
A Woman's Touch: The Dichotomy Between Passivity and Activity for the New Woman within Naturalistic Literature

12:00 Harry Shontz – History
Rhetoric, Reputations, and Rabbits: Mary Toft and the Medical Culture in Eighteenth-Century Britain

26 Wellman · Moderator: Susan Avila

10:45 Miquette F. Elliott – Design
Fiat Lux: Chartres Cathedral's Representation of Medieval Culture Seen Through 21st Century Design

11:00 Megan M. Friel – Art History
Sublime Void: Experiencing the Art of the Light and Space Movement

11:15 Kirsten Y. Garlitos – Design
L'Arte della Carta e del Cuoio

11:30 Helen X. Trejo – Design
Sustainable Fashion: Bridging Zero-Waste Clothing with Architecture

11:45 Nidia K. Trejo – Design
Expanding the Do-It-Yourself Movement in Fashion: Natural Colorants on Clothing

12:00 Cristina I. Urrutia – Art History
Caravaggio's Break from Tradition in His Imagery of John The Baptist

106 Wellman · Moderator: Raju Pandey

10:45 Andrew R. Burton – Civil Engineering
Modeling the Resistivity of Carbon Nanotube Thin Films

11:00 Keyan Kousha – Computer Science
Location-Based Wiki for Davis, CA

11:15 Anna M. McKenna – Civil Engineering
A New Standard for Climate Action Plans

11:30 Frederick N. Meyers – Mechanical Engineering
Piezoelectric Zinc Oxide-Poly(Vinylidene Fluoride) Nanocomposites for Sensing and Actuation

11:45 Jeff J. Tang – Civil Engineering
Development of Gold Nanoparticle-Embedded PDMS Composites for Multifunctional Mechanical and Chemical Sensing

12:00 Jason Wang – Computer Science
Location-Based Wiki for Davis, CA

107 Wellman · Moderator: Holland Cheng

10:45 Mohammad Ali Baikoghli – Biological Sciences
Structure Analysis of HIV Env-based Immunogen gp140 Using Single Particle Reconstruction and 2D Segmentation

11:00 Brian E. Bradley – Biochemistry & Molecular Biology
The Role of Minor Capsid Protein, VP2, in Simian Virus 40 Capsid Formation

11:15 Benjamin M. Lorton – Biochemistry & Molecular Biology
Single Particle Reconstruction of gp140 Bound to Broadly Reactive Neutralizing Antibody VRC01

11:30 Alicia Schlenz – Biological Sciences
Immobilizing HIV-1 Envelope glycoprotein gp140 by ELISA Assay

11:45 Onur M. Yenigun – Biological Sciences
Ligand-induced Conformational Changes in HIV-1 Env Protein gp120 and Env-based Recombinant gp140 Detected by Second Harmonic Generation and FRET

115 Wellman · Moderator: Diana Strazdes

10:45 Stephen S. Hudson – Music
"Left Hand Path": Authenticity and Rivalry in Extreme Metal Music

11:00 Mariana Moscoso – Art History
Multitude in Arte Povera: Tensions of Immaterial Labor

11:15 Christina Novakov-Ritchey – Comparative Literature
Social Functions: The Dramaturg as Social Commentator in Michael Barakiva's Ensemble Theatre Workshop

11:30 Brittany L. Royer – Art History
Andrew Wyeth's Traditional Persona: The 'American artist' or the 'American man'

11:45 Mitchell R. VanLandingham – Linguistics
Potentials for Community and Interdisciplinary Outreach via Practice-as-Research

119 Wellman · Moderator: Krishnan Nambiar

10:45 Walter Y. Lam – Neurobiology, Physiology & Behavior
Using Human AGO2 in Conjunction with Docking Software and Analogs to Further Explore RNA Interference Therapy

11:00 Diana D. Ly – Chemistry
Theoretical Study of RNA Toward Computational Docking

11:15 Stephanie Mac – Chemistry
Using Traditional Drug Design Programs to Develop a Method for Examining the Stability of Modified Bases in RNA

11:30 Aisha D. True – Chemistry
Investigation of the $[4Fe\text{-}4S]^{2+}$ Coordination Sphere in the DNA Glycosylase AfUDG

11:45 Joseph B. Yu – Biological Sciences
The Conversion of α-Ionone to 4-Hydroxy-β-Ionone

126 Wellman · Moderator: JoAnne Engebrecht

10:45 Alexa Adams – Biotechnology
Utilizing Cell Penetrating Peptides to Deliver Engineered Proteins Across the Blood-Brain Barrier

11:00 Hamza Ahsan – Chemical Engineering
A Search for Biochemical and Post-translational Protein Modifications Induced by Chromosome Bridges in Saccharomyces cerevisiae

11:15 Brian M. Bush – Biochemistry & Molecular Biology
Does Aging Negatively Impact Male Meiosis?

11:30 Colin K. Deniston – Biological Sciences
Regulation of Meiotic Crossing-over by Chromosome Size: Roles of Csm4-dependent Chromosome Movement and the Pch2-dependent Checkpoint Response

11:45 Becky Xu Hua Fu – Genetics
The Role of Non-Essential Polymerases in Microhomology-Mediated End-Joining

12:00 Kaitlyn Kortright – Microbiology
Aneuploidy Induced Stress, an Early Stage in Cancer Progression

202 Wellman · Moderator: Carlos Castaneda

10:45 Nichole A. Barry – Physics
Mathematica(TM) Calculation and Visualization of Complex Electric Fields: Uses as Accelerator Beam Diagnostic of Flux and Energy

11:00 Brian D. Busemeyer – Physics
Exploring Half Metals in Li-based Half Heusler Alloys

11:15 William Mann – Physics
Unusual Island Formations of Iridium on Ge(111) Studied by Scanning Tunneling Microscopy

11:30 Justin C. Smith – Physics
Theory of Interstitial Hydrogen Impurities in Semiconducting Germanium

11:45 Xiaolan Sun – Physics
Computer Simulations of Photoelectron Holographic Images

12:00 Daniel P. Thorngren – Physics
Simulated Photon Yields of WIMPs in the LUX Detector

212 Wellman · Moderator: Tom Gordon

10:45 Steven A. Heisey – Plant Biology
Nutrient Addition Predisposes Pines to Woundless Infection by the Pitch Canker Pathogen Fusarium circinatum

11:00 August P. Higgins – Evolution, Ecology and Biodiversity
The Differential Effects of Volatile and Vascular Signaling in the Defense Induction of Phaseolus lunatus (Lima Bean)

11:15 Margaret Huang – Biochemistry & Molecular Biology
Sporulation of Fusarium Circinatum in Festuca Arundinacea Suggesting Possible Propagule Source for Spread of Pitch Canker

11:30 Tuyen V. Le – Plant Biology
Should You Believe What You See on the Web?

11:45 Brian Lin – Genetics
De Novo Analysis of Repetitive Sequences in the Pinus Taeda (Loblolly Pine) Genome

12:00 Jacob J. Zieve – Biotechnology
Similarity Analysis of Repetitive Sequences in the Pinus taeda (Loblolly Pine) Genome

216 Wellman · Moderator: Frank Mitloehner

10:45 Sean R. Barberie – Physics
Research Applications of Synchrotron Radiation

11:00 Mathew D. Cohen – Animal Science
The Effects of Monensin Doses in Lowering Methane Emissions in Lactating Dairy Cattle

11:15 Joseph Dorsch – Animal Science
Does Effects of Monensin on Lactating Holstein Dairy Cattle

11:30 Hasan Ghadialy – Electrical Engineering
Investigation of Fundamental Mechanisms for Field Assisted Sintering

11:45 Alexandra N. Taylor – Animal Science
Space Allowance for Holstein Bull Calves Influences Innate Immune Responses After Castration

12:00 Kyle M. Tos – Physics
Search for NMSSM Higgs Bosons at the LHC

226 Wellman · Moderator: TBA

10:45 Meghan L. Bauder – Human Development
Adult Intervention Methods on Peer Conflict

11:00 Lovina Fernandes – Psychology
Is Outgroup Bias Different When You're of Mixed Heritage?

11:15 Caylen B. Garrie – Community and Regional Development
The Impact of Distance Learning on Community Building in Younger Learners

11:30 Ahmad Raza – Political Science
Pakistan Foreign Relations: A Historical Look at Contemporary Issues

11:45 Kayla E. Rouse – Biological Sciences
Online Giving and Fundraising Strategies for University Research Laboratories

12:00 Sergey Saluschev – International Relations
Hypocrisy Inc.: The Politics of State Recognition in the Post Cold War Caucasus and Eastern Europe

229 Wellman · Moderator: TBA

10:45 Elizabeth R. Axton – Biological Sciences
Plasticity of Pigmentation in the Marine Copepod Tigriopus californicus

11:00 Christopher J. Knight – Evolution, Ecology and Biodiversity
Do Changes in Salinity Affect the Distribution of the Sea Star Pisaster Ochraceus in Bodega Harbor?

11:15 Steven A. Ramsay – Animal Biology
The Effect of Water Quality on Larval Distribution of the Anopheles gambiae Complex from Cameroon and Mali

11:30 Sarah L. Staley – Biochemistry & Molecular Biology
Prevalence of Selected Avian Haemosporidians in Vector Populations of Mosquitoes and Black Flies in California and Washington

11:45 Monica Stupaczuk – Wildlife, Fish & Conservation Biology
Effects of Predation on Incubation Behavior in Waterfowl

230 Wellman · Moderator: Michael Ziser

10:45 Tatiana M. Bush – Political Science
Dismantling Cosmopolitan Canopy: An analysis of the Social, Political, and Economic Forces that Produce Spaces of Civility

11:00 Daniella Moses – Sociology
A Socio-Historic Analysis of Urban (Re)Development in Sacramento

11:15 Gianina M. Coturri – English
Nature is Political: How Nature Heals Society in George Orwell's Political Critique

11:15 Chelsea J. Jones – American Studies
The Intersections of Race and Renewable Energy

11:45 Julia M. Plotts – Landscape Architecture
Virtual Projections of Ideal Urban Landscapes

233 Wellman · Moderator: Seth L. Schein

10:45 Lisette M. Betsinger – Comparative Literature
When the Medieval Meets the Modern: An Analysis of Beowulf Adaptations in Literature in Film

11:00 Evan F. Loker – Comparative Literature
Desire and Immanence: Reflections on a Literary-Theoretical Excursus

11:15 Sara Schoch – English
Gothic Monsters: Male Creators as a Threat to Patriarchy in Frankenstein, Dracula, The Great God Pan, and The Strange Case of Dr. Jekyll and Mr. Hyde

11:30 Kaileigh A. Snyder – English
"In Some Bluebeard's Castle": The Supernatural and the Domestic in Nineteenth Century British Literature

11:45 Celsiana M. Warwick – Classical Civilization
Post-Homeric Representations of Achilles and Patroclus in Greek Literature

234 Wellman · Moderator: Mark Lubell

10:45 Dustin Cutler – Environmental Policy Analysis & Planning
Understanding Compliance Through the California Surface Mining and Reclamation Act

11:00 Nicholas J. Depsky – Hydrology
Understanding Compliance through the California Surface Mining and Reclamation Act

11:15 Jatin Malhotra – Managerial Economics
Big Bank Mergers During the Financial Crisis – Impact on Shareholder's Wealth, Profitability, and Efficiency

11:30 Juliana Romano – Community and Regional Development
The Two Faces of Microfinance

11:45 Anna J. Stolitzka – History
Policy and Accountability: The National Polar-orbiting Operational Satellite System (NPOESS)

12:00 Robert K. Wagner – Managerial Economics
Effects of Unions on California Agriculture: 1990-2010


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ABSTRACTS

ABSTRACTS

Interactive Three Dimensional LED Matrix

Louis Abastas
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

The purpose of this project is to create an interactive, intuitive, and attention-gathering exhibit that will attract people of various ages and interests; more notably sway students into studying an engineering field. In designing the exhibit, we set out to achieve three goals. The exhibit must be visually appealing, uncommon and interacts with the user in unexpected ways. We are using bright, high-flux, red light emitting diodes to attract attention. We arrange them in a three dimensional lattice shape. The cube will be a bright three dimensional display which can be built very easily and at a low-cost. It will use five hundred and twelve light emitting diodes, the same type used in vehicle indicator lights, each acting as a pixel of light. The cube display will show a variety of different patterns. The patterns are controlled remotely via human interaction and an external handheld device. The external handheld device allows the viewer to interactively change the light pattern. The handheld device will be a watch that detects motion and is connected via a wireless connection to the electronic controller. It will be able to display a simple game as well as display patterns that can be user modified.

Origin of Mutations During Growth Under Selection

John Paul J. Aboubechara
Sponsor: John R. Roth, Ph.D.
Microbiology

Natural selection requires heritable variation in populations to select individuals of increased fitness. Whereas natural selection is well understood, the development of variation remains controversial. Classical experiments in *Escherichia coli* demonstrated that variation arises from mutations that occur spontaneously and without the influence of selective stresses. However, those experiments made use of lethal antibiotics-resistance assays that cannot detect growth and the presumably small effects of selection. Therefore, current research systems study the role of selection using non-lethal nutrient starvation. One such system studies the reversion of a leaky +1 frameshift mutation in the lactose utilization genes (*lac*) located on a conjugative plasmid. Selection on lactose yields mutations at a rate 100-fold higher than obtained in antibiotic selections. So under starvation conditions, selection seems to be mutagenic and allows for sudden adaptation. In contrast, we consider that the appearance of Lac+ colonies on selective medium depends on common variants with high copy numbers of the leaky *lac* gene to slowly initiate growth under selection. This work investigates the role of growth temperature, which may induce changes in the permeability of lactose, and of the conjugative functions of the F plasmid to understand the origin of mutants under selection.

Assessing the Needs of Female Homeless Veterans: An Evaluation of Veteran Aid Programs

Justin Ray P. Abraham
Sponsor: Jeffrey Sherman, Ph.D.
Psychology

While the success of transitional/aid programs has mitigated the problem of chronic veteran homelessness, the number of female homeless veterans has more than doubled since 2006. Moreover, this amount is predicted to grow as a result of the unprecedented number of American women serving in Iraq and Afghanistan. With only sixteen funded projects targeted specifically for women nationwide, governmental programs have been slow to adapt to the unique needs of female veterans (Foster 45). The lack of current data about this demographic only hinders the appropriate policy reforms from taking place. This study attempts to identify the prevailing factors that affect the participation of female homeless veterans in aid programs. I will examine the significance of specific program components using a cross-sectional analysis of various programs in the greater Sacramento region. I hypothesize that the main factors influencing retention include the presence of child care services, treatment for sexual trauma, and sex-segregated shelters. Foster, Lisa K. "California's Women Veterans: The Challenges and Needs of Those Who Served." *California Research Bureau*. Aug 2009.

Utilizing Cell Penetrating Peptides to Deliver Engineered Proteins Across the Blood-Brain Barrier

Alexa Adams
Sponsor: Dave Segal, Ph.D.
Biochemistry and Molecular Medicine

Cell Penetrating Peptides (CPPs) are used to deliver "cargo" molecules into cells, independently of cell receptors or energy. This can be exploited for medical applications as CPPs can be attached to cargo molecules, delivering them across cellular barriers more efficiently than if CPP were not present. Such cargo molecules could include Artificial Transcription Factors (ATFs), which can activate or deactivate DNA. ATFs are delivered to the targeted region of DNA by zinc-fingers, proteins which are engineered to bind to specific DNA sequences. In this study, CPPs were bound to zinc-finger ATFs to deliver the ATFs across the blood-brain barrier in a mouse model of Angelman Syndrome. This method eliminates the need to drill into the skull to deliver the injection directly into the brain while simultaneously delocalizing the effects from the injection site and greatly expanding the area of brain that is exposed to the ATF. The purpose of this study is to develop and test non-CPP ATFs by comparing them to the CPP ATFs, confirming CPP's role in widespread distribution of the ATF within the mouse brain. It is hypothesized that the non-CPP ATF brains will show decreased penetrance of the blood-brain barrier when compared to the CPP-ATFs.

Determining the Role of MeCP2-e1 in Neuronal Development

Justin O. Aflatooni
Sponsor: Dag H. Yasui, Ph.D.
Medical Microbiology & Immunology

Rett syndrome is an autism spectrum disorder characterized by severe neurologic defects. Mutations in *MECP2* are responsible for up to 95% of Rett syndrome cases. The *MECP2/Mecp2* gene encodes two protein isoforms, MeCP2-e1 and MeCP2-e2. While MeCP2 has been well characterized, little is known about the function of MeCP2-e1. Therefore, to study the role of the MeCP2-e1 protein isoform in neurodevelopment, MeCP2-e1 deficient mice were designed and generated. Western Blot and Immunofluorescence (IF) analysis confirmed the absence of MeCP2-e1 protein in the MeCP2-e1 deficient mouse brains and normal expression of both Mecp2 isoforms in control littermates. However, both assays revealed higher levels of the MeCP2-e2 isoform in the MeCP2-e1 deficient neurons than in the control neurons. In addition, IF results indicate that MeCP2-e1 is primarily localized to euchromatic regions in the nucleus while, in contrast, MeCP2-e2 localizes to heterochromatic regions. Behavioral and overall health and motor function tests revealed that MeCP2-e1 deficient mice had abnormal anxiety levels, social behaviors as well as reduced lifespan compared with control littermates. Collectively, these results suggest that MeCP2-e1 is necessary for normal neurodevelopment and has a related but distinct function from that of the MeCP2-e2 isoform.

Modulating Brain Copper by Diet and Genetics Alters Neurobehavior

Samson I. Aghedo
Sponsor: Janet Uriu-Adams, Ph.D.
Nutrition

Schizophrenia patients have a reduced pre-pulse inhibition (PPI) response to auditory stimuli. PPI is a neurological sensory gating that allows individuals to filter out stronger auditory stimulation (pulse) after exposure to weaker stimulation (prepulse). Low copper (Cu) can reduce PPI in mice; however, the mechanisms are unknown. Cu deficiency can decrease superoxide dismutase activity and increase superoxide anions, which can combine with nitric oxide (NO) to produce peroxynitrite leading to increased protein nitration and subsequent dysfunction. Research showed NO was higher in the plasma of schizophrenic patients compared to controls; phencyclidine treatment (a drug used to model schizophrenia in experimental animals) increased brain NO concentrations and reduced PPI. Inhibition of NO synthase (NOS) decreased brain NO levels and attenuated the PPI deficit, indicating that NO played a role in sensory motor gating. My hypotheses are: low brain Cu (induced by low Cu diet or genetic mutation of the Ctr-1 Cu transporter) will 1) increase NOS expression, and 2) increase protein nitration. Preliminary data show that brain Cu concentrations were inversely correlated with brain protein nitration. Optimal Western blot conditions for NOS have been determined. Effects of dietary and genetic Cu deficiency on brain NOS protein expression are currently being evaluated.

Sequencing RELL1, a Candidate Gene for Hypertrophic Osteodystrophy in Weimaraner Dogs

Miriam Aguilar
Sponsor: Danika Bannasch, Ph.D.
School of Veterinary Medicine

Hypertrophic Osteodystrophy (HOD) affected dogs suffer from swelling and pain in their bones, which leads to reluctance to walk or stand. A similar disease in children is called Chronic Recurrent Multifocal Osteomyelitis (CRMO). Children who suffer from CRMO have recurrent episodes of unexplained debilitating bone pain, and the disease course is virtually identical to that of HOD. The aim of the research is to identify the molecular basis of HOD in Weimaraner. Genome wide association (GWA) analysis resulted in the mapping of HOD to a 2.5 mega-base region on canine chromosome 3. An appealing candidate gene in this region belongs to the Tumor Necrosis Factor (TNF) family of genes. Preliminary expression studies showed reduced expression of Rell1 in an HOD affected Weimaraner compared to non-HOD dogs. However, the complete sequence of the coding region of Rell1 from the cDNA of an HOD affected Weimaraner dog revealed no sequence changes when compared to an unaffected (non-Weimaraner) dog. I am testing the hypothesis that HOD is associated with a mutation in the non-coding region of Rell1. I will sequence the non-coding regions of Rell1 to identify any sequence changes between affected and unaffected samples to test the hypothesis.

A Search for Biochemical and Post-translational Protein Modifications Induced by Chromosome Bridges in *Saccharomyces cerevisiae*

Hamza Ahsan
Sponsor: Ken B. Kaplan, Ph.D.
Molecular and Cellular Biology

Proper chromosome segregation in mitosis is essential for genome maintenance in all living organisms. Although most chromosomes segregate to daughter cells during anaphase, small regions of connected chromosomes, termed "chromosome bridges," stretch across the cell delaying complete segregation. The inability to resolve these bridges has been linked to Human diseases such as Bloom's Syndrome and Fanconi Anemia Syndrome. Although the phenomenon of chromosome bridges has been characterized, it remains unclear how the cell cycle monitors bridges. We hypothesize that chromosome bridges "signal" to change the rate of anaphase spindle elongation, delaying exit from mitosis until bridge resolution has fully occurred. To test this, we are using *Saccharomyces cerevisiae* to identify bridge-induced, post-translational modifications of spindle-associated proteins, such as the microtubule plus-end associated protein, Bim1. We have developed a protocol to enrich for cells with chromosome bridges which are then biochemically analyzed by western blotting for protein modifications. Once identified, modifications will be analyzed for their role in anaphase to ascertain the significance of the modifications for anaphase progression and bridge resolution. Results from this work will have important implications for understanding how cells accurately segregate chromosomes and how failures might contribute to human disease.

Biochemical Characterization of the Secretion Mechanism of the ESX-1 ATPase EccC

Spenser C. Alexander
Sponsor: Lorena Navarro, Ph.D.
Microbiology

The ESX-1type VII secretion system (T7SS) is a key virulence determinant for the intracellular pathogen *Mycobacterium tuberculosis* (Mtb), allowing for the secretion of virulence proteins into the host cell. The T7SS is broadly conserved throughout all Gram-positive organisms; two protein groups are also highly conserved in all species, the secreted ESAT-6/CFP-10 virulence complex, and the essential EccC ATPase. This ATPase recognizes the CFP-10 signal sequence, directly interacting with the ESAT-6/CFP-10 dimer, allowing for the translocation of these proteins into the host. Although the EccC ATPase has three active ATPase domains, it is unknown whether these domains act alone or in concert. In this study, I created a panel of *Thermomonaspora curvata* mutants to test the hypothesis that all three EccC ATPase domains are required for ATPase activity. I created several variations of a homologous *Mtb* EccC ATPase gene from *T.curvata* to generate proteins with combinations of single inactivating mutations in either the Walker A or B motif of the ATPase domains. I used a coupled ATPase assay to measure the activity of each variant. Assay results yielded data confirming my hypothesis that all three ATPase domains are required for activity of the EccC ATPase.

A Comparative Dynamic Analysis of Shuttle Robotic Arm Using Traditional and GATE Elements

Adiba Ali
Sponsor: Nesrin Sarigul-Klijn, Ph.D.
Mechanical and Aeronautical Engineering

The benefits of a robotic arm attached to the Space Shuttle are immeasurable. The robotic arm, otherwise known as the Shuttle Remote Manipulator System, is a mechanical arm used to deploy payloads from/to the Space shuttle to/from the International Space Station, along with countless other tasks that it performs. This study was conducted to compare two methods to reevaluate the Shuttle Remote Manipulator System. The first method was to use the computer software called PATRAN and the second method was using the GATE Family of high fidelity finite elements, formulated by Professor Nesrin Sarigul-Klijn, in order to analyze the static and dynamic loads, along with various types of stresses, on the Shuttle Remote Manipulator Systems. Understanding the design and development of the Shuttle Remote Manipulator System enables us to better implement the technology and reiterate the importance of advancements in Space technology. Analysis of the Shuttle Remote Manipulator System design paves the way for the present and future generation to build similar technologies and will prove beneficial to engineering fields other than Aerospace.

Age of Weaning from Stable Isotope Ratios - Amador County, CA 1000-2000 BP

Erik R. Allen
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Stable isotope analysis of human remains has allowed archaeologists to examine a wide range of phenomena such as migration, climate change, diet composition, and age of weaning. This study focuses on estimating the age of weaning within a population as a proxy for health and parental investment. Changes in weaning age over time, coupled with other evidence, such as increased occurrence of enamel hypoplasias or parry fractures, can be used to infer changes in diet quality and rates of warfare and disease. This study examines ratios of nitrogen isotopes within serial samples of first molars of individuals buried between 1000-2000 years ago in Amador County California, to determine age of weaning. In particular, we compare males and females to determine if there was differential investment in one or the other sex. As well, we compare the average age of weaning in this population to similar studies in an earlier population dating 4000-3000 years ago.

Colloidal Synthesis of Germanium Nanocrystals

Marlene M. Amador
Sponsor: Susan M. Kauzlarich, Ph.D.
Chemistry

Demand for energy is rising with population growth. With this new challenge, semiconductor nanoparticles offer a cost efficient alternative for the fabrication of photovoltaic devices. Germanium (Ge), with its unique characteristics (narrow band gap, non-toxic), is considered as a potential material for solar energy conversion. Our group is focusing on producing high quality Ge nanocrystals while controlling size and morphology. We would also like the developed method to be amenable to industrial scale up. Our method for the preparation of Ge nanocrystals involved the reduction of Ge halides under an inert atmosphere in a Schlenk line. Oleylamine was used as a solvent, binding ligand and also as a reducing agent. To achieve size control, we evaluated variables such as temperature, time, rate of heating, precursor quantities, and precursor ratios ($GeI4^{+}/GeI2^{+}$). The Ge nanoparticles were characterized by Powder X-Ray Diffraction (PXRD) and Transition Electron Microscopy (TEM), and the results will be presented in the poster.

The Discursive Power of Environmental Problems and the Development of Agricultural Biotechnology

Alfonso A. Aranda
Sponsor: Diana K. Davis, D.V.M.
History

Given its depth and complexity, the ongoing debate surrounding agricultural biotechnology raises many important questions for political ecologists. In recent years, transgenic crops have been introduced for their potential to neutralize the excessive greenhouse gas emissions of industrial agriculture through genetically engineered traits such as Nitrogen Use Efficiency (NUE), which promote fewer fossil fuel inputs. Paralleling scholarly accounts of environmental narratives, this paper analyzes the history of social action for the environment through the powerfully discursive lens of agricultural biotechnology (as a technology which re-imagines and re-produces nature). In this regard, biotechnology is considered as an example of social action for the environment; one which defines things like climate change as amenable to technological solutions. Findings indicate that socially constructed scientific explanations of environmental "problems" continually justify the development of such technologies. However, the relationship between Western plant biotechnology and diverse cultures (particularly in the global South) unfolds as a colonizing one.

Pulse Oximeter: Mobile Device Interface: Android Development and LabView Interface

David E. Arellanes
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Blood oxygenation is a critical indicator of the health of a person. Measuring patients' oximetry information in a reliable and convenient manner is important. The pulse oximeter is an electronic device that makes this possible. A finger probe attachment pulses two light emitting diodes of different wavelengths on one side of the finger, and on the other side a photo detector, which creates an electric signal when light photons hit it, detects the light coming through the finger. The oxygen level is determined through the analysis of the absorption of the two different wavelengths that indicate changes in the optical absorption caused by oxygen induced changes in hemoglobin. The processing core of this system lies in the Cypress Psoc Microcontroller, which allows programmability of digital and analog functions, as well as serial interface with other components. In this project, I am applying National Instruments' Labview software, which will display real time pulse plots and oximetry information. I am also developing software for the commercially popular and accessible Android phones; which will wirelessly transmit oximetry information to the phone for display. This feature provides a more accessible interface.

Quantification of the Temporal Response of Post-exercise Anterior Cruciate Ligament Stiffness

Eric D. Ashuckian
Sponsor: David A. Hawkins, Ph.D.
Neurobiology, Physiology and Behavior

Injury of the anterior cruciate ligament (ACL) is one of the most debilitating and common knee injuries. Nearly 70% of ACL injuries are non-contact in nature with a possible overuse mechanism of injury. To explore the role overuse may play in ACL injuries, it is necessary to characterize the temporal response of ACL mechanical properties pre- and post-exercise. The objective of the study is to characterize pre-exercise ACL stiffness and the temporal response of ACL stiffness following exercise. A custom knee arthrometer is used to apply a small cyclic anterior force to the tibia (-50 to 200 N) while recording tibia displacement relative to the femur. ACL stiffness can be approximated from these force-displacement data. ACL stiffness is measured immediately before and at hourly intervals following a 50 minute strenuous exercise protocol. Preliminary testing of 3 subjects resulted in pre-exercise ACL stiffness values of 281.2±159.10 N/mm. Testing is currently in progress to characterize ACL stiffness changes over time following exercise. Advanced understanding of ACL recovery rates is necessary to develop more effective training programs for people to promote fitness and improve athletic performance while minimizing their risk for ACL injury.

The Ecology of Coastal Foraging by Native Californians in the Ten Mile Dunes

Chloe Atwater
Sponsor: Bruce Winterhalder, Ph.D.
Anthropology

Though the southern California coast has a relatively rich ethnographic and archaeological record, little is known about early native Californians on the northwest coast. A further puzzle is presented in the Ten Mile Dunes of MacKerricher State Park: why did native Californians leave shell middens in the dunes, some distance from the collection site, when ostensibly better habitats existed? To investigate this, I will apply optimal foraging theory (OFT) to archaeological data from the Ten Mile Dunes. OFT consists of a set of models that describe human subsistence patterns from an evolutionary ecology perspective. OFT models can be used in an archaeological context to reconstruct prehistoric behavior, which can further our understanding of evolutionary patterns. I participated in excavations during the UCD Field School 2011. Data from field school is currently being analyzed by me and fellow undergraduate and graduate students at the Center for Archaeological Research at Davis. I will apply OFT to the archaeological data from two sites to construct optimal foraging radii, make predictions about where Native Californians were living, and explore foraging behavior and its implications. This work will enrich our understanding of early coastal societies, and contribute to the larger body of work investigating OFT.

Investigating the Effects of Hyperglycemia on the Proteasome Activity in Rat Cardiac and Monkey Kidney Cells

Asadullah K. Awan
Sponsor: Aldrin V. Gomes, Ph.D.
Neurobiology, Physiology and Behavior

Despite present medical advances, diabetes still causes a greater rate of heart disease related death when compared to non-diabetic persons and is still the leading cause of kidney failure. Hyperglycemia, a condition of elevated levels of blood glucose, is partly responsible for these diabetic complications, but the mechanism by which hyperglycemia contributes to diabetic complications has not been fully resolved. We explored the effects of high glucose levels on the proteasome, a multi-catalytic protease complex that degrades greater than 60% of protein in eukaryotic cells to maintain proper cellular function. Purified proteasomes incubated with glucose concentrations ranging from 0 to 50mM did not show any significant changes in activity. However, H9c2 rat cardiac cells incubated in high glucose media (25mM glucose) for 43 hours showed an approximate 25% increase in proteasome activity as compared to cells incubated in a normal, non-diabetic glucose level (5.5 mM glucose). These results suggest that some of the effects of hyperglycemia may be due to an indirect effect on proteasome function.

Plasticity of Pigmentation in the Marine Copepod *Tigriopus californicus*

Elizabeth R. Axton
Sponsor: Ernest S. Chang, Ph.D.
Neurobiology, Physiology and Behavior

Tigriopus californicus is a species of marine copepods that reside in shallow pools in the upper intertidal region, and are characterized by their unique orange-red color. A high concentration of the carotene pigment astaxanthin protects copepods from ultraviolet radiation, yet will attract visual predators such as tidepool sculpins (*Oligocottus maculosus*). *T. californicus* should elicit a plasticity response to optimize its survival rate. Marine copepods were collected from five tide pools in Bodega Bay, California. For 15 days copepods were exposed to natural sunlight or shade, and were either housed with a tidepool sculpin in a mesh cage or an empty cage. Every three days 15 copepods from each treatment were analyzed for pigment saturation using a stereo microscope equipped with a PixeLink CCD camera and Photoshop CS2. After three days the pooled results demonstrated significant differences between light and dark treatments ($P < 0.0001$); after nine days there were significant differences from sculpin presence ($P < 0.0001$). The response of the copepods varied between pools, yet the differences did not correlate to features such as temperature, sun exposure, distance from tide, or predator presence. This indicates that there may be genetic differences in pools among the same intertidal region.

Network Analysis: A Method for Visualizing Organizational Communication Structure

Daniel Badiali
Sponsor: George Barnett, Ph.D.
Communication

Recent research examining organizations emphasize the importance of communication in pursuit of organizational goals. Ideally, organizational structure is developed to optimize the individual and collective roles of employees. This is commonly depicted in a formal organizational chart that displays individuals' roles and authorities. However, it is important for organizations to understand the informal communication structure by examining patterns of information flow within a company, which can be done through social network analysis. This research uses social network analysis (SNA) to map and analyze the communication structure of a company of nearly 400 employees. Past studies have primarily used surveys of employees to describe communication structure and culture. However, in the digital era, this measurement doesn't depict an objective criterion for analyzing information exchange. The data sources for this study use the most common modes of communication: email and telephone exchange. The input of upper management and latest structural changes will help determine specific areas for the company to analyze. With an accurate description of communication structure, organizational leaders will be better informed about inter/intra department relations, the effects of structural change, and potential communication inefficiencies. Moreover, social network analysis can be used to plan company growth and restructuring.

Structure Analysis of HIV Env-based Immunogen gp140 Using Single Particle Reconstruction and 2D Segmentation

Mohammad Ali Baikoghli
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

The HIV-1 viral membrane contains an average of 10 Env spikes, each composed of two subunits, gp120 and gp41. The virus also carries the protein Tat, Transactivator of Transcription, which increases transcription of the HIV genome. Upon interaction with receptor (CD4) and co-receptor (either CCR5 or CXCR4) on T-lymphocyte membranes, Env undergoes a series of conformational alterations that result in fusion of the host cell membrane and the viral membrane, and in viral genome release. The soluble recombinant immunogen gp140 is derived from Env, with the transmembrane protein cleaved; it contains the antigenic region that binds CD4. A 3D reconstruction of the gp140 trimer was generated through cryo-electron microscopy and single particle reconstruction (SPR), a method of structure elucidation via computer reconstruction of various images gathered from micrographs. Following SPR, density maps were analyzed using 2D segmentation techniques which are used to extract segments from these 3D reconstructions for further analysis. Currently, several key structural factors have been determined, such as the relative position of VRC01 (a highly neutralizing antibody) as well as Tat protein. Further analysis to uncover details of Tat-gp140 and VRC01-gp140 interactions is currently underway.

Darfur Genocide: Economic Expansion vs. Regional Stability and Human Rights

Gabrielle Baker
Sponsor: Keith Watenpaugh, Ph.D.
Religious Studies

Genocide is a contemporary and ongoing crisis in the international community, and there have been few significant actions or mandates made to stop the spread of genocide in impoverished regions of the world. This research focuses on the different factors that led to denial of genocide in Darfur, and the repercussions of inaction. These factors include international policy, specifically focusing on the United Nations Security Council and divisions in human rights and peacekeeping, regional cultural differences, and methods of genocide and genocide denial. I used papers written by scholars of the Darfur region in Sudan, United States Congressional hearings, research journals, and United Nations Hearings to identify different factors and to analyze the action taken by the United Nations. This paper will also focus on the varying international pressures, specifically by China, in influencing the United Nation Security Council vote. The purpose of this research is to further understand the conflict between short term economic gain and longstanding issues of human rights, and human rights violations, and why countries, especially those in positions of significant power, will choose not to aid those in situations of crisis and open warfare.

Noble Element Simulation Technique (NEST) for Dark Matter Detectors

Francisco J. Baltazar
Sponsor: Sudhindra M. Triphati, Ph.D.
Physics

Dark matter is believed to constitute around 80% of the matter in the universe; yet, its nature remains unknown. It is a type of matter that neither emits nor scatters light or other electromagnetic radiation, and interacts weakly with other types of matter, consequently making it very difficult to detect. The leading candidate for non-baryonic dark matter is the *Weakly Interacting Massive Particle* (WIMP). WIMPs are expected to interact only with nuclei, therefore dark matter detectors aim to maximize their ability to discriminate between electron and nuclear recoils within a detection medium. Liquid noble elements (LNE) have been established as an attractive detection medium in these experiments. LNEs both scintillate and become ionized when interacting with particles. The ratio of scintillation over ionization energy caused by the collision provides a way of identifying the interacting particle, potentially dark matter. NEST is a comprehensive software model for the simulation of the scintillation and ionization processes in LNEs. By incorporating all available data, NEST is able to reproduce a wide variety of measurements. We analyze this data with an objective of improving detector calibrations and performance verification which will aid in the design and optimization of future detectors.

Shifting Cultural Production in the Dialectic of US-Japan Relations

Linh N. Banh
Sponsor: Mark C. Jerng, Ph.D.
English

The Post-World War II era of Japan experienced an influx of American presence, both in terms of military and cultural manifestation and as Okada Toshio states, "We only become Japanese by comparing ourselves with the West, and so we feel most ourselves when the American's look is on us." However, with the impetus of the economic boom Japan experienced in the 80's, and the advent of the digital age that transformed notions of cultural imperialism into globalism, the hegemonic information flow has been reversed from a trickle-down effect to a dialectical exchange between Japanese culture and American culture. This essay will be examining the representations emerging from the cultural simulacrum that engages in acts of re-appropriation and re-packaging. The analysis of this cultural simulacrum will occur in the popular culture sites such as: anime, mangas, Godzilla films, and cyberpunk novels written by American authors (Neal Stephenson, etc.). The significance of this cultural exchange lies within mimicry in cultural productions from both ends of the dialectic. This framework of cultural reception and cultural production will elucidate the various vectors of the idea of Americanism and its re-appropriation into Japanese culture.

Research Applications of Synchrotron Radiation

Sean R. Barberie
Sponsor: Thomas A. Cahill, Ph.D.
Physics

While working as a physicist and researcher in the UC Davis DELTA Group, we developed techniques for using synchrotron emissions for elemental analysis in a wide variety of applications; emphasizing environmental work in air quality and climate but also including work in historical, medical, and material science fields. The Advanced Light Source (ALS) at Lawrence Berkeley National Lab and the Stanford Synchrotron Radiation Lightsource (SSRL) at SLAC National Lab are high energy facilities that produce synchrotron radiation—polarized radiation that is produced by accelerating electrons to near the speed of light in a large containment ring. The two facilities, merely a stone's throw apart, represent two of the biggest and most advanced synchrotron laboratories in the world. Research groups like the DELTA Group have developed innovative techniques for exploiting the high energy emissions of these machines to do cutting-edge work in aerosol analysis and environmental science; ranging from finding the composition of air samples to test for harmful metals, to analyzing arctic ice cores to learn about the conditions of early Earth. This talk will focus on the physics behind these impressive facilities, the unique research they advance, as well as the great opportunity they represent to UC Davis researchers.

Creative Process in Contemporary Art

Naomi K. Barney
Sponsor: Robin Hill, B.F.A.
Art Studio

In Fall 2011, I took part in the Integrated Studies Creative Process in Contemporary Art course and it was through this course that I both developed a better understanding of my own creative process and my artistic skills. In class discussion, I contemplated the creative process of other artists whose works I had seen either through films or museum visitations. From there, my classmates and I created our own works. Each project acted as a personalized reflection of our own interpretation of creativity. Projects ranged from explorations of our own life to our comprehension of "the body". Personally, my projects focused on nature; not just the literal definition but also the nature of people. For example, in a piece entitled "Only in Captivity", I explored the issue of habitat destruction and its effect on wildlife. In another called "Kasa", I looked at gestures and the nature in which people use these to interact. Overall, this experience opened a new doorway into understanding my creative process as one hidden in the psychology of interactions.

Mathematica(TM) Calculation and Visualization of Complex Electric Fields: Uses as Accelerator Beam Diagnostic of Flux and Energy

Nichole A. Barry
Sponsor: Carlos Castaneda, Ph.D.
Physics

The electric field between a grounded plane and a uniformly charged ring has been calculated using the method of images, Zypman's off-axis electric field equations, and the simulation code Mathematica(TM). The calculation was applied to a system used at Crocker Nuclear Laboratory to measure the low energy beam flux for the Radiation Effects Facility. The measuring device consists of positively charged rings flanking grounded 6.35um thick aluminum foils. The energy lost in the foils by the charged particles in the beam produces an electron cloud on the faces of the foil. The electric field produced by the rings then sweeps the electrons to make the electron yields more efficient. The calibrated device is used to monitor the Cyclotron beam flux to energies as low as 4 MeV or less. Comparison of the yields of two different sets of foils and rings will be presented. The use of the devices to measure the Cyclotron beam energy will also be discussed.

Adult Intervention Methods on Peer Conflict

Meghan L. Bauder
Sponsor: Lawrence Harper, Ph.D.
Human and Community Development

This research project examines types of peer conflict in a preschool setting and the ways in which adults intervene. 12 typically developing subjects, 6 boys and 6 girls, were drawn from a preexisting data set. Overall, a total of 122, 20 minute video tapes of free play periods were used for this study. For each tape, any episode of conflict which involved adult intervention was noted. 29 of the 122 tapes contained one or more episodes of conflict. The cause of the conflict, as well as the subject and peer's physical behavior were recorded. The adult's method of intervention and behavior were also recorded. The origins of conflict include, difference in opinion, object control, and friend control. Adult intervention methods include verbal explanation, verbal demand and physical restraint. It is hypothesized that female subjects will have a higher percentage of friend control, and difference in opinion conflicts, while male subjects will have a higher percentage of object control conflicts. It is also hypothesized that conflicts between a male subject and peers will be intervened using verbal demand and physical restraint, while conflicts between a female subject and peers will be intervened using verbal explanation.

Local Effect of Ovarian Steroid Hormones on Lactational Performance of Cows Induced to Lactate - an ANS194 Research Project

Brittany M. Bazeley
Sponsor: Russ Hovey, Ph.D.
Animal Science

Induced lactation stimulates non-pregnant cows to lactate using systemic estradiol (E) and progesterone (P), although milk yield responses vary between animals. This study tested the hypothesis that supplemental E and P administered to the udder via intramammary infusion would increase subsequent milk yield. Eight non-pregnant multiparous cows were injected with E (.075 mg/kg) and P (.25 mg/kg) sc. for 9 days. On days 3, 6 and 9, half of each udder was infused with saline (SAL) while the other half was infused with E+P (1 ng and 2.5 ug, respectively). Milking commenced on day 21 after sc. injections of dexamethasone (15 mg) on days 19 and 20. Preliminary results indicate that the treated quarters responded positively to the intramammary infusions of E+P and displayed more growth prior to milking. Six of the eight cows produced more milk from the E+P quarters within the first 2 days of milking. The mean yield difference between the right and left quarters during the first 2 days of milking for all 8 cows was 174ml ($P<.05$). This indicates that during induced lactation E and P may act locally on the mammary glands rather than by acting solely at the systemic level.

Plasmic Lipid Profiling and Analysis of Potential Biomarkers that Track Insulin Sensitivity and Fitness

Angela Beliveau
Sponsor: Oliver Fiehn, Ph.D.
Molecular and Cellular Biology

Insulin resistance is a gradual development that often leads to type-2 diabetes. Although type-2 diabetes is defined by high glucose concentrations, several other biochemical changes occur within adjacent metabolic pathways. Metabolomic analysis of these pathways has established many regulatory relationships including insulin and lipid metabolism. We will focus on this mechanism using a gas chromatograph and mass spectrometer, which measures and compares changes in molecule accumulations. A sufficient change could signify them as biomarkers for type-2 diabetes risk. A previous study done with African American women has already isolated several potential biomarkers under sedentary conditions. Currently being analyzed are the changes in the metabolites when performing an exercise regiment. We hypothesize that simple means of exercise will show a positive change in some insulin related metabolites corresponding with improved insulin sensitivity. Although this project will be processed in much more detail, the main focus of this summary will be lipid profiling and analysis of these possible biomarkers and other relatable metabolites. Mentioned previously, insulin resistance affects several biochemical pathways including beta-oxidation. Indication of insulin sensitivity generation could be inferred from this known pathway if we find evidence of increase lipid metabolism during adjusting levels of these potential biomarkers.

The Creative Process: An Examination of Time

Laura J. Bell
Sponsor: Robin Hill, B.F.A.
Art Studio

This set of works is part of a collection of art pieces created for the Creative Process in Contemporary Art Practice class. Over the course of the quarter, we focused upon observing, as well as experiencing, the creative process in art-making. For each project, we were given certain parameters (e.g. a medium or a concept) to work within, and at first, as a fledgling artist, I encountered many difficulties in manipulating my materials in the way I desired. I soon learned that instead of working against my artistic limitations, I needed to figure out a way to work around them instead. It was from these challenges that my creative process emerged and my true enjoyment of art-making began. I approached each piece like a puzzle, and in each work I explored a different topic. However, through sheer coincidence, a universal theme began to surface throughout my pieces--the ever-forward movement of time and its ability to create or erase.

Identifying Topoisomerase-specific Activities of the Sgs1-Top3-Rmi1 Complex

Amber R. Berry
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Microbiology

Homologous Recombination occurs in damaged cells to repair DNA that has undergone a double stranded break. The Sgs1-Top3-Rmi1 complex acts during Homologous Recombination to dissolve intermediate DNA structures called Double Holliday Junctions that if unrepaired are toxic to cells. This complex contains a helicase, Sgs1, and a topoisomerase, Top3, that act to repair damaged DNA. Single point mutations disabling Sgs1 helicase activity still maintain a physical association with Top3 and Rmi1 and have some similar phenotypes to wild-type. Data from several recombination assays suggest additional Sgs1-independent roles for Top3. I hypothesize that 1) the helicase-independent roles of this complex can be attributed to the topoisomerase activity of Top3 and 2) Top3 has roles in addition to those with Sgs1. My approach to studying these roles is through integration of a point mutation in the Top3 gene disabling its catalytic activity, but allowing complex formation with Sgs1 and Rmi1. This will allow me to deduce the Top3 specific activity by comparing the topoisomerase-dead and helicase-dead complex with wild-type complexes using an assay that measures gene conversion tract length. This protein complex is important to maintaining genome stability and minimizing genomic rearrangement, one of the major sources of predisposition to cancer.

When the Medieval Meets the Modern: An Analysis of Beowulf Adaptations in Literature in Film

Lisette M. Betsinger
Sponsor: Brenda D. Schildgen, Ph.D.
Comparative Literature

In the article *Aesthetics and Hermeneutics*, Hans-Georg Gadamer raised the following issue: "If we define the task of hermeneutics as the bridging of personal and historical distance between minds, then the experience of art would seem to fall entirely outside its province." He also defines hermeneutics as "the task of ... avoiding misunderstanding." Certainly the historical and the personal hermeneutical approaches yield interesting and informative analyses of works of art, but the aesthetic is an entirely other level of interaction between the artistic object and the experiencer that should not be neglected. The aesthetic is what perpetuates artistic traditions. Gadamer asserts that a work of art is constantly in a timeless present and there is no better example of this than the 8th -10th century medieval text *Beowulf*. The epic narrative has become a twentieth and twenty-first century mining field of inspiration for novels, comics, oral performance, and has been recreated in four films in a little over a decade. Aristotle made the claim in his work *Poetics* that poetry and music were modes of imitation or mimesis. How have postmodern interpretations and modern filmic adaptations maintained a mimetically timeless relevance for *Beowulf*, or has it become something altogether different?

Genocide Denial and Australia's Stolen Generations

Phoebe Bierly
Sponsor: Keith Watenpaugh, Ph.D.
Religious Studies

Beginning in the 1860's and continuing into the 1970's, thousands of Aboriginal children were forcibly removed from their families by the Australian government, in an attempt to preserve the integrity of "White Australia" from contamination by the "half-caste" Aboriginal population. Though this would seem to fall under the UN Convention on the Prevention and Punishment of Genocide's stipulation against the forcible transfer of children, within Australia there have been fairly widespread attempts to deny that the removal of the Stolen Generations was a genocidal act. I examine historians' accounts of this debate, as well as quotes and articles written by people at the center of it. In the process, it becomes clear that attempts to interpret the removal of Aboriginal children as an occurrence of genocide have been hampered by an ambivalent relationship with the past, particularly the perception that the present Australian population is not connected to this past, as well as an intentionalist interpretation of genocide, which regards the Holocaust as a prototype for all genocides, and thus struggles to recognize the genocidal nature of events that lack the mass killings that characterized the Holocaust.

Toni Morrison's Wayward Women: Evaluating the Queer Role of the Female Trickster

Alana M. Bjorkquist
Sponsor: Gregory Dobbins, Ph.D.
English

While the hybridity of African-American literature generally draws upon folkloric elements, the presence of the mythic female trickster figure in selected works by Toni Morrison is unique. Historically the traditional figure of the trickster is male. Conversely, the female trickster figures in Morrison's *Sula and Song of Solomon*, and *Beloved* and in Alice Walker's *The Color Purple* offer queer alternatives. Elucidating the political function(s) of these female tricksters within the larger narrative causes disparate mythical and/or magically realist characterizations to coalesce in unexpected ways. Because the vivid difference of these trickster figures radically destabilizes the narrative, the collective queer critique they provide challenges not only heteronormativity, but also pointedly indicts alienating features of capitalist hegemony in post-emancipation Midwestern regional culture. In this way, the social critique offered by these novels is actually dependent upon the "queer" nonconformity of its unsung trickster heroines.

Sex Estimation Using the Hyoid in Modern Human Populations

Mandy K. Blume
Sponsor: Timothy Weaver, Ph.D.
Anthropology

Accurately estimating the sex of skeletal remains is crucial for developing a biological profile (age, sex, stature, and ethnicity). Methods for identifying other components of the biological profile are most reliably applied when sex is known. Recent research on the hyoid has found it to be comparable in sex estimation to common techniques using long bones. By exploring morphometric variation of the hyoid, particularly in the region the region of geniohyoid muscle attachment site, this study aims to better improve upon the available techniques of sex estimation that are often unusable due to the variability in fusion between the greater cornua and the body, and the fragility of the greater cornua. The study examined 61 hyoids of known sex at Maxwell Museum of anthropology's Documented Skeletal Collection. Preliminary results suggest that the concavity of the geniohyoid muscle attachment can be used to reliably estimate sex in the hyoid, and also support previous research that size in nearly all dimensions examined is correlated with sex.

Individual Differences in Attentional Control

Zachary Blumenfeld
Sponsor: Joy Geng, Ph.D.
Psychology

What exactly does it mean to "pay attention"? Attending to certain relevant stimuli can be determined by our goals or the sensory environment. Goal-driven attention corresponds to selectively filtering out irrelevant stimuli in order to focus on a specific task (e.g. reading while loud music is playing). In contrast, stimulus-driven attention corresponds to the shifting of focus from one stimulus to another (e.g. reading while also talking on the phone). I would like to see if there are different anatomical regions that correlate with performance in these two types of attention. In this study, subjects first completed the Derryberry Attentional Control Scale, which measures both attention types. In order to assess the anatomical correlates of the focus and shift components of self-report, I am using voxel-based morphometry to quantify the gray matter volume in different brain regions. I will then conduct correlational analyses to delineate a potential relationship between greater regional gray matter volume and Derryberry ATTC scores. The goal is to identify locations in the brain that are significantly correlated with subjects' self-reported attentional abilities. The results could provide a quantifiable physical reason for why there are individual differences in the ability to focus and shift attention.

Autocorrecting Glucose Biosensors Improve the Quality of Care in Severely Burned Patients

Jennifer C. Bockhold
Sponsor: Nam K. Tran, Ph.D.
Pathology

The goal is to determine if glucose meter systems (GMS) that autocorrects for hematocrit effects improves tight glycemic control (TGC) in severely adult burned patients. Glycemic variability, hyperglycemia, and hypoglycemia are is associated with high mortality. Insulin regulates metabolism, wound healing, and inflammation. Intensive insulin therapy helps patients maintain TGC. Inaccurate GMS measurements due to sample hematocrit effects lead to inadequate insulin dosing and disrupt glycemic control. Accurate glucose monitoring can improve the quality of burn care by increasing TGC effectiveness. We evaluated GMS1, standard GMS, and GMS2, which incorporates a highly accurate glucose biosensor, in 12 adult burn patients. Patients were randomly assigned to receive GMS1 or 2. GMS2 exhibited lower bias (GMS — reference) than GMS1 (6.79[7.74] vs. .79[5.19], P=0.001). Greater proportions of hyper- (23.4% vs. 11.3%, P=0.001) and hypoglycemic events (0.17% vs. 0.00%, P<0.001) occurred with GMS1. Insulin rates were significantly higher in GMS1 patients than GMS2 patients (4.02 [3.68] GMS accuracy is crucial to TGC and IIT. Hyper- and hypoglycemic events occurred more frequently with GMS1. Accurate GMS readings have the potential to improve the quality of care by reducing glycemic variability, and adverse hyper- and hypoglycemic events that impact patient mortality.

Egypt and the Arab Spring: A Political and Economic Analysis of the Future of the Muslim Brotherhood in the Middle East

Chantal Boctor
Sponsor: Miroslav Nincic, Ph.D.
Political Science

A year post the January 25 Egyptian Revolution, the former autocracy is still characterized with ongoing civil resistance and general strikes. Following the resignation of key officials such as Hosni Mubarak and Ahmad Shafik, Egypt has failed to successfully transition to a stable democracy under military rule. Strict analysis of select political parties and their economic agendas generate evidence that the Muslim Brotherhood and their political sub-part, the Freedom and Justice Party has the sufficient and necessary financial and political qualities to lead Egypt towards a successful democratic transition. Sujian Guo's theory on democratic transition reveals four approaches that provide evidence assuring that the Muslim Brotherhood is the sole political party in the Middle East with satisfactory structuralist, strategic, institutionalist, and political economic approaches via their current platform. Following Egyptian analyst Alaa El Aswany's studies, it is statistically sound to presume the political dominance of the Muslim Brotherhood in Egypt, as well as in participating nation-states of the Arab Spring such as Tunisia, Bahrain and Yemen. The following literature provides an extensive analysis on the degree of importance of democracy in the 21st-century international arena, including peaceful means of implying types of conflict resolution.

Screening Microalgae to Increase Lipids for Biofuel Applications

Jordan R. Boothe
Sponsor: Annaliese K. Franz, Ph.D.
Chemistry

Microalgae are a useful source of triacylglycerides (TAGs) that can undergo transesterification to provide a renewable source for biodiesel. Microalgae are a desirable source of biodiesel, as they serve as a carbon-neutral, renewable, and sustainable source of energy.The goal of this project is to screen different strains and growth conditions that increase microalgae growth and TAG levels. Microalgae are grown in microplates, where growth is monitored by UV/Vis spectroscopy and neutral lipid levels are measured at stationary phase using Nile Red fluorescence intensity. Growth conditions include screening organic molecules from natural sources that can affect biological pathways. These natural products were identified to increase algae growth and lipid levels up to 200% in microplates. Following these positive results, analogues have been synthesized and tested to compare biological activity. These advances in lipid increase could help enable large-scale biodiesel production from microalgae as an important part of solving future energy problems.

The Effect of Varus-Valgus Malalignment on the Envelopes of Passive Motion and the Balance of Contact Forces of the Tibio-femoral Joint Following TKA

Elisma Botha
Sponsor: Maury L. Hull, Ph.D.
Mechanical and Aeronautical Engineering

Kinematically-aligned total knee arthroplasty (TKA) aims to restore natural knee kinematics, thus reducing pain and restoring joint function. Often patient-specific cutting guides are used to determine proper alignment of the components, but femoral component malalignment from either inaccuracies in cutting guide geometry, uncertainty in seating the cutting guides, or cutting errors affects TKA outcome. The purpose of this study is to determine the changes that 3° and 5° varus and valgus malalignments create in the envelopes of passive motion and the balance of contact forces of the tibio-femoral joint from neutral component alignment. Five femoral components will be rapid-prototyped to produce the neutral alignment and the four malalignments. A six degree-of-freedom load application system will be used to determine the envelopes of passive motion as a function of flexion angle for internal-external, varus-valgus, and flexion-extension rotations, as well as anterior-posterior and compression-distraction translations. A tibial force sensor will be used to determine imbalance of compartmental contact forces during passive flexion. Changes in the envelopes of passive motion and imbalance of compartmental contact forces will indicate the ±3° range of varus-valgus alignment accepted by surgeons negatively affects the kinematics of the knee, thereby failing to reduce pain and restore joint function.

Transient Optical Absorption Plant Spectrometer: Noise Reduction in an Optical Frontend

Hope M. Bovenzi
Sponsors: Andre Knoesen, Ph.D.
Electrical and Computer Engineering &
Steven Theg, Ph.D., Plant Biology

We are building a plant spectrometer to detect the decay time of electrons due to the absorbency of light within a plant. Using a combination of red and green light pulses sent from light emitting diodes (LEDs) we are able to excite the photosynthetic mechanisms within a plant and detect changes in the plant's electrical states. A voltage potential is generated when the electrons within the plant are excited to a higher energy state from the red LEDs causing green light absorption to decrease. When the red light is turned off the electrons return to the original steady-state, allowing more absorption from the green LEDs. Accuracy is paramount within this optical spectrometry system and any noise, or unwanted fluctuation in the signal, must be minimized. Noise can be introduced in various ways however the main focus of noise minimization is in the optical frontend (OF) which consists of the photodiode that detects the light passing through the plant sample, an a operational amplifier, feedback capacitor, and resistor. Each of these components contributes to the noise within the OF. My focus is on minimizing the noise in the OF to accurately measure very small voltage signals the optical spectrometer produces.

The Role of Minor Capsid Protein, VP2, in Simian Virus 40 Capsid Formation

Brian E. Bradley
Sponsor: Robert H. Cheng, Ph.D.
Molecular and Cellular Biology

The icosahedral capsid of the Simian Virus 40 (SV40) is comprised of major capsid protein, VP1, and minor capsid proteins, VP2 or VP3. In a poorly described mechanism, 72 minor capsid proteins associate in a 1:1 ratio with 72 five-fold VP1 pentamers to induce the assembly of a T=7*d* surface lattice. Calcium binding and disulfide bond formation coordinate and stabilize the pentamer's C-terminal arms, locking assembled pentamers into position. To interpret VP2's role in particle formation, we utilized cryo-electron microscopy (cryo-EM) to visualize SV40 virus like particles (VLP) composed of Wild Type VP1 pentamers associated with an N-terminal deletion mutant VP2. Cryo-EM visualizes the various VLPs formed and reconstructs a three-dimensional electron density map to dock VP1 pentamer x-ray crystal structures. Micrographs captured SV40 VLPs as spherical images with similar diameter (50nm) to SV40 virions. Small, donut-shaped densities of similar size (7nm) to VP1 free pentamers were also observed. A more detailed VLP pentamer-pentamer association will be revealed after modeling VP1 coordinates to the reconstructed density map. We expect this architectural knowledge will aid in developing a protein-cage for targeted drug delivery and aid in developing a target to destabilize related BK and JC human polyomaviruses.

Barriers to Resistance in the Case of Genocide

Geneva Brooks
Sponsor: Keith Watenpaugh, Ph.D.
Religious Studies

Genocide, a term coined by Raphael Lemkin, describes the willful destruction, in whole or in part, of a national, religious, or racial group. The causes of genocide and conditions under which genocide may take place have been the subject of study since the end of the Second World War. The question of resistance to genocide, however, is critical in addressing effective responses to genocide and the prevention of future acts of genocide. What means of resistance are available either to victims or to potential perpetrators of genocide? While there are certainly documented cases of resistance, why is that more people, victim or perpetrator, have not resisted, historically? I look at cases of resistance and structural barriers to action across several instances of genocide in order to begin to answer these questions. I examine historical resistance, and obstacles thereto, and analyze ways in which resistance efforts in the present might be bolstered and supported to combat genocide in the modern world.

Modeling the Resistivity of Carbon Nanotube Thin Films

Andrew R. Burton
Sponsor: Kenneth Loh, Ph.D.
Civil and Environmental Engineering

Accurate and efficient sensing ability is key for the safe use and intelligent replacement of mechanical, aeronautical, and civil structures. A key component of developing the next generation of sensing technology is the understanding and subsequent implementation of nanoscale materials that have shown promise far beyond the abilities of currently used sensors. In this study a mechanical-electrical model was created in matlab to investigate the resistivity of carbon nanotube (CNT) thin films for future use in sensing applications. This model functions through the accurate representation of nanoscale film properties including CNT shape, CNT resisitivity, CNT junction resisitivity, and CNT density. In general terms the model is a percolation network where current flow occurs once the network is percolated. The completion of this model allows for an accurate representation of nanoscale behavior of CNT composite thin films and the ability to vary film properties or loading conditions for expanded investigation of film behavior. The model is currently being used to investigate the failure mechanisms of these thin films in tensile testing.

Exploring Half Metals in Li-based Half Heusler Alloys

Brian D. Busemeyer
Sponsor: Ching-Yao Fong, Ph.D.
Physics

We examine the electronic and magnetic properties of three Li-related half Heusler alloys, namely LiMnN, LiMnP, and LiMnSi in a structure close to the well-known zinc-blende structure in the attempt to find new half metallic materials. Half metallic materials are substances which are conducting in one spin channel, but are insulating in the other. Thus they exhibit 100% polarized spin current, and are thus ideal in the application of spintronic materials. If the Li-based alloys do demonstrate half metallic properties, this will open new grounds for half metallic spintronic materials, and our results will serve as guidelines for future exploration of alkali-related half metals. Using the primitive cell LiMnSi is a half metal, while the pnictides are not. However when the conventional cell is used, we find that $Li_3Mn_4P_4$ and $Li_3Mn_4N_4$ are half metals. The physical reason for these two pnictides to be half metallic and for their magnetic moment per unit cell will be presented, as well as how the Li ion plays a role in the half metallicity.

Does Aging Negatively Impact Male Meiosis?

Brian M. Bush
Sponsor: JoAnne Engebrecht, Ph.D.
Molecular and Cellular Biology

Meiosis, the formation of sex cells by cell division, is not as accurate in human females (oogenesis) as it is in males (spermatogenesis). There is a strong correlation between increasing maternal age and increased incidence of Down syndrome in progeny. Studies have shown that there is a decrease of progeny fitness with the increased age of the father, though the correlation is not nearly as strong as with the mother. Researchers are still trying to understand why oogenesis is error prone with increasing age. An analogous situation has been described in the nematode *Caenorhabditis elegans* in which oogenesis has been shown to degrade over time. My experiment addresses whether age is pertinent to the father's spermatogenesis quality. Using a fluorescent-based assay that monitors the number of chromosomes inherited from fathers, I am probing the affect of age and chromosome pairing status on the accuracy of male meiosis. Using the tools available in C. elegans, future research may be done to discover the basis for the underlying difference in fitness between female and male meiosis. The results may be comparable to the events that determine this in humans.

Dismantling Cosmopolitan Canopy: An analysis of the Social, Political, and Economic Forces that Produce Spaces of Civility

Tatiana M. Bush
Sponsor: Bruce D. Haynes, Ph.D.
Sociology

In his book The Cosmopolitan Canopy: Race and Civility in Everyday Life, Yale sociologist Elijah Anderson uses ethnographic research to analyze sites in Philadelphia that evoke civility and community efficacy, specifically the core of Center City. Anderson argues that these civil spaces have arrived following an "ethos of getting along" and "the growth in immigration". Sacramento has also seen a growth in immigration. In this project, we use Symbolic Interactionism to explore public spaces in Sacramento in an attempt to apply Andersons' model. Through ethnographic work of downtown Sacramento, we argue that the cosmopolitan canopies that Anderson perceived are not simply formed following social progression but rather these spaces are created following a large economic (re)investment by the state, as well as social progression. Through historical analysis, we examined the implication of past public spending and redevelopment on our ethnographic observation. Our findings reevaluate Anderson's model of the new diverse cosmopolitan city and suggest that social, economic, and political forces have created the socio-historic recipe necessary for both redevelopment and urban sprawl which generates a social climate in which individuals are selected into these spaces as a result of their socio-economic status and race.

Perceptions of Women's Sexuality, Gender Construction, and the Ottoman Empire

Clare Callahan
Sponsor: Ali Anooshahr, Ph.D.
History

Current historical publications on Ottoman sexuality centralize their examinations on men's sexual desires and sexual fantasies without investigating how these fantastical depictions reflected how men actually understood women's sexual desire. Examining the trend in how Ottoman male authors depicted female sexuality, from the 13th to the 17th century, allows further discussion on how and why later legal rulings regulated women's activities in the public sphere. Furthermore, political institutional change, away from rural life and toward urban, which took place between the 13th and 17th centuries and that ultimately developed a new legal system, provides a temporal shift in depictions of women's sexual desire. These depictions are traced through Ottoman literature and legal codes including *The Book of Dede Korkut, Dafi 'u'l-gumum ve rafi 'u' l-humum* and the legal codes of *Ebu's-Su'ud*. Ultimately, male literary conceptions of women's sexual desire were translated into legal institutions, which more stringently regulated women's access to the public sphere. Investigating male perceptions of women's sexual desires in the Ottoman Empire allows for a deeper understanding of history and gender construction.

The Effects of Various Physiological Insults on *Salmonella* internalization in Melon Vines

Alex B. Camacho
Sponsor: Trevor V. Suslow, Ph.D.
Plant Sciences

This project aims to explore the relationship between various physiological insults and the occurrence and rate of internalization of Salmonella into two melon cultivars, Oro Rico (Cantaloupe) and Summer Dew (Honey Dew). A preliminary trial monitored the internalization, movement and survival of an ampicillin resistant strain of *S.enterica ser*. Montevideo into both melon cultivars that were subjected to various water availability conditions simulating flood and drought events. Five weeks after emergence, samples were inoculated with 5mL of log 8 cfu/mL *S. enterica ser*. Montevideo; their survival and distribution were determined by selective enrichment. In a subsequent trial, both cultivars were irrigated to exceed soil field capacity conditions under various mineral nutrient availabilities, specifically available nitrogen. Samples were similarly inoculated five weeks after emergence with a 5mL cocktail of Rifampicin resistant *S. enterica ser*. Poona and Montevideo (log 8 cfu/mL); their uptake, survival and distribution were determined by recovery in selective enrichment media. The results of this ongoing project indicate that *Salmonella* species are more likely to internalize into both cultivars under flood-like water conditions irrespective of prior nitrogen availability.

Bloodfeeding Patterns of *Culex* Mosquitoes in Sutter and Yuba Counties of California

Rebecca L. Campbell
Sponsor: William K. Reisen, Ph.D.
School of Veterinary Medicine

West Nile virus is a mosquito-borne flavivirus now endemic in California. The virus is transmitted mainly between birds and *Culex* mosquitoes, with spill-over transmission to mammals, including horses and humans. Host competence for WNV varies by species, so understanding bloodfeeding patterns of the vector mosquitoes will extend our understanding of viral transmission. To explore *Culex* bloodfeeding patterns in California, mosquitoes were sampled from Sutter and Yuba counties. DNA was extracted from the bloodmeals of engorged mosquitoes, and hosts were identified using a sequence of the mitochondrial gene, cytochrome oxidase I (COI). The DNA sequence was then analyzed for species identification using the BOLD identification systems website. It is hypothesized that more prevalent feeding on WNV-competent hosts would lead to increased virus activity. The most common host found was the American Robin, followed by the American Crow. Both of these species are WNV-competent, so frequent feeding may increase WNV transmission in these study areas.

Identitying Sonic Hedgehog Pathway Activation in the Developing Mouse Brain

Juliana Campo Garcia
Sponsor: Robert Berman, Ph.D.
Center for Neuroscience

Adult neural stem cells (NSCs) are present in the subventricular zone (SVZ) of the mouse brain. Location within the SVZ determines the type of differentiated progeny these cells generate. However, the exact mechanisms regulating cell destiny are not yet understood. The hedgehog signaling pathway has been implicated as a signal that directs production of specific types of neurons. Sonic Hedgehog (Shh) signaling is known to occur in the adult ventral SVZ and is associated with specification of NSCs to particular cell types within the olfactory bulbs. High mRNA levels of Gli 1, which normally correspond with high Shh pathway activation, were observed in the dorsal SVZ during early postnatal life, suggesting dynamic Shh pathway activation during maturation of the SVZ. Therefore, I investigated sites of Shh production in the postnatal SVZ. I prepared tissue using a primary antibody for Shh (Genentech) in wild type mice that were 4 (n=2), 8 (n=2), 13 (n=2), 16 (n=2), 20 (n=2) days old and in an adult (n =1). Preliminary results identified several regions of high Shh positive signal during early postnatal ages, suggesting that production of this protein is more widespread in the immature brain than anticipated.

Innate-like B Cell Responses After Influenza Infection

Esmeralda J. Cano
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School of Veterinary Medicine

Among white blood cells of the body's immune system, conventional B lymphocytes are known to produce highly specific and protective antibodies in response to vaccination and infection. B-1 cells are a small subset of phenotypically similar B lymphocytes that produce antibodies of broad reactivity even prior to an infection. These "natural" antibodies are essential for survival from infections with numerous pathogens, including influenza virus. Yet, little is known about the mechanisms that regulate B-1 cell contributions to the immune response. This ongoing study aims to identify the tissue location and the cell populations that B-1 cell might interact with during influenza infection of mice. Using multicolor flow cytometry we show that B-1 cells increase in frequency and number in the draining mediastinal lymph node (MedLN) early after infection. To determine their precise location within the MedLN, we are performing immunohistochemistry on histological sections taken from day 7 infected, immunoglobulin-allotype chimeric mice. Chimeras were created because their B-1 cells can be identified via a single distinct allotypic marker. Two additional markers are used in three-color immunohistochemistry to identify cells in the B-1 cell's vicinity. Together, this study begins to define the physiological context of B-1 cells contribute to antiviral defenses.

Pulse Oximeter Adaptive Control

Kentin M. Cantwell
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

A pulse oximeter is a device that measures the pulse rate and blood oxygen content of a human subject. One of the many stages in the system design is the adaptive control unit. The signal after the input sensor has a direct current (DC) offset. For the system to properly function, the DC offset needs to be subtracted from the signal. Having a zero offset allows the rest of the system to properly perform other signal manipulation. The adaptive control unit measures the DC so that it can be subtracted. I implemented an adaptive control unit with a low pass filter and an infinite impulse response (IIR) filter. The low pass filter removes the high frequency and transient spikes from the signal so that these effects do not affect the DC offset measurement, leaving the low frequency signal of the heartbeat. The IIR filter returns the DC offset by using the previously calculated DC offset and the current sample. The DC offset can be continuously changing, so this unit must have a fast response time. This way the DC offset will be accurately removed. I simulated this design in MatLab, and implemented it in Psoc.

Ultra-Stable Thermal Enclosure for the Integration of X-Ray Optics - Controls

Serena E. Carbajal
Sponsor: Cristina Davis, Ph.D.
Mechanical and Aeronautical Engineering

X-rays are measured to study the behavior of black holes and the life progression of stars. The Next Generation X-Ray Optics team at NASA Goddard Space Flight Center is developing an x-ray observatory to explore these phenomena. The observatory utilizes very thin mirrors (0.4 millimeters thick) to focus the x-rays, but due to the thickness, the mirrors distort easily under small thermal changes. A Mechanical Engineering Senior Design team at UC Davis has taken on the challenge to create an Ultra-Stable Temperature enclosure to house these mirrors during orientation and placement. This enclosure is required to reach and maintain a temperature of +/-0.1 degrees Celsius within a ten minute period. Therefore, it is pertinent that the control system utilizes high accuracy temperature sensors and an appropriate control loop for the heating elements and fans in the system. This research project concerns the design and testing of a thermal control system using a proportional–integral–derivative controller and high accuracy temperature sensors. Design goals include reaching the set temperature, without overshooting, within ten minutes.

Pulse Oximeter System: Microcontroller Programming and Adaptive Control

Angelo U. Carino
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Electrical and Computer Engineering

A pulse oximeter system is a device that allows for non-invasive monitoring of the heart rate and oxygen saturation of a patient. It utilizes a sensor consisting of two light emitting diodes (of different wavelengths) in conjunction with a photo detector. Light passing through the finger is detected by the photodiode, generating a current that is converted to a voltage signal that undergoes signal processing. A microcontroller controls the pulse oximeter system and acts as the interface between the system and the LabView program. The primary focus of the project was creating the necessary microcontroller code to control the pulse oximeter system and creating an adaptive control that will ignore any random deviations from an incoming waveform; deviations must be corrected in order to precisely calculate the heart rate and oxygen saturation and to prevent loss of the signal, due to clipping, after the gain stage. A moving average filter and conditional logic were used to find the average voltage of a waveform; this voltage value is used in other circuits to correctly gain the signal for easier processing.

Rebecca West and the Politics of Fluidity

Alexandra N. Casavant
Sponsor: Elizabeth S. Freeman, Ph.D.
English

This essay examines the ways in which the classic literary tradition of symbolically aligning women with water perpetuates misguided conceptions of feminine identity as being unstable, fluctuating, and murky. Turning to Rebecca West and her short story Indissoluble Matrimony, I argue that the symbolic relationship between women and water frequently functions to metaphorically drown the feminine voice in its own ostensibly naturalized element. That is, the woman's emblematic affiliation with the watery realm incites a masculine impulse to re-immerse her in her own liquid grave. Indeed, for the male, to smother the woman is to deny the presence of "the other" in himself, and thus also to avoid the risk of destabilized identity; of having his masculine autonomy threateningly reabsorbed in the boundless feminine sphere. Hence, several French feminist theorists have located the innate connection between this symbolic construct and what Freud termed the Death Instinct. Rather than abolishing the politics of fluidity and its application to the feminine, I instead propose a radical refiguring of the tradition; an approach which inverts popular methods of handling this symbolic association and thus produces a more crystallized understanding of how the feminine performs concepts of fluidity.

Finding the Minimal Requirements Needed to Form a Functional Tetramer in Kinesin-5

Perla G. Castaneda
Sponsor: Jonathan M. Scholey, Ph.D.
Molecular and Cellular Biology

The primary purpose of the mitotic spindle is the accurate segregation of genetic material. This is in part due to the action of Kinensin-5, a tetrameric motor protein necessary for interpolar microtubule crosslinking and sliding. Our lab has previously identified the region of the protein that directs formation of a stable tetramer in the Drosophila Kinesin-5, Klp61F. It is not known if shorter versions of Klp61F could form tetramers capable of crosslinking and sliding microtubules in the spindle or how the morphology of the spindle changes in the presence of these truncations. I am exploring the minimal requirements of Klp61F to form functional tetramers that could replace the necessity of the full length Klp61F protein in cells. We have created cell lines expressing GFP-tagged Klp61F truncation mutants capable of tetramerization. I am analyzing the mitotic spindle morphology by confocal fluorescence microscopy and determining the ability of the mutants to form functional tetramers able to slide microtubules in mitotic cells depleted of the endogenous protein. Learning how this molecular motor contributes to proper spindle morphology and function could provide insights into how defects in its function can give rise to genomic instability, birth defects, and cancer.

Exclusively Two-Electron Oxidation Chemistry Affords a Ga(III)-OH Complex: Ga Hydroxides Activate Carbon Dioxide

Chelsea D. Cates
Sponsor: Louise A. Berben, Ph.D.
Chemistry

The goal of my research is to use Gallium, a readily available main group element, complexed with an iminopyridine ligand (IP) as a mechanism for the reduction of small molecules, specifically Carbon Dioxide, Carbon Monoxide and water. Redox active complexes were obtained by stirring Gallium trichloride with iminopyridine ligand and varying stoichiometric quantities of sodium to yield complexes in two distinct oxidation states, $(IP^{-})_2GaCl$ and $[Na(DME)_3][(IP^{2-})_2Ga]$. Stirring Gallium chloride with iminopyridine ligand and 3 equivalents of sodium affords a mixture of $[Na(DME)_3][(IP^{2-})_2Ga]$ and $(IP^{-})_2GaCl$, indicating that reaction occurs exclusively via two electron chemistry. Reaction of $M^{+}[(IP^{2-})_2Ga]$ (M = $Na(DME)_3$, Bu_4N) with a stoichiometric quantity of the two electron oxidant pyridine-*N*-oxide affords a monomeric Gallium hydroxide species, $(IP^{-})_2GaOH$. Exposure of the hydroxide species to Carbon Dioxide at ambient temperature and pressure affords a bridging carbonate structure, $[(IP^{-})_2Ga]_2(\mu^2\eta^3\text{-}CO_3)$.

Prehistoric Bone-tool Production in Northwest Alaska

Grace Cesario
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Anthropology

Prehistoric ancestors of the Iñupiat people lived at Cape Espenberg, Alaska, in semi-subterranean houses with long entrance tunnels for about nine months of the year. At site KTZ-087, house feature 68A was excavated in 2010 (ca. AD 1450-1650), and the adjacent feature, 68B, was excavated in 2011. These two features are no more than two meters apart and share similarities in tunnel construction and orientation, suggesting contemporaneous occupation. Despite the similarities, however, the two houses appear quite different in terms of use. The amount of lithic, wood, and bone working debris in feature 68B is astonishing compared to the near lack of such debris in the adjacent house, 68A. My research will focus on understanding bone-tool production through the analysis of osseous debitage (bone, antler, and ivory) from both houses. In Feature 68A, 54 pieces of osseous debitage were recovered, whereas over 900 pieces were recovered from Feature 68B. It is possible that feature 68A was a single family house while feature 68B was a men's house (*karigi*) or a workshop area. This research will help to reconstruct the past activities of the prehistoric Iñupiat people of Northwest Alaska and the mystery behind these adjacent features.

Prader-Willi Syndrome: Investigating Neurodevelopmental Implications of the Genetic Loss of Non-coding RNAs on Chromosome 15q11-13

Samuel Chadwick
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

Prader-Willi syndrome (PWS) is the second most common genetic cause of obesity, and affects one in ten thousand to one in twenty five thousand live births. PWS first presents as failure to thrive in infants, which is followed by mental retardation, short stature, respiratory distress, and hyperphagia. While PWS is usually caused by a paternal deletion on chromosome 15 or maternal uniparental disomy, it can also be caused by a genetic deletion in non coding RNAs (ncRNAs). One of the clusters of these ncRNAs consists of small nucleolar RNAs (snoRNAs/SNORD116). We are currently breeding mice with small nucleolar RNA (SNORD116) gene knockouts and extracting DNA and tissue samples in order to better understand the mechanism behind PWS. The goal of our project is to determine the mechanism for chromatin decondensation in mature neurons, determining which ncRNA is responsible for PWS (Snord116 snoRNAs or host ncRNA), and to find the genetic basis for mouse/human phenotypic differences associated with the PWS locus in chromosome 15. We predict that understanding the functions of multiple types of non-coding RNAs on the PWS locus in chromosome 15 will lead to a better understanding of gene regulation and improve our ability to treat PWS.

Reward Modulation of Attentional Selection

Rajpreet Chahal
Sponsor: Joy Geng, Ph.D.
Psychology

The ability to process information and to act upon the environment depends on one's ability to selectively bias attention to features or locations that have higher priority. Attentional mechanisms help to prioritize information so that one can perceive, memorize, and recognize optimally. While most studies have defined priority as due to features such as color or location (perceptual salience), the effects of motivational information could also be important. The current study aims to test the hypothesis that expected reward values serve to influence the prioritizing of information and biasing sensory processes. Reward expectations and their influence on spatial attention are measured by running subjects on a behavioral task implementing both spatial probability and reward values. The seven healthy adult subjects ranging from ages 18-35 years were required to press a button that indicates the direction of a perceived stimulus following a cue screen that indicates two spatial reward values. Eye position is monitored using eye-tracking to ensure that the participant fixates on a central position. The data shows that subjects were faster at the task and prioritized information with bias on reward as the magnitude of reward (global arousal) increased.

Pulse Oximeter: LED Driver and a Low-power Implementation

Jonathan H. Chan
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

The pulse oximeter relies on a finger probe containing two out-of-phase flashing LED's – a red and ultraviolet – facing a detector used to detect a human heart beat and calculate the blood- oxygen levels. In order for the readings to be clear, the circuit must be configured to provide the LED's with enough current to emit the appropriate amount of light through the finger and finally to the detector. With a peak current limit of 50mA, any value below that limit would be sufficient to power the LED's. However, running 50mA through the LED driver would be impractical for my group's original portable and versatile goal as we have concluded that, in order for our design to be effective, we would ultimately aim to run the system through a lithium-ion battery. Having successfully designed and built the LED driver, my goal now is to bring the current down to a low but sufficient level that would allow a clear and strong detection. Working hand-in-hand with my partner in charge of the transimpedance amplifier, we have been able to detect a signal at with the LED's running at 32mA, and aim to go even lower.

A User-friendly Graphical Interface for the Transient Optical Absorption Plant Spectrometer

Frank Chang
Sponsors: Andre Knoesen, Ph.D.
Electrical and Computer Engineering &
Steven Theg, Ph.D., Plant Biology

LabVIEW is a graphical programming language that provides a visual approach to better suit the user's needs. In this particular case, LabVIEW will serve as an intermediate platform for the user and the plant spectrometer system. The spectrometer contains a light emitting diode (LED) driver and an optical frontend photodetector that monitors the behavior of protein complexes within the electron transport chain of thylakoid membranes upon exposure to light with different wavelengths. The interactive interface thus allows the user to configure parameters such as light duration and intensity through knobs, drop-down menus, switches, or even manual entering of values and characters. In addition, realtime charts and graphs provide the user with instant feedback, making it easier to manipulate data for analysis. A serial communication port is setup in LabVIEW along with the Virtual Instrument Software Architecture (VISA), which is used to transfer data from LabVIEW to the microcontroller (and vice versa) via a universal serial bus (USB). Upon termination, the LabVIEW program automatically saves data in a text file that could later be opened and used in more abstract math interfaces like Excel and MATLAB.

An in Vitro Model for Immobolization of Epidermal Growth Factor ONTO Wound Beds

Yow-Ren Chang
Sponsor: Nihar M. Shah, Ph.D.
School of Veterinary Medicine

One of the current treatments for healing chronic wounds involves topical application of cytoactive factors, such as epidermal growth factor (EGF), which suffers from diffusive loss. In order to avoid overdosage and the resulting systemic effects, it is necessary to develop localized EGF delivery methods. We hypothesized that EGF modified with the heterobifunctional crosslinker sulfoSMCC (sSMCC) can be covalently immobilized to reactive sulfhydryl (-SH) groups generated on wound beds by reduction of native disulfide bonds. We developed and characterized an *in vitro* model representing -SH groups created on a wound bed, and demonstrate surface immobilization of sSMCC modified EGF (EGF-sSMCC). Self assembled monolayers (SAMs) of 3mercaptopropyltrimethoxysilane were deposited on silicon and glass substrates, and SAM formation was confirmed by contact angle and ellipsometry. SAMs were treated with tris2carboxyethylphosphine to ensure generation of free SH groups simulating the *in vivo* process. Conjugation of EGF sSMCC was verified using an antibody-based assay, followed by cell culture to demonstrate sustained bioactivity. Our results demonstrate successful surface immobilization of EGF. More importantly, our model suggests that EGF immobilization using -SH and sSMCC chemistry does not reduce cell viability, and in fact may increase the efficacy of EGF for the treatment of chronic wounds.

Histamine Increases Tolerance of Syrian Hamster Hippocampal Neurons to an Anoxic Insult

Roni Chau
Sponsor: John M. Horowitz, Ph.D.
Neurobiology, Physiology and Behavior

In previous studies, the neuromodulator histamine has been shown to attenuate ischemic neuronal damage in non-hibernating species. Ischemia, a restriction of blood flow, often triggers apoptosis/cell death. We tested the hypothesis that histamine also exerts a neuroprotective effect in the Syrian hamster, a hibernating species, by promoting the recovery of hippocampal neurons after bouts of anoxia. By comparing the effect on evoked responses (ERs)during a 15 minute period of anoxia (where oxygen was replaced by nitrogen) with and without the addition of histamine, we were able to detect histamine-induced ER changes. In these experiments, 10μM histamine was applied to hippocampal slices at 30°C and ERs generated by electrical stimulation were recorded before, during, and after a 15 min treatment period. Following anoxia in the presence of histamine, five slices recovered faster, two slower, and one was unaffected compared with slices without histamine. These data support the hypothesis that histamine applied directly to the hippocampus has neuroprotective effects that could contribute to reliable signal processing. Further studies may show that this neuroprotection also occurs during hibernation to facilitate maintenance of cell integrity during times of lowered cell metabolism, temperature and activity.

Rnf212, a RING E3 Ligase, is a Regulator of Pro-Crossover Factor, MSH4-MSH5

Jeff Chen
Sponsor: Neil Hunter, Ph.D.
Microbiology

During meiosis prophase I, homologs pair and undergo recombination, and ultimately forms at least a crossover. Mishaps or failure to form crossovers result in aneuploidy, which can lead to spontaneous abortions and developmental diseases. Though the rate of crossovers varies across populations, crossovers have a strong heritable component. In yeast, Zip3, has been shown to be vital for crossover formation. A RING E3 ligase, Zip3 has been associated with the SUMO pathway of post-translational modification of proteins. Conjugation to the small ubiquin like modifier, SUMO, can impact protein stabilization, localization, and protein-protein interaction. In humans, RNF212, the homolog of yeast Zip3, has been linked to heritable variation in crossover rates and fertility. In mouse, RNF212 is required for crossing-over and, consequently, fertility. Here, we analyzed the function of RNF212 in mice and found it to play a significant role in crossover formation. On a molecular level, we show that RNF212 influences crossovers by stabilizing recombination factors, MSH4 and MSH5. This MSH4-MSH5 complex in turn remains bound to the DNA to stabilize single strand exchange intermediates. Our findings on RNF212 have significant implications in understanding the effects of human RNF212, which have been linked to genetic diseases, miscarriages and human infertility.

Tail Movement and Attention Shift in California Ground Squirrels

Melody Chen
Sponsor: Richard Coss, Ph.D.
Psychology

Prior research indicates Columbian black-tailed deer (*Odocoileus hemionus*) tail movements are specific to situations. Tail flicking, the brief swaying of the tail from one side to the other, have been shown to be associated with feeding. Tail erection, the lifting of the tail, has been associated with alarm and flight behaviors. Tail flagging ,the lateral side-to-side movement of the tail in rapid succession, has been associated with both feeding and alert behaviors. In the current field study conducted, we look to see if certain tail movements of California ground squirrels (*Spermophilus beecheyi*) correlate with shifts in attention. We analyzed attention shift of foraging ground squirrels in the presence of a tethered rattlesnake, and recorded behavior before and after these shifts. We also recorded associated type and duration of tail movement and their temporal relation to the attention shift. Results will analyzed prior to presentation of the study at the conference.

A Study on Quantification of Reactive Oxygen Species Generated from Anthraquinone Colorants on Textiles

Yijun Chen
Sponsor: Gang Sun, Ph.D.
Textiles and Clothing

Anthraquinone (AQ) is a common structure that can be found in many chemical reagents. Anthraquinone structured colorants are the second popular dyes and pigments in use today. Recently, researchers found that AQ and some AQ based chemicals can generate reactive oxygen species (ROS) such as hydroxyl radical (·OH) under UVA and day light exposure. ROS can readily react with many chemicals and even microbes on the surface of the textile products because of the high reactivity. Considering the use of textiles in indoor environment, ROS generated by colored textiles could largely affect indoor air quality. Few attentions have been paid to the ROS generated in indoor environment and the impact on the indoor air quality. Therefore, the purpose of my research is to explore the potential influence of ROS by quantitatively analyzing the ROS generated from textiles. Quantitative measurements of ROS produced from different AQ compounds in solvents and polymers that simulate colored textiles in indoor environment will be done through chemical analysis, UV-visible spectrophotometer and LC/MS. The influence of anthraquinone structures and solvents or polymers on generation of ROS will also be studied here.

GCP Sensitizes Prostate Cancer Cells to Irradiation

Jean P. Cheung
Sponsor: Paramita M. Ghosh, Ph.D.
Urology

External beam radiation therapy (EBRT) is one of the primary treatments for patients with localized prostate cancer (PCa), however, the probability of 5-year relapse remains high. The present study is undertaken to develop adjuvant therapy to reduce risk of relapse. Androgen deprivation therapy (ADT) is a standard-of-care therapy for patients with Stage IV PCa and Genistein combined polysaccharide (GCP), a drug formulation derived from fermented soy and mushroom products, has exhibited anti-PCa activity. Here we investigated whether radiosensitivity of PCa can be modulated by pre-treatment with GCP and/or ADT. Using PC-346C cells, an androgen sensitive cell line, we showed that pre-treatment with 100µg/ml of GCP for 24h followed by irradiation leads to increased cell death, whereas ADT also displays a similar effect. Preliminary results indicate that the effects of GCP are due to combined effect of different constituents of GCP, genistein and daidzein, of which genistein causes increased G2 arrest which likely mediates the radiosensitizer effect of GCP whereas daidzein promotes the effects of androgen withdrawal. We are currently conducting experiments with genistein and daidzein, to understand the fundamental mechanism by which GCP, alone or together with ADT, leads to increased apoptosis and radiosensitivity of PCa cells.

Investigation of Phosphorylation Cascade of Chemotaxis Proteins in the Cyanobacterium *Nostoc punctiforme*

William G. Chew
Sponsor: John C. Meeks, Ph.D.
Microbiology

Nostoc punctiforme is a filamentous cyanobacterium capable of gliding motility, through an unknown mechanism, for phototaxis and plant infection of its symbiotic host. The *Nostoc* genome contains five chemotaxis systems, designated as Che1 through Che5, each of which encodes a complete set of homologs of the *E. coli* chemotaxis proteins (CheA, CheY, CheW, and MCP) that regulate bacterial mobility. Only Che2 and Che4 have known functions. Che4 is important for phototaxis. The Che2 locus, the focus of this study, is essential for motility and contains five genes, NpF5960 through NpF5964. NpF5964 is a homolog of CheA, a protein that can auto-phosphorylate and then transfer the phosphate to proteins with REC domains. NpF5960, NpF5961, and the C-terminus of NpF5964 also contain a REC domain, but which of these is a target for phosphotransfer from NpF5964 is unclear. I have currently purified the REC domains of NpF5961 and NpF5964 using nickel-affinity chromatography, and am in the process of purifying the NpF5960 REC domain and NpF5964 with the REC domain removed. The phosphotransfer from NpF5964 to different REC domains will be assayed using autoradiography. If successful, I will then test phosphotransfer from NpF5964 to REC domains of protein in the other chemotaxis loci.

Volumetric Development of the Human Hippocampus in Children and Adolescents

Simon W. Choi
Sponsor: Simona Ghetti, Ph.D.
Psychology

Although the human hippocampus is fundamental to memory and declarative learning, relatively little research has been conducted to investigate the development of this structure during childhood and adolescence. While the overall volume of the hippocampus is comparatively stable during this age span, sub-regions divided along the long-axis of the anterior and posterior hippocampus show heterogeneous volumetric development in the juncture of adolescence (Gogtay et al., 2006). While memory deficits and memory distortions are linked to the volume and shape of the hippocampus, a general trajectory of typical hippocampal development has yet to be outlined. The present research aims to replicate Gogtay et al.'s (2006) findings via analyses of a longitudinal sample of structural magnetic resonance images in 53 participants aged 6 to 22 years old. Initial findings suggest that sub-regions along the long-axis show heterogeneous developmental change, broadly mirroring previous literature, but also revealing new findings such as that sub-regional volumes appear to follow non-linear trajectories.

Filamentous Fungi and Yeasts Collected from Beetle–Infested Trees in Indonesia

Elaine S. Chow
Sponsor: Kyria Boundy-Mills, Ph.D.
Food Science and Technology

In a microbial survey funded by the NIH International Cooperative Biodiversity Groups Program, we isolated microbes from wood-feeding insects and their galleries in infested wood in the rain forest in southeast Sulawesi, Indonesia. One goal was to profile and compare the culturable fungal communities associated with beetle families that have varying feeding patterns. The beetle larvae were surface sterilized, dissected, and gut contents were plated. Microbes were identified by sequencing Ribosomal DNA. Past researchers isolated *Scheffersomyces stipitis* from passalidae beetles. This yeast was only cultivated in this study from Lucanidae (scarab beetle) larva which, like Passalids, live in deadfall wood at the log/ground interface. We also isolated a new species of *Spathospora*. *Scheffersomyces stipitis* and *Spathospora* species have been the subject of commercial research due to their ability to ferment xylose. *Candida pseudovanderkliftii*, previously believed to be an associate of platypodidiae (ambrosia beetles), was isolated from platypodidiae, carambycidae and scolytidae larvae. *Trichoderma harzianum/Hypocrea lixii*, a cellulolytic filamentous fungus found in decaying plant matter, was found in the guts of cossidae, platypodidae, and passalidae larvae. Overall, this survey has generated a wealth of microbes available from the Phaff Yeast Culture Collection for a variety of research uses.

Anthropogenic Effects on Fish in a Chesapeake Bay Sub-estuary

Philip Choy
Sponsor: James Hobbs, Ph.D.
Wildlife, Fish and Conservation Biology

Human intrusion into aquatic ecosystems is increasing prevalent around the world. A fish condition and community health assessment of post-spawning/ nurturing creek mouth habitats in the Rhode River (Edgewater, Maryland) was conducted to determine the effects of developed shorelines on Chesapeake Bay fishes. Many commercially important fish rely on the health of these habitats for successful hatching and fry survival. Deleterious effects of manmade structure may have a larger effect on fish recruitment than previously suspected and regulations may need to be modified appropriately. Fish were sampled from various regions in the Rhode River to take representative samples of natural and anthropogenic habitats. Comparing fish in each habitat type revealed significant results. Adult white perch(*Morone americana*) in natural habitats have significantly better short term condition indexes and wider prey selection. Community fish assemblages showed a notable decrease in species abundance and diversity in anthropogenic habitats. Otoliths are currently being processed for back calculation of age specific growth and chemistry to categorize collected white perch into contingents and cohorts. Previous studies of white perch in neighboring estuaries have shown significant growth differences between freshwater residents and saltwater emigrants. Analyzing contingent likelihood may expose human influence on white perch habitat selection.

The Effects of Monensin Doses in Lowering Methane Emissions in Lactating Dairy Cattle

Mathew D. Cohen
Sponsor: Frank M. Mitloehner, Ph.D.
Animal Science

Monensin is a feed additive used in dairy cattle diets that may reduce methane (a greenhouse gas) emissions; however, past results are variable, which could be due to the dose of monensin fed to cattle. Thus, four treatments, CON, LOW, MED, and HIGH, (0, 175, 368, and 518 mg cow^{-1} d^{-1} of monensin, respectively) were established to test for dose effects. Twenty lactating Holstein cows were randomly allocated to a treatment (n=5 cows per treatment), which was provided in a top dress. The study consisted of a "PRE" period (all cows fed CON for 19 days), a "MON" period (cows were fed their assigned treatment for 21 d), and "POST" period (all cows returned to CON for 21 d). Gas emissions were collected on the last day of each period for each cow. Methane emissions were not different ($P>0.05$) across treatments in the MON period. The change in methane emissions from the PRE to MON period across treatments varied, with MED having a lower ($P<0.05$) change in methane emissions compared to CON. While there was an effect of 368 mg monensin cow^{-1} d^{-1} on emissions, translating the "over time difference" to percentage reductions in methane emissions is impossible.

Compressive Sensing with Highly Coherent Dictionaries

Sara E. Cohen
Sponsor: Thomas Strohmer, Ph.D.
Mathematics

Compressive sensing is an emerging field based on the discovery that sparse signals and images can be reconstructed from highly incomplete information. Conventional approaches follow Shannon's theorem, which states that the sampling rate must be twice the maximum frequency present in the signal. In the case that the sensing matrix is highly coherent, which happens when signals are only sparse in a truly redundant dictionary, one must consider less traditional approaches to reconstruct the signals. Sensing matrices are highly coherent in imaging problems such as radar and medical imaging. This work compares existing methods to solve the coherence problem. The first method attempts recovery via an ℓ_1-analysis optimization problem and the second method uses algorithms based on band exclusion and local optimization. Detailed comparisons demonstrate the superiority of the band exclusion method which can reconstruct sparse signals up to one Rayleigh length, which is the minimum resolvable length in the frequency domain, independent of grid spacing.

The Treaties of Empire: An Analysis of the Treaties Enacted Between the British East India Company and the States of Southern India from 1790-1805

Gideon D. Cohn-Postar
Sponsor: Sudipta Sen, Ph.D.
History

This paper will investigate the treaties signed during the Governor-Generalship of Richard Wellesley, the Earl of Mornington, which lasted from 1798-1805. Mornington's administration marked a shift in British relations with Indian states as the British East India Company rapidly became the predominant power in the Indian subcontinent. Though the British policies and their results have been well studied, the motivations and goals of the men who put them into place, as well as the information available to them at the time they made their decisions have been neglected. I will use the treaties and correspondence between British leaders and the Indian princely states to analyze what the British officers and diplomats thought they were doing during these critical years. Additionally, by exploring the wording, meaning and purpose of the treaties I will attempt to improve our understanding of how Indian and British leaders interpreted the value and use of treaties at this time.

The Oral Capacity of Allopregnanolone in Digestible Oils and the Beneficial Effects Against FXTAS

Gregory R. Cooke
Sponsor: Michael A. Rogawski, M.D./Ph.D.
Neurology

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a neurodegenerative disease that specifically targets elderly men with permutation alleles in the fragile X mental retardation 1 (FXMR1) gene. Symptoms include kinetic tremors, memory loss, and Parkinsonism. This study focused on a natural neurosteroid, allopregnanolone, which is being studied as a treatment for FXTAS. Allopregnanolone has been proven to stimulate neurogenesis in the hippocampus, reduce memory loss, and even reduce Parkinson-like symptoms. However, allopregnanolone is poorly absorbed by the oral route. It has been found that digestible oils promote the absorption of oral allopregnanolone. This study will examine a series of oils to determine which is best as a carrier for allopregnanolone. Allopregnanolone will be dissolved or suspended in canola oil, miglyol, peanut oil, and others and then administered to lab mice orally by gavage. After a specific time period has passed (30 min-2 h), pentylenetetrazole (PTZ), a chemoconvulsant, will be administered via IV infusion. The time to onset of seizures is expected to be prolonged by allopregnanolone. Using this method, the oil that causes the greatest prolongation will be selected, indicating the best delivery of allopregnanolone.

The Presence of Hormones, Pharmaceuticals, and Personal Care Products in Wastewater Biosolids and Biosolid-Amended Soils in Solano County

Andrew P. Cooley
Sponsor: Thomas M. Young, Ph.D.
Civil and Environmental Engineering

Wastewater biosolids, the treated solid wastes removed in wastewater treatment, are commonly applied to land as a soil amendment to increase nutrient content. Along with nutrients, biosolids contain trace amounts of potentially toxic organic contaminants, such as hormones, pharmaceuticals, flame retardants, and personal care product chemicals (like fragrances and antibacterial agents from soaps and lotions). Significant data gaps exist regarding the transport and persistence of these trace organic contaminants in biosolid-amended soil and the surrounding water. In order to characterize the fate of organic contaminants released from biosolids, an analysis of soil and water quality in Solano County, California is being conducted. I am investigating the presence of hormones, pharmaceuticals, and personal care product chemicals in Solano County wastewater biosolids and biosolid-amended soils. The investigation consists of extracting the organic components from soil and biosolids, then analyzing them using Liquid Chromatography Mass Spectrometry. Conclusions from this investigation will provide insight into the identity and concentrations of these contaminants in biosolid and biosolid-amended soil. This information is useful for the characterization of potential risks posed to human and environmental health by the presence of these contaminants.

Hormonal Effects Impact Gender Differences in Gut Mucosal Function

Kathryn Coolidge
Sponsor: Sumathi Sankaran-Walters, Ph.D.
Medical Microbiology & Immunology

Higher levels of immune activation in the gut generally coincide with increased microbial translocation across the epithelial barrier. In women, T cell activation is elevated, compared to men, and fluctuates with hormonal cycling. Thus, the role played by female sex hormones, specifically estrogen and progesterone, in the maintenance of epithelial barrier function in the gut is of importance. This study examined, *ex vivo*, immune activation in gut lymphocytes, using flow cytometry, real-time polymerase chain reaction, and microarray analysis. *In vitro* measurement of trans-epithelial resistance (TER) and cell proliferation of gut epithelial cells, treated with estrogen and progesterone, provided further information regarding hormonal influence on epithelial barrier function. Preliminary findings suggest that estrogen increases epithelial proliferation and TER, while progesterone has the opposite effect. It is likely that during hormonal cycles in women, in periods of low estrogen levels, there is increased microbial translocation and increased T cell activation. These findings provide a better understanding of the cyclical changes in epithelial barrier function, which affects immune activation in women. These studies can be expanded to include disease states like IBD and HIV infection to provide insight into the molecular mechanisms of gender based differences in mucosal function, thus identifying novel therapeutic options.

Nature is Political: How Nature Heals Society in George Orwell's Political Critique

Gianina M. Coturri
Sponsor: Michael Ziser, Ph.D.
English

On the whole, environmental critics have ignored George Orwell. However, the environment plays an important role in his work. This essay explores Orwell's representation of the environment, especially in *1984*, to analyze how his conception of nature as a place of reflection and healing relates to his political critique and to the post-*1984* genre of dystopian literature. I will explore the ways that Orwell reacts to industrialism and the environmental concerns of England. I will examine his depiction of the repressive architecture in *1984* and the contrast he builds between human built environments and naturally occurring ones. I will analyze Orwell's view that nature can help stall what he sees as the apparent physical weakening of the British race. This will all be grounded in a thorough reading of the nature scenes of *1984* and will also draw on Orwell's essays, journalism, and biography. Furthermore, I will attempt to trace the influence Orwell has had on modern dystopias and the way his depiction of the environment continues to influence today's literature. While Orwell shied away from a fully articulated environmental message, his concern regarding human isolation from nature is an obvious theme and one that deserves an ecocritical analysis.

Manufacture of the Next Generation X-Ray Optics Thermal Enclosure

Nathaniel Craig
Sponsor: Christina Davis, Ph.D.
Mechanical and Aeronautical Engineering

Astronomy uses x-ray technology to view phases of stellar evolution. The Next Generation X-ray Optics (NGXO) team's mirrors can refract x-ray images of high resolution at a low cost. Although a revolutionary design, the mirrors have one major flaw: they are susceptible to warping. The mirrors are sensitive, allowing subtle changes in the ambient temperature are enough to damage them. The senior design team, at University of California Davis, is developing a prototype enclosure to allow proper installation of the mirrors. To manufacture the prototype, the team plans to build a frame and installing insulated walls. Two of the walls will be designed to be removed from the box to allow a technician access inside. The level of insulation is important because it keeps the working temperature constant, preventing damage to the mirror. A heating element, installed outside of the system, combined with an airflow directing the heat into the system provides the temperature control. A pipe, capable of withstanding the hot air, channels the air directly into the enclosure. The enclosure will allow the NGXO team to properly install their mirrors into an x-ray telescope so that stellar lifecycles can be observed with high resolution at a low cost.

Regulatory Mechanisms of Stereotyped Axon Pruning in Primary Visual Cortex

Jeremy M. Crane
Sponsor: Hwai-Jong Cheng, Ph.D.
Neurobiology, Physiology and Behavior

Proper functioning of the nervous system depends on establishment of precise neuronal connectivity. During early development, initially formed exuberant neuronal connections are pruned back to eliminate inappropriate contacts. Trimming immature connections by stereotyped axon pruning promotes a precise and functional network. Currently, the mechanism of stereotyped axon pruning in the brain remains unresolved. In the visual system, axons originating from layer V pyramidal neurons initially target the spinal cord (called CST, corticospinal tract), but are subsequently pruned back to the brainstem. Prior evidence indicates that semaphorin signaling mediates this pruning. Furthermore, we recently found that visual CST pruning depends on patterned spontaneous activity in the retina and may also depend on visual experience. Whether these mechanisms operate along the same signaling pathway has not been addressed. Here, we elucidate the interaction between these pruning mechanisms and their combined effect on visual CST remodeling. Using dark-reared and eye-enucleated mice, in combination with *in vivo* experiments, we examine the effect of combined deficits on visual CST pruning. Based on preliminary data we predict that 1) visual CST pruning is not dependent on visual experience and 2) semaphorin signaling and spontaneous retinal activity operate along the same pathway to mediate visual CST pruning.

Determination of R-loop Presence in 15q11-13 by *In Vitro* Transcription

Florence K. Crary
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

Prader-Willi Syndrome is caused by loss of a portion of chromosome 15 (15q11-13) that undergoes chromatin decondensation in neurons. The mechanism of the decondensation is unknown, but we hypothesize that the formation of RNA:DNA hybrids, called R-loops, may play a role. R-loops form when a G-rich RNA hybridizes to its complementary C-rich DNA. This study used two *in vitro* methods to test regions from 15q11-13 for their capacity to form R-loops. Four regions were cloned from human 15q11-13, and 2 regions were cloned from mouse 7q (syntenic to human 15q11-13) and then *in vitro* transcribed. R-loop formation was assayed by testing for a change in super-coiling that was removed by RNAse H treatment, and by incorporating biotinylated rUTP into transcribed RNAs. Regions that formed R-loops are being tested for their impact on chromatin structure. Discovering the mechanism of decondensation in chromosome 15 may further the understanding of Prader-Willi Syndrome.

Behavioral Experiment on the Fruit Fly *Eutreta diana* (Diptera: Tephritidae)

Melissa Cruz
Sponsor: Donald Strong, Ph.D.
Evolution and Ecology

The effect of density on insect behavior is an important part of the ecology and the conservation of species, but for most species we lack a detailed understanding of this relationship. In order to fulfill this gap of knowledge we conducted behavioral studies on the *Eutreta diana* fly in order to gain some insight on their behaviors at different densities. We collected the flies from the Valentine Eastern Sierra Reserve and reared them in flight cages. We segregated flies into three different cages in order to observe male and female behaviors at densities of two, six, and twelve flies. The flies exhibited behaviors including resting, copulating, vibrating wings, walking, ovipositing (egg-laying), cleaning, and flying. Overall, males tended to display for females more frequently when densities were higher suggesting that the increased levels of competition can influence the fly's behavior. This study allowed us to understand the different behaviors male and female *E. diana* exhibit. It is important to understand how the behaviors of the *E. diana* shift with increased density because it can help explain how social behavior can dictate the fitness of an individual and serve as a model system for increased density behaviors in fruit flies.

Elevated Perceived Stress and Negative Mood in Mothers of Children with Chromosome 22q11.2 Deletion Syndrome (22q11.2DS)

Nina Q. Cung
Sponsor: Elliott A. Beaton, Ph.D.
Medical Psychiatry

Chromosome 22q11.2 deletion syndrome has complex and variable presentations including significant medical, intellectual, and socioemotional difficulties in childhood with high risk of depression and schizophrenia in adulthood. Physiological and psychological effects of chronic childhood stress likely mediate risk of adult mental illness in this population. Given the negative effects that maternal depression has on typical child development, parental mental health and coping abilities may contribute to or protect against the negative effects of stress on development in children with 22q11.2DS. Yet, unlike families of children with other neurodevelopmental disorders including Down Syndrome, little attention has been paid to parental emotional well-being and stress in families coping with the medical and developmental challenges of 22q11.2DS. In the current study, we asked mothers of children with and without 22q11.2DS to complete a battery of psychological self-report measures to assess their emotional health and self-perceived stress. Mothers of children with 22q11.2DS reported elevated depression, anxiety, and stress along with lower quality of life and more negative life events than mothers of typically developing(TD) children. These findings have important implications for risk of major mental illness in children with 22q11.2DS and suggest a need for family-focused treatment programs.

Understanding Compliance Through the California Surface Mining and Reclamation Act

Dustin Cutler
Sponsor: Mark Lubell, Ph.D.
Environmental Science and Policy

California's Surface Mining and Reclamation Act (SMARA) of 1975 established a host of regulatory standards for surface mining operations. However, compliance by individual mine operators to SMARA is enforced not by the state itself, but by many local 'lead agencies', typically cities or counties. In turn, a principal-agent dilemma arises, as the level of compliance enforced by each lead agency (agent) often varies from the level of compliance desired by the state (principal). Determining potential causes of such variability is the principal aim of this paper, and is done so first by quantifying each lead agency's level of compliance, and identifying a number of independent factors which might influence this level of compliance. The primary dependent variables used to quantify a lead agency's compliance-level are its rates of inspection and amount of fiscal assurances for each mining operation within that lead agency. We hypothesize that an agency's compliance level is a function of its median household income (positive correlation), economic dependency on its mining operations (negative correlation), and average environmental awareness (positive correlation). Multiple regression analyses will be conducted between the dependent factors of compliance and these independent factors to test our correlation hypotheses.

Assessing the Effectiveness of Passive Integrated Transponder Devices in Wood Ducks

Elena M. Daggett
Sponsor: John M. Eadie, Ph.D.
Wildlife, Fish and Conservation Biology

Wood ducks (*Aix sponsa*) are conspecific brood parasites because female wood ducks lay eggs in nests belonging to other females, a behavior that is not fully understood. Wood ducks nest in tree cavities where available, but have adapted well to wooden nest boxes created by humans, such as those set up at Conaway Ranch in Woodland. The purpose of this research is to closely monitor the activity of two such nest boxes through the implementation of passive integrated transponder devices (PIT tags) injected subcutaneously into females, PIT tag readers installed around nest box openings, motion-activated cameras attached to nest boxes, and small video cameras placed inside nest boxes. Behavioral observations and information from the cameras will be used to assess the effectiveness of PIT tags in studying wood ducks, a technology that has not previously been used to study this species. Results from this study will shed light on the nature of brood parasitism behavior observed in female wood ducks in and around nesting sites.

Effect of Aspirin on Proteasome Activity

Gunitika Dandona
Sponsor: Aldrin Gomes, Ph.D.
Neurobiology, Physiology and Behavior

Recent studies have shown a promising potential for drugs such as curcumin and aspirin in the treatment of various forms of cancer and cardiovascular disease. One possible role of some of these compounds is modulating proteasome function. The proteasome is responsible for the degradation of normal as well as unneeded or misfolded proteins. However, significant knowledge gaps still exist in the study of the proteasome in relation to aspirin. This project investigates the effect of aspirin on the proteasome through the use of proteasome activity assays. Previous studies have found that aspirin had no effect on the purified proteasome, but our results suggest that aspirin can directly inhibit the purified proteasome, but only at high concentrations. At lower concentrations, aspirin inhibited proteasome activity in rat cardiac H9c2 and monkey kidney CV1 cells. These results suggest that the proteasome is indirectly inhibited by aspirin at the concentrations usually taken by individuals.

Clinical Assessment of Sustained-Release Oral Dalfampridine on Walking Ability in Multiple Sclerosis Patients

Jonathan C. Danel
Sponsor: Mark A. Agius, M.D.
Neurology

Multiple Sclerosis (MS) is a neurological disorder where the body's immune system attacks the protective coating around nerve fibers, called myelin. This can cause progressive walking impairment that contributes to disability, loss of independence, and reduced quality of life. The in-progress drug study I am involved in assesses the efficacy and safety of Dalfampridine (4-aminopyridine) in people with MS-related ambulatory deficits. In a randomized, multicenter, double-blind, controlled phase IIIb trial, 405 MS patients are randomly assigned to 4 weeks of treatment with either Dalfampridine (5 or 10 mg twice daily) or a placebo. We're looking for consistent improvement on a timed 25-foot walk test and 6-minute endurance walk test. The 12-item MS walking scale is used to validate the clinical significance of the response criterion. In a similar phase III study conducted from 2005-2006, walking speed improved by 25.2% in patients treated with Dalfampridine (10 mg twice daily only) and by 4.7% in the placebo group. Timed walk responders showed greater improvement than non-responders in the 12-item MS walking scale scores. Results suggest that Dalfampridine improved walking ability in some people with MS, which was associated with a reduction of patients' ambulatory disability – a clinically meaningful therapeutic benefit.

Royal Grandeur : Experiencing the Mughal Era Textiles

Faizan F. Dar
Sponsor: Susan T. Avila, M.F.A.
Design

In the United States very few people are aware of the Mughal Era. The Mughal Empire was an imperial dynasty in sub-continental India that ruled from 1526 to 1764 (Pre-colonial India). The Mughal rule is considered as a 'Golden Age' of textile crafts in India. Mughals provided an atmosphere of creativity and experimentation for the artisans of the time, which resulted in the evolution of a rich and dynamic culture, luxurious textiles and astonishing architectural masterpieces such as the Taj Mahal. Their Central Asian culture not only left a visible mark on Indian fashion, but it also influenced western fashion. Western fashion adopted many designs from that era such as the bandana, cashmere, cummerbunds, dungaree and khaki pants, muslin fabric, pajamas, and shawls. My research includes studying the color combinations, dyeing, intricate embellishments, patterning, motifs, and silhouettes from the Mughal era textiles as inspiration for designing a fashion line. I will use methods such as hand dyeing, embroidery, and patterning to create contemporary silhouettes that will broaden public awareness of this golden age of Mughal textiles.

Conversion of Gluconate to Ethanol Using *Escherichia coli* KO11

Sarang Dave
Sponsor: Zhiliang Fan, Ph.D.
Biological and Agricultural Engineering

With rising world energy demands, depleting fossil fuels, and rapid global climate change, the need for clean, cheap energy sources is central to maintaining our human lifestyle. The fundamental obstacle for the commercialization of biofuels production from cellulosic biomass is the lack of low cost processing technology. Our lab proposed a new route for biofuels production from cellulosic biomass which can potentially lower the overall processing cost drastically. In this route, sugar aldonates, instead of sugar, will be produced as the intermediate for the subsequent conversion. The objective of this study is to determine if gluconate is a viable substrate for producing ethanol and how it compares to glucose in terms of yield and fermentation efficiency using *Escherichia coli* KO11 as the ethanologen. The effects of different cations, as well as the solubility of sugar adonates on gluconate fermentation, were investigated. This research has shown that gluconate was consumed faster than glucose by *E. coli* KO 11; however, the yield of ethanol from gluconate was lower than that from glucose. Potassium gluconate had the highest ethanol yield among different aldonates tested. The presence of gluconate affected the glucose utilization, while the presence of glucose did not affect glucose utilization.

The Evolution of Primate Locomotor Diversity: A Phylogenetic Analysis

Dinah R. Davison
Sponsor: Andrew J. Marshall, Ph.D.
Anthropology

Primates as an order exhibit a high degree of locomotor diversity relative to other groups of vertebrates. Differences in locomotion are often explained using correlations with body mass, substrate size and habitat usage. Previous research has indicated that patterns of locomotion are conserved within different primate clades but to date no study has used a modern analytical approach to address this question. In this study, we will use phylogenetic analysis to examine the evolution of primate locomotion and the role of phylogenetic inertia. We will use Bayesian comparative methods to investigate different evolutionary models and detect the most likely phylogenetic origins of different patterns of locomotion. We will also evaluate the relationships between locomotor patterns and several relevant variables, including body size, relative limb length, habitat type and behaviour. This research will allow for a greater understanding of primate locomotion and may also provide insights into the constraints phylogenetic inertia places on adaptation and evolution.

Transient Optical Absorption Plant Spectrometer: LED Driver Design and Prototyping

Armen Davtyan
Sponsors: Andre Knoesen, Ph.D.
Electrical and Computer Engineering &
Steven Theg, Ph.D., Plant Biology

The Plant Spectrometer is an instrument designed to measure the amount of photosynthesis occurring in a plant using high power red and green LEDs. The red LEDs excite the electrons in the plant to higher energy levels and the decay time of these electrons is measured by detecting the absorption of the green LED pulses. One of the most challenging aspects of this project was the requirement to pulse the high power green and red LEDs on and off within 20 microseconds. These LEDs operate with a current of 1 Amp and can get bright enough to damage the human eye. To meet these requirements a high power LED driver was designed with a constant variable current capability using MOSFETs as switches in series and in parallel with the LEDs. The designed high power LED driver circuit accomplished the goal of 20 microseconds and has the capability to lower the switching time to 1 microsecond. The variable current design can control the brightness of the LEDs by changing the current through them from 0 to 1 Amp. My input in this project was designing, simulating, and prototyping the LED driver circuit.

Mindful Eating in the Garden: Planting the Seeds for Healthy Behavior

Isa H. Del Signore Dresser
Sponsor: Frank Hirtz, Ph.D.
Human and Community Development

There is widespread consensus that the health of Americans, especially children is declining, marked by an increase in obesity and related diseases. Studies have shown that behavioral patterns are one of the root causes of this problem. "*Mindful Eating in the Garden: Planting the Seeds for Healthy Behavior*" focuses on educational methods to improve the health and eating habits of children in grades K-12. I posit that a combination of Garden Based Learning and Mindful Eating programs in schools would have positive effects on children's overall health and help reduce childhood obesity especially when one focuses on the emotional relationship between food and the body. These two approaches are a well-suited match because they are learner-centered; they promote healthy lifelong eating habits, and they do not instill a negative connotation with food. This study looks at ways to increase consumption of fruits and vegetables, if and how this decreases risks for obesity, eating disorders and disordered eating, and simultaneously increases the participants' awareness of the body's natural cues for hunger and satiety. The preliminary research results of this case study demonstrate a high likelihood of success of such a two-pronged program.

Investigating the Mechanism of Copper Influence on Endothelial Cells Motility

Lyudmyla Demyan
Sponsor: Louise Lanoue, Ph.D.
Nutrition

Blood vessel formation (vasculogenesis) and remodeling (angiogenesis) are essential to support both, normal and abnormal physiological processes and can be influenced by copper (Cu). Hence, Cu deficient mouse embryos have markedly impaired vasculature and Cu deficient adult mice implanted with tumors appear more resistant to cancer progression because of reduced vascularization. The roles of Cu in vascular development have not been fully identified. To test the hypothesis that abnormal blood vessel development in Cu deficiency results from abnormal endothelial cell motility, I have developed a cell culture model using human vascular endothelial cells (HUVEC). HUVEC grown in presence of a Cu chelator (TEPA) show a significant reduction in cell viability and have altered shapes or morphology in a dose-dependent manner; the addition of equimolar amounts of Cu prevents these effects. Preliminary results from Western blotting show that Cu deficient HUVEC have reduced expression of FAK and paxillin, two important central regulators of actin, which is the driving force of cellular motility. My future work is to continue investigating how Cu deficiency may disturb the organization of the cytoskeleton in HUVEC, and examine the functional implications of these altered patterns of protein expression using migration and invasion assays.

Regulation of Meiotic Crossing-over by Chromosome Size: Roles of Csm4-dependent Chromosome Movement and the Pch2-dependent Checkpoint Response

Colin K. Deniston
Sponsor: Neil Hunter, Ph.D.
Molecular and Cellular Biology

During meiosis, each pair of chromosomes always becomes connected by at least one crossover. These connections promote accurate chromosome segregation and gamete formation. Crossover rates vary with chromosome size, with smaller chromosomes showing increased rates. To identify the genetic determinants of this "chromosome-size effect" and better understand crossover regulation in general, I am studying roles of chromosome-movement and a checkpoint response defined by an AAA-ATPase called Pch2. Mutation of the *CSM4* gene prevents chromosome-movement, making chromosome pairing and synapsis slower and less efficient. Previous analysis in our lab indicates that the chromosome-size effect becomes exaggerated in *csm4* mutants. Oppositely, a *pch2* mutation has little effect on the crossover rate of a short chromosome, but increases crossing-over on larger chromosomes. These observations suggest a model in which: (a) the chromosome-size effect is a response to the defective pairing and synapsis of short chromosomes; or (b) Pch2 limits crossing-over between larger chromosomes by sensing successful synapses. To address this model, I will determine the relationship between *csm4* and *pch2* mutations. This will involve the construction and analysis of budding yeast strains carrying native and shortened chromosomes that are genetically marked from end to end.

Understanding Compliance through the California Surface Mining and Reclamation Act

Nicholas J. Depsky
Sponsor: Mark N. Lubell, Ph.D.
Environmental Science and Policy

California's Surface Mining and Reclamation Act (SMARA) of 1975 established a host of new regulatory standards for surface mining operations. However, compliance by individual mine operators to SMARA is enforced not by the state itself, but by many local 'lead agencies', typically cities or counties. In turn, a principal-agent dilemma arises, as the level of compliance enforced by each lead agency (agent) often varies from the level of compliance desired by the state (principal). Determining potential causes of such variability is the principal aim of this paper, and is done so first by quantifying each lead agency's level of compliance, and identifying a number of independent factors which might influence this level of compliance. The primary dependent variables used to quantify a lead agency's compliance-level are its rates of inspection and amount of fiscal assurances for each mining operation within that lead agency. We hypothesize that an agency's compliance level is a function of its median household income (positive correlation), economic dependency on its mining operations (negative correlation), and average environmental awareness (positive correlation). Multiple regression analyses will be conducted between the dependent factors of compliance and these independent factors to test our correlation hypotheses.

Modeling Sediment Resuspension Due to Wind-Induced Events at Salton Sea, USA

Devinder S. Dhillon
Sponsor: Fabian Bombardelli, Ph.D.
Civil and Environmental Engineering

The Salton Sea is a large wind-exposed shallow lake in Southern California, USA. The water quality of the Salton Sea is characterized by high nutrient concentrations, low oxygen concentrations, and noxious odors. Numerical simulations of Salton Sea wind-induced waves are carried out using STWAVE, a steady-state spectral wave software developed by the US Army Corps of Engineers, obtaining wave heights, periods, and directions. In addition to this, wave-induced shear stresses at the lake bottom are estimated using available information from STWAVE calculations. The simulation results are then compared with data available from a four-month campaign carried out in 2005 to obtain field estimates of sediment resuspension, according to the local bed composition. STWAVE results are in addition compared to the Sverdrup-Munk-Bretschneider (SMB) method for wave prediction, a widely used parametric model that predicts wave heights and periods for given values of wind speed and fetch for shallow water waves. Important conclusions regarding the risk of nutrient contamination in the lake are obtained.

Molecular Determinants for *Yersinia* Protein Kinase A Substrate Specificity Reside Outside the Gα Protein Conserved Serine Residue

Karina Diaz
Sponsor: Lorena Navarro, Ph.D.
Microbiology

Pathogenic *Yersinia* bacteria inject host cells with virulence proteins that manipulate signaling pathways during infection. One of these virulence proteins, *Yersinia* protein kinase A (YpkA), is essential for pathogenesis. YpkA disrupts host actin cytoskeleton rearrangements and phagocytosis. Also, YpkA binds and phosphorylates the host protein Gαq on a critical serine residue, Ser47, preventing its activation. Remarkably, Ser47 is located within a conserved region shared by all G-protein α subunits that is critical for activation. I investigated the substrate specificity of YpkA by determining if YpkA targets additional Gα proteins. My hypothesis is that molecular determinants outside the phosphorylation sequence on Gαq determine YpkA substrate selectivity. I performed immunoprecipitation assays on HEK293A cells expressing YpkA and a representative Gα member from each of the four families (Gαq/11, Gα12/13, Gαi, Gαs). YpkA did not form a complex with members of the other Gα families, but did interact with all Gαq/11 family members. These results support the hypothesis that YpkA substrate specificity is conferred by molecular determinants outside of the conserved serine residue in Gα proteins, and suggest a potential role for Gαq signaling in host antimicrobial defenses, highlighting the ability of YpkA to selectively target host-signaling pathways during a *Yersinia* infection.

A Hard Way to Make One's Living: Morality, Immorality, and Moralizing in Ihara Saikaku's *The Life of an Amorous Woman*

Amineh Dibajzavareh
Sponsor: David J. Gundry, Ph.D.
Japanese

The Japanese 17th century novel *The Life of an Amorous Woman*, was written by Ihara Saikaku, widely regarded as the most important fiction writer of the early Edo period, during which he established the "floating world" genre that dominated Japanese prose fiction for decades afterward. Though it offers, from the perspective of its heroine, an indispensable window into Edo period Japan's prostitution/entertainment districts, it has been subjected to little English-language analysis. The book is unique for its heroine's raw, realistic portrayal of life as a sex worker and her own voracious, unsentimental sexuality. I examine the underlying social message(s) of this work in terms of attacking versus upholding the status quo, dialogism involving characters and narration, and argue that taken as a whole the work does not censure the prostitutes themselves, but rather that Saikaku's black humor and bleak, empathetic recounting of the careers of sex workers convey distaste for heavy-handed sexual moralizing. I use Ivan Morris's complete English translation of the work and key portions of the classical Japanese original, and the 1952 film adaptation, "The Life of Oharu," as a tool for analysis via contrast, discussing how and why it departs from the original.

Affect of Inhibition on Epileptiform Activity

Mitchal Dichter
Sponsor: Tim Lewis, Ph.D.
Mathematics

The onset of epileptic seizures have been linked to decreased effectiveness of inhibition in the brain, however recent finding suggest that increased levels of inhibition can also promote seizures. It has been postulated that epiletiform cortical dynamics result from self-sustained reentrant electrical activity (spiral waves), however the exact mechanisms underlying epileptic seizures and the influence of inhibition are unclear. To address this issue, we construct and analyze an idealized model of cortical network that consists of a two-dimensional array of excitatory and inhibitory neurons. The dynamics of the individual neurons are described by the leaky integrate-and-fire model implemented with an absolute refractory period. Synaptic connections between neurons are randomly assigned according to a Gaussian probability distribution based on the distance between neurons. Synaptic input is modeled by an exponentially-decaying current injection. We explore how changes in the inhibitory network structure (e.g., numbers of synapses, synaptic strength, and spatial extent of synaptic connections) affect the probability of generating self-sustained reentrant activity.

The Construct of Dual Hepatitis A and E Vaccine Using Hepatitis E Virus Virus-Like-Particles (HEV VLPs)

Trieu V. Do
Sponsor: Holland R. Cheng, Ph.D.
Molecular and Cellular Biology

Vaccination is one of the most effective methods of preventative healthcare, especially against virus. Among the hepatitis viruses, both hepatitis A virus (HEV) and hepatitis E virus (HEV) are transmitted through the fecal-oral route. This invokes the need to construct a dual HEV/HAV vaccine using HEV virus-like-particles (VLPs). The current hepatitis E vaccines are based on recombinant proteins derived from immunogenic parts of HEV open reading frame 2 (ORF2) encoded capsid protein. The first step of the study involves the genetic engineering of HEV ORF2 gene by inserting the immunogenic epitope of HAV at the C terminal, where has been proved to expose the inserted epitope without interfering the VLP formation. In the next step, the HEV VLPs are expressed in the suspension Tn5 insect cells and purified through two gradients of cesium chloride under high speed centrifugation. The formation of VLPs is confirmed by transmission electron microscope. The insertion and exposure of HAV epitope on HEV VLPs are tested by ELISA. Following the achievement of desirable VLP formation and exposure of inserted HAV epitope,the immunogenicity of the HEV/HAV VLPs is confirmed by animal tests on mice before potential clinical trial.

Mathematics Problem Solving in English and Spanish by English Language Learners

Eva Dominguez
Sponsor: Rebecca Ambrose, Ph.D.
School of Education

As the number of bilingual students in California increase, it is important to consider how these children understand certain subjects. It can be seen that many of these students fall behind in at least one subject not related to the English language. One of the most essential subjects for these students is mathematics. Currently at most schools, mathematics is taught in English only. Would allowing these students to use either language increase their understanding of mathematics? Through various interviews with bilingual students, I will test whether these students are more proficient at explaining their understanding of mathematics problems using English, Spanish, or a combination of both. Initial findings have suggested that students tend to use a combination of both languages. With my findings, I hope to support the idea of bilingual education for all these students. I hope that in the near future bilingual students will be able to use either of their languages to better understand all subjects.

Does Effects of Monensin on Lactating Holstein Dairy Cattle

Joseph Dorsch
Sponsor: Frank Mitloehner, Ph.D.
Animal Science

Monensin is a feed additive utilized in dairy cattle to improved feed efficiency; however the results may be variable due to different dosages. The problem was tested by treating Holstein dairy cattle to various treatment levels in order to analyze the dosage effects. There was an initial 19 day control period (CON), followed by a 21 day treatment period (MON), followed by a final 21 day control period. During the periods, milk production, milk composition, and feed intake (DMI) were measured. In the end, the different treatment levels (control, low, medium, and high containing 0, 175, 368, and 518 mg of monensin per cow per day, respectively) did not yield variable efficiencies. All treatments had comparable milk production per unit of DMI from the control to treatment periods. However, milk production and DMI did have a lower change in the medium treatment versus the control. Ultimately, there is not a significant correlation between feed efficiency and varying dosages of monensin.

Propagated Waves and Neural Networks

Noah A. Doss
Sponsor: Timothy J. Lewis, Ph.D.
Mathematics

Propagated waves of activity have been shown to occur in the brain and have been linked to both normal function and pathological activity, such as epilepsy. However, the exact conditions for the initiation and propagation of propagated waves are not well understood. In order to address this issue, we construct and analyze a spatially distributed neuronal network model. Local dynamics, which are governed by the Wilson-Cowan model, describe the firing rate of populations of excitatory and inhibitory neurons. The strength of connectivity between local populations is described by decaying exponential functions of the distance between the populations. Using a systematic parameter search to find conditions with which a traveling wave occurs, we determined parameters that enabled wave propagation in the model. In doing so we found many complex wave phenomena that will be the subject of future research. Our work will provide information that could lead to insight into normal brain function and treatment of diseases such as epilepsy.

Does Classroom Education Take Away from Learning About the Forest? A Study Examining the Link Between Schooling and Traditional Ecological Knowledge

Jennie Dougherty
Sponsor: Bruce P. Winterhalder, Ph.D.
Anthropology

As more government implicated schooling programs have been used to educate indigenous populations, researchers have begun to question the affects of schooling on the acquisition of traditional ecological knowledge (TEK). Previous studies examining the connection between schooling and TEK find mixed conclusions, resulting in a lack of definite understanding of how indigenous communities are changing. Our research project examines the Jenu Kuruba in south India who collect various products from the surrounding forest and most notably have a rich tradition of honey collecting. To assess how people in these communities learn to collect wild honey, we collected data on both theoretical knowledge as well as practical knowledge, and gathered information related to schooling, such as literacy, attendance and performance on exams for the last 5 years, and the number of years of school completed. For both adults and children we expect to find that a negative relationship exists between schooling and acquisition of TEK. This indicates a tradeoff in time and energy spent acquiring and maintaining one form of knowledge over the other with implications for conservation and biodiversity management by local populations.

Increased Thermal Sensitivity in an Invertebrate Model of Type 2 Diabetes

Connie Duong
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

Type 2 diabetes (T2D) in humans is closely associated with obesity, hyperglycemia, and neuropathy. A novel model resembling T2D was recently implemented in *Drosophila melanogaster* via rearing on a high sugar diet. To determine if adult wildtype flies reared on varying concentrations of sucrose vs. a control diet displayed behaviors indicative of increased thermal nociception, flies were exposed to a thermal plate of either non-noxious (35°C) or noxious (43°C) temperature for 60 sec. Total number of limb withdrawals, identified by a characteristic hopping behavior, as well as latency to hopping, were quantified. Flies reared on high sucrose diets demonstrated a decrease in hop latency and increase in number of hops compared to flies reared on the control diet when tested at either temperature; thus T2D-like flies display increased sensitivity to both noxious and non-noxious temperatures. These results may be relevant to the study of fibromyalgia syndrome (FMS) in patients with T2D, since human studies indicate a potential correlation between T2D and FMS. Utilizing an invertebrate model of T2D to study its potential correlation with increased thermal sensitivity and/or FMS may potentially uncover novel discoveries for the treatment of these two disabling, chronic disorders.

Visual Narratives Through Printmaking

Kylie Duthie
Sponsor: Bryce Vinokurov, M.F.A.
Art

My work is focused on the development of a style that engages the viewer in a visual story based on perception and personal experience within the natural world. Through my exploration of this topic, I am constantly refining my printmaking skills, specifically in the intaglio process of etching. Most of my inspiration stems from the anthropomorphism of animals in traditional fables. These fables are taken from many different cultures. I use animal imagery to represent certain human characteristics in a similar way to these fables, basing my work not on perceived morality but rather the animals' role in the natural world to challenge the viewers' perception. Printmaking used to be the pinnacle of technological advancement, but is now so archaic it has become an art form. A strong component of my work is blending together a process and subject matter that have been rendered obsolete into something more relevant and contemporary.

Microbial Mat Structures as a Proxy for Lake Level Rise in Lake Joyce, Antarctica

Jane Elliott
Sponsor: Dawn Sumner, Ph.D.
Geology

Lake Joyce, a perennially ice covered lake in the McMurdo Dry Valleys of Antarctica, is host to microbial communities that display interesting and unexplained growth patterns. Over the past 30 years, Lake Joyce has been experiencing lake level rise (.2 meters per year). Due to the impermeable ice cover, the lake is supersaturated with gases (mostly O_2 and CO_2) causing gas bubbles to nucleate onto surfaces in the lake. With low enough hydrostatic pressure, the microbial mats become buoyant enough to separate off the lake floor, known as a "lift-off structure." Because the lift-off structures only form where hydrostatic pressure is low enough, we can use them to evaluate lake level change. To quantify the distribution of various microbial structures, I studied video footage taken of the lake bottom and created a searchable spreadsheet cataloging the distribution of the microbial structures at different depths. Lift-off structures occur only between 24 and 30 feet. At depths just beyond this zone, relict lift-off structures exist, a strong indicator of lake level rise. The constrained depth zone where lift off occurs is therefore a potential proxy for changes occurring in the microbial communities as well as environmental change in the surrounding area.

Fiat Lux: Chartres Cathedral's Representation of Medieval Culture Seen Through 21st Century Design

Miquette F. Elliott
Sponsor: Susan Avila, M.F.A.
Design

Cathedrals are some of the last artifacts that communicate life and values from the Middle Ages. Chartres Cathedral in France exists as a time capsule of its culture, as an exhibition of religious, material, and social values as well as the expert craft guild that flourished in the city. Capturing the structure of the society and the cathedral became the objective of this project: a 21st century men's and women's wear fashion collection. The menswear collection will focus on the architectonic aspects of the patriarchal society and the Cathedral. The women's wear will express the similarities between the cathedral's stained glass and the women of medieval society. The didacticism of the glass helps present the juxtaposing values of women in medieval culture. I used texts from both UC Davis and the University of the Arts London, explored several other French medieval cathedrals, and spent time visiting the Chartres Cathedral to grasp the complexity of the topic. The final product of this research will be exhibited during the Fashion and Design Society's sponsored fashion shows during the 2012 UC Davis Picnic Day and in San Francisco on May 6th to both a public and professional audience.

Postnatal Requirement of Rac1 for Mitral Cell Dendritic Development

Jason A. Estep
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Cell Biology and Human Anatomy

Brain development is a highly regulated process that requires the formation of many precise connections. Early in development, temporary changes in gene expression can have lasting effects on neuronal growth and synapse formation. *Rac1*, a member of rho-family GTPase, has been shown to play an important role in the growth and remodeling of cortical neuron dendrites. To study the role of *Rac1* in dendritic development of the mouse olfactory system, mitral cell specific knock outs were generated by crossing homozygous conditional mutants ($Rac1^{flox}/Rac1^{flox}$) with TARSH-promoter driven Cre recombinase (TARSH-Cre) or CMV-driven Cre recombinase(CMV-Cre) lines. Offspring were further bred to produce animals with complete *Rac1* knock outs in mitral cells, but one functional copy in all other cells (TARSH-Cre; $Rac1^{flox}/\Delta$). These TARSH-Cre mice express Cre at critical postnatal periods (E18 to P10), during which dendritic remodeling is most active. Currently we are collecting animals of various ages and staining mitral cells via Golgi's silver impregnation technique to look for differences in dendritic maturation between knock-out and control samples. Once data on all ages is collected, this experiment will reveal if *Rac1* plays any significant role in postnatal mitral cell dendritic development.

Colorectal Cancer Screening Uptake Among South Asian and Middle Eastern Patients at Shifa Community Clinic

Mohamed A. Esuf
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Obstetrics and Gynecology

Surveys have indicated that the overall colorectal cancer screening prevalence in the United States is low among ethnic minorities. Recommended colorectal cancer screening options include an at-home fecal occult blood test (FOBT), Fecal Immunoassy Test (FIT) or colorectal endoscopy. We wanted to determine whether providing FOBT/FIT kits as well as culturally sensitive and language specific health education to eligible patients at Shifa Community Clinic can contribute to higher colorectal cancer screening (CRCS) rates among our patients. Therefore, we conducted a study of individuals that were 50 years and older to determine the size of the potential screen-eligible population and to compare the rate of colorectal screening uptake of FOBT kits (2008-June 2011) to the uptake rate of FIT kits (July 2011-October 2011). Shifa Community Clinic had an increase in the percentage of eligible patients who were given a CRC screening kit. There was also an increase in CRC kit uptake rate after the implementation of FIT kit. The CRCS uptake rate grew 43%. Increased uptake rates are likely due to a substitution of screening kits including, multilingual instructions as well as ease of sample collection. However, future studies are needed to explore the discrepancies in screening and compliance.

Developmental Phenotypes of *Myxococcus xanthus* Predicted Regulatory Mutants

Sarah J. Ettinger
Sponsor: Mitchell H. Singer, Ph.D.
Microbiology

Myxococcus xanthus is a social soil bacterium that reacts to starvation by aggregating and producing resilient myxospores in fruiting bodies. The overall goal of our work is to define the regulatory pathways that control the developmental program of *M. xanthus*.To carry out this project, I am focusing on constructing in-frame deletions of a series of regulatory genes predicted from the *M. xanthus* genome. Our hypothesis is that those genes that are believed to be involved in controlling development will be required for the correct developmental process and that null mutations in those genes will lead to a developmental defect. To test how each individual regulatory gene affects development, I am creating in-frame null mutations using PCR protocol. After I confirm the deletion, I assay whether the deletion strain exhibits a developmental defect by determining both sporulation frequencies and the timing of development. So far I have found that the gene MXAN4468 displays a delay in the formation of fruiting bodies under starvation conditions. I am currently still performing the experiments to determine whether other genes of interest have effects on the developmental pathway.

Microbial Fuel Cells: Wastewater Treatment and Energy Generation from Seafood-Processing Wastewater

Allison Evans
Sponsor: Jean VanderGheynst, Ph.D.
Biological and Agricultural Engineering

The microbial fuel cell (MFC) is a technology that utilizes the principles of electrochemistry and microbiology toward the goal of renewable energy production. Studies have confirmed the MFC as useful for generating electricity simultaneously with wastewater treatment, methane production, hydrogen generation, water desalination, and bioremediation. Power generation in MFCs, however, has been limited by dilute, soluble carbon sources with few studies on utilizing complex, high-protein, nitrogen-rich waste streams from the food-processing and meatpacking industries. The growth of the global seafood industry produces a vast amount of waste, which is expensive and energy-intensive to treat. It is therefore valuable to confirm the feasibility of utilizing MFCs for simultaneous electricity production and chemical oxygen demand (COD) removal with a substrate of untreated seafood wastewater. After monitoring voltage production and COD removal over three cycles, it was demonstrated that seafood wastewater produced sustained electricity generation for cycles as long as 23 days with a maximum normalized power generation of 90 mW/m^2. COD removal during MFC treatment was as high as 65%, with a coulombic efficiency of 24%. Future experiments will focus on more highly concentrated food-processing waste streams to elucidate the maximum capacity for electricity production and COD removal using the MFC technology.

Exploring the Molecular Properties of OEP80

Amarpreet K. Everest
Sponsor: Kentaro Inoue, Ph.D.
Plant Sciences

About one and a half billion years ago, an endosymbiosis event occurred in which a plant cell engulfed an ancestral cyanobacterium. This endosymbiont evolved to be the chloroplast in extant plants. During this evolution, most genes located in the endosymbiont were transferred to the host nucleus. Proteins not made by the chloroplast must be transported into the chloroplast. This process is catalyzed by proteinaceous machinery that contains Translocon at the outer-envelope-membrane of chloroplasts 75 (Toc75), which originated from a prokaryotic protein. How did Toc75 evolve to acquire this function? This question may be answered by studying a protein paralogous to Toc75 called Outer Envelope Protein 80 (OEP80). Research with *Arabidopsis thaliana*, the model plant for genetic studies, has shown that both OEP80 and Toc75 are vital for chloroplast function, since knock-out of genes encoding these proteins is embryo-lethal. The function of OEP80 remains unknown, however. To address this issue, we began to study OEP80 in pea, the model plant for biochemical studies. We take two approaches. The first approach is to use proteolytic assay and immunoblotting to examine the membrane topology of OEP80. The second approach is to clone a cDNA encoding OEP80 and use it for molecular characterization studies.

The Effects of Plant Growth Regulators, Polyurethane Foam, and Growth in Hydroponics on Cut Lily Production Methods

Fatimah Fahimuddin
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Plant Sciences

Lilies are popular ornamental horticultural flowers often used as potted plants or as cut flowers. Each of these forms requires different characteristics to be apparent; potted lilies must possess shorter stems, while cut lilies require longer stems. To get shorter plants, lily growers use plant growth regulators or water stress to regulate stem elongation accordingly. Manipulating these established techniques on the lily variety, 'After Eight,' possible new methods in cut lily production are investigated. One such method includes placing polyurethane foam on the stem above the bulb to encase and control new root growth during production and post-production. This may allow for a direct nutrient supply to the plant during shipment, as well as a continued nutrient reserve if kept by florists. Additionally, this lily variety's response to a plant growth regulator was assessed to investigate methods to achieve exact plant height as required by florists. Finally, lilies were grown in hydroponics to a pre-determined stage, placed in a cool storage, and then potted to determine how these plants would grow to final flowering. This could be an important technique, as lilies could be grown in one location, and then shipped to another grower for finishing.

Fashion Design Elements: Significance to Society

Samantha Fannin
Sponsor: Susan Avila, M.F.A.
Design

During the 17th century, red-heeled shoes were worn in French and English Royal Courts to signify status. In Contemporary 21st century, French shoe designer, Christian Louboutin, is in a current lawsuit over his signature style of red-soled shoes. The objective of my research is to examine: (1) where do fashion design elements, like Louboutin's red-soled shoes, fit into the significance to contemporary society? (2) At what point can a designer claim to be identified with his/her signature fashion design element? I will use methods of public surveys and media representations to address these research problems. Additionally, I will use the history of fashion and contemporary designer case examples to help understand my research problem. Public surveys will be presented to understand public opinion and the connection to current fashion culture. Through further research, I hope to discover a new understanding of how fashion design elements are significant to 17th century and contemporary society.

Effects of Surgery on Guinea Pig Eating Behavior

Rachel L. Feldman
Sponsor: Yeunshin Lee, Ph.D.
Animal Science

Domestic guinea pigs (*Cavia aperea*) are commonly utilized as models in laboratory settings. Very little research has been conducted to compare normal guinea pig behaviors to behaviors performed by guinea pigs in a potentially painful state. This study examines behavioral aspects of guinea pigs in a laboratory setting pre- and post- orchiectomy. The behavior of five guinea pigs was recorded continuously for two days before and after surgery, and later analyzed in order to determine whether changes could be detected. In particular, the frequency and duration of eating bouts of nutritionally balanced pellets each day were observed. The results were analyzed with a paired sample t-test, and both time (before: 73.54±17.96, after: 36.05±8.02 min/day, $p<.03$) and frequency of eating (before: 105.1±38.57, after: 47.7±21.27 bouts/day, $p<.035$) were found to significantly decrease following surgery with $p<.04$. This depression in eating behaviors could indicate that the guinea pigs were experiencing postoperative pain that interfered with their normal activities.

Big Mama in the American Cultural Imagination

Mitchell Faust
Sponsor: Halifu Osumare, Ph.D.
African American and African Studies

Who is the Big Mama? What role does she play in Black family structures? How can we (re)interpret the role of Black maids in a movie such as *The Help* to be seen from a Big Mama perspective? This study engages with these questions on the Big Mama figure to create a framework that challenges dominate hegemonic discourse about Black female caretakers and motherhood. Most scholarship focused on Black females in American culture has been resoundingly attentive to deconstructing and problematizing Black female stereotypes -- the most notable being the "mammy" figure. While scholarship that seeks to depict the mammy as an inaccurate depiction of Black women is needed, her ubiquity has led to the positive and progressive Big Mama figure to go largely unrecognized. Through historical literary text, such as Margaret Walker's *Jubilee*, and visual media, like Tyler Perry's film, *Madea's Big Happy Family*, this study attempts to offer a chronicled ethnography and Black feminist-centered analysis through a historical-comparative inquiry of the Big Mama figure in American culture. This study also seeks to address why the Big Mama is commonly misread as a mammy despite the different roles and communities each figure purports to support.

Kino Project

Sonja J. Fenske
Sponsor: Soheil Ghiasi, Ph.D.
Electrical and Computer Engineering

Post-surgery effects and various sports injuries can cause motion impediments. Currently, risky motion is determined through inspection. These movements are well defined when a domain-expert observes an athlete or patient - by watching a subject make a specific movement, such as jumping or rotating the arm. The goal of this project is to automate these observed risky motions: What constitutes a harmful or safe movement via computer processing? The sensor study, or Kino Project, will supply feedback on the direction, velocity, and acceleration of arm movements made during various rehabilitation motions using Shimmer motion sensors and electromyograms (EMG) on specific locations on the body. Data is compiled and analyzed in terms of the maximum, mean, and variance of the force and movement about a location (the arm). This data is then utilized to find a pattern in risky behavior numerically. MATLAB, a programing language, is also used in order to arrange the data in numerical forms and to design a model for comparison.

Association Between Social Anxiety and Memory for Social Evaluation

Molly R. Fensterwald
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Human and Community Development

Social anxiety (SA) is a highly common mental illness affecting over 13% of the population. Core symptoms include a focus of attention to social threats, e.g., negative evaluation from others. A cognitive bias model has been proposed to explain the underlying cognitions associated with socially anxious individuals' fear of social situations (Rapee & Heimberg, 1997). Although memory processes are thought to contribute to these biases, they haven't been examined in socially evaluative experiences. This project tests the role of memory bias in SA guided by the hypothesis that socially-anxious individuals will exhibit greater recall for social rejection vs. acceptance over non-socially-anxious participants. Participants include 60 undergraduates (50% female), half identified as scoring high on social anxiety based on the Social Interaction Anxiety Scale. I am collecting responses to potential interactions through an experimentally simulated online chat-room. Participants view 60 pictures of "peers" and indicate a yes/no preference to chat online with each. Subsequently, participants receive fictitious social evaluation from the peers, and after 20 minutes view each picture again and indicate if the peer had accepted or rejected them. I will examine whether percent of correctly-remembered feedback varies by group (high or low SA) and feedback type (acceptance vs. rejection).

Breaking Barriers: Disruption of Intestinal Epithelial Tight Junctions During Early SIV Infection

Anne N. Fenton
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Medical Microbiology & Immunology

The epithelium functions as a gatekeeper of the body, sensing external stimuli and producing an appropriate response. HIV infection is known to disrupt intestinal epithelial barrier function, but it is not well understood how early in infection this damage ensues. We investigated intestinal epithelial integrity 60 hours post-SIV infection in rhesus macaques. Utilizing the intestinal loop model, we examined the effects of pathogenic and non-pathogenic organisms on intestinal epithelial integrity in the context of SIV infection. In uninfected animals a commensal bacteria, *Lactobacillus plantarum*, aided in increasing beneficial tight junction proteins while pathogenic *Salmonella typhimurium* had the opposite effect. Concurrent SIV infection not only decreased tight junction proteins and exacerbated damage by *S. typhimurium*, but also counteracted the enhancement of epithelial barriers normally provided by *L. plantarum*. This rapid decline in integrity demonstrates that the intestinal epithelium is early target of SIV. Further understanding of the kinetics of epithelial dysfunction will assist in the development of effective HIV treatment strategies.

Is Outgroup Bias Different When You're of Mixed Heritage?

Lovina Fernandes
Sponsor: Jeffrey Sherman, Ph.D.
Psychology

The problem that motives this study is determining whether or not exposure to multicultural backgrounds minimizes racial biases. Previous research has shown that mixed-race individuals show less prejudice toward members of either of their social categories than do full-fledged out-group members. More recently, a study of mixed Macedonian/Croatian students found that they had more favorable attitudes even toward groups to which they did not belong at all, compared to non-mixed students. One potential problem with that study is that the measure of prejudice was a self-report measure. As such, the results could reflect greater concern with appearing unbiased among the mixed-ethnicity students. The purpose of the present research was to attempt to replicate that result with an implicit measure of prejudice that is not affected by self-presentational concerns. Undergraduate students from the University of California, Davis were asked to self report their ethnicity and were categorized into Asian/White mixed students and students with single ethnic identities. Implicit measurements of participants' attitudes towards various racial groups were taken to assess whether the mixed-ethnicity students show less prejudice than non-mixed students to groups to which they do not belong.

Molds in the Cold: Immunology of Ascospore Allergens

Julie Feusier
Sponsor: Patrick Leung, Ph.D.
Internal Medicine

Fungal allergy is an important health issue but is frequently overlooked. It is estimated that 3-10% of the world population has some sort of fungal allergy, with the symptoms more severe in the wet season. Only 3-4 fungal species are focused on, yet approximately 100 genera of fungi have been recognized to cause allergies. Interestingly, ascospore is a family of molds, which are released mostly on damp days. We hypothesize that ascospore can be a major but previously unreported cause of mold allergies. Our objective is to identify candidates of ascospores that are important in causing mold allergies. To achieve this goal, we have collected airborne fungal species during the wet seasons and established a library of pure cultures derived from single fungal spores including ascospores. Furthermore, we have analyzed around 15 ascospore derived mold extracts from individual fungal colonies for their immunoreactivity with serum samples obtained from patients with mold allergy and healthy controls by Western Blotting. Our data showed that several mold samples showed IgE specificity against serum samples from mold allergy patients but not controls. Current work is focused on the molecular characterization and identification of these IgE reactive mold allergens.

Nahuat-Pipil Indigenous Identity: Effects of the 1932 Massacre

Rebeca Figueroa
Sponsor: Ines Hernandez-Avila, Ph.D.
Native American Studies

The 1932 massacre of peasant communities in western El Salvador has formed a conflicting dilemma in the self-identification of Nahuat-Pipil indigenous people. To be indigenous was synonymous to being a communist, which threatened the power that the few elite families obtain. Since this massacre, individuals of Nahuat descent have begun to self-identify as mestizo, not indigenous, to avoid the negative connotations placed on the identity of *indio*, which would help deviate their community from another massacre scenario. However, in light of the recent increase of Nahuat self-identification, which is not acknowledged by the Salvadoran government, a resurgence to fight for indigenous rights and recognition originated after the 1992 Peace Accord. This study places in dialogue census statistics from the 1930s with contemporary statistics in order to contemplate patterns of Nahuat self-identification that began after the massacre. Opposed to common beliefs that El Salvador is an "Indian-free" country, this paper illuminates the issues that the Nahuat-Pipil continue to face even after their supposed termination in 1932. As a point of departure, this paper proposes to analyze the trauma caused by colonization and state-sponsored terrorism against indigenous peoples, contributing to the limited previous research that relates to the Nahuat-Pipil community and their identity.

Secondary Cell Wall Biosynthesis: Characterization of the Biological Function of Key Transcription Factors in Vascular Development

Jessica Foret
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

As an important component of a plant's vascular system, the secondary cell wall confers structural support and facilitates water transport from root to shoot. Construction of the secondary cell wall must be regulated in order to coordinate the synthesis of many different components in the correct cell type at the correct developmental time. Proper plant development relies on this precise spatiotemporal regulation; however, the mechanisms driving spatiotemporal regulation are not well understood. The *Arabidopsis thaliana* root serves as a model to study such regulation. Transcriptional regulation of secondary cell wall biosynthesis has been shown to be particularly important. In a previous experiment, interactions between transcription factors (TF's) and promoters of secondary cell wall biosynthesis-related genes were identified using yeast one-hybrid (Y1H) screenings; however, a yeast system does not represent what's occurring *in planta*. I will present work I've performed to characterize the biological function of a selection of key TF's in *Arabidopsis* by using T-DNA insertional mutants that have had key TF's knocked-out. Changes in target gene expression will be identified using qPCR and changes in vascular morphology will be identified using and anatomical analyses.

Breakdown of Fiber in Tomato Pomace from Heat and Alkali Treatments

Kayla J. Fox
Sponsor: Annie King, Ph.D.
Animal Science

A significant amount of tomatoes grown in California are processed to make different food products. The by-product from processing is called tomato pomace which is comprised of seeds, peels, and other fibrous material. Tomato pomace is a good source of vitamin E and protein. When supplemented in a broiler (meat–type chicken) diet, this by-product could decrease the amount of lipid oxidation (breakdown of unsaturated fatty acids) in postmortem tissue (especially thigh meat) during heating and storage. However, the high amount of fiber in tomato pomace, especially lignin, makes tomato pomace difficult for broilers to digest. Thus, it was important to study ways to eliminate lignin in the by-product. Tomato pomace samples were heated to the desired temperature for one or two hours. The samples were then strained and rinsed with de-ionized water and allowed to dry for 48 hours. Other tomato pomace samples were mixed with different amounts of calcium hydroxide. Heated and alkali samples were then analyzed for fiber content.

Persuading the Public: Postmodernism and Propaganda During the Vietnam War

Melissa Freeman
Sponsor: Evan Watkins, Ph.D.
English

Although the postmodernist war fiction that emerged in the decades following World War II, as exemplified by Kurt Vonnegut's *Slaughterhouse-Five*, appear to deal directly with World War II, they can equally be read as a response to the unpopular Vietnam War. Written during the almost 20 year span of the conflict, the antiwar novels produced during that time participated in a discourse that involved both those who supported and protested the war. I place the novels in a dialogue with print and film government-issued war propaganda from the Vietnam era in order to compare the persuasive devices employed by the opposing camps, both vying for approval by public opinion. While propaganda masquerading as fact stands in stark contrast to the self-awareness of metafiction, the rhetorical devices of each share common qualities. Within this frame, I examine the use of symbols in each medium in order to identify how the two may be distinguished. Through the comparison of propaganda and postmodernist war fiction, I seek to understand attempts to mediate public perception of U.S. involvement in the Vietnam War in the absence of reliable information.

Analysis of Putative Tas1R Genetic Loci in the Cnidarian *Hydra magnipapillata*

Rebecca Freeman
Sponsor: Rick Grosberg, Ph.D.
Evolution and Ecology

Bilateral taxa, including mammals and insects, have historically received more attention than their evolutionary sister taxa, the radial organisms such as cnidarians. The study of the evolution of sensory systems is no exception to this trend. Tas1R receptors have been found to play a role in sweet and umami taste in vertebrates, but have not yet been fully studied in radial organisms. However, recent bioinformatic analyses of the cnidarian *Hydra magnipalillata* have revealed the presence of a family of putative Tas1R genes. Here, I describe the molecular cloning and sequencing of a subset of these genes in *H. magnipapillata*. I found, through comparisons of 10 kb regions of the hydra genome, regions of strong, extragenic similarity both within the family of Tas1R genes as well as in the Tas1R family compared with a previously described clade of cnidarian opsin genes. This suggests the possibility of shared, conserved cis-regulatory regions even though these genes serve different sensory functions. These finding may serve as a starting point for the development of functional genomics approaches in the cnidaria.

Visualizing the Integration of Sex-Specific Sensory Neurons into a Sex-Specific Central Nervous System Circuit in 3-D

Daniel A. Friedman
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

Sex-specific neurological differences are one of the major forms of sexual dimorphism in animals, and have enormous implications for areas of research ranging from medicine and cognitive psychology to the evolution of development. *Drosophila melanogaster* is a powerful model organism for the study of genetics and developmental neurobiology. Additionally, the relatively unknown coupling of sex-specific sensory organs to sexually-dimorphic neural circuits presents a unique opportunity to elucidate their interactions. A line of transgenic flies will be created which allows the unambiguous tracing of sensory neurons traveling from the male-specific sex comb to sex-specific neural circuits in the brain. Using confocal microscopy, males and females will be imaged, giving three-dimensional reconstructions of the locations of integration between the CNS and PNS and allowing direct comparisons between the males and females to be made. Ultimately, I would like to explain behavioral differences between the genders as an emergent property of their sex-specific neuroanatomical differences, and in doing so, contribute to the scientific body of which seeks to understand consciousness from a biological perspective.

Sublime Void: Experiencing the Art of the Light and Space Movement

Megan M. Friel
Sponsor: Blake Stimson, Ph.D.
Art History

The Light and Space movement was an artistic movement that emerged in Southern California in the 1960's with the intention of bringing a heightened awareness to our own perceptions of light and space. Artists associated with the Light and Space movement created large-scale installations that provided the viewer with a powerful and overwhelming sensory experience, an experience of the sublime. Through an examination of the sublime in the work surrounding the Light and Space movement my research explores the central question, is the aesthetic experience still a factor in art? Taking the work of the Light and Space artists as my example and the theories of Kant, Burke and Lyotard as my philosophical framework I examine the experience of the sublime in modern and contemporary art. Through my research I explore the transition from an experience of the beautiful to an experience of the sublime. In examining this transition I tease out what it is about our historic moment that draws us to work that simultaneously invites us to loose ourselves and seeks to re-sensitize us to an experiential way of being.

The Role of Non-Essential Polymerases in Microhomology-Mediated End-Joining

Becky Xu Hua Fu
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

DNA double-strand breaks (DSBs), caused either by exogenous or endogenous factors, will lead to cell death unless repaired by DNA repair pathways. The major DSB repair pathways are homologous recombination (HR) (utilizing 30 base pairs (bps) of homology) and non-homologous end-joining (NHEJ) (utilizing 0-4 bps of homology). Microhomology-mediated end-joining (MMEJ) is a recently discovered repair pathway that utilizes 5-25 bps of homology. This study analyzes the role of non-essential polymerases (Rad30, Rev1, Rev3, Pol4) and the polymerase cofactor Pol32 in MMEJ repair using a novel MMEJ assay in the model organism, *Saccharomyces cerevisiae*. The MMEJ assay contains varying amounts of homology (16, 20 or 25 bps) on either side of an inducible DSB, which contain either perfect homology or a 2 bp mismatch within the homology. Each non-essential polymerase is shown to have statistically significant decreases (ranging from 2- to 500- fold) in DSB repair. The results show that Pol32 is essential for MMEJ while Rad30, Rev1, Rev3, and Pol4 have specific roles in DSB repair involving mismatches in the short homologies. Understanding the contribution of each polymerase in MMEJ will help determine the mechanisms underlying MMEJ repair and potentially its role in human disease.

Synthesis of New Clathrate Phase Using Gold

James J. Fulmer
Sponsor: Kirill Kovnir, Ph.D.
Chemistry

The search goes on in today's society to find alternative energy sources as gas prices start to rise again. One potential answer could be the development of highly efficient thermoelectric materials. In our lab we are developing such materials based on clathrates. Clathrates are crystalline compounds with three-dimensional framework containing large cages. Inside the cages guest atoms are encapsulated. New clathrate structures have the potential for a high thermoelectric efficiency, which means they can convert heat energy into electricity and *vice versa*. My current research project aimed for synthesis of new clathrate materials containing transition metals (Cu, Ni, Au). Typical synthesis includes weighing out elements in a glove box, then sealing them in a test tube, followed by putting the tube into a furnace at a set temperature, before finally analyzing the substance using powder and single crystal X-ray diffraction. To be successful, each step needs to be done meticulously or else the sample could be compromised. I have synthesized two new compounds, $BaAu_2P_4$ and $Ba_8Au_{16}P_{30}$. Crystal structure of former one has been determined, and crystal structure of $Ba_8Au_{16}P_{30}$ is on the verge of being solved. Characterization of thermoelectric properties is in progress.

Samuel Beckett's Ruins: Tracing Trauma Through the Rubble of Language

Stephanie L. Galasso
Sponsor: Timothy Morton, Ph.D.
English

Samuel Beckett's experimentation with language in his postwar corpus has long been interpreted as the breakdown of traditional paradigms of logic and knowledge. But his famously opaque texts, including *Endgame*, *Waiting for Godot*, *Watt*, and *How It Is* also seem to be in conversation with several of the aims of Germany's *Trümmerliteratur* [lit., "rubble literature"] writers; namely, salvaging language from the ruins of war. In examining these Beckettian texts alongside the stories and poetry of such postwar German writers as Wolfgang Borchert, Heinrich Böll, and Paul Celan, as well as the criticism of German thinkers such as Theodor Adorno and Walter Benjamin, I aim to explore how this figure of rubble permeates both Beckett's topography of grief as it appears on stage and in writing, as well as his very construction and destruction of language. Indeed, his sort of rubble-making from the former signs of human interaction departs from the linguistic salvation sought by his German counterparts. Hence, I intend to trace Beckett's formulation of his postwar aesthetic and his depictions of history-- that which Benjamin calls the "relentless heaping of rubble on top of rubble"-- against the backdrop of this distinctly German approach to trauma and commemoration.

Chicana/Latina Identity in Higher Education

Estrella A. Gamino
Sponsor: Angie Chabram, Ph.D.
Chicano Studies

The purpose of this study is to examine the construction of identity and its role in shaping the university experience of Chicanas and Latinas. I will conduct a series of basic informational surveys, individual interviews, and focus groups dedicated to certain topics among 10-15 students that highlight this experience. These questions are designed to gain insight on how these young women 1) define identity and identify individually, 2) use identity in their everyday practices, academic activity, and in their commitments to social groups on and off campus, 3) negotiate their identity at the university level 4) experience change in consciousness during their college years. Expected results will strengthen the idea that identity is a result of uniqueness, similarities, and multiplicities among the highly diverse Chicana/Latina ethnic group. The study will provide valuable information regarding the role of identity and how it affects the educational experience and/ or achievement of Chicana/ Latina students at the level of higher education in terms of academic perseverance, retention, and success.

Redesigning a Modern Mouse Head Holder Used in Magnetic Resonance Imaging (MRI) for a 25mm Coil to be Used in Biomedical Engineering Applications

Destiny R. Garcia
Sponsor: Angelique Louie, Ph.D.
Biomedical Engineering

Small animal Magnetic Resonance Imaging (MRI) machines at UC Davis are vital tools for evaluating small animal models and relating the studies towards human clinical medicine. Many researchers at the institution are concerned about the wellbeing of the mice and criticize that the present design does not treat issues addressed in their research needs. The current head holder is not properly sized to fit into the existing coils for the MRI. It also does not incorporate a warming capability that is essential to animal welfare. The purpose of this research is to redesign the practical mouse head holder used in MRI scanning for a 25mm coil to make MRI brain scans of mice more practical for researchers. Goals for this project are aimed at improving the ability of the holder to maintain head position, increase comfort, be easier to manipulate by the user, and fit into the 25mm coil. We will compare MRI images of the brain taken with the newly designed device and compare it with existing systems to verify that the new design has improved resolution and clarity. Findings from the new head device may be useful in future studies involving animals for studies aiming at human health.

L'Arte della Carta e del Cuoio

Kirsten Y. Garlitos
Sponsor: Ann Savageau, M.F.A.
Design

For my senior capstone project, I will be designing and creating a signature fashion collection that will be presented during the spring fashion shows at U.C. Davis and in San Francisco. This fall, I was lucky to have been given the opportunity to study abroad at Lorenzo de Medici in Florence, Italy. I learned so much there, and I was truly inspired by this beautiful city. Florence is known as the birthplace of the Renaissance and for its remarkable art and architecture. It is also known for being the first home of Italian fashion. Florence is also home to many of this nation's most notable fashion designers, including Guccio Gucci, Emilio Pucci, Salvatore Ferragamo and Roberto Cavalli. Moreover, Florence's artistic legacy is also enriched by the great traditions of the city's craftspeople. For centuries, artisans have been perfecting their techniques and honing their skills, making Florence well known for its rich artistic heritage. I plan to design and create a fashion collection inspired by the traditions of Florentine artisans, specifically focusing on hand-made Florentine paper and leather craftsmanship.

The Impact of Distance Learning on Community Building in Younger Learners

Caylen B. Garrie
Sponsor: Bernadette Tarallo, Ph.D.
Human and Community Development

Distance learning is an alternative educational model embedded in cyberspace. In an increasingly technological world, the distance learning system furthers the relationship between computer and user. The computer evolves from a means of accessing information for instructional purposes, to the means of instruction. Proponents of distance learning identify the success of programs for adult learners. Increasingly, K through 12 programs are available that present educators with the chief concern regarding distance learning, namely lack of social integration. This study will include analysis of data generated through independent research, including observation, interviews and review of scholarly journals on the educational and psycho-social dynamics of traditional and electronic learning bases in order to identify the factors that define the strengths and weaknesses of electronic-based learning programs. I contend that education devoid of interaction among and between faculty and peers fails to promote the social development of students, and therefore, neglects a critical mission of education—to prepare future citizenry for participation in society and its governance. The implications for this study are critical to the structural reforms to education that emerge as a result of improved accessibility to computer technologies.

From Sorcery to Western Medicine: The Growing Health Disparity of the Yolngu People

Rebecca Garza
Sponsor: Mark Elmore, Ph.D.
Religious Studies

Australia has one of the largest health disparities between indigenous and non-indigenous populations in the developed world. The average life expectancy of Indigenous Australians born before 1996 is 20-25 years lower than that of non-indigenous populations (AIWH). Government efforts to address these problems have focused on Western medical interventions which have failed disastrously. Public Health perspectives attribute these failures to poor sanitation, overcrowded housing, and diet. I, however, argue that by labeling cultural healing practices as sorcery and magic, European colonists, subsequent governments, and modern society has created a problem in the healthcare system itself. This study uses stories from the Yolngu people, as well as the researchers that have lived amongst them, about their health from pre-colonization to the present. It explains how dissonance between Western Medicine and Yolngu Healing methods has created a schism that the Yolngu are not able to navigate in order to get the healing they need. In order to truly make a change in the health of this population, they will need a new system that attends to new medical needs which neither healthcare system can on its own.

Uncovering Genes Involved in Tomato Shade Avoidance Response

Natalie N. Gath
Sponsor: Julin Maloof, Ph.D.
Plant Biology

Shade-avoidance is a phenomenon in which wild-type tomato plants elongate when grown in shade conditions in an effort to reach light. The purpose of this study is to further explore the genes that are involved in tomato shade avoidance by mapping mutations in tomato plants that have been observed to display such elongation. The ten tomato lines chosen for this study were observed to display the shade avoidance phenotype even when in the sun. The method of mapping used is outcrossing to the domesticated Heinz cultivar followed by bulked segregant analysis. I will characterize these mutants in both sun and shade conditions, as well as explore their responses to two plant hormones, auxin and gibberellic acid. The goal of this characterization is to observe the behavior of seedling and juvenile plants under various conditions and determine the cause of the constitutive shade-avoidance phenotype. The anticipated future outcome of this study is to identify the mutation responsible for the elongated phenotype and gain new insight into the genes involved in shade avoidance. The findings may be useful in understanding the factors that cause tomato plants to shift priority from fruit production to plant body elongation, which has possible applications in agriculture.

Peanuts, Islam, and Development: The Story of Senegal

Dominique P. Gebru
Sponsor: Corrie Decker, Ph.D.
History

The issue of poverty and economic stagnancy present in many African nations is omnipresent in global development discussions; why has such a large proportion of this massive continent failed to "develop" and what might help it become "developed"? I strive to determine why Senegal, an historically Islamic society and former French colony, remains a part of this grouping. Senegal is plagued with a massive national debt and a legacy of failed economic liberalization, particularly in connection with its colonially encouraged peanut industry. Interestingly enough, the French colonial government and prominent Muslim leader Amadu Bamba were able to strike a middle ground with regards to differing hopes for Senegal's future via the peanut industry in the early twentieth century. An alternate to the classic development discourse has emerged in Senegal that does not simply look to economic indicators, but which seeks to form a completely new order centralized around Senegalese Islamic principles. Historically, this divergence has been framed as a disruption to development and progress, resulting in conflicts of interest between the secular state and the Islamic majority. However, the Muslim basis for development and modernization could be the force that creates a modern Senegal, truly of and for its people.

Investigation of Fundamental Mechanisms for Field Assisted Sintering

Hasan Ghadialy
Sponsor: Klaus Van Benthem, Ph.D.
Chemical Engineering and Materials Science

Casting, machining, and sintering are just a few of the processes that manufacturers can use to produce parts including bearings, gears, and axles. The focus of our research is the process of sintering during which compressed powdered materials are densified at elevated temperatures to form rigid microstructures. The method of sintering that we are currently examining is electric field assisted sintering (EFAS). In this method the powder is consolidated in a graphite dye while exposed to an electrical field/current. For many materials this process is more efficient than traditional sintering techniques since required temperatures are reduced and processing times are shortened. In this research, the fundamental mechanisms for densification during EFAS are investigated through testing of granular metals and oxide powders. We hope to isolate the effects of electric field and electric current during EFAS processing compared to the traditional sintering. The anticipated results will allow for a reduction of costs during parts manufacturing through decreased power consumption and reduced processing times while maintaining superior mechanical strength.

Spatial Memory Behavioral Tasks to Assess Cognitive Function in a Rodent Model of Traumatic Brain Injury

Rahil Ghiasvand
Sponsor: Bruce Lyeth, Ph.D.
Neuroscience, Center for

Traumatic Brain injury (TBI) is the leading cause of death and disability in people under 45 years old in the USA. Many survivors develop chronic cognitive disorders disrupting functional daily life. The Morris water maze (MWM) is the most commonly used spatial learning task to assess function in experimental models of TBI. However, the MWM is a stressful environment, is both cortically and hippocampally dependent, and has no clinical correlate. The topological, metric, and temporal ordering tasks are low stress working memory paradigms that take advantage of a rodent's natural exploratory behavior, and have specific functional correlates in the parietal cortex, dentate/CA3, and CA1 hippocampal regions respectively. As the parietal cortex and CA3 of the hippocampus have the most significant damage in our model of TBI we hypothesized that injured rodents would be impaired in the metric and temporal, but not topological tasks. Our data indicates that TBI significantly impaired performance in the metric and temporal tasks ($p < 0.05$), and not in the topological task. Expanding our understanding about learning and memory following TBI, both what is impaired and why, is critical to the long-term goal of finding a treatment for chronic cognitive dysfunction in TBI patients.

Mass Spectrometric Quantification of Phosphorylation of Eukaryotic Initiation Factors

Yuliya Glusker
Sponsor: Julie A. Leary, Ph.D.
Molecular and Cellular Biology

Proteins are widely considered to be molecular effectors of biology and catalyze many reactions integral in maintaining processes on which life depends. Protein assembly, known as translation, involves the conversion of messenger RNA (mRNA) into proteins. Translation may be subdivided into three sequential phases: initiation, elongation, and termination. During the highly regulated initiation phase, ribosomes interact with initiation factors. For eukaryotic organisms, eukaryotic initiation factor 4B (eIF4B) positions mRNA properly onto the ribosome. Although eIF4B's mechanism during initiation is well defined, determinants of eIF4B's effectiveness during translation initiation have yet to be fully determined. Characteristic to proteins, phosphorylation, the process whereby phosphate groups are added to specific residues, can determine a protein's function. Herein, we seek to discover the role of phosphorylation on eIF4B's function. Although established as a phosphoprotein, endogenous levels of eIF4B phosphorylation have yet to be determined. Thus, we have cultured human cell line and from it have isolated eIF4B. We then use mass spectrometry to quantify the phosphorylation levels of the various phosphorylated residues of eIF4B. Determination of eIF4B's phosphorylation levels may gain insight into its regulation during protein translation initiation.

The Turbidity Assay Shows that the L348P Mutation Causes Increased Interaction Between Cardiac Myosin Binding Protein-C and Actin

Hamza Gohar
Sponsor: Samantha Harris, Ph.D.
Neurobiology, Physiology and Behavior

Approximately 40% of Hypertrophic Cardiomyopathy causing mutations affect a sarcomeric protein called Cardiac Myosin Binding Protein-C (cMyBP-C). It has 11 domains and an intrinsically disordered region called the M domain. Results from our lab and others suggest that cMyBP-C regulates actin-myosin crossbridge kinetics in part by binding to actin with a portion of it's N-terminus called C1C2. Phosphorylation of cMyBP-C has been shown to reduce binding with actin. L348P is a naturally occurring HCM mutation found in the M domain. Here we used a turbidity assay (which measures the scattering of light in a solution) to determine whether the L348P mutation affects interactions between cMyBP-C and actin. We assayed the interactions of actin with the following cMy-Bp-C fragments: C1C2, a mutant C1C2 with the L348P substitution, and phosphorylated versions of each. Results showed that the L348P mutation induced a greater amount of turbidity than C1C2 and that upon phosphorylation, there was a smaller decrease in turbidity with L348P-P than the decrease seen in C1C2-P. These results suggest that the L348P mutation increases binding of cMyBP-C to actin, which points to a possible mechanism by which this mutation causes disease.

The Self-Made Romance: Self-Publishing's Effect on Romance E-books

Stephanie Goldman
Sponsor: Grace Wang, Ph.D.
American Studies

E-books are becoming an increasingly popular form of reading, causing many people to question the future of the publishing industry. Although authors have been able to self-publish their books for years, self-publishing has blossomed in recent years, largely due to electronic publishing services. Even with the recent economic downturn, sales of romance e-books have remained strong. In this paper, I look at self-published romance e-books in comparison with romance e-books from traditional publishing companies in order to learn more about what each type of publishing brings to the reader, and how self-published e-books have changed readers' expectations about the books they read. I begin by looking at the romance books that appear on various bestsellers' lists before comparing these books that are selling well with the multitude of romance e-books that are available on amazon.com for their Kindle e-reader to look at the balance that has formed between the two publishing types. Using a close reading of several books, reviews on amazon.com and comments from readers, themselves, I then look at how self-publishing has changed reader responses to reading romances.

Davisville Remembered Website - Creating a Dynamic User Experience that Encapsulates a Century of Development in Davis

Gabrielle Grinberg
Sponsor: John Driscoll, M.F.A.
Design

The history and evolution of Davis, California has been documented through a diverse archive of photographs, maps and written history. Our challenge, as a web design and development team, was to capture the essence of this history in an accessible and dynamic multimedia website. To develop an effective user interface and user experience required the implementation of javascript, hypertext mark-up language, cascading style sheets as well as content management. The latest principles of responsive web design were also incorporated so that the website could be accurately viewed on a variety of mobile devices. The team of design and art studio majors: Clinton Andor, Tien Bach, Akriti Bhambi, Sarah Chang, Michelle Chiu, Drew Deurlington, Gabrielle Grinberg, and Jessica Severn, researched content for the site through the archives of the UC Davis Library, Hattie Webber Museum and private collections. In addition, they created video and audio elements to complement a visual "walk-through" of major episodic periods in the city's history. The goal of the project is to create an overarching narrative and web-based framework for an ongoing living history of the community that can be used by city planners, residents and historians.

Cardiac Hypertrophic Signaling in Pre-Diabetes as a Result of Hyperamylinemia

Katie Guglielmino
Sponsor: Sanda Despa, Ph.D.
Pharmacology

Type-2 diabetes is a major risk factor for cardiac disease. Heart failure often occurs in the pre-diabetic stage, which is characterized by hyperglycemia, insulin resistance, hyperinsulinemia, and hyperamylinemia. Our lab has shown that amylin oligomers accumulate in the heart in pre-diabetic rats transgenic for amyloidogenic human amylin (HIP rats) and increase cardiac myocyte $[Ca^{2+}]i$. This effect was not seen in pre-diabetic rats that express only endogenous, non-amyloidogenic rat amylin. Elevated $[Ca^{2+}]i$ may activate cardiac hypertrophic signaling pathways involving histone deacetylase (HDAC) and nuclear factor of activated T-cells (NFAT). HDAC phosphorylation by Ca^{2+}/calmodulin–dependent kinaseII causes its export from the nucleus. In the NFAT pathway, upon activation by Ca^{2+}/calmodulin, calcineurin dephosphorylates NFAT, causing NFAT import into the nucleus. Both HDAC nuclear export and NFAT nuclear import lead to activation of hypertrophic gene expression, resulting in cardiac hypertrophy and heart dysfunction. We used immunofluorescence to examine nuclear vs. cystolic localization of HDAC4 and NFATc4 in cardiomyocytes from pre-diabetic HIP rats compared to control rats. We found that in pre-diabetic HIP rats, HDAC4 is exported from the nucleus and NFATc4 is imported into the nucleus. These results indicate that calcium dependent hypertrophic signaling is activated in pre-diabetic HIP rats.

Mimicry of Itch and Pain-like Behaviors in Adult *Drosophila melanogaster*

Richa Gupta
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

Humans have the capacity for empathy, the ability to recognize and share the sensory experiences of another such as itch or pain. Vertebrate models that distinguish between pain- and itch-like behaviors are established, but it remains unknown if invertebrates are capable of such discrimination, or of mimicking the behavioral manifestations of pain or itch in conspecifics. Topical application of the pruritogen (itch-producing agent) histamine to the wings of *Drosophila melanogaster* selectively elicits excessive wing grooming suggestive of itch, whereas wing application of the algogen (pain-evoking agent) mustard oil selectively elicits pacing behavior suggestive of pain-related escape. When one fly received wing application of either histamine or mustard oil in the presence of four untreated "observer" flies, the observer flies mimicked the evoked behavior (wing grooming or pacing) displayed by the treated fly. Mimicking was abolished in decapitated flies, indicating the necessity of intact visual or other forebrain-mediated processes in the observer flies. Thus, adult *Drosophila* are capable of mimicking selective pruritogen- and algogen-evoked behaviors expressed by conspecifics; such mimicry requires an intact forebrain. These results suggest evolutionary ties to mammalian mimicry of complex behaviors, and support the use of *Drosophila* as a model to investigate other cognitive psychology-based concepts.

Does Parents Socioeconomic Status Have an Impact on Young Children's Social Competence? Parental Factors and Children's Emotional Understanding

Alberto Guzman-Alvarez
Sponsor: Ross Thompson, Ph.D.
Psychology

Developing social competence is a crucial achievement in early childhood. Research has found that children with greater social competence have fewer behavior problems (Izard et al., 2001), and better peer relationships (Fabes et al., 2001). For children at socio-demographic risk, enhanced social competence buffers the development of behavior problems (Schultz et al., 2001). To better understand how children develop these competencies, the current study (N=65) assessed differences in children's social competence in relation to three aspects of their socioeconomic status: (a) maternal ethnicity, (b) maternal education, and (c) annual family income assessed using maternal reports. Social competence was examined using three key indices: prosocial behavior, empathic concern, and emotional knowledge. Multivariate Analyses of Variance (MANOVAs) indicate that there were no significant differences in children's prosocial or emphatic responses between groups. However, significant group differences were found for children's emotional understanding, particularly for negative emotions (i.e., sad, mad, scared). Further analyses will be used to understand the directionality of these findings, as well as which of these factors has a greater affect on the child's emotional knowledge. The implications of these findings for the social and emotional development of children from culturally and socially diverse backgrounds will be discussed.

Confirmation Bias in Binary Choice

Rachael E. Gwinn
Sponsor: Joy Geng, Ph.D.
Psychology

When choosing between two cars, often one will "grow on you," so you seem to like it more once you've chosen it. This can occur with any decision, and is due, in part, to confirmation bias. Confirmation bias is the tendency to assure oneself that a decision is correct by searching for evidence in support of an opinion or hypothesis, or through self-reassurance. In two experiments, 40 participants chose one of two black and white objects and then rated each one (on a scale from 1-9) based on aesthetics. While making the choice, an eye-tracker monitored eye movements, called saccades. Eye data from Experiment 1 indicated subjects looked longer at the object they chose, while behavioral data indicated that when a participant chose between two objects, the one chosen was subsequently rated higher than when it was presented on its own, indicating a confirmation bias. To determine if choice was responsible for this effect, Experiment 2 was conducted which eliminated choice but preserved simultaneous rating of two objects. Results from Experiment 2 showed that with elimination of choice, confirmation bias decreases, suggesting that making an explicit binary choice was important in individual's adjusting their ratings of beauty when comparing objects.

Soluble Epoxide Hydrolase: Inhibition and Pain

Edward Hackett
Sponsor: Bora Inceoglu, Ph.D.
Entomology

Chronic pain affects many people worldwide. Therefore, development of a novel and safe treatment options for chronic pain is required to address the well-being of patients that do not respond adequately to current drugs. It is shown that inhibition of soluble epoxide hydrolase (sEH) will reduce pain-like symptoms in rodents, but its possible side effects, such as additive behaviors, remain unknown. Here we will test the hypothesis that inhibition of sEH, after being presented with a painful stimulus, will cause addictive-like behaviors in rodent. The sEH is an enzyme that has been shown to metabolize epoxy eicosatrienoic acids (EETs) into dihydroxyeicosatrienoic acids (DiHETEs). The inhibition of sEH causes a build up of EETs, which has been shown to have a variety of biological effects. A place preference test will be performed on mice of C57/BL6 strain. Type I diabetes mediated neuropathic pain will be induced. Mice will be given the sEH inhibitor to determine if any addiction-like symptoms can be detected. Gabapentin will be used as a negative control while morphine will be used as a positive control. With this information we will be able to evaluate a major possible side effect.

Loss of Ambulatory, Cardiovascular, and Pulmonary Function in Duchenne Muscular Dystrophy: A Longitudinal Study

Jason Haidar
Sponsor: Richard Abresch, M.S.
Physical Medicine and Rehabilitation

Duchenne muscular dystrophy (DMD) is a neuromuscular disease, deteriorating muscle tissue due to lack of dystrophin at the sarcolemma. Knowing how the disease progresses is critically needed to develop appropriate outcome measures for clinical trials. We have performed a longitudinal, observational study with 270 males ages 3-27 years old with DMD. Assessments of timed motor performance, anthropometrics, pulmonary function, and cardiac function have been obtained from the past 20 years. A 5-level functional "milestone" has been created to measure loss of functions in upper and lower extremities. Pulmonary functions were assessed using KoKo spirometer, Dwyer pressure gauge, and T-tube. An echocardiogram used to measure cardiac function. The results demonstrate that loss of lower extremity function correlated highly with early teenage years; while cardiac and pulmonary functions greatly suffer at onset of adulthood. These observations show great correlation between timed motor performance, loss of extremity function ambulatory capacity and pulmonary function and can be used as predictors of subsequent morbidities. These clinically meaningful measures may be used as surrogate measures in clinical trials that are attempting to preserve functional capabilities and reduce progression of muscle strength loss.

Cellulose Nanofibers by Chemical and Mechanical Defibrillation Methods

Siyuan Han
Sponsor: You-Lo Hsieh, Ph.D.
Textiles and Clothing

Rice straw is the major byproduct of rice, largest cereal crop in the world, and represents largest crop residue. With close to 40% cellulose, rice straw is an under-utilized and readily available source of the nature's most abundant polymer. This study is designed to derive and improve the yield of cellulose nanofibers (CNFs) from rice straw cellulose by using two different chemical and mechanical defibrillation methods. The chemical approach employs 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO) to oxidize the rigid cellulose molecule chains to enhance the production of CNFs. TEMPO converts the cellulose hydroxyl groups into aldehyde and carboxylic groups to break inter-molecular and intra-molecular hydrogen bonds and facilitates the defibrillation of cellulose macrofibers into CNFs. The mechanical way is operated by using a high-speed blender to provide shear forces to separate cellulose fibrils to improve the yield of CNFs. Imaging techniques such as optical microscopy and atomic force microscopy as well as analytical techniques like FTIR, thermal analyses (DSC, TGA) and Zeta potential will be conducted to characterize the degree of defibrillation and the structure of CNFs.

Analysis and Comparison of Coiled Basketry from the Ohlone/Coastanoan and Coast Miwok

Kathleen Hanrahan
Sponsor: Robert Bettinger, Ph.D.
Anthropology

The basketry traditions of the Native American groups the Ohlone/Costanoan of the Monterey and San Francisco bay areas and the Coast Miwok of Marin and Sonoma counties are known to have produced some of the most striking quality baskets in California and are both highly distinctive and visually similar. This study focuses on the differences and similarities between the Ohlone and Coast Miwok coiled basketry and specifically how to attribute and distinguish coiled baskets to their individual cultures. By looking at historically documented baskets and comparing technical features such as foundation, work direction, rim finish, design materials, the use of specific attached materials such as olivella and clam shell disk beads, abalone, and woodpecker feathers. These individual features can help us in determining which culture a basket is from. The information and knowledge gathered from this study will help distinguish formal differences between these two cultures basketry traditions, and will also contribute to the overall ethnographic knowledge of these areas.

Investigating the Role of UNC-84 in Germline Apoptosis

Kevin C. Hart
Sponsor: Daniel A. Starr, Ph.D.
Molecular and Cellular Biology

Nuclear positioning is important for many cell and developmental processes including nuclear migration, establishment of cell polarity, and chromosome pairing in meiosis. All of these processes require two families of nuclear envelope proteins: SUN and KASH proteins. In *C. elegans*, the SUN protein, UNC-84, is known to function in late embryonic and larval nuclear migration events. However, UNC-84 is expressed in the germline. I therefore hypothesize UNC-84 plays an unknown role in germline apoptosis. To test this hypothesis I counted apoptotic nuclei. UNC-84 mutants have elevated levels of apoptosis, around 11-12 apoptotic bodies compared to 5-6 in wild type worms. I then looked at CHK-1 phosphorylation, where we saw an increase in phosphorylation levels. This indicates the activation of the DNA damage response pathway. The activation of this pathway leads to increased apoptosis. My research will characterize how the DNA damage response (DDR) is elicited in *unc-84* mutants by crossing *unc-84* mutants into strains known to function in the DDR. This research with further our understanding of how SUN proteins function in apoptosis.

Evidence of Stress-induced Antinociception in Adult *Drosophila*

Habiba Hashimi
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

Stress-induced antinociception (SIA) is a natural phenomenon in which pain is suppressed in response to stressful stimuli. SIA has been studied in mammals via analysis of thermal withdrawal latencies. Although invertebrates demonstrate thermal withdrawal responses when exposed to noxious heat, it is unknown if they experience SIA. Here we exposed adult *Drosophila melanogaster* to an acute stressor and quantified thermal nociception using a novel paradigm to determine if flies exhibited behaviors characteristic of SIA. Upon exposure to a thermal plate of noxious temperature (43°C), flies displayed withdrawal-like responses indicative of nociception, compared to a non-noxious temperature (35°C). When placed on the noxious thermal plate, flies with RNA silencing of *painless* displayed behaviors equivalent to control flies on the non-noxious plate. Wildtype flies exposed to an acute stressor (continuous vortexing) followed by the noxious thermal plate displayed withdrawal latencies equivalent to non-noxious temperature controls, indicative of SIA. These data indicate a possible evolutionary tie between vertebrates and invertebrates regarding SIA. Furthermore, *Drosophila* may be used as a model to study stress and antinociception.

Nutrient Addition Predisposes Pines to Woundless Infection by the Pitch Canker Pathogen *Fusarium circinatum*

Steven A. Heisey
Sponsor: Tom Gordon, Ph.D.
Plant Pathology

Pitch canker, caused by the fungal pathogen *Fusarium circinatum*, is an important disease of pines. This fungus infects wounds and can cause cankers on branches and the main stem of the tree, which reduce growth and can cause mortality. Studies show a positive correlation between nitrogen levels and disease incidence and severity in the field. This interaction may be due in part to increased production of succulent tissue, which is more susceptible to infection. The aim of this study was to test the hypothesis that *F. circinatum* can infect succulent tissue in the absence of wounding, and that increased nitrogen levels may be one factor that facilitates wound-free infection. *Pinus radiata* seedlings were grown under three different fertilizer regimes for a period of eight weeks. Plants were then spray inoculated with an aqueous suspension containing10^6 *F. circinatum* spores/ml. Lesion formation was monitored beginning one week after inoculation. In support of our hypothesis, we found that this pathogen was capable of infecting succulent tissue in the absence of wounding, and that there was a positive correlation between nutrient level and both incidence and severity of fungal infection.

Creating the Self: Identity and Authenticity in Caribbean Emigrant Fiction

Kathryn S. Hempstead
Sponsor: Gregory Dobbins, Ph.D.
English

The body of literature from Anglophone Caribbean authors has inspired a rich and diverse array of scholarship. Yet comparatively few scholars have examined the phenomenon of the Caribbean diaspora. In fiction, and in the lives of its authors, it has now become more common to encounter the narratives of those who leave the islands than those who stay. It is my intent to examine emigrant narratives in the novels of Patricia Powell, Edwidge Danticat, and Jamaica Kincaid. In each, Caribbean protagonists leave their homeland for the United States, and in each they face the monumental challenge of defining for themselves what it means to be 'authentically' Caribbean, 'authentically' American, and how to reconcile the two. The novels are, I argue, the stories of the conscious creation of an identity, an identity that reflects the complex racial and cultural histories and realities of both the Caribbean and the U.S. With this reading I hope to provide a new lens through which to interpret these works, as well the close attention to the Caribbean emigrant experience that has heretofore been missing from this field of literary study.

The Physiological and Behavioral Related Effects of Water Restriction on Rhesus Macaques (Macaca mulatta)

Jacob D. Herford
Sponsor: Kevin O'Connor, Ph.D.
Center for Neuroscience

Rhesus macaques are model primate organisms because of their genetic, physiologic, and metabolic similarities to humans. Most behavioral training and testing requires that the monkeys be food or water deprived to allow the use of rewards for desired behavior. Both maintaining animal health while maximizing performance can consume time and resources. Physiological measures relevant to water restriction, such as hematocrit, sodium concentration, blood urea nitrogen, creatinine concentration, and osmolarity within the blood and urine, may be useful in making behavioral predictions and developing efficient protocols. These physiological measures will first be compared with water restriction levels to determine initially whether monkeys undergo similar physiological changes with respect to water restriction. If significant correlations are found, behavioral/performance ratings will be used to examine the relationship between physiology and behavior using an ANOVA and multiple regression analysis. Finding significant relationships between physiological responses and behavior may greatly facilitate the design and efficacy of particular protocol standards and practices involving water restriction.

The Differential Effects of Volatile and Vascular Signaling in the Defense Induction of *Phaseolus lunatus* (Lima Bean)

August P. Higgins
Sponsor: Louie H. Yang, Ph.D.
Entomology

Plant communication is a relatively new area of research, despite the ubiquity of plants and their importance to life. The lima bean (*Phaseolus lunatus*) is one of the few thoroughly researched species in the field of plant communication. The lima bean signals to induce defenses in response to herbivory both internally and externally. Lima beans communicate internally through the vascular system and externally through the release of volatile compounds. It remains unknown what effects these mechanisms of defense induction have on one another. I will separate vascular and volatile communication using barriers and impose artificial herbivory in order to separate the effects of each type of communication on defense induction. I will measure natural herbivory levels, plant growth, number of seeds, and other indicators of defense induction to determine the relative importance of each communication mechanism in the induction of plant defenses against herbivory. I predict that the signals are redundant, thus there will be similar amounts of defenses induced despite the communication mechanism used. I believe natural selection would favor redundancy in these signals due to the variable environments and other factors that may limit one of the mechanisms.

Mapping an Oocyte-Specific Translational Regulatory Element in the *nanos3* 3'UTR

Scott D. Hirsch
Sponsor: Bruce W. Draper, Ph.D.
Molecular and Cellular Biology

The production and maintenance of the oocytes in female animals is important for survival of the species. The *nanos3* (*nos3*) gene in zebrafish is expressed in, and required for the production of oocytes in females. The Draper lab has determined that expression of Nos3 in oocytes is controlled in part by translational regulation due to sequences in the 3' untranslated region of the *nos3* mRNA: If GFP alone is expressed in the ovary under the regulation of the germ cell-specific *ziwi* promoter, all germ cells, including late stage oocytes, express high levels of GFP protein. By contrast, if the *nos3* 3'UTR is fused to the GFP mRNA, then high levels of GFP expression are only seen in early stage oocytes. To map the specific 3'UTR sequence that is responsible for this regulation, I have subdivided the *nos3* 3' UTR into three sections and fused them to the GFP mRNA. For each of these constructs, I have produced transgenic zebrafish that express this transgene in ovaries under the regulation of the *ziwi* promoter. My results so far indicate that the translational regulatory element is present in the 3' half of the 3'UTR.

Understanding the Mechanism of Callose Deposition During Cell Plate Formation Using a Novel Synthetic Chemical, Endosidin 7 (ES7)

Htwe H. Hlaing
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

In higher plant cells, late cytokinesis involves the formation of cell plate. The callose synthase complex has known to be involved in deposition of the polysaccharide callose during cell plate formation and has been proposed to act as a spreading force for cell plate expansion. Our current understanding of callose deposition along the phragmoplast is very limited. Histological studies have shown that phragmoplasts, complexes of microtubules, microfilaments, and endoplasmic reticulum, guide secretory vesicles to the growing cell plate. These vesicles are thought to carry both proteins and polysaccharides to the cell plate and possibly callose synthase or callose itself. Previous studies have led to the identification of ES7, which effects callose deposition and causes mis-accumulation of vesicles during cell plate formation. In this project, ES7 is hypothesized to have an effect on stabilizing cell plate formation during late cytokinesis by inhibiting a subunit(s) of callose synthase complex. To test this hypothesis, callose synthase mutants and wildtype *Arabidopsis* seedlings are grown in ES7 containing media to investigate their response. Resistant callose synthase mutants will not show root growth defects compared to the wildtype plants. This will further indicate a role of ES7 on callose deposition and cell plate maturation.

Eyes Closed, Neck Heavy

Lilly Hoang
Sponsor: Mike Henderson, M.F.A.
Art Studio

Death is a ritual. "Eyes closed, neck heavy" focuses on the expression of grief and the process of bereavement, while also exploring my own coming-to-terms with the first death in my family. The inevitability of death, the impermanence of the body as a vessel for our spirit, is the essence of this body of work. I investigate the history of mourning jewelry, and the connection of that experience to the individual's acceptance of death. Two funerary customs are present: the burning of paper, and bronze casting. Through the process of making paper flowers by hand, and essentially burning the paper within a mold, I participate in a long Chinese tradition of ushering the dead into the afterlife. Likewise, casting has been used historically to memorialize individuals in their last moments of life. The burning of the paper releases the anxiety that surrounds death, and makes way for something new. Molten metal flows into the cavity left behind by the paper and solidifies into existence. The two processes together mimic life, death, and rebirth. The fragile paper casts, worn to express an individual's sense of loss, are relics of mourning.

Impact of Videoconferencing on Stress in Hospitalized Children

Nayla M. Hojman
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Pediatrics

Family-Link is a videoconferencing program at the UC Davis Children's Hospital that uses laptops to connect hospitalized children and their parents to family and friends outside the hospital. Our goal was to evaluate whether the Family-Link program has an impact on the levels of stress experienced by the child and family during hospitalization. We measured stress using a validated parental stress survey containing 23 items within 4 domains on a six-point Likert scale. A Student's t-test was used to compare mean stress levels before and after the use of Family-Link. 92 hospitalized children used Family-Link from January to September, 2011. A majority of parents felt that communicating with family and friends helped improve theirs (74.2%) and their child's level of stress (76.3%). 85% of parents agreed that Family-Link helped them stay connected with family and friends more than usual and 55% of parents felt that Family-Link was "extremely important" for their children during hospitalization. The mean stress score at admission was 31.3 (SD=1.9), and at discharge was 15.4 (SD=1.8), $p<0.05$. Our analysis showed that parents reported a high level of satisfaction with the Family-Link program, and that measured levels of stress were reduced during hospitalization, perhaps because of Family-Link.

Turkey Vulture Olfaction and Odors of Death

Tara Hole
Sponsor: Gabrielle Nevitt, Ph.D.
Neurobiology, Physiology and Behavior

Cadavers are often essential for closure in the grieving process but can be a challenge to locate. Cadaver dogs can fatigue quickly and cannot be sent into rough terrain. Turkey vultures (*Cathartes aura*) are known to forage using their excellent smell and vision. They can also travel great distances without expending much energy by relying on thermals. Pigs produce volatile odors of decay that are similar to those produced by human cadavers and are commonly used as a model for human decay. By merging the study of pig decay and turkey vulture behavior, I will attempt to study a first step in understanding how to train vultures as cadaver detectors. I will also experiment with a controlled odor mimic permeation system (COMPS). I will mix known cadaver associated volatile odors such as di-methyl sulfide, toluene, hexane, and benzene together to create a synthetic bouquet of human death that I will place in the field to determine if turkey vultures can be attracted to synthetic bouquets of death.

Assaying the Levels of DNA Methyltransferases in Tissues with and without Partially Methylated Domains

Danna Hong
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Medical Microbiology & Immunology

DNA methylation of the dinucleotide CpG influences levels of gene expression and is important in the development and growth of mammals. In adult tissues, most CpG sites outside of CpG island promoters are methylated. Partially methylated domains (PMDs) are regions in DNA greater than 200 kilobases that are not completely methylated. One possible explanation for the low methylation in PMDs is low levels of one of four enzymes with the function of methylating DNA – DNA Methyltransferase (DNMT) 1, 3L, 3A, and 3B. DNMT1 is a housekeeping methyltransferase – it attaches a methyl group to a corresponding unmethylated strand of DNA after DNA replication. DNMT3L interacts with DNMT3A and 3B, which are *de novo* methyltransferases – they add a methyl group to a free cytosine. This study investigates the four enzymes' levels in tissues with PMDs and in tissues with no PMDs. Quantitative PCR was performed after RNA extracted from both tissue types to measure the levels of DNMTs in each. A comparison of the levels of DNMTs between these tissues can provide insight into the cause of low methylation in PMDs. Understanding this cause is important because global hypomethylation of DNA has been associated with diseases such as cancer.

Determining the Limit of Detection (LoD) of a Novel LATE-PCR Assay for 16 Pathogens Associated with Septicemia

Isaac S. Horowitz
Sponsor: Gerald J. Kost, MD/Ph.D.
Medical Pathology

The purpose of this study is to determine the limits of detection (LoD) of pure pathogen genomic DNA (gDNA) from 16 organisms commonly associated with septicemia using a multiplex linear-after-the-exponential polymerase chain reaction (LATE-PCR) assay. LATE-PCR is an advanced form of asymmetric PCR that utilizes limiting and excess primers to produce single stranded DNA amplicons that are identified by organism-specific probes during temperature dependent endpoint analysis. The gDNA is serially diluted to concentrations ranging from 10^5 to 10^0 genome copies/uL by adding 5uL of gDNA into 45uL Tris (10mM, pH 8.0). Five uL of gDNA at each concentration was added to 20uL of PCR mastermix and run in triplicate in the multiplex assay. The lowest DNA concentration to produce positive results in all three replicates defines the LoD for each respective organism. Our results illustrate that the LoDs for *C. albicans*, *C. dubliniensis*, *C. parapsilosis*, and *C. tropicalis* were all 10^3 genome copies/uL. We expect the LoDs of all 12 remaining organisms to be between 10^1 and 10^3 genome copies/uL. LATE-PCR has the potential to act as an adjunct to blood culture by providing fast, accurate results for definitive pathogen identification.

Co-expression of Substance P and Gastrin Releasing Peptide in Itch-Signaling Sensory Neurons

Alexander B. Horwitz
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

Chronic itch is a burdensome clinical problem that decreases the quality of life. The central transmission of itch is thought to involve the neuropeptides substance P (SP) and gastrin releasing peptide (GRP) that are released from itch-sensing primary afferents to excite second-order spinal cord neurons that express NK-1 and GRP receptors. To verify roles for SP and GRP in itch, we used a combination of calcium imaging and immunohistochemistry to investigate the expression of SP and GRP in primary sensory dorsal root ganglion (DRG) neurons that respond to itch mediators. In calcium imaging experiments, we identified cultured DRG cells that responded to bath application of various pruritogens (histamine, chloroquine and BAM8-22). The culture dishes were then subjected to immunohistochemical processing to identify neurons expressing SP and/or GRP. Of the histamine-responsive DRG cells, 24.2% and 21.8% were immunopositive for SP and GRP, respectively. Of the chloroquine-responsive DRG cells, 36.8% and 25.3% stained for SP and GRP, respectively. Of the BAM8-22-responsive DRG cells, 20.0% and 40.0% stained for SP and GRP, respectively. These studies show that a high percentage of pruritogen-sensitive DRG cells express SP and/or GRP, supporting a role for these neuropeptides in the spinal transmission of itch signals.

The International Criminal Court and the Promotion of International Peace and Justice

Michael D. Hoye
Sponsor: Keith D. Watenpaugh, Ph.D.
Religious Studies

My paper argues that despite a few limitations and failures, in the years since its creation (July 1, 2002), the International Criminal Court has become a successful tool in implementing international justice, bringing charges against numerous individuals guilty of Genocide, Crimes Against Humanity, or War Crimes. However, its ability to deter and prevent these acts has been called into question. Similarly, its role in implementing a true process of Peace and Reconciliation in countries that have seen violence and conflict has been non-existent. I will also contend that an understanding of how former international tribunals used to punish these crimes, such as the International Criminal Tribunal for the former Yugoslavia, and the International Criminal Tribunal for Rwanda influenced the functions, and led to the creation of the International Criminal Court. The paper employs as primary evidence the records of the International Criminal Court, as well as secondary material on international law and peacemaking.

The Effects of Different Cooking Methods on Shrimp Tropomyosin Allergenicity

Jacqueline Hsieh
Sponsor: Patrick Leung, Ph.D.
Internal Medicine

Shrimp allergies are among the one of the most common allergies worldwide, affecting both adults and children. Patients allergic to shrimp are serologically characterized by the presence of IgE antibody to shrimp. To date, a number of shrimp allergens including tropomyosin, sarcoplasmic calcium binding protein and arginine kinase have been reported. The most common shrimp allergen is the shrimp muscle protein tropomyosin. Tropomyosin is a highly conserved protein of approximately 38 kiloDaltons. Recent literature has shown that boiling may actually increase the allergenicity oftropomyosin. Here, we address the question of whether different cooking methods affect the allergenicity of shrimp. Raw shrimp was obtained. Shrimp were divided into batches of 5 shrimps of about the same weight and size. Batches were either boiled, fried or microwaved and cut into small pieces. Extracts were prepared from raw shrimp and each batch. Using Western blots, we compared the IgE reactivities of each of the shrimp extract using sera from patients with and without shellfish allergies. Preliminary results show that IgE reactivity to tropomyosin is reduced by different cooking methods. Currently, quantitative analysis is in progress to titer out the IgE antibodies to tropomyosin extracts prepared from different cooking methods.

Pain Sensitivity in Bovine Respiratory Disease and Modulation with NSAID

Tu Chun Hsu
Sponsor: Cassandra Tucker, Ph.D.
Animal Science

The coordinated sickness response includes fever and increased pain sensitivity. This study measured pain sensitivity during bovine respiratory disease (BRD), and assessed if a non-steroidal anti-inflammatory drug (NSAID) attenuated this response. We hypothesized that BRD will cause fever, increased sensitivity to pain, and NSAID will mitigate sensitivity. Beef steers were randomized as follows (n=5/group): Healthy, healthy+NSAID, BRD, BRD+NSAID. To cause BRD, steers received *bovine respiratory syncytial virus* (d0) followed by *Histophilus somni* (d5), while healthy steers received media. Designated steers received NSAID (d8). Pain sensitivity was assessed by pushing a blunt-ended pin into the leg at a consistent pressure; steers that showed a behavioral response (kicked or stepped) with the tested leg at lower pressure had increased sensitivity. BRD steers had a fever from d3 to d6, with the greatest difference on d5 (BRD:42.1±0.16 vs. healthy:39.9±0.16°C, $P<0.001$) and increased sensitivity on d7 (BRD:13.8±4.07 vs. healthy:26.2±4.48 kPa, $P=0.045$). Though pain sensitivity was increased in BRD animals, NSAID administration had no effect overall, or within BRD ($P\geq0.130$). We speculate lack of NSAID effect because fever had normalized before drug administration. In the future, effects of NSAID should be examined during peak sickness.

Sodium Hypochlorite Capacity to Eliminate Bacterial Pathogens During Waste Management of Biohazard Material

Laura Huang
Sponsor: Trevor V. Suslow, Ph.D.
Plant Sciences

The purpose of this study was to determine the minimum amount of sodium hypochlorite (NaOCl) needed to treat liquid biohazard waste containing great amounts of organic matter including soil and plant matter as well as a mixture of different enteric pathogens including Salmonella enterica, Escherichia coli O157:H7. A common treatment for such biohazard waste is to add large concentrations of NaOCl whose oxidative properties are able to kill most vegetative bacterial cells. However in presence of organic matter NaOCl losses its effectiveness, thus high doses of NaOCl are required to effectively eliminate the pathogens In this study, we evaluated different ratios of liquid waste: sodium hypochlorite (10%, 25%, 33% and 50%) in combination with different contact times (30 min, 1, 4 and 12 hours) to ensure the killing of 100% of Salmonella enterica in a log 9 CFU/mL in the waste. For each treatment samples were collected, neutralized with sodium thiosulfate, and then plated on nutrient media to determine the presence of the applied Salmonella. Results showed that the lowest concentration and the minimal contact time sufficient to ensure the 100% elimination of the applied Salmonella was10% of sodium hypochlorite for 30 minutes.

Sporulation of *Fusarium circinatum* in *Festuca arundinacea* Suggesting Possible Propagule Source for Spread of Pitch Canker

Margaret Huang
Sponsor: Thomas Gordon, Ph.D.
Plant Pathology

Fusarium circinatum is a fungal pathogen which causes pitch canker, a pine disease that poses major problems for forest health and agroforestry production. The host range for *F. circinatum* was thought to be limited to species within *Pinaceae*, but recent studies have extended the host range to include grasses. Grasses may provide a heretofore unrecognized source of inoculum for establishing infections in pines. To address this possibility, I examined whether and under what conditions *F. circinatum* can sporulate on infected grasses. Six-week-old *Festuca arundinacea* plants, a perennial bunchgrass common in pine forests, were challenged independently with *F. circinatum* isolates (10^6 spores per ml water) from grass and pine–the pine isolate was tagged with green florescent protein (GFP) for ease of detection. Six weeks after inoculation, healthy and senescing leaves were placed in glass petri plates on moist sterile filter papers and monitored for sporulation. Subsequently, *F. circinatum* colonies formed on grass leaves inoculated with either isolate. Sporulation on tissue was confirmed for the GFP-tagged grass strain using epiflorescent microscopy. The results of this study indicate that grasses may be an important source of inoculum for susceptible pines in forests, plantations, and seedling nurseries.

Investigating Patterns of Juvenile Dispersal in Golden-Mantled Ground Squirrels

Yu Tung Huang
Sponsor: Dirk Van Vuren, Ph.D.
Wildlife, Fish and Conservation Biology

Dispersal is the permanent relocation of an individual away from its natal burrow and facilitates gene flow and genetic variation. This phenomenon is male biased in many mammal species and helps to avoid inbreeding or resource competition. In this study, the dispersal behavior and exploratory excursion distances were recorded and analyzed for the golden-mantled ground squirrel pups (*Callospermophilus lateralis*) at the Rocky Mountain Biological Laboratory (RMBL). Daily observations and pup distances were recorded and compared between male and females pups and males with their sisters and their non-sisters. There was no difference in mean exploratory travel distances for males and females or the distances between males and their sisters vs. non-sisters. This could be because of high space availability, which may discourage pups from traveling farther than is necessary. An alternative hypothesis is that it is still too early in the active season to know whether or not dispersal will occur. Further studies should be made to know the dispersal behavior more confidently.

"Left Hand Path": Authenticity and Rivalry in Extreme Metal Music

Stephen S. Hudson
Sponsor: Chris Reynolds, Ph.D.
Music

In the mid-1980s, an international underground of heavy metal musicians began developing new, more extreme styles of their music through informal tape-trading communities. In Sweden, this coalesced gradually into a more cohesive local Death Metal scene, which had strong musical ties with the international metal community as well as developing styles unique to Sweden. Initially, many Norwegians were involved in the Swedish scene, and were close friends and collaborators with Swedish scene members. Around 1990, however, a group of Norwegian musicians broke ties with this Swedish scene and created a radically different musical style from their former Death Metal, centered around harsh, unintelligible vocals and rough, inaccessible production. In this presentation, I will analyze the music and culture of the Swedish Death Metal and Norwegian Black Metal scenes by examining the development of styles used in each genre and the attitudes of the musicians towards the production of their music, with the goal of interrogating claims of authenticity from each scene.

The Effect of Early Life Experience and Genetics on Alloparenting in Juvenile Rhesus Macaques

Jennifer Huntley
Sponsor: Karen Bales, Ph.D.
Psychology

Early-life experiences play a role in development, and early-life stress may have adverse effects on social and neurological development of juveniles. This project aims to investigate whether adverse mother-infant interactions change how individuals interact with infants as juveniles. Additionally, this project investigates a possible correlation between a juvenile's behavior towards infants and the serotonin transporter promoter polymorphism (5-HTTLPR). Twenty-six rhesus macaques (1-2 years old) were selected (15 males, 11 females). Subjects were observed as infants to determine the quality of their relationship with their mothers. Observations are conducted biweekly according to an ethogram of my design: 15 second behavioral scans and a record of social transactions. Observations will continue months after the arrival of new infants. I will use previously collected data for mother-infant interactions and the polymorphism (5-HTTLPR) genotype of each individual, as well as my own data on juvenile interactions in 2012. I hope to find an effect of both early-life experience and an individual's polymorphism for the serotonin transporter on juvenile treatment of infants. The results may either suggest that early life stress and the polymorphism influence alloparenting in rhesus macaques, or that there is no correlation between early life experience or the polymorphism and juvenile-infant interactions.

Plant-derived Auxins as Inhibitors of Neutrophil Myeloperoxidase: Potential Anti-inflammatory Agents for the Treatment of Cystic Fibrosis

Kim Ngan M. Huynh
Sponsor: Jason P. Eiserich, Ph.D.
Internal Medicine

Cystic Fibrosis (CF) is a hereditary disease resulting in the accumulation of viscous mucus in the lung. CF patients suffer chronic infections and overwhelming inflammation that leads to pulmonary dysfunction and premature death. Chronic inflammation in the CF lung is associated with exuberant neutrophilia the CF airway. Neutrophils express myeloperoxidase (MPO) that can cause oxidative injury in the CF airway. We hypothesized that MPO may be a feasible therapeutic target for the treatment of CF. A survey of natural chemicals possessing an indole moiety reveal plant-based compounds typically termed 'auxins' as inhibitors of MPO. Accordingly, we tested a number of these indole derivatives as MPO inhibitors such as indole-3-propanol, indole-3-carboxylic acid and indole-3-acetic acid. Spectrophotometric assays have been utilized to assess the ability of these compounds to inhibit MPO. Our results indicate that some of these compounds are extremely potent inhibitors of MPO (IC_{50} = ~30 nM), while others are essentially inactive. The data have revealed important structure-activity relationships that will allow the development of potent and selective MPO inhibitors. Our studies define the capacity of these indole-based natural products to potentially be utilized as therapeutic agents to ameliorate oxidative stress in CF and other inflammatory diseases.

Histamine Enhances Excitability of Neurons in CA1 and CA3 Regions of the Hippocampus of the Syrian Hamster

Giancarlo G. Ibanez
Sponsor: John M. Horowitz, Ph.D.
Neurobiology, Physiology and Behavior

Previous studies showed that injection of the neuromodulator histamine into the brains of hibernating ground squirrels increases the duration of their hibernation bout. Although it has been postulated that this effect involves hippocampal neurons, this possibility has not been directly tested. In this study, we addressed this issue by testing the hypothesis that low doses of histamine enhance the excitability of hippocampal neurons from the Syrian hamster, a hibernating species. Histamine (10μM) was applied to slices of the hippocampus maintained in artificial cerebral spinal fluid. Evoked responses (ERs) following electrical stimulation were recorded before, during, and after histamine perfusion at 30°C. In the CA1 hippocampal region, we found that histamine increased the amplitude of the ERs (23%, $P<0.05$) and shortened the time period between the ER peaks (16-26%, $P<0.01$) in seven slices from five hamsters. We found similar, though smaller, effects on latency and amplitude in the CA3 region. Data are consistent with our hypothesis and suggest that histamine has multiple, synergistic effects on the excitability of the hippocampal neurons that play a key role in the neural pathway regulating hibernation bout duration.

Germanium Nano-particle Synthesis Using Microwave Technologies

Andrew S. Iskandar
Sponsor: Susan M. Kauzlarich, Ph.D.
Chemistry

The search for alternative forms of energy has greatly increased over the years and semiconductor nanoparticles show great promise in providing an efficient source of solar energy that is also cost effective. Germanium nanoparticles have shown interesting optical and electronic properties that will allow them to be used for solar energy conversion and optoelectronic applications. There are many different published methods for the preparation of these nanoparticles. However, there are issues that need to be resolved with respect to size control and yield. Microwave synthesis has become a popular method for the preparation of nanomaterials and has not been evaluated for the preparation of Germanium nanocrystals. We have been successful in developing a simple one-pot synthesis for the preparation of Germanium nanocrystals. Our observations point out that the reduction reactions in a microwave reactor can be successfully carried out shorter heating times and temperatures compared to other published reports. Further experimentation on reaction variables, such as precursor quantities, temperature, heating time and precursor ratios (Ge^{4+}/Ge^{2+}) were manipulated in order to control the nanoparticle size. Furthermore, we would like to extend the synthesis to develop doped Germanium nanoparticles.

Modulation of Pain and Thermal Sensation by TRPV3 Channel Agonists

Christopher L. Joe
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

TRPV3 is a thermally sensitive ion channel that is gated by an increase in temperatures just above thermoneutral. We wished to investigate if chemical agonists of the TRPV3 channel, eugenol and carvacrol, would modulate sensitivity to thermal and mechanical stimuli in rats. We measured the hindpaw withdrawal latency to radiant heat (Hargreaves test), mechanical paw withdrawal using an electronic von Frey stimulus, and changes in thermal preference. To assess changes in the behavioral sensitivity to radiant heat and mechanical stimulation to these agonists, we applied either eugenol or carvacrol to one paw and used the opposite paw as a control. Topical application of eugenol or carvacrol to the rat's hindpaw resulted in increased withdrawal latency (i.e. analgesia) to radiant heat while intraplantar injections did not alter withdrawal latencies. Mechanical sensitivity did not change when applied topically or by intraplantar injection. The thermal preference test measured the percent time the rat spent on either of two adjacent surfaces that were independently warmed to different temperatures. Rats prefer a thermoneutral temperature range. Following topical application of eugenol or carvacrol to both hindpaws, rats exhibited a greater avoidance of warmed vs. thermoneutral surfaces, indicating enhanced sensitivity to warmth that became aversive.

The Economics of Sunscreens

Ritika Johal
Sponsor: Roslyn R. Isseroff, M.D.
Dermatology

Health care providers highly recommend the use of sunscreens for protection against ultraviolent radiation. The purpose of our study was to compare the prices of name brand and store brand sunscreens and estimate their annual economic burden. Overall, name brand sunscreens rated at SPFs of 30, 50 and 70 were significantly more expensive in comparison to store brand sunscreens of a similar SPF. Interestingly, name brands and store brands were similarly priced up when compared at an SPF rating of 100. The annual economic burden for an adult male using SPF 50 sunscreen daily to the arms, face, upper chest, upper back, and the legs (for half the year) was estimated to be $402.61 and $196.36 for a name brand or a store brand sunscreen applied at 2 mg/cm^2, respectively. When accounting for actual application density (1 mg/cm^2) rather than the recommended application density (2 mg/cm^2), this economic burden was reduced to $201.30 and $98.18 for the use of name brand or store brand sunscreens, respectively. Our findings show that the financial burden for using sunscreens under actual use conditions is economically feasible.

The Intersections of Race and Renewable Energy

Chelsea J. Jones
Sponsor: Julie Sze, Ph.D.
American Studies

I am researching African American environmental thought to better understand their role in the field of renewable energy. Mainstream discourse on renewable energy rarely includes a racial analysis. There is a low participation of African Americans in the field of renewable energy and environmental scholarship, and my aim is to understand why there are few African Americans in these leadership roles, and determining the barriers to their inclusion. The energy crisis we face in America and globally is going to require an effort across cultural boundaries, my aim is to understand the historical, social, and political implications involved in major energy decisions made and how that will affect Black communities. I am researching the historical relationship of African Americans and environmentalism, and contemporary writings by Black leaders and organizations that understand the connectivity of race and energy management in America. My argument is that racial hierarchies have barred African Americans from leadership roles in energy choices while they have dually been the receptacle of industrial energy waste and exploitation. Despite the exclusion in this genre African Americans, continue to be active in environmentally and socially sustainable energy.

Physical and Digital Sculpture in Contemporary Art

Christopher R. Jones
Sponsor: Tom Bills, M.F.A.
Art Studio

My art practice is informed by symbols of spirituality and domesticity, and how those symbols have changed with the integration of digital space into the framework of our culture. I am interested in how the expression of one' s own identity changes between interactions in the physical world and on the Internet. Created with materials used in the construction of suburban housing developments, I have sought to create sculptural forms that synthesize my experiences with the physical expressions of inherited culture. The work conveys a reconciliation of that inherited culture with an awareness of the contemporary notion of digital persona and culture. This process results in work that is static and active; static in its form and active in its participation with time and space. Each work incorporates its history prior to the point of its completion. This sense of past is manifested by time based processes of decay and growth. I incorporate video to further explore issues of time, projecting the video document of the sculpture in an active state over its finished form. The effect is similar to expanding a timeline and then flattening it, so that each of its points align and become one.

Functional Characterization of PIN1a, b, and c in Tomato

Jeanice L. Jones
Sponsor: Neelima R. Sinha, Ph.D.
Plant Biology

A family of auxin transporters called *PINFORMED* (*PIN*) largely determines the direction of flow of this plant hormone. Auxin is involved in many processes of development and plays major roles in determining venation, phyllotactic patterning, and leaf morphology. Phylogenetic analysis has indicated many duplication events in the *PIN1* clade of the family, but little information of the function of *PIN1* outside *Arabidopsis* exist. My research has identified three *PIN1* genes in tomato (*PIN1a, PIN1b, and PIN1c*). Leaf characterization of the *pin1a* mutant and RNAi lines parse out the contribution of each gene in regulating leaf development. I did a complementation test in a population segregating for presence of a functional *PIN1a* (*AtPIN1::AtPIN1::GFP*) fusion protein, and I performed genotyping for presence of *AtPIN1::GFP* by PCR. This test confirmed that I identified a *pin1a* mutant. I also created RNAi constructs to knockdown *PIN1b* and *PIN1c* in tomato. These knockdown lines will provide a model for examining the roles of *PIN1b* and *PIN1c* in tomato. This work provides a deeper understanding of the prominent role of *PIN1* in auxin-mediated leaf development and helps explain leaf diversity.

Role of Myosin IIA in Cell Migration

Melissa Jorrisch
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Cell migration is vital for the maintenance of any organism. Cells are thought to migrate by grabbing onto the surface and exerting traction forces to pull itself forward. Myosin II, together with the actin cytoskeleton, generates the traction force. To examine traction force regulation, I microfabricated a flexible substrate containing an array of micron-sized pillars. The cells adhere and migrate along the top of the pillars and, in doing so, bend the pillars proportionally to the traction force generated. I observed that, in normal cells, an isoform of Myosin II (IIA) localized to the leading edge where traction force was greatest. To test the roles of Myosin IIA in cell migration, I reduced the level of Myosin IIA using RNA interference techniques. In the absence of Myosin IIA, the cells did not exert traction forces. This observation is consistent with the localization of Myosin IIA in migrating cells and confirms the requirement of Myosin IIA for force generation. Surprisingly, the Myosin IIA deficient cells still migrated efficiently. This result suggests in the absence of force generating machinery, cells move by gliding on the surface without traction force and demonstrates the remarkable ability of cells to adapt to migrate.

Use of CMAPs to Convey Vitamin Requirements for Individuals of Varying Metabolic Genotypes

Amelia Joslin
Sponsor: Bruce German, Ph.D.
Food Science and Technology

One of the next frontiers of nutrition science and genetics is the personalization of nutrient requirements for individuals. It has been established that individuals of particular metabolic genotypes may require more or less of particular nutrients. Single nucleotide polymorphisms (SNPs) are one upcoming mechanism through which varying nutrient requirements can be determined for individuals. Therefore, I decided to research SNPs affecting the metabolism of Vitamin B12 and convey this information in a user-friendly format termed concept maps (CMAPs). I chose to focus my efforts on variants in the One Carbon Metabolism pathway. The One Carbon Metabolism pathway is of particular interest because it is important for proper DNA methylation and de novo purine synthesis. Aberrations in this pathway have been found to increase risk for CAD and certain cancers. I mined databases such as NCBI and WikiPathways for information on nutrient-gene-phenotype interactions. The mining involved manual searches of the genes as well as automated mining of databases using key words such as Cobalamin and MTHFR. My resulting CMAPs include 43 genes associated with increased or decreased nutrient needs. The use of CMAPs to visualize information is extremely practical and could be used to convey any type of data.

R-loop Formation Enhances the Efficiency of DNA Demethylation Mediated By the AID and TET1 Enzymes

Jesus E. Juarez
Sponsor: Frederic L. Chedin, Ph.D.
Molecular and Cellular Biology

Cytosine methylation in CpG dinucleotides is a frequent modification in mammalian genomes. While most CpG sites are methylated, a group of CpG-rich sequences called CpG islands (CGIs) tend to remain unmethylated. CGIs function as promoters for most mammalian genes and since methylation at promoters is associated with gene silencing, it is essential that CGIs be protected. I investigated the possibility that CGIs maintain their unmethylated state by recruiting DNA demethylation complexes that trigger a repair pathway resulting in demethylation. I tested two specific hypotheses: 1) that the AID and TET1 proteins are involved in the demethylation process and 2) that R-loops enhance demethylation. Human cells were transfected with an episome containing a methylated CGI together with expression vectors for the AID and TET1 enzymes. I assessed demethylation using a methylation-sensitive restriction enzyme digest followed by Southern blotting. My results showed complete demethylation when AID was expressed along with the presence of R-loops. Additionally, when TET1 and AID were both expressed, more effective demethylation was seen. These results led to two conclusions supporting my hypothesis. First, AID demethylation is enhanced by the presence of R-loops. Second, TET1 may enhance demethylation by providing AID with a more specific substrate.

Early Signs of Assimilation in Middle School:The Concept of Belonging and Its Relationship to the Educational Experience of Mexican Immigrant Children

Steve G. Juarez
Sponsor: Erin Hamilton, Ph.D.
Sociology

With the arrival of post-1965 immigrants from Asia and Latin America, scholars have observed divergent paths of assimilation for immigrant groups. Classical assimilationists argue that over time, the children of immigrants will eventually assimilate into white middle class America. Others, however, claim that immigrants no longer follow a straightforward path of assimilation, and argue that segmented assimilation theory encapsulates the complex integrative process for today's immigrants. Segmented assimilation theory identifies three possible pathways: the traditional integration into the middle class over successive generations, downward assimilation into the underclass, and economic success within an ethnic economy. It is unclear however, whether the paths apply specifically to all members in a group, or whether there is variation among groups. In this study, I focus on education as an indicator of assimilation, examining variation in educational outcomes among a socioeconomically homogeneous group of Mexican-American middle school students. Survey data and ethnographic observations suggest that a sense of *belonging* is crucial for educational achievement. Mechanisms influencing a sense of *belonging* include: peer and teacher support, after-school activities, positive role models, and participation in religious and ethnic activities. This paper illuminates the concept of *belonging* for explaining intra-group variations in educational outcomes and assimilation.

Exploring Distributions of Tubular Structures in Fenestrae Microbialites

Marisol Juarez Rivera
Sponsor: Dawn Y. Sumner, Ph.D.
Geology

Fenestrae microbialites are rocks that contain fossil remnants of ancient microbial communities. Microbialite samples were collected in South Africa, from the Gamohaan Formation and have been dated to 2521+/- 3 Ma. By analyzing these structures, we can create growth models and have a better understanding of interactions between bacteria and their environment. Samples D501-k49 and AL1 were serial sectioned by increments of 130 and 100µm with 140 and 120 digital scans collected from the samples, respectively. The scans were rendered into a volume in the KeckCAVES, which allowed the exploration and manipulation of 3-D data sets. Although both samples showed great 2-D spatial variability of organic material, they shared a similar 3-D structure. Both samples were found to have tube-like structures connecting thick neighboring surfaces of organic inclusions. Sample D501-K49 had greater density of tubes than sample AL1 and the distributions varied between the samples. Tube structures have not been previously identified in similar samples, and their distribution and function have not yet been characterized. Further research is being done to identify the role of tube structures for each sample and determine if they were essential for the outward growth of the bacterial communities.

Pulse Oximeter Micro Design with PCB Shield

Geovid K. Kali
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Our pulse oximeter is unique in the face that it uses the PsoC5 to its full potential. What we have done is moved the majority of the analog signal processing onto the PsoC5. The remaining stages, TIA, LED driver, power, and RS232, were put on a to a clip on Psoc5 shield, a PCB that I designed. The point of this shield is to simplify and make the entire PoX setup as small as possible. This shield clips onto the bottom of the PsoC5 first touch kit via the PsoC5 output pins. This board was developed to be small, portable and eventually battery powered, meaning it is very small. In fact the entire setup is about 1/10 or less than the original design. This board was also designed to be battery powered this meant we had to Incorporate a -5V to 5V charge pump on the PCB. This makes it so that a 5V battery pack can power our entire board. With the PCB adding functionality to the PsoC5 first touch kit we will be able to complete the PoX project with much less resources used and achieve a much smaller product.

The Impact of Self-affirmation on Forecasting Reactions to Anxiety-Inducing Events

Anne E. Kalomiris
Sponsor: Wesley G. Moons, Ph.D.
Psychology

People self-affirm by expressing values that are important to them. This self-affirmation has various beneficial effects including enhanced coping with anxiety-producing events. However, the impact of affirmation on construals of future anxiety-producing events remains unexplored. In this study, participants reported their trait levels of persistent anxiety and the extent to which they felt baseline anxiety at the beginning of the session. They were then self-affirmed or remained non-affirmed. When forecasting how anxious they would feel before a public performance, self-affirmation's effect on participants' forecasts depended on both their trait and baseline anxiety levels. Specifically, affirmed individuals with low trait anxiety made more anxious forecasts if they were more anxious at baseline. Non-affirmed low trait anxiety people did not show this relationship. People high in trait anxiety were uninfluenced by the affirmation manipulation and baseline anxiety and consistently predicted consistently high levels of anxiety. Thus, self-affirmation makes low trait anxiety individuals more sensitive to their current levels of anxiety when making predictions about their future anxious reactions.

The Creative Process of Personal Contemporary Art

Seo J. Kang
Sponsor: Robin Hill, B.F.A.
Art Studio

The creative process is an accessible, learning experience that is available to every person, regardless of education or previous knowledge. Creativity is entirely personal and individual—no two artist's creative process is alike. It involves the search for the messages the artist wishes to convey and the best way to send this message. Any person, whether professionally trained or self-taught, can develop his or her own creative process and establish growth as an artist through exploration of different mediums. The creative process can be highlighted by observing the work of other artists and discovering a personal interpretation of their artwork. Through research and the development of the understanding the thought process of making the artwork, an artist can glean a distinct style after expanding his comfort zone and practicing the technical aspects of art. Each process can be built by different methods, all tailored to the personal wants and needs of the artist. Through the creative process, anyone can access the world of art and expression and will only gain valuable insight about the self and its surroundings.

Differences in Parent-Child Relationships Among Children with Attention-Deficit/ Hyperactivity Disorder

Ayla M. Kapahi
Sponsor: Julie Schweitzer, Ph.D.
Psychiatry

Attention-deficit/hyperactivity disorder (ADHD) is the most common childhood psychiatric disorder, afflicting approximately 5% of children in the U.S and predicts strained family relationships. Three subtypes of ADHD exist- the predominately inattentive subtype, the predominantly hyperactive-impulsive subtype, and the combined hyperactive-impulsive and inattentive subtype. The purpose of the present study is to examine the relationship between ADHD symptoms and parent-child relationship dimensions. Continuous measures of inattentive and hyperactive/impulsive behavioral symptoms in 25 children (21 male, 4 female) were compared to parent-child relationship factors as assessed by the Parenting Relationship Questionnaire. A bivariate correlation analysis indicated a negative correlation between hyperactive-impulsive symptoms and attachment (r = -.43, p=.03), as well as school satisfaction (r = -.46, p=.02); however, the correlations between inattentive symptoms and these variables were not significant. This signifies that parents whose children exhibit increased levels of hyperactive-impulsive symptoms experience less secure attachments with their children and feel less satisfied with the capacity of their child's school to meet their academic and emotional needs. While the direction of causality of these relationships is unclear, understanding differences between ADHD subtypes and parental differences is important for future research aimed at designing parent-child ADHD therapies and/or educational workshops.

Release of Red Azo Dye from Heat Set Whey Protein Gels in a Viscous Media

Erica L. Kenney
Sponsor: Kathryn L. McCarthy, Ph.D.
Food Science and Technology

Whey protein-based gels absorb water and swell when placed in an aqueous environment. This makes them excellent devices for controlled release applications. As the gel swells, compounds of interest are slowly released from the protein matrix into the surrounding medium. The objective of this study was to investigate the release of a model release agent (red azo dye/Allura Red AC) from whey protein gels. Cylindrical heat-set whey-protein gels were prepared using 17% WPI solution at 90°C for 30 min. Before heating, varying amounts of red dye (.0005 g/mL, .001 g/mL, and .0015 g/mL) were added to the protein solution. Gel pieces were immersed in 1% alginate solution. Swelling and release were monitored for 6 hrs gravimetrically and spectrophotometrically. Light microscope images of the gels were also obtained during swelling. Results showed equilibrium swelling ratios of 14.2%, 12.42% and 11.78% for the dye concentrations of .0015 g/mL, .001 g/mL, and .0005 g/mL, respectively. For release experiments, changes in absorbance over time were measured using a UV-VIS spectrophotometer and data revealed that release of dye into the alginate solution was inversely related to dye concentration. These results demonstrated that kinetics of the swelling and release could be successfully monitored experimentally.

Expression and Purification of Mutations Linked to Distal Arthrogryposis in Full Length Human Slow Skeletal Muscle Myosin Binding Protein C

Jaskiran K. Khosa
Sponsor: Samantha Harris, Ph.D.
Neurobiology, Physiology and Behavior

Myosin binding protein C (MyBP-C) is a protein that regulates muscle contraction and has three distinct isoforms, including cardiac, slow skeletal, and fast skeletal. The slow skeletal isoform is believed to interact with actin and myosin in a way that stabilizes the functional unit of muscle, the sarcomere. Two mutations (Y831H and W212R) in slow skeletal MyBP-C have been implicated in the development of the congenital deformity distal Arthrogryposis type 1. This suggests that MyBP-C is critical for the normal function of skeletal muscle. However, the mechanism by which these mutations lead to disease is not yet known. The purpose of this study was to produce mutant proteins that can be assayed to determine their effect on function in comparison to wild-type MyBP-C. Slow skeletal MyBP-C containing a Y831H amino acid substitution and a W212R substitution were produced with site-directed mutagenesis and expressed in a baculoviral-insect cell expression system. The mutant proteins were purified with a talon-binding column that binds a His-tag placed at the N-terminus of the proteins. The proteins produced in this project will be used to study how these mutations affect skeletal muscle, and possibly how they lead to disease.

Developmental Integration of Adult-born Dentate Gyrus Granule Cell Mossy Fiber Boutons in Aged Mice

Anna King
Sponsor: Hwai-Jong Cheng, Ph.D.
Neurobiology, Physiology and Behavior

Adult neurogenesis, the generation and incorporation of new neurons into existing neural circuits, occurs in restricted areas of the mammalian brain, such as the hippocampal dentate gyrus. Dentate granule cell extends mossy fiber to CA3 and forms boutons to make synapses with proximal dendrites of pyramidal cells. Previous studies have shown adult-born dentate granule cells form mature synapses in about 8 weeks. However, it is unknown how adult-born mossy fibers form new connections in existing circuits and how this integration process is changed with age. To address these we utilized a novel inducible transgenic mouse model, where newborn dentate granule cells and their axons are GFP-labeled. To evaluate the maturation of developing boutons, we compared densities of homo- and heterochronic boutons in brain sections at different ages from young adult (4 month) to old age (22 month). We also performed single axon analyses of bouton maturation using Neurolucida reconstructions. Preliminary evidence suggests mossy fiber boutons retain the capacity for full maturation even in aged mice, but that the number of mature boutons is reduced in old age. Further analysis of newborn mossy fiber development in aged hippocampus will be important for understanding how adult neurogenesis is changed in aged brain.

Secondary Organic Aerosol Production from the Aqueous Reactions of Benzene-diols and Aromatic Carbonyls

Haley Kinney
Sponsor: Cort Anastasio, Ph.D.
Land, Air, and Water Resources

The combustion of wood releases particulate matter (PM) and gas phase organic compounds into the atmosphere. PM has been shown to affect global climate and can induce harmful health effects on the human population. Wood combustion products are generally oxygenated organic compounds and possess significant water solubility. They may be aqueous phase Secondary Organic Aerosol (SOA) precursors. SOA is the formation of non-volatile particulate phase matter in the atmosphere from lower volatility species. Specifically, wood burning produces benzene-diols and aromatic carbonyls that in the presence of solar light may undergo photochemical reactions. The products of these reactions are thought to be of lower volatility and can be considered aqueous SOA. This study examines the reactions of several benzene-diols released from wood combustion, specifically Catechol and Resorcinol, with aromatic carbonyls under atmospheric conditions. Currently, knowledge of aqueous SOA formation pathways is limited, and the goal of this study is to explore SOA production from wood smoke aromatic organic precursors. Our results indicate that the photochemical reactions of benzene-diols and aromatic carbonyls proceed rapidly and may result in the formation of low volatility products on an atmospherically relevant time scale.

Measurement of cMyBP-C Protein Levels in Cats with and without an HCM-causing A31P Mutation

Ryan Kirk
Sponsor: Samantha Harris, Ph.D.
Neurobiology, Physiology and Behavior

Cardiac myosin binding Protein C (cMYBP-C) is a sarcomeric protein involved in fine-tuning the contraction of cardiac muscle. Mutations in *MYBPC3*, the gene encoding cMyBP-C, are a frequent cause of hypertrophic cardiomyopathy (HCM), which is a key contributor to sudden cardiac death in young adults.Maine Coon cats have a naturally occurring mutation in *MYBPC3*, A31P, that causes HCM similar to that of humans and as such they provide a larger mammal model for HCM. The goal of this project is to determine if there is a difference in the amount of total cMYBP-C and mutated cMYBP-C protein in the cardiomyocytes of A31P mutation carriers compared to wild type (WT) cats. To answer this question we performed Western blots to detect cMYBP-C using two antibodies, K-16 and C-pro, against different regions of the protein. We also used an A31P mutation specific antibody to detect the A31P mutated cMYBP-C. Using the A31P antibody we were able to detect mutant protein in cardiac tissue of the A31P mutation carriers. The determination of total cMYBP-C is in progress.

Purification of Full Length COMP and Its Effect on Chondrogenesis of Human Mesenchymal Stem Cells

Ashleen Kishore
Sponsor: Dominik Haudenschild, Ph.D.
Orthopaedic Surgery

Cartilage oligomeric matrix protein (COMP) is a 524 kDa extracellular matrix protein that is found in cartilage, tendons, and ligaments. COMP is a major structural component of the cartilaginous matrix and is secreted in significant amounts by chondrocytes. Our previous studies show that COMP binds to Transforming Growth Factor Beta 1 (TGFβ1), a cartilage inducing growth factor. In this study, we want to test the effect of COMP-TGFβ1 complex on the chondrogenic differentiation of human bone marrow-derived mesenchymal stem cells (MSCs). We purified recombinant COMP to near-homogeneity by Ni-NTA agarose affinity chromatography and confirmed its binding to immobilized TGFβ1 in a solid-phase ELISA-type binding assay. To identify the role of COMP and TGFβ1 in chondrogenesis, we performed chondrogenesis assays with MSC pellet cultures in the presence or absence of recombinant COMP. Cartilage matrix formation was assayed by histological staining of the cell pellets with 0.1% Safranin O. There was a higher deposition of cartilaginous matrix present in MSC pellets incubated in the presence of recombinant purified COMP. This suggests that COMP enhances TGFβ1-mediated chondrogenesis. Ongoing experiments include identifying specific domains of COMP that bind TGFβ1 and other growth factors like Bone Morphogenic Protein 2 (BMP2) that are important for osteogenesis.

Microbial Community Structure of the Infant Colon and the Importance of Breast Milk Composition

Jonathan Klein
Sponsor: Rick Grosberg, Ph.D.
Evolution and Ecology

Human breast milk is composed of a diverse group of oligosaccharides known as human milk oligosaccharides (HMOs). These HMOs are largely indigestible by infants and instead promote the growth of non-pathogenic bacteria in the infant colon. Empirical studies also suggest that these HMOs are the only significant food resource available to the infant microbial community. The composition of the infant gut microflora can have effects on the development of the nervous and immune systems. We develop a model to investigate how HMO diversity and abundance in breast milk affects the composition of the infant microbial community. Results of this model suggest that the genetically-determined breast milk composition of the mother, identified by her Lewis Secretor status, plays a large role in determining the infant microflora community structure. The model shows that quantity of HMOs has relatively little effect on the range of microbial taxa observed. Instead, the diversity of HMOs plays a large role in determining microbial diversity in the infant GI tract. Future studies might investigate the health consequences related to specific Lewis Secretor statuses and their associated microbial community structures in the infant colon.

Do Changes in Salinity Affect the Distribution of the Sea Star Pisaster Ochraceus in Bodega Harbor?

Christopher J. Knight
Sponsor: Eric Sanford, Ph.D.
Evolution and Ecology

Variability in an environment can drastically affect the distribution of species. An example of variability in a marine environment that can affect organisms is the fluctuation of salinity levels. It is known that the sea star *Pisaster ochraceus* is sensitive to low salinity levels and therefore avoids inhabiting such environments. In the Bodega Harbor *P. ochraceus* is absent. It is speculated that this absence is due to salinity decreases caused by winter rain storms. However, another sea star *Pisaster brevispinus* is found in the Bodega Harbor. Using *P. brevispinus* as a control, I tested whether decreases in salinity negatively affect *P. ochraceus*. I also tested whether placing *P. ochraceus* in the Bodega Harbor during times of seasonal high salinity levels would have any negative effects on the organism. While not all results were statistically significant, *P. brevispinus* and *P. ochraceus* placed in low salinity treatments generally increased righting response time and decreased mussel consumption. It was also found that righting response times did not vary among species placed in the harbor. Overall, there was no conclusive evidence suggesting that seasonal low salinity levels limit the distribution of *P. ochraceus*.

The BRIZ Heteromeric E3 Ligase and its Effects on Cell Division and Interaction with Other Genes

Christine L. Knox
Sponsor: Judy Callis, Ph.D.
Molecular and Cellular Biology

BRIZ is a heteromeric ubiquitin E3 ligase important for seed germination and seedling growth. Mutant *briz* seeds fail to germinate and their embryo cells fail to divide and elongate. Our goal is to learn more about BRIZ. In this study, we will express a cell-cycle marker protein that is detectable only in dividing cells in the mutant *briz* background. We will then compare the pattern of dividing cells to wild-type and mutant embryos to see if *briz* affects cell division. To perform this experiment, we will identify plants heterozygous for the *briz* mutation that produce mutant individuals and that are homozygous for the cell-cycle marker. Once a suitable plant is found, using the cell cycle marker protein, we can track the pattern of the cell division to see exactly where in the cell cycle the cells are affected. Another approach to learn about BRIZ is to place the mutant *briz* alleles in different genetic backgrounds to see how that affects the *briz* phenotype. Progeny of *BRIZ/briz* plants segregate 3:1 (wild-type:briz phenotype). If the genetic background has no effect, we expect a 3:1 (wild-type: *briz*) germination pattern. If another mutation affects *briz* phenotype, then less *briz* seedlings will be observed.

Identifying Genes Involved in the Regulation of Ovule Development in *Arabidopsis thaliana* via Mutagenesis with Fast Neutron Radiation

Jeffrey S. Koble
Sponsor: Charles Gasser, Ph.D.
Molecular and Cellular Biology

Arabidopsis thaliana is a plant model organism used for many biological studies. However, the function of many genes remains unknown. The Gasser lab studies ovules (the precursors to seeds) and is interested in genes involved in the regulation of ovule development. We are attempting to identify such genes via an enhancer-suppressor screen of aberrant testa shape (ats) and innernoouter (ino-4) mutants. An enhancer-suppressor screen involves mutagenesis of a mutant with a phenotype affecting the biological process under study. Mutagenized populations are screened for individuals with enhanced or exaggerated features of the original phenotype (enhanced) and for plants which lack the original mutant phenotype (suppressed). Enhancers/suppressors likely contain mutations in genes involved in the biological pathway of interest. The ats and ino-4 mutants have disrupted development of the integuments (outer layer of seeds). Thus we are using the ats and ino-4 mutations as a genetic background to identify putative mutants in ovule integument development. I assist in planting and collecting progeny of seeds mutagenized via fast neutron radiation (M1 to M2 generation). I then assist in screening for enhancers and suppressors among the M2 generation and characterizing new mutants. Genes disrupted in new mutants may be identified through positional cloning.

Intron Mediated Enhancement in *Arabidopsis thaliana*

Noah Kojima
Sponsor: Alan Rose, Ph.D.
Molecular and Cellular Biology

Genes are made up of exons, which specify the structure of a specific protein, and introns, which are often included in the category of "junk DNA" because their functions are relatively unspecified. It has been determined that introns play a role in gene expression in a phenomenon called intron mediated enhancement (IME), which increases the amount of proteins produced from a gene by unknown mechanisms. The IME phenomenon is not specific to plants; IME can also be seen in mammals, insects, and fungus, and could possibly be a universal process within eukaryotes. By using computation and experimentation, a reoccurring sequence has been identified and seems to be linked to IME. In order to better understand the properties of IME, we manipulated the sequence by adding and subtracting the number of motifs present in the intron and by changing some of the bases within the nucleotide sequence. Biochemical techniques were used to identify plants with higher gene expression in order to see the effects of sequence modification. Because we have evidence that this phenomenon is mediated at the DNA level, we are testing plant intron sequences in yeast to see if we encounter similar results.

DNA Damage Checkpoint kinase Mec1 Phosphorylates Rad55 in Response to DNA Damage

Jeremy C. Kong
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

Homologous recombination is an essential repair pathway cells use to recover from genetic damage and is an important area of study for cancer research. A crucial step in homologous recombination is the formation of the Rad51 filament. In *Saccharomyces cerevisiae*, the Rad55-Rad57 heterodimer complex helps mediate the formation of this Rad51 filament. In response to genotoxic stress, Rad55 is phosphorylated by kinases of the DNA damage response pathway at seven different sites, including a serine cluster between amino acid residues 371 and 378. Although it has been shown that other phosphorylation sites on Rad55 are important for its role as a Rad51 filament mediator, the exact function of the serine cluster between residues 371 and 378 is unknown. To uncover the role of this serine cluster, we constructed a mutant, in which all potentially phosphorylated residues have been changed to negatively charged residues, potentially mimicking constitutively phosphorylated Rad55 protein. In this poster, we present preliminary results with yeast strains harboring this and other phosphorylation site mutations in the *RAD55* gene.

Creative Process Art Projects

Timothy Kontje
Sponsor: Robin Hill, B.F.A.
Art Studio

Hello. A lot of outside factors (guidelines, other people, other paintings, etc.) have influenced this work, but it's also very much indicative of who I am. I tried to work with the aspect that was most appealing to me within each assignment, and more often than not this was something cinematic: The Western-style cowboy, a fake movie poster, and an actual movie all share this common theme. I've always enjoyed and been fascinated with movies, so it stands to reason that there is some cinematic aspect to a lot of these projects. Many of these pieces also have a story or characters in them. I tried put these in without making them too defined or obvious; each piece tells a specific story to me but it could easily be different for someone else. I tried to keep what I put into a piece open-ended because I like the idea of viewers imagining their own stories based off the work.

Aneuploidy Induced Stress, an Early Stage in Cancer Progression

Kaitlyn Kortright
Sponsor: Ken Kaplan, Ph.D.
Molecular and Cellular Biology

Failure to maintain genomic stability during mitosis leads to mutation or aneuploidy, two forms of genomic instability associated with the initiation and progression of human diseases such as cancer. In particular, a mutation in a tumor suppressor, the adenomatous polyposis coli (APC) gene, is linked to mitotic errors that result in chromosome instability. We hypothesize that the dominant APC mutation causes mitotic errors that induce cell stress, contributing to early stages in cancer progression. We predict that an increase in cell stress markers, such as Hsp90, will correlate with increases in DNA damage, altering of the epigenetic modifications and changes to the organization of intestinal stem cells. To test these predictions, we are comparing tissue slides of healthy mice to those of mice that carry the APC mutation. Using different antibodies, we will compare levels of Hsp90 with changes in epigenetic markers and DNA damage. Hsp90 levels show a significant increase in 80% of crypts in APC mutant mouse intestine. We will also use tissue cultures to test the relationships we discover in vivo. Identifying the different cell markers that take a precancerous cell to a cancer cell has important implications about the nature and treatment of cancer cells.

Location-Based Wiki for Davis, CA

Keyan Kousha
Sponsor: Raju Pandey, Ph.D.
Computer Science

The thesis will explore multitier applications using both mobile and web technologies. The canon for this exploration will be the development of a mobile application, a collaborative, crowd-sourced location-based wiki for Davis, CA. The project will deal with such complexities as: developing and designing native mobile applications (e.g. for iOS, Windows Phone, etc.) with several features, developing and scaling a web service to communicate with multiple platforms, human-computer interaction, in addition to persistent shared storage and all issues encountered in the development of such systems (concurrency, performance tuning, ranking algorithms, testing, scaling, caching, etc.). Features of the applications should include: editable shared maps, editable shared location data (including photos, which can be uploaded and downloaded by users), allowing users to filter what data is displayed (e.g. just coffee shops, veterinary clinics, etc.), intelligent display of data given the users zoom level on the map (ranking), the ability to see multiple past versions of the location data and restore past versions with the click of a button, and location voting. Further, the application will attempt to make use of currently available location data for Davis, CA, from such sources as the Davis Wiki, SimpleGeo, Wikimapia, and others.

Stable Oxygen Isotopes in Human Teeth as a Measure of Mobility at the Scale of the Individual

Oleksandr Kovalyov
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Archaeologists are interested in reconstructing the mobility patterns of ancient societies to shed light on how peoples moved about different landscapes. While past studies have generally focused on mobility at the scale of the population, that is, whether groups of people were generally nomadic or sedentary, this research explores new ground by examining mobility at the level of the individual. Because teeth grow slowly in successive serial sections, we can extract information about where a person was at different points in time. We analyze oxygen and carbon isotope ratios in serial samples of third-molar dentin and enamel from a 2000-year-old site in the Sierra Nevada foothills of California. From such information, we can compare mobility patterns among different segments of society, such as between males and females, or the poor and the wealthy. Our preliminary results indicate differences in residential mobility between males and females that are consistent with a patrilocal post-marital residence pattern, where females moved to the villages of their husbands after marriage.

Pulse Oximeter: Transimpedance Amplifier and LabVIEW Interface

Samson Kuang
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

A pulse oximeter system is a device that allows for non-invasive monitoring of the heart rate and oxygen saturation of a patient. It utilizes a sensor consisting of two light emitting diodes (of different wavelengths) in conjunction with a photo detector. Light passing through the finger is detected by the photodiode, generating a current that is then converted to a voltage signal that undergoes signal processing. A microcontroller acts as the interface between the pulse oximeter system and the LabView program. An integral part of the pulse oximeter's signal detection was the differential transimpedance amplifier. Taking into consideration signal-to-noise-ratio, bandwidth, and slew rate, by varying two pairs of resistors and capacitors, current generated by the photodiode was converted into a voltage signal for signal processing and manipulation. The implementation of a differential setup also aided in reducing common-mode noise. In addition, the LabView software was used to display the captured signal on a computer monitor in real time. The signal was sampled continuously at 100 Hz via the National Instrument's Data Acquisition tool.

National Identity and Public Opinion on Immigration in Western Europe

Jessica Kuge
Sponsor: Daniel Kono, Ph.D.
International Relations

With the development of improved technology and means of travel, fewer barriers exist between countries. Consequently, immigration has become an increasingly salient political and social issue at the international level. Immigration as a relevant and current policy concern is particularly significant in Western Europe, as the EU and her member states grapple with the implications of utilizing immigration to maintain a competitive economic edge. I am interested in exploring possible explanations for negative European public responses toward immigrants integrating into Western European society and the prospects of public opinion changing immigration policies implemented by EU member states and the EU. My research questions within the scope of my paper focus upon national identity, economic factors, and public opinion. Namely, does national identity affect Western European public opinion toward immigration policy? If so, how? Does national identity have a greater affect than economic consequences on immigration policy? For my research, I therefore am interested in viewing national identity through these social, cultural, and traditional perspectives. I hypothesize that national identity has a greater impact on European public opinion toward immigration policies, rather than economic effects of immigration.

A Genetic Screen for Proteins Involved in the Migration of the Cell Nucleus

Jonathan A. Kuhn
Sponsor: Daniel Starr, Ph.D.
Molecular and Cellular Biology

The movement of cell nuclei is a basic and critical process in the development of many organisms. Although defects in nuclear migration are implicated in a number of human disorders, including muscular dystrophies, neurological disorders, and ataxias, many of the mechanisms that control this process are poorly understood. In the model organism *Caenorhabditis elegans*, there exists at least two pathways that govern nuclear migration: a microtubule-mediated pathway in which proteins UNC-83 and UNC-84 bridge the nuclear membrane and recruit motor proteins kinesin and dynein, and an almost uncharacterized pathway we refer to as the emu pathway, which functions in parallel to the UNC-83/84 at lower temperatures. Using whole-genome sequencing and mapping, we have been uncovering the proteins involved in the emu pathway. The discovery that FLN-2, an actin-binding gene, indicates that actin may be providing the force for nuclear movement in this pathway. Discovering more proteins involved in this pathway and characterizing the function of FLN-2 will help us better understand actin's role in nuclear migration and nuclear migration in general.

Effects of Heat and Mild Acid Treatment on Fiber in Tomato Pomace

Tara Kurihara
Sponsor: Annie King, Ph.D.
Animal Science

The manufacturing of tomato products such as ketchup, tomato paste, and tomato sauces uses the majority of the raw tomato weight; about 10% to 30% of the remaining weight consists of the tomato peels, cores, culls, and seeds and is considered an agricultural by-product or tomato pomace (TP). This by-product has the potential to be a good source of protein in animal feeds, especially for non-ruminants. However, the absorption of the protein from TP in non ruminant diets may be limited due to high fiber content from lignin, cellulose, and hemicelluloses of this by-product. Microwave (MW) and autoclave (AC) treatments may reduce undigested plant materials such as lignin, which is difficult to digest by non ruminants like poultry. These heat treatments in combination with a mild acid (MA) treatment of 5% H2SO4 have also been shown to be effective methods. Thus, the content of protein and fibrous components in TP before and after treatment with these four treatments (AC, MW, MW+MA and AC+MA) were measured. Increasing the bioavailability of proteins and simultaneously reducing indigestible fibrous components with heat and acid treatments will give rise to more convenient and environmentally friendly non-ruminant feeds.

Chloroplast and Thylakoid Division in *Arabidopsis thaliana*

Warren Kwan
Sponsor: Steven M. Theg, Ph.D.
Plant Biology

Chloroplasts are double membrane enclosed organelles found in plant cells and algae that are responsible for photosynthesis. Chloroplasts contain an additional membrane-enclosed compartment called the thylakoid which houses the light harvesting machinery of photosynthesis. Replication of chloroplasts and thylakoids are essential for maintenance of the cell and survival of the plant; however, little is know about the division of thylakoids. In this study, we are investigating whether thylakoids possess their own replication cycle or machinery independent from the chloroplast division process by monitoring the sizes of thylakoids in a chloroplast division mutant Arabidopsis, arc6 (accumulation and replication of chloroplast). Whereas wild-type cells contain approximately 60 chloroplast, these mutant plants contain only one or two giant chloroplasts per cell due to a mutation of the arc6 gene responsible for the recruitment and coordination of key proteins required for chloroplast division. Wild-type *Arabidopsis* and arc6 mutant protoplasts were isolated and osmotically lysed, resulting in the release and swelling of thylakoids called "blebs". Fluorescent images of the blebs show that those from the arc6 mutants were significantly larger (around ten-fold) compared to those from wild type thylakoids. This suggests that the thylakoids in the arc6 mutant do not possess their own replication machinery.

Kristallnacht: The Catalyst that Began the Demise of the German American Bund

Julia C. Lahl
Sponsor: David Biale, Ph.D.
History

On November 9th and 10th 1938, German officials and members of the Nazi party participated in a pogrom that specifically targeted the German Jews, in a event that would later become known as *Kristallnacht*. In 1936, prior to the events of *Kristallnacht*, a Neo-Nazi group named the German American Bund established itself as a prominent group in American cities around the nation. Consisting of German immigrants, the German American Bund aimed to bring German-Americans together to support their mother country and the Nazi party. However, the German American Bund began to raise concerns from the American population and government as tensions mounted between Germany and the United States. With these rising concerns, the German American Bund began to change the representation of their group by abandoning their German ties and highlighting the "Americanization" of their group. By their own definition, the German American Bund acted as a representative for Germany in the United States. This study will investigate the events of *Kristallnacht* as a catalyst for the change in ideologies within the German American Bund which forced their group to dissolve by 1941.

Sodium Hypochlorite Capabilities in Deactivating *Salmonella enterica* in Biological Waste

Jocelyn Lam
Sponsor: Trevor Suslow, Ph.D.
Plant Sciences

The purpose of this study was to determine the minimum dose of sodium hypochlorite (NaOCl) to treat liquid biohazardous waste containing substantial oxidative-demand, including soil and plant material, known to interfere with disinfection of enteric pathogens including *Salmonella enterica* and *Escherichia coli* O157:H7. A common treatment is the addition of large concentrations of NaOCl whose oxidative properties are lethal to most vegetative bacterial cells. However in the presence of organic matter NaOCl is consumed in non-target oxidative reactions, thus high doses are required to meet pathogen inactivation for biosafety compliance. Excessive doses are prohibited from discharge via lab drains and may be problematic for worker's comfort and health. In this study, we evaluated different ratios of liquid waste: sodium hypochlorite (10%, 25%, 33% and 50%) in combination with different contact times (30 min, 1, 4 and 12 hours) to ensure a 9-log reduction of *Salmonella enterica* in the waste. For each treatment samples were collected and neutralized with an excess of sodium thiosulfate and plated on nutrient media to determine the presence of the applied *Salmonella*. The lowest concentration (10%) and the minimal contact time (30 min) was sufficient to ensure the 100% elimination of the applied *Salmonella*.

Using Human AGO2 in Conjunction with Docking Software and Analogs to Further Explore RNA Interference Therapy

Walter Y. Lam
Sponsor: Dean Tantillo, Ph.D.
Chemistry

Many diseases today are caused by overproduction of certain proteins. The RNAi(RNA interference) pathway involves siRNA(short interfering RNA), the argonaute complex (AGO2) and the endoribonuclease 'Dicer'. Dicer is able to effectively stop translation. Frank, Sonnenberg, and Nagar have reported the crystal structure for the human AGO2 (Nature, 2010 vol 465 pg 10). By looking at the AGO2's active site and its specificity for the 5' end of siRNA, we are developing a virtual analog that binds better to AGO2 than the four natural nucleosides, allowing us to direct Dicer. Using the structure of AGO2, experimental docking techniques and analogs made by collaborators, we can predict the results of how well the ligand binds. Using our predictions, the synthesis group will save time and money as we use the RNAi pathway to further drug treatments. My poster and panel will explain the RNAi therapy concept, show the basis of theoretical methods, and present our results to date.

Malaria-induced Damage to the Intestinal Barrier: How Does Increased L-arginine Bioavailability Reverse this Damage?

Jessica Lawrence
Sponsor: Shirley Luckhart, Ph.D.
Medical Microbiology & Immunology

Malaria and non-typhoidal *Salmonella* serotypes are major causes of death in endemic countries. Co-infection increases disease severity because malaria increases susceptibility to bacteremia, often resulting in septic shock and death. Malaria infection reduces the bioavailability of L-Arginine (L-Arg), which can reduce the synthesis of nitric oxide and enhance parasite sequestration that obstructs intestinal blood flow. Together, these phenomena can lead to increased intestinal permeability to co-infecting *Salmonella*. When malaria-infected mice were supplemented with L-Arg or L-Citrulline (L-Cit) to increase bioavailable L-Arg, we observed a significant decrease in bacterial translocation out of the intestine. RNA extracted from the ileum tissue of supplemented, infected mice showed an increase in expression of mast cell proteases and a decrease in TNF-alpha expression over unsupplemented controls. These data suggest that increased L-Arg bioavailability reduces harmful inflammation and protects the intestinal barrier. Additional results showed that supplementation resulted in increased in nitric oxide synthase expression. This enzyme catalyzes the synthesis of nitric oxide (NO) from L-Arg, suggesting that enhanced NO-dependent parasite killing may indirectly improve barrier function during L-Arg supplementation. By investigating the mechanisms of L-Arg action, we hope to develop nutritional interventions to restore the intestinal barrier and reduce mortality in endemic countries.

Determining the Role of Different Proteins in Homologous Recombination

Evangelia L. Lazaris
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

Cancer is becoming an increasingly prevalent issue in today's world. The necessity of accurate DNA Double-Strand Break Repair is essential to prevent the augmentation of large-scale rearrangements and defects that can lead to cancer. The role of different proteins in Homologous Recombination can be identified in mutants that contain defects in specific components of the pathway and determining the efficiency and accuracy of repair in such mutants. My project involves creating a complex mutagenesis assay that assesses mutations introduced during homologous recombination. By using this assay to compare wild-type to strains containing deletions of various proteins thought to be involved in repair-mediated DNA synthesis, I will be able to identify the different proteins and polymerases involved in these high-fidelity gene conversion events. I hypothesize that an absence of specific essential DNA polymerases, such as Polδ and Polε, and other key proteins involved in Double Strand Break Repair will increase mutations during the associated DNA synthesis. I will also evaluate other non-essential DNA polymerases, such as Polζ, Polη, and Pol32 to determine their requirements for this process. These observations underscore the significance of specific proteins in repair-mediated DNA synthesis.

Should You Believe What You See on the Web?

Tuyen V. Le
Sponsor: Judy Jernstedt, Ph.D.
Plant Sciences

Microwaved water cooled to room temperature kills plants! Should you believe it? An article posted online makes this claim. Two plants were treated with either microwaved water or stove-top heated water cooled to room temperature. It was hard to believe that microwaved water kills plants, especially since the experimental design had several flaws: 1) inadequate sample size, 2) no replications, 3) failure to randomize samples. I designed an experiment that eliminated these flaws. Fifty-four soaked red kidney bean seeds were planted in individual pots and allowed to grow for 20d, and were then randomly divided into two treatment groups: those receiving 25ml per day of water microwave-boiled then cooled and those receiving 25ml per day of water boiled in a microwave oven then cooled. The experiment ran for two months, and all plants were grown in the same environment. Height, leaf number and flower/fruit data were collected from both treatment groups two times, at 39d after planting and at 55d, and dry weight data was collected once at 55d. My results showed no difference between plants watered with microwave-heated water and hotplate-heated water. So, don't believe every thing you see on the web.

Novel Embryological Study of *Vanilla planifolia* Using Confocal Scanning Laser Microscopy

Caprice Lee
Sponsor: Sharman ONeill, Ph.D.
Plant Biology

Orchidaceae remain to be a widely under-investigated lineage despite long-standing biological and evolutionary interest. In particular, detailed studies of post-pollination ovule development regarding development of the female reproductive structures, individual generative cells, and the female gametophyte are lacking. Confocal scanning laser microscopy (CSLM) has been used successfully to examine ovule and female gametophyte development in one orchid and in Arabidopsis. Here, state-of-the-art CSLM techniques will be adapted in order to develop effective protocol for imaging *Vanilla planifolia* ovules via confocal scanning laser microscopy. The results of this applied technique should yield novel images of developing pre- and postmeiotic ovules in *V. planifolia*. Knowing more about ovule development and its correlation with pollination may lead to a better understanding of how to develop improved and new vanilla varieties that are hardier, more disease-resistant and offer enhanced flavor. The proposed research can ultimately be used to benefit the smallholder vanilla farmers worldwide, most of whom are indigenous groups in food-insecure and impoverished developing nations.

The Effects of MAFbx Gene Deletion on Metabolic and Autophagy Markers in Skeletal Muscle During Congestive Heart Failure

Nathaniel T. Leu
Sponsor: Sue C. Bodine, Ph.D.
Neurobiology, Physiology and Behavior

MAFbx, a muscle-specific E3 ubiquitin ligase, is a marker of muscle atrophy as demonstrated through its upregulation in various atrophy-inducing conditions including congestive heart failure (CHF). Additionally, deletion of MAFbx spares muscle mass following skeletal muscle denervation. MAFbx knock out (KO) mice develop CHF between 12 and 16 months of age and die by 18 months of age. The skeletal muscles of these mice, however, seem to be relatively protected by this heart failure. The purpose of this study was to determine whether deletion of MAFbx spares skeletal muscle from the effects of CHF, such as decreased muscle mass, decreased oxidative capacity, and increased autophagy. We analyzed metabolic and autophagy markers in the gastrocnemius muscle of female and male wild type (WT) and MAFbx KO mice of varying ages (4-6, 11-13, 17-18 months) through western blots. Western blot results suggest a sparing of oxidative metabolism, but increases in autophagy in MAFbx KO mice in response to CHF. Furthermore, deletion of MAFbx did not spare muscle mass or force output.

Comparing the Tuberculin Skin Test and Interferon γ; Release Assay for Diagnosis of Mycobacterium Tuberculosis Among Health Care Workers

Ada L. Li
Sponsor: Kathryn DeRemier, Ph.D./M.P.H.
Medical Microbiology & Immunology

New screening tests are needed to diagnosis infection and disease caused by Mycobacterium tuberculosis (TB). The traditional screening method to detect TB infection is the tuberculin skin test (TST), a test that measures a delayed hypersensitivity response to a purified protein derivative (PPD). More recently, interferon γ; release assays (IGRAs) were developed to detect TB infection. The IGRAs measure and quantify the amount of interferon γ; released by T-cells in an individual's blood, and may be more sensitive and less subjective than the TST. Furthermore, individuals who previously received the BCG vaccine might have a false positive result in the TST but a negative result in the IGRA, supporting use of the IGRAs as a more effective method to screen for TB infection. Using a cross sectional study design, I will compare the results of the TST and IGRA among a cohort of health care workers, and calculate the degree of concordance and discordance between the TST and IGRA tests. This study will produce data comparing these two tests, and could lead to more rapid treatment and prevention of TB disease.

Pulse Oximeter System: Microcontroller Programming and Adaptive Control

Fernando Li
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

A pulse oximeter system is a device that allows for non-invasive monitoring of the heart rate and oxygen saturation of a patient. It utilizes a sensor consisting of two light emitting diodes(of different wavelengths) in conjunction with a photo detector. Light passing through the finger is detected by the photodiode, generating a current that is converted to a voltage signal that undergoes signal processing. A microcontroller controls the pulse oximeter system and acts as the interface between the system and the LabView program. The primary focus of the project was to capture, analyze, display the heart beat signal, and oxygen concentration in the blood. The strategy to filter the heart beat from ambient and hardware noise was to simulate various mathematical models, perform statistical analysis, and develop a digital filter to clean and correctly display the heart beat signal. By collecting and analyzing unfiltered data, the correction process identifies the portion of data that is not compatible to be a heartbeat, modifies it through a mathematical process, and corrects the heartbeat signal to be correctly displayed. This process is applicable to both light emitting diodes, and the final screen shows only clean heartbeat signal.

De Novo Analysis of Repetitive Sequences in the Pinus Taeda (Loblolly Pine) Genome

Brian Lin
Sponsor: David Neale, Ph.D.
Plant Sciences

The characterization of repetitive DNA sequences, which are implicated in important biological roles, is necessary to understand the genome and its evolution. Tandem repeats, which are short repeating units, often occur close to genes, and can serve as genetic markers. Interspersed repeats are longer sequences that can code for proteins, and are mobile within the genome. We are currently studying repeat sequences in loblolly pine (Pinus taeda), an economically and ecologically important coniferous species. The study involves the identification and analysis of undiscovered de novo repeat sequences, many of which are expected to be unique to conifers and/or loblolly pine. We will primarily be using RepeatScout to identify de novo repeat sequences in a total of 103 loblolly pine BAC sequences. RepeatScout generates a frequency table of k-mers which is then used to find repeats. Due to the limited representation of gymnosperms in repeat databases such as Repbase, we expect to find a large number of unique de novo repeat sequences. RepeatMasker, Tandem Repeat Finder, and other tools will aid in further analysis of de novo repeats.

Pulse Oximeter: Adaptive Control Simulations

Chianny Lin
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

A pulse oximeter system is a non-invasive medical device which monitors the heart rate and oxygen saturation of a patient. This device provides early detection of unstable oxygenation, which is critical information in intensive care, operation, and post-operative recovery situations. The pulse oximeter utilizes a sensor consisting of two light emitting diodes (LEDs). Photons pass from the LEDs through the finger and are detected by the photodiode, generating a current that is then converted to a voltage signal which undergoes processing. A microcontroller communicates between the pulse oximeter system and the user interface, or LabView program. Although the pulse oximeter is a convenient medical device, a patient's unique age, gender, and natural fluctuations deviate the signal. The primary focus of the project is to develop a signal processing algorithm, or adaptive control system, which removes said distortion. Several approaches were implemented. Analysis and simulations were done in Matlab using an ideal heart beat signal which is intentionally distorted. The signal is filtered with a low pass noise removal filter and IIR DC removal filter then a processing algorithm is implemented to give the most stable, accurate, real-time data of a patient's heart beat pulse and oxygen saturation.

Chemotaxis Toward Organic Acids in *Pseudomonas putida* F1

Pamela Lin
Sponsor: Rebecca Parales, Ph.D.
Microbiology

Pseudomonads are motile bacteria known for their metabolic diversity, which allows them to utilize a wide range of organic compounds as sources of carbon and energy. These organisms can sense and respond to chemical concentration gradients using a process called chemotaxis. Pseudomonads have a conserved chemotaxis system that is homologous to that present in *Escherichia coli*. *E. coli* has five methyl-accepting chemotaxis proteins (MCPs), which serve as receptors for specific compounds. In contrast, *Pseudomonas putida* F1 has 27 MCP-like genes in its genome. To characterize the functions of the MCPs in strain F1, mutants with deletions of each of the 27 MCP genes were constructed and screened for defects in chemotaxis to a variety of chemicals. To characterize chemotactic responses, we used soft agar plates, which contain a chemical attractant and low concentration of agar. As the bacteria consume the chemical, a concentration gradient develops and the bacteria swim outward to higher concentrations and form a ring. Using this assay, we identified one receptor that detects malate and fumarate, and a second receptor that detects citrate and fumarate. A double mutant lacking both receptors was defective in the response to all three organic acids.

Wilson Disease: Copper Accumulation and Its Effects on Methionine Metabolism

Sarah Liu
Sponsor: Valentina Medici, M.D.
Internal Medicine

Wilson disease (WD) is an autosomal recessive disorder of copper transport resulting in excessive hepatic copper accumulation characterized by hepatic steatosis, inflammation and ultimately cirrhosis. Copper accumulation is associated with abnormal methionine metabolism which can affect gene expression. We studied the effects of copper accumulation on SAM/SAH which has been shown to be an indicator of DNA methylation status using 12 and 24 week old male toxic-milk mice (tx-j), model of WD, and C3H control mice. A group of 24 week old tx-j mice was treated with the copper chelating agent, penicillamine (PCA). Copper levels were 40 times higher in tx-j mice than the control and were reduce by half in the PCA treated mice. Tx-j and PCA treated mice had lower SAM/SAH compared to the C3H mice. At 12 weeks, tx-j mice displayed reduced expression of GRP78 compared to control mice (-1.5 +/- 0.31 vs 0.24 +/- 1.4, p=0.005) as well as at 24 weeks for the expression of transcription factor SREBP (-2.17 +/- 0.53 vs -0.35 +/- 1.33, p<.003), and the enzyme SAHH (-1.98 +/- 0.40 vs 1.28 +/- 0.94, p< .001). Our results indicate that gene expression in WD may be regulated by abnormal methionine metabolism.

Crystallization of Thirster-Containing Protein 1 from Malaria-Susceptible Mosquitoes

Shankar I. Logarajah
Sponsor: Andreas Toupadakis, Ph.D.
Chemistry

Malaria is a parasitic disease transmitted through the *Anopheles* mosquito to humans caused by the apicomplexan parasite *Plasmodium*. On a global scale nearly 1 million lose their lives to the disease, most of who are children in Africa. As the parasite grows resistant to medications such as chloroquine and the hunt for a vaccine with high efficacy continues, the biology of the mosquito as a vector has become an interest in regulating the combating the spread of the parasite. Vector controls outside of the mosquito have been used with great success to reduce the spread and even eradicate the disease. Thioester containing protein-1 (TEP1) is part of the mosquito innate immune system that combats *Plasmodium* following infection. The protein is processed by proteolytic cleavage in order to become activated, then covalently binds to the parasite and targets it for destruction. Two alleles of TEP1 have been described so far that take part in this process, the susceptible allele (S) and the refractory allele (R). The structure of the R allele was previously crystallized and solved using a 2.7 Å resolution. Here we describe our efforts to optimize crystals of the S allele and ultimately collect a 3.7 Å data set.

Desire and Immanence: Reflections on a Literary-Theoretical Excursus

Evan F. Loker
Sponsor: Neil Larsen, Ph.D.
Comparative Literature

What is the *telos*, the ultimate goal, of literary studies? If we accept a common defense of the humanities—fostering of critical thinking and unique insight into social and historical reality—how are we to envision cultural criticism in an era when economic crisis poses a ubiquitous threat to the very study of culture? What does this reveal about the relation of the critic to the cultural object, i.e. is criticism merely a chance meeting between critic and object, theory and "text," or are there more fundamental connections? Although I cannot offer answers to these intellectual, even existential, questions, I hope to advance new insights from six months of intensive research that culminated in my honors thesis. Through retracing my comparative, theoretical investigation into narrative structure and comedic irony I will emphasize three primary conclusions gained from the process, rather than the content of the investigation itself. First, the importance taking what critical theory proper (the Frankfurt School), termed immanent cultural criticism as the theoretical standpoint; second, the need to illustrate the necessity of comparative analysis, beyond mere contingency, through self-reflexive, analytic methods; and finally the centrality of the historical and the social in relation to formal, aesthetic criticism.

The Lactoferrin Receptor is Differentially Expressed Across Several Human Epithelial Cell Types

Sydney A. Lopez
Sponsor: Bo Lonnerdal, Ph.D.
Nutrition

The cationic glycoprotein lactoferrin (Lf) exhibits an array of biological activities that contribute to host development and immunity. The lactoferrin receptor (LfR) has been detected in multiple tissues and cell types. The internalization and subsequent cellular activities of Lf are likely dependent upon the tissue-specific expression patterns of the LfR and physiologic state, as suggested by dynamic fluctuations of Lf concentrations in the materno-fetal compartment across gestation, and postnatally in the neonatal small intestine of the breastfed infant. In the present study, the effect of culture period on LfR protein expression patterns was investigated using various epithelial cell models. Human intestinal (Caco-2), placental (BeWo), hepatocellular (HepG2), and mammary (T47D) cells were seeded at a density of 1.5×10^5 cells per 10 cm dish in triplicate. Cellular lysates were harvested daily beginning at day 4 and thereafter for 24 days. LfR protein expression was strongly detected in BeWo, Caco-2, and HepG2 cells, and less extensively in T47D cells. Cellular LfR expression patterns varied across time, reaching different maximal levels in each cell line culture. However, the LfR expression profile within this range was cell type specific. These results suggest that LfR expression depends on cell type as well as degree of maturation.

Single Particle Reconstruction of gp140 Bound to Broadly Reactive Neutralizing Antibody VRC01

Benjamin M. Lorton
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

Human immunodeficiency virus type-1 envelope glycoproteins gp120 and gp41 (Env) mediate membrane fusion with host cells. A structural characterization of Env and the fusion mechanism should assist HIV-1 vaccine development. The isolation of VRC01, a highly potent and broadly reactive neutralizing antibody that recognizes over 90% of circulating HIV-1 isolates, provides insight for the determination of critical neutralization epitopes. gp140 is a functional Env-based immunogen, truncated at the trans-membrane domain for solubility; soluble proteins are ideal for imaging with cryoelectron microscopy (CryoEM). We are using CryoEM and single particle reconstruction (SPR) to produce a three-dimensional electron density map of VRC01 antigen binding fragment conjugated with gp140. CryoEM uses an electron microscope with a CCD camera to digitally image 2-dimensional projections of objects suspended in vitreous ice. SPR analyzes and classifies these projections in Fourier-space then reconstructs a real-space 3-dimensional structure. Preliminary results confirm recent findings in tertiary and quaternary rearrangements induced upon HIV-1 encountering a host cell. Furthermore, we are culturing transfected Chinese hamster ovary cells for Env-expression that will be purified and used in future structural characterizations with other broadly-reactive neutralizing antibodies, such as PG9 and PG16, and for other biochemical analyses.

(Un)making the Body: Monitoras de Salud and the 'Right to Health'

Amanda Lotspike
Sponsor: Marisol De la Cadena, Ph.D.
Anthropology

Drawing on the work of medical anthropologists, the following study is grounded in the notion of the human body as a process rather than an objective, concrete physical form. In order to understand this process, I interviewed six women health promoters from socioeconomically marginalized poblaciones of Santiago, Chile. Their community health groups are affiliated with the foundation EPES (Educación Popular en Salud). The work of this group reaches beyond providing immediate medical assistance to facilitating a greater consciousness of the structural social and economic disparities that define health and wellness in the twenty-first century. Through interviews and bibliographic research, I look at how health promoters push the spatial and ontological notions of the body, framing their work in terms of the 'right to health' and a 'dignified life' for all. I hope to understand how health promoters affirm their subjectivities amid popular discourse on the liberal, individual, and sovereign body.

Hepatitis B Screening, Prevention, and Comprehensive Care in the Underserved Asian Community: A Novel Collaborative Free Clinic

James Luong
Sponsor: Ronald Jan, M.D.
School of Medicine

The Paul Hom Asian Clinic (PHAC) and the Vietnamese Cancer Awareness, Research and Education Society (VN CARES) have partnered together in an effort to provide Hepatitis B screenings, treatment, and vaccinations to the underserved Asian and Pacific Islander communities of the Sacramento area. From 2009-2011, we have provided free HBV serological screening to 504 patients. For chronically infected patients who elected to undergo follow up monitoring, a series of blood tests were given to evaluate for liver damage (alanine transaminase, ALT), a liver cancer marker (alpha-fetoprotein, AFP), and HBV replication (HBV DNA levels). Of those screened, 17% were chronically infected. Of those chronically infected, 76% had signs of active liver damaged measured by elevated ALT, and 18% had elevated AFP liver tumor marker for Hepatocellular carcinoma (HCC). Over one-third (36.8%) of those chronically infected carried HBV DNA levels that met the criteria for treatment. We provided patients with low-cost antiviral therapy through the clinic's Patient Assistance Program and, on occasion, provided ultrasounds for those with suspected tumor developments. For uninfected patients, we offered HAV/HBV vaccinations at no cost. Through our clinical findings, we find a need for aggressive outreach and screening of HBV for the underserved Asian immigrant populations.

The Effects of FoxG1 and MeCP2 on Neuronal Development

Stefanie Luu
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

What if our brains couldn't fully develop or make enough neurons for normal brain and body function? In my research, I am looking at just that by investigating the importance of two proteins, MeCP2 and FoxG1, and their effects on cell turnover. In mice, we know that if FoxG1 expression is completely diminished, the mouse dies during embryonic development. It is assumed that a failure to adequately produce new neurons is responsible for this premature death. To test whether FoxG1 and MeCP2 are required for cell turnover, I will culture neural stem cells and access whether deficiency of either protein causes changes in cell cycle mechanisms. I will utilize a technique called Bromodeoxyuridine (BRDU) labeling. BRDU integrates into the DNA of the cells when they divide, such that subsequent rounds of cell division will also have integrated BRDU. Using a microscope, I can quantify the extent of cell proliferation by determining the abundance of BRDU in cultured neural stem cells. If cell turnover is affected, we can conclude that MeCP2 and FoxG1 are required for the generation of neurons during embryonic development.

Theoretical Study of RNA Toward Computational Docking

Diana D. Ly
Sponsor: Dean Tantillo, Ph.D.
Chemistry

RNA interference is already being widely used in basic science as a useful method to discovery new drugs therapy for diseases and may lead to novel therapies in the future. However, there are challenges appear during the process of discovery such as designing nucleoside analogs modification due to labor intense and time-consuming. Therefore, theoretical methods toward computational screening could potentially resolve these challenges. In this study, we will present our efforts of developing theoretical methods by utilizing a traditional drug docking program (OpenEye Software Suite); Fred-receptor specifically. As to test for our method, we performed an analysis of pose prediction experiments using Fred-receptor and evaluated a series of natural bases and analogs whose effect on RNA duplex stability is known. The process of operating the program and results based on our collaborators previous experiments will be discuss, as well as on going experiments based on the prediction of our method.

Going with the Flow: How Endothelial Cells Are Regulated by Their Biophysical Environment

Irene Ly
Sponsor: Josh T. Morgan, Ph.D.
School of Veterinary Medicine

Vascular endothelial cells (VECs), which form the thin interior lining of blood vessels, are a fundamental component in the regulation of the cardiovascular system. Consequently, they are key players in the development of cardiovascular disease, one of the most prevalent chronic health problems faced by our society. Previous research indicates that VEC behaviors, including the inflammatory response, are modulated by biophysical attributes such as the stiffness (compliance) of the surfaces they adhere to. However, there is little research to demonstrate how VECs respond to such biophysical cues in conjunction with the presence of a unidirectional flow environment. We are examining specifically how human aortic endothelial cells (HAECs), a type of VEC, behave in response to variations in surface stiffness under the presence of flow. Preliminary results demonstrate that subjecting HAECs to these varying biophysical factors can profoundly influence the gene expression of important biological markers that clue us into the regulation of the inflammatory response within blood vessels. Ultimately, these findings will further elucidate the intricate relationship between VECs and their external environment in relation to potential treatments for cardiovascular disease.

Using Traditional Drug Design Programs to Develop a Method for Examining the Stability of Modified Bases in RNA

Stephanie Mac
Sponsor: Dean Tantillo, Ph.D.
Chemistry

Ribonucleic acid interference (RNAi) is a cellular process that mediates the expression or inhibition of genes. The ability to manipulate this process makes it a powerful therapeutic tool. Although the pathway of RNAi is evident, there remains a certain level of challenges to proposing a useful approach. One approach, that remedies the challenge, is designing base modifications that increase the stability of base pairs thus decreasing the risk of mutations. However, the course of developing this approach is challenging---often costly and time consuming. In this study, we present the development of a theoretical method that could potentially assist in reducing the cost and time. This theoretical method involves the use of traditional drug design programs (OpenEye Suite) to examine the interaction between natural base pairs of a specific RNA strand to a modified base. Challenges associated to the development of this method will be discussed as well as ongoing experiments for the purpose of validating this method.

Formation of Standard Curves Using Real-Time LATE-PCR for Semi-Quantitation of Bacterial Load for Ventilator Associated Pneumonia (VAP) Infections

Samaan Mahmoudzadeh
Sponsor: Gerald J. Kost, M.D./Ph.D.
Pathology

Ventilator associated pneumonia (VAP) is the leading cause of death from nosocomial infections. The purpose of this research is to produce standard curves by real time linear-after-the-exponential polymerase chain reaction (LATE-PCR) using organisms commonly found in VAP infections (*Klebsiella pneumoniae*, *Stapylococcus aureus*, and *Pseudomonas aeruginosa*). Purified DNA standards for these organisms were purchased from American Type Culture Collection (ATCC). Ten fold serial dilutions were made from a known starting concentration (106 copies/uL) by consecutively adding 5uL of bacterial DNA to 45uL of Tris six times. Five uL of DNA from each concentration was added to three PCR tubes containing 20uL of mastermix. Experiments were repeated three times. From these dilutions the raw data consisted of smooth sigmoidal curves with 3-4 cycles between each concentration. The data was analyzed by averaging the nine cycle threshold values from each concentration and forming a best fit line through the use of linear regression, with the x-axis being the average cycle threshold (Ct) values and the y-axis as log10 concentration. Standard deviations (SD) and 95% confidence intervals were added for each concentration. These standard curves may be used to approximate concentration of bacterial load in VAP infected patients.

Big Bank Mergers During the Financial Crisis – Impact on Shareholder's Wealth, Profitability, and Efficiency

Jatin Malhotra
Sponsor: Phil Martin, Ph.D.
Agricultural and Resource Economics

The financial crisis of 2007-2009 eliminated several major financial services firms, in part because the government encouraged Mergers and Acquisitions to bolster the economy. This thesis examines four major M&A transactions that occurred during the peak of the financial crisis (late 2008) using event study methodology and accounting data. The event study method uses daily abnormal returns to determine the impact of each M&A on shareholder wealth from the acquired and acquirer's perspective while accounting ratios such as return on equity (ROE), operating cash flow (OCF), and absolute cash flow (ACF) measure profitability. Results from both studies indicate a better market response for government-assisted transactions, investors' preference of merging firms vs. non-merging firms in a highly distressed period, and business integration difficulties for forced mergers. The study also shows initial market reaction towards merger announcement to be highly correlated with actual earnings during subsequent years which is consistent with previous findings.

Development of Liposome-Based Radiometric Probe for Detection of X-ray Enhancement Due to Gold Nanoparticles

Anna K. Malubay
Sponsor: Ting Guo, Ph.D.
Chemistry

Safe delivery of chemotherapeutic cancer treatment has been pursued for nearly 20 years. However, recurrence rates in many cancers remain high due to ineffective drug release from the liposomes. Thus, we are developing a controlled-release drug delivery method. This allows the drug release from the vehicle only within the tumor cells and will greatly reduce recurrence rates and side effects. The method is based on using gold nanoparticles (GNPs) to enhance X-ray absorption. The GNP can enhance the amount of energy deposited by the X-rays and trigger drug release. To detect the enhancement due to GNP, we developed dye-filled liposomes to be used as radiometric probes. With these, we can optimize our liposome design to increase drug release. Fluorescent dyes loaded within liposomes were used in measuring the destruction of fluorescence upon X-ray radiation. Several dyes were used including Alexa Fluor, Calcein, and Sulforhodamine B. In the liposome control studies, 30% and 60% decrease in the fluorescence of various dyes were observed after 100 and 200 grays (Gy) of radiation, respectively. Upon completion of the synthesis of the GNP-modified liposomes, the enhancement will be measured. This will optimize the liposome enabling a novel drug release capsule for cancer therapy.

Effects of Chlorpyrifos on Synaptic Density in Rat Superior Cervical Ganglia in Situ

Linley Mangini
Sponsor: Pamela Lein, Ph.D.
Molecular Biosciences

The organophosphorus pesticide (OP), chlorpyrifos (CPF), is one of the most commonly used pesticides worldwide. While much is known about the acute toxicity of OPs, little research has been done on the physiological mechanisms underlying the neurotoxicity associated with chronic low-level exposures. The objective of this research is to determine the effects of chronic exposure to CPF on synaptic density in the superior cervical ganglion (SCG), a target tissue for OPs. Previous work has suggested that CPF may affect the density of sympathetic innervation of salivary glands. For the current work, we used SCG harvested from the rats that were the source of the salivary glands in the previous study. Young adult (50 days old) male Long Evan rats were injected daily for 4 or 10 days with CPF at 3 or 10mg/kg, or an equal volume (250 μL) of vehicle (peanut oil). After exposure, the animals were euthanized and SCG were harvested and fixed with 4% paraformaldehyde. SCG were subsequently cryosectioned and immunostained for synaptophysin, a synaptic vesicle protein that serves as a pre-synaptic marker. To determine whether CPF changes synaptic density, immunostained sections are being analyzed by microscopy to quantify the number of synaptophysin-immunoreactive puncta per unit area.

Unusual Island Formations of Iridium on Ge(111) Studied by Scanning Tunneling Microscopy

William Mann
Sponsor: Shirley Chiang, Ph.D.
Physics

We have used scanning tunneling microscopy (STM) to characterize the growth of iridium onto Ge(111). The ultrahigh vacuum STM is connected to a low energy electron microscope and an auxiliary chamber for cleaning and characterizing single crystal samples. The Ge(111) samples were cleaned by repeated cycles of argon ion sputtering followed by annealing to 1025K. Iridium was deposited onto the room temperature Ge(111) c(2x8) reconstructed surface at different coverages less than 1ML, and the samples were annealed to temperatures between 550K and 750K. A new form of growth was observed, consisting of pathways connecting larger iridium islands. As the annealing temperature increased, the iridium growth first formed unusual shapes with finger-like protrusions. Next, these shapes broke apart into smaller islands, which ultimately formed into larger islands at higher temperatures. High resolution images have been obtained, which allow insight into the atomic arrangements. A model is being developed to explain the potentials and preferred binding sites of atoms during growth in order to explain these unusual island formations.

EEC 136: Pulse Oximeter Team Charlie

Evan Mansoor
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Our group is building a pulse oximeter system which we have redesigned to be both much smaller in size as well as low power. In order to decrease the size of the circuit we used a microcontroller (a small programmable processor) to replace many of the tradition blocks of the system. The system was also made low power by tuning many the high power parts of the system. My individual contribution to the circuit was on three parts. First I built the transimpedance amplifier which takes a current signal and converts it into a voltage; this circuit is used to convert the pulse oximeter signal coming from the finger probe. My second part was the sample and hold, which is one of the many circuits that we moved onto the microcontroller. The sample and hold separates the signal from the Transimpedance amplifier into two separate channels, one for each LED in the probe. My final contribution was the LabVIEW interface. Our circuit's final results will be sent to a program called LabVIEW once they are processed, and LabVIEW will be used to display the final data and provide a user interface.

Using *Arabidopsis thaliana* as a Genetic Toolbox

Brenda I. Marin-Rodriguez
Sponsor: Simon Chan, Ph.D.
Plant Biology

Haploid plants can greatly accelerate plant breeding and advance plant genomics. Haploid plants were previously generated in the Chan lab by crossing wild-type (WT) A. thaliana plants to a transgenic haploid inducer with defects in its centromeres (chromosome structures required for inheritance). After fertilization, defects in chromosomes from the haploid inducer resulted in their loss from the zygote. The result of these crosses was that 25-50% of progeny had genetic material from only the WT parent. There are two important aims of this project. The first is to provide easy identification of haploids by inserting a dominant marker (PDS-miR) that produces a white vein phenotype in leaves of the haploid inducer. Haploid progeny will not inherit this gene and will not have white veins, whereas diploid and aneuploid plants will. The second is to rapidly create a plant carrying five homozygous mutations (yuc1, yuc 2, yuc 8, DRS5-GFP and DrS-RED) from a multiple heterozygote as a proof of principle to show that haploids can greatly reduce the amount of plants a researcher must screen to acquire a multiple mutant. This project intends to demonstrate the use of haploid plants for the advancement of genetic studies.

An Autonomous Pulse Oximetry System for Dynamic Measurement of Vital Signs

Andrew M. Marnell
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Accurate and reliable diagnostic tools are key to effective and low cost health care. We are building a clinical device to measure the oxygen saturation and pulse rate of patient in a noninvasive manner. The device automatically determines the appropriate settings for measurement and dynamically corrects for changes. Two LEDs, one red and one infrared, shine through a finger. The light is detected, and the difference in intensity due to optical absorption of hemoglobin in blood flowing in the veins is used to estimate the oxygen saturation and pulse rate. The intensity of the LEDs is determined automatically when a finger is inserted. A key challenge in implementing such a sensor is to compensate when the patient moves the finger such as when the patient is shivering. This disturbance complicates the measurement of the signals of interest. In order to address this issue, electronic control systems have been implemented to automatically compensate for movement changes to allow accurate and reliable measurements to be performed even under adverse conditions.

Optimization of the Cardiothoracic Surgery Journal Club Curriculum through Resident Surveys

Imran R. Masood
Sponsor: David T. Cooke, M.D.
Surgery

The purpose of this study was to develop the optimal Journal Club (JC) format for the UC Davis cardiothoracic (CT) surgery training curriculum. A pre-change needs assessment survey was administered to 27 residents. Based on the survey results JCs were changed from weekly to bi-monthly, articles were emailed to residents and staff 10-14 days prior to JC, and definitions of level of evidence were emailed along with the articles. The following year, a post-change survey was given to 23 resident participants. There were a total of 12 (44.4%) and 13 (56.5%) respondents to the pre-change and post-change surveys respectively. The survey questions were rated on a 5 point Likert scale. We observed improved responses to the statements, "Through JC, I developed a better understanding of the levels of evidence," 3 (25%) respondents stating 'Agree' or 'Strongly Agree,' compared to 8 (67%) respondents following the changes, and "Through JC, I developed a better understanding of CT surgery," with 4 (33%) respondents marking 'Agree' or 'Strongly Agree' before change, to 8 (66%) respondents after. The study indicated that JC structural changes were positively received by residents. Further analysis will determine if JC optimization improves knowledge of CT surgery.

Female Sexuality in Faulkner

Renee Mattos
Sponsor: Karl Zender, Ph.D.
English

In the South of Faulkner's *The Sound and the Fury* and *Absalom Absalom!* the myth of the pure virgin woman is held as the ideal. How then can female sexuality be understood in these texts as part of a predominantly masculine narrative? By reading Caddy Compson and Judith Sutpen against the more direct perspective of Charlotte Rittenmeyer in *If I Forget Thee, Jerusalem*, I argue that the representation of female sexuality in these texts, in conjunction with the subservient narrative position occupied by these women, suggests an attempt to contain the female body and the threat it poses to the Southern ideology of virginity and the broader ideas of a woman's role in American culture. None of these three women survives beyond the masculine discourse of the text. The danger their sexuality poses is ultimately neutralized by burying their voices beneath the narrative of others or by writing them out of the narrative altogether. In the end, the question at stake is whether female sexuality can ever be embraced and played out—can enjoy a kind of masculine status—without tragic results.

An Autonomous Pulse Oximetry System for Dynamic Measurement of Vital Signs: Serial Link and Graphical Display

William J. Mattos
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Accurate and reliable diagnostic tools are crucial to effective and low cost health care. We are building a noninvasive clinical device to measure the oxygen saturation and pulse rate of patient. Two LEDs, one red and one infrared, shine through a finger. The light from each LED is detected and then processed electronically through separate channels. A key challenge in implementing such a sensor is to send data from multiple channels over a single serial link and displaying this data on a graphical interface. To address these issues, we programmed a microcontroller (MCU) to process each channel at specific times. A serial link controller transmits the data from the MCU to a LabView interface. The LabView program calculates and displays the patient's heart rate and oxygen saturation level. The oxygen saturation level is calculated by interpolating the data from a table of known measurements. The LabView program also displays the waveforms from the red and infrared channels in real-time on a sweep chart similar to a commercial pulse oximeter scope.

Analysis of D-loop Dissociation by Sgs1-Top3-Rmi1 After a Single Double-Strand Break

Lloyd McCarthy
Sponsor: Wolf-Dietrich Heyer, Ph.D.
Microbiology

Double Strand Break Repair (DSBR) is a necessary process to the survival of the cell, as any damage to both strands of DNA left unrepaired can lead to cell death. Sgs1-Top3-Rmi1 form a complex known to be involved in the DSBR process, specifically in resection and double holiday junction dissolution. I hypothesize that this complex plays also a role in D-loop dissociation during Homologous Recombination. I will approach this by using synchronization assays combined with Chromatin Immunoprecipitation in order to physically locate the complex on the DNA strand during a controlled double-strand break. In addition to "classic" Chromatin Immunoprecipitation of Sgs1-Top3-Rmi1, I will perform Chromatin Immunoprecipitation during repair-mediated synthesis, which occurs immediately following D-loop formation, by incorporating BrdU and precipitating the DNA with an antibody against this nucleotide analog. Synchronization is necessary to both enrich for the protein, and to eliminate background noise created by cells undergoing S-phase DNA replication. I have created the triple-tagged strain and begun preparations for the cell-synchronization assays. These data will provide further insight into the role of the Sgs1-Top3-Rmi1 complex during the Synthesis Dependent Strand Annealing and double Holliday Junction pathways of Homologous Recombination.

Air Pollution and Health: Which Chemicals in Airborne Particles can Produce Adverse Oxidants?

Alexander McFall
Sponsor: Cort Anastasio, Ph.D.
Atmospheric Sciences

Particulate matter (PM) is a form of air pollution that is ubiquitous in the air we breathe. Inhalation of PM has been correlated with adverse health effects and premature mortality in humans. Though the mechanisms of toxicity are not well understood, one theory suggests that PM deposits in the lungs and produces adverse oxidants, such as hydrogen peroxide (HOOH). Some harmful effects of PM are thought to arise from the buildup of these oxidants, a phenomenon known as oxidative stress. Our goal is to discern which chemicals in PM can produce hydrogen peroxide the fastest, and may therefore lead to the greatest buildup in the lungs. To do this, we quantitatively measure the rate of hydrogen peroxide formation in a surrogate lung fluid containing chemicals commonly found in particulate matter. Preliminary research shows that copper and iron are both important in the hydrogen peroxide balance. Copper rapidly forms HOOH, while iron can destroy it. Further research will investigate hydrogen peroxide production from additional chemical species. By identifying those species that are important for hydrogen peroxide production, we can begin to understand which aspects of the particulate matter may lead to oxidative stress.

Assay of "Kissing" Interactions Between Chromosomes During Meiosis in *Saccharomyces cerevisiae* Using Live Cell Imaging

James M. McGehee
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

Meiosis is a specialized form of the cell cycle where diploid cells divide to form haploid gametes for sexual reproduction. During meiosis, homologous chromosomes pair and form crossovers to ensure proper segregation. It is not known if chromosome pairing is directed or stochastic and it is unclear if it involves strong interactions that hold the chromosomes tightly together or weak interactions that allow dissociation. We have addressed this question by assaying chromosome pairing in 3D space over time. Using homologous chromosomes tagged with Green Fluorescent Protein (GFP) we acquired images of the cells over time. Next we measured the distances between GFP foci in 3D space using MATLAB software. We identified five classes of interactions between homologous chromosomes over a six minute time interval: i) homologs that were always paired; ii) homologs that never paired but were constrained to certain distances; iii) homologs that never paired but were not constrained; iv) homologs that paired for an extended time but also unpaired; v) homologs that exhibited "kissing interactions" or paired for short time intervals before unpairing. We can now determine the frequency and duration of these kissing-interactions.

A New Standard for Climate Action Plans

Anna M. McKenna
Sponsor: Debbie A. Niemeier, Ph.D.
Civil and Environmental Engineering

Climate change is one of the biggest problems facing the world. In response, cities and counties all over the country are developing Climate Action Plans (CAP). A CAP identifies sources of greenhouse gas emissions and then outlines the reduction measures necessary to reach a specified target of reduced emissions by a specific year. In this study, we describe an analysis of the content, language, and data included in CAPs. Our analysis shows that the standard approach to creating a CAP is flawed. On average, the features of the CAPs are inconsistent and the language fails to identify the gravity of climate change. Since we are responsible for writing CAPs for Winters and Woodland, California, we intend to create two documents that are innovative, consistently transparent, and implement change at a significant level. Through this process we are improving upon and refining the techniques that are commonly used for CAPs. Our goal is to develop a more rigorous system for constructing CAPs that will become the standard for all future CAPs. Research Team: Anna M. McKenna, Karandev Singh, Lily Tomokovic, Michelle Rugg, Taylor Helgestad, Tracy Heidersbach, Devinder Dhillon, Kai Tang

Social Development and Social Learning in Nonhuman Primates

Tara L. McMahon
Sponsor: Lynne A. Isbell, Ph.D.
Anthropology

Social interaction in primates is complex and requires years to master. There are many nuances including body language, gestures, facial expressions, and vocalizations that are dependent on the relationship, the situation, and the context. The primate order is also one of the most socially diverse of the mammalian orders; there are solitary foragers, monogamous pairs, polygamous groups, fission-fusion groups, and the complex, ever-changing society of humans. The juvenile period is crucial for social development, and primates as a whole have an unusually long juvenile period. They spend this period learning how to survive in their respective societies. This literature review looks at the many different studies of various aspects of social development: how individuals form social relationships, how young monkeys learn how to react to the behaviors of others, how traditions are passed between and within generations. Many of these studies look at a primate's first relationship: the mother-infant relationship. The patterns and trends of social development across the primate order may offer some insight into the evolution of human social development and the unique diversity of human society.

A Comparison of Two Field Diagnostic Tools for Subclinical Diagnosis of Pregnancy Toxemia in Ewes

Emma L. Mele
Sponsor: William T. Ferrier, D.V.M.
School of Veterinary Medicine

Pregnancy toxemia in sheep is a metabolic disease that occurs when a ewe enters a ketotic state during the last three to four weeks of gestation. It is triggered by multiple fetuses, declining nutrition, or environmental stress. This disease is occasionally seen at the UCDSOM Surgical Research Facility probably because sheep are often carrying twins and undergo stress during the surgery, recovery, and transport. Because this disease has a quick clinical progression and a high mortality rate, early diagnosis is crucial to an effective treatment plan. This project researches the accuracy and practicality of two field methods for diagnosing pregnancy toxemia in ewes while the disease is in a subclinical state. A blood and urine sample will be taken from each ewe at strategic points throughout their stay at the UCDSOM Facility in order to sample a variety of metabolic states. These blood and urine samples will be immediately analyzed in the barn for BHBA levels using a Precision Xtra handhled "ketometer" and acetoacetate levels using Ketostix Urine Reagent Strips, respectively. Both methods are relatively inexpensive compared to traditional laboratory blood assays. The results will be used to advise economical pregnancy toxemia screening protocols.

Identifying the Developmental Role of *nanos2* in Zebrafish Germline Stem Cells

Emmanuel V. Mendoza
Sponsor: Bruce W. Draper, Ph.D.
Molecular and Cellular Biology

Nanos-related genes in vertebrates and invertebrates have an important role in the development of germline stem cells (GSC), which give rise to gametes. Unlike mammals, which have a fixed number of oocytes at birth, adult zebrafish females are capable of producing new oocytes, which makes zebrafish an ideal model to study the development and regulation of germline stem cells. The *Nanos2* ortholog in mice has been shown to play a key role in maintaining spermatogonial stem cells (SSC), as inactivation of *Nanos2* results in loss of SSC. The Draper lab has recently found that zebrafish nanos2 (*nos2*) is expressed in a subset of early oogonia and spermatogonia in zebrafish and may therefore be an important regulator of germline stem cells in both males and females. Zinc Finger Nucleases (ZFN) have been used successfully in many organisms, including zebrafish, to determine gene function by producing sequence-specific deletion mutations. My project is to test the hypothesis that *nos2* is a key regulator of germline stem cell maintenance in zebrafish by using *nos2* targeted ZFN to produce a loss of function *nos2* mutation.

The Experimental Reproduction and Application of Neandertal Lissoir Technology

Natalie Mendoza
Sponsor: Teresa Steele, Ph.D.
Anthropology

Recent findings have associated Middle Paleolithic Neandertals with a bone tool type unseen in human populations until the Upper Paleolithic: a leather smoother or *lissoir*. This tool appears to be a worked piece of rib bone from red deer–common prey in the Middle Paleolithic. Previous ethnographic research and experimental comparisons suggest that bone tools like this were used to scrape sinew and connective tissue from the visceral surface of prey pelts. In this experiment we attempt to further replicate the methods of producing functional *lissoirs* and to duplicate the techniques applied to process prey hides. We use adult elk ribs to simulate red deer; both fresh and dry bones are used in order to best determine which produces results more similar to the artifacts discovered. We process a fresh domestic sheep pelt to test the function of the manufactured tools, as well as the wear patterns on them. Our results will help identify the role of bone technology in the Middle Paleolithic and could shed some light on whether Upper Paleolithic modern humans acquired this tool technology through cultural transmission or through independent invention.

Understanding Compliance through the California Surface Mining and Reclamation Act

Robert A. Merk
Sponsor: Mark Lubell, Ph.D.
Environmental Science and Policy

California's Surface Mining and Reclamation Act (SMARA) of 1975 established a host of new regulatory standards for surface mining operations. However, compliance by individual mine operators to SMARA is enforced not by the state itself, but by many local 'lead agencies', typically cities or counties. A principal-agent dilemma arises, as the level of compliance enforced by each lead agency (agent) often varies from the level of compliance desired by the state (principal). Determining potential causes of such variability is the principal aim of this paper, and is done so first by quantifying each lead agency's level of compliance, and identifying a number of independent factors which might influence this level of compliance. The primary dependent variables used to quantify a lead agency's compliance-level are its rates of inspection and amount of fiscal assurances for each mining operation within that lead agency. We hypothesize that an agency's compliance level is a function of its median household income (positive correlation), economic dependency on its mining operations (negative correlation), and average environmental awareness (positive correlation). Multiple regression analyses will be conducted between the dependent factors of compliance and these independent factors to test our correlation hypotheses.

Piezoelectric Zinc Oxide-Poly(Vinylidene Fluoride) Nanocomposites for Sensing and Actuation

Frederick N. Meyers
Sponsor: Kenneth J. Loh, Ph.D.
Civil and Environmental Engineering

The objective of this research is the fabrication and characterization of a new piezoelectric thin film consisting of zinc oxide (ZnO) nanoparticles embedded in a poly(vinylidene fluoride)-trifluoroethylene (PVDF-TrFE) matrix. Piezoelectric materials have been used in Structural health monitoring (SHM) as sensors and actuators. Lead zirconate titanate (PZT) is a popular choice because it has a high piezoelectric response. However, PZT is very brittle and contains lead that can be potentially harmful to the environment. PVDF-TrFE is a flexible piezoelectric polymer, but it is not as responsive as PZT. This research aims to demonstrate that the piezoelectric response of PVDF-TrFE thin films can be enhanced with ZnO nanoparticles. High voltage hysteresis loops were used to measure the remnant polarization. Then, an impact test is used to characterize the piezoelectric voltage output as a result of vibration. Fabrication and poling techniques are also discussed. This new nanocomposite can be used in SHM for active sensing of fatigue or dynamic strain to prevent catastrophic structural failure.

Barriers and Solutions to Reproductive Women's Health Access in California

Rebecca E. Michelson
Sponsor: Lisa Ikemoto, J.D.
School of Law

In recent years there has been a drastic spike of anti-reproductive rights legislature and budget cuts of women's health care resources. This research identifies historically under-served populations in California that are most affected by these attacks. Article reviews, interviews, and data collections are used to identify socioeconomic, political, and cultural barriers women face to reproductive health care access. Potential solutions are proposed in the form of economic, health care provider education, and policy reforms. In examining solutions, special emphasis is placed on ensuring preventative services, besides just immediate care. A reproductive justice framework is utilized which promotes a holistic outlook on these issues. It takes into account their interrelatedness, while addressing the disparities between policies, services, and the populations they aim to serve. Collected narratives help demonstrate the range of difficulties women encounter in their process of maintaining reproductive health, and can be used to influence political and grassroots changes. Women's health is a contentious issue for many groups due it being inextricable with moral and religious beliefs for some. Thus I analyze how overall cultural attitudes impact reproductive health access, especially in light of upcoming health care reforms.

A Study of Navy Reserve Officer Training Corps Students' Time Management and Lifestyle and Their Impact on GPA and Physical Readiness Test Scores

Meighan P. Middleton
Sponsor: Paul Salitsky, Ph.D.
Neurobiology, Physiology and Behavior

Navy Reserve Officer Training Corps (NROTC) students represent a unique population of undergraduate college students. They face challenges similar to intercollegiate athletes in balancing their academic course load with their commitments to the NROTC unit, maintenance of physical fitness, and extracurricular activates. However, whereas intercollegiate athletes are often the subjects of study by sport psychologists, NROTC students have been previously overlooked. Unsuccessful time management is the most cited reason for attrition from the NROTC Unit at UC Berkeley. Often by the time the problem is noticed, the student is facing expulsion from the program. By administering a self-report questionnaire into the habits and lifestyle choices of students at the NROTC Unit at UC Berkeley, as well as completing several case studies, and then comparing the results to Grade Point Averages and the numerical scores from the Navy Physical Readiness Test and the Marine Corps Physical Fitness Test, I hope to identify specific barriers to time management as well as predictors of success, leading to the development of better strategies of teaching time management skills to NROTC students and identifying at risk students for individual counseling and additional intervention.

Youth Revolutions in Egypt

Helen Min
Sponsor: Omnia El Shakry, Ph.D.
History

What allowed the successful popular overthrow of Hosni Mubarak in Egypt? While many scholars suggest that the unity of Egyptian youth was the strongest element in the revolution, previous literature on Egypt suggests that youth were too disenfranchised to ever motivate collectively driven reforms in Egypt. What historical changes occurred in Egypt that allowed for this recent social and political transformation by the so-called "juvenile delinquents"? I argue that (1) disenfranchised youth were already empowered in ways that were not political; (2) the authoritarian regime recognized the power of youth early on and took steps to mitigate youth's collective power; and (3) youth were finally able to exercise their collective power through modern technological tools that have only become recently available. I will argue that this transition emerged historically with the breakdown of socialist policies under Anwar Sadat and the creation of a new "youth minority," accompanied by the systematic vilification of street youth by the autocratic regime. Youth, however, were able to offset this attempted disenfranchisement through the opportunities made available to them by new technologies of the twenty-first century.

Multitude in Arte Povera: Tensions of Immaterial Labor

Mariana Moscoso
Sponsor: Blake Stimson, Ph.D.
Art History

Arte Povera was an art movement borne in the tumultuous political climate of 1960s Italy and is recognized for its use of 'poor' materials. It arose amidst the new consumer culture resulting from the Italian economic 'miracle' produced by the massive migration of agricultural workers from the South to the North to work in factories at low wages this caused a social and economic upheaval that lead to the rise of the political movements of Italian Workerism (*operaismo*) and the later, Italian Autonomism (*autonomismo*). This paper develops an account of the works of Arte Povera artists, Giuseppe Penone and Michelangelo Pistoletto, that demonstrate aspects of the political theories of Antonio Negri and others associated with operaismo and autonomism. Even though Arte Povera is no longer recognized formally as a collective artistic identity, the artworks of Penone and Pistoletto continue to reflect the political tensions of Italy's volatile contemporary politics and economic uncertainty, demonstrating their adherence to the political and social tensions of the 1960s and 1970s that are still relevant in Italy today.

Prevention, Prosecution, Protection: The United States' Efforts in the Fight Against Human Trafficking

Karen R. Moser
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Political Science

The Trafficking Victims Protecting Act of 2000 (TVPA) and its subsequent reauthorizations are the key pieces of legislature used to combat human trafficking in the United States. As the second largest and fastest growing criminal industry in the world, human trafficking is a multidimensional problem. Designing effective policy to stop it faces many constraints. This paper will examine specifically how the TVPA and its reauthorizations have been used to prevent sexual exploitations, prosecute offenders and protect victims of human trafficking and the commercial sexual exploitation of children (CSEC). I analyze the language used to describe human trafficking, the collaborative efforts of government and nonprofit agencies, and court cases involving trafficking issues in order to evaluate the efforts the United States has made to fight human trafficking. I will show that the TVPA and TVPRA, while mandated to promote *both* protection and prosecution, have been more heavily used to prosecute offenders than protect victims, with the consequence that children are frequently re-victimized, and prevention efforts fall too heavily on NGOs and nonprofit groups.

A Socio-Historic Analysis of Urban (Re)Development in Sacramento

Daniella Moses
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Sociology

In his book *The Cosmopolitan Canopy: Race and Civility in Everyday Life*, Yale sociologist Elijah Anderson uses ethnographic research to analyze sites in Philadelphia that evoke civility and community efficacy, specifically the Center City. Anderson argues that these civil spaces have arrived following an "ethos of getting along" and the" growth in immigration". Sacramento has also seen a growth in immigration. In this project, we use a Symbolic Interaction to explore public spaces in Sacramento in an attempt to apply Andersons' model. Through ethnographic work of downtown Sacramento, argue that the cosmopolitan canopies that Anderson perceived are not simply formed following social progression but rather these spaces are created following a large economic (re) investment by the state, as well as social progression. Through the historical analysis we examined the implication of past public spending and redevelopment on our ethnographic observation. Our findings reevaluate Anderson's model of the new diverse cosmopolitan city, and suggests that social, economic, and political forces have created the socio-historic recipe necessary for both redevelopment and urban sprawl which generates a social climate in which individuals are selected into these spaces as a result of their socio-economic status and race.

Determining the Timing of Developmental Regulatory Genes in *Myxococcus xanthus*

Andrew Y. Mu
Sponsor: Mitchell H. Singer, Ph.D.
Microbiology

Myxococcus xanthus is an unusual microorganism that can form multicellular fruiting bodies when starved in order to produce resilient myxospores. This behavior requires the majority of the cells to be sacrificed and this research is focused on defining the regulatory pathway that governs this behavior. In a previous experiment, mutants were created for genes known to belong to this developmental pathway. I will be using a technique called RNA seq to determine when the genes of interest are normally being up and down-regulated. Currently I am preparing to run RNA seq by extracting total mRNA from the mutants and wild-type cells at different times under starvation conditions. Because this developmental program is not well understood, the levels of mRNA are compared to individually created standards of each gene rather than to a relative level of rRNA which may or may not vary during development. So far I have created twenty one clones that will act as the standard, eight of which are in adequate concentration for RNA seq. At this stage I am still extracting total mRNA from the different of mutant strains available.

Characterization of the Aerosolization and Toxicity of Multi-Walled Carbon Nanotubes (MWCNTs)

Leng K. Mut
Sponsor: Kent Pinkerton, Ph.D.
Environmental Toxicology

Multi-walled carbon nanotubes (MWCNTs) are of special interest because their unusual tensile strength, thermal conductivity, and electrical properties make them highly marketable. Unfortunately, scientific inquiry into the safety of MWCNTs is lagging behind the commercial applications of these materials leaving regulators at a loss with regard to the task of protecting health and welfare. More information is needed about MWCNT aerosolization since there is high potential for inhalation of these materials in the workplace. The primary goal of this project was to investigate the potential toxicity of MWCNTs. MWCNTs were nebulized from a well-dispersed aqueous suspension, into respirable airborne particles and delivered to a nose-only inhalation system. Rats were exposed for six hours to MWCNTs with an inner and outer diameter and length of 5-10 nm, 20-30 nm, and 10-30 μm, respectively. Animals were examined at 1 and 21 days post exposure. At 1 day, lung lavage samples showed limited numbers of inflammatory neutrophils, and approximately 10% of macrophages with cytoplasmic MWCNT inclusions. By 21 days, it decreased to 4%. These studies suggest MWCNTs induce mild, but significant effects in the lungs following short-term inhalation.

The Co-option of the Genes Dachshund and Distal-less in the Evolution of Sex Combs

Nancy-Jaime Napan
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Evolution and Ecology

Evolutionary change often occurs by recycling genes, a process referred to as "genetic co-option". To arrive at a better understanding of the genetic basis of evolution, we analyzed the genetic control of a recently evolved trait, the *Drosophila* sex comb, present in only a fraction of fly species. We studied the role of two genes, *dachshund* (*dac*) and *Distal-less* (*Dll*), with a known role in leg patterning prior to metamorphosis. Our hypothesis is that these genes are involved in the formation of the sex comb in addition to their original roles. The expression of both genes was modulated during sex comb development specifically to determine their roles. The UAS- Gal4 system was used in conjunction with the Gal80ts system to regulate transgenic expression of either RNAi or sense transcripts of both genes. This system permitted temporal and spatial control of transgene expression. I observed the morphology of the sex combs of the transgenic lines in comparison to wild-type. Down-regulation of *Dll* resulted in inhibition of sex comb rotation. Up-regulation of *Dll* resulted in reduced sex combs. Our results provide evidence that sex comb evolution likely occurred through the co-option of genes with an ancestral role in global leg patterning.

Choosing Fatness: Size Acceptance and Rational Choice Theory

Rajiv R. Narayan
Sponsor: James H. Smith, Ph.D.
Anthropology

Size acceptance and advocacy groups, such as the National Association for the Advancement of Fat Acceptance, International Size Acceptance Association, and the Size Acceptance for Empowerment, are membership organizations that serve the fat community by way of social gatherings and "fat rights" legislative advocacy. Neither new nor sparse, they have recently attracted much attention (and scrutiny) as increasing national fatness is framed as a public health concern. Previous ethnographic research into size acceptance groups have sought to demonstrate their "rights consciousness" in the context of a social change movement. In economics, Rational Choice Theory is a long-held assumption underlying formal economic theory that claims all agents balance the costs and benefits of various choices to optimize their self-interest. Some economists have explained the prevalence of seemingly irrational behavior, such as the rise of obesity despite its well known health risks, by way of a "bounded rationality" that assumes denial on the part of the agent. That size acceptance groups claim to be well-informed and pragmatic about their bodily state complicates this explanation of irrational behavior. The purpose of this project is to explore a "rationality consciousness" in the size acceptance movement through ethnographic research.

Culturing Human Coronary Artery Endothelial Cells

Frances A. Navea
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Biomedical Engineering

Atherosclerosis is the buildup of plaque in the arteries. When this occurs in arteries of the heart, it is referred to as coronary artery disease (CAD)—the leading cause of death in the United States. For this study, human aortic endothelial cells (HAECs) are collected from balloon catheters that were used in surgery to dislodge plaques of heart attack patients. By studying these HAECs, we can observe their capacity to form confluent monolayers (measured by the amount of cells covering a cell culture dish). The objective is to measure the amount of time to become confluent for HAEC harvested from catheters of aged patients with CAD compared to those of young healthy donor hearts from accident victims. Since retrieving HAECs from patients only yield several thousand cells that are senescent and more difficult to culture in the lab, we engineered a process to seed HAEC in low density on 5mm diameter glass culture cylinders- designed to convey small cell populations to a defined area- and quantified coverage at various time points to plot the kinetics of confluence. By comparing the diseased to healthy HAEC *ex vivo*, we are able to determine if atherosclerosis is accompanied by altered proliferation of endothelial cells.

Investigating a New Nuclear Migration Pathway in *Caenorhabditis elegans*

Minh Q. Ngo
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Molecular and Cellular Biology

Normal development requires organelles like the nucleus to be properly positioned in the cell. In humans, failure of nuclear migration can lead to defects like muscular dystrophy, mental retardation, cancer, and premature death. Therefore, we must study in detail the mechanisms of nuclear migration. The *emu* enhancer pathway is required for nuclear migration in the nematode *Caenorhabditis elegans*, but only two genes in this pathway have been identified. Thus, this study attempts to identify other genes involved in the *emu* enhancer pathway. Whole Genome Sequencing (WGS) of an *emu* strain provides a map of all putative molecular lesions present in its genome. Specifically, we examine the single nucleotide polymorphic (SNP) base pairs, which are sequence variations between divergent strains of a single species. Our strategy integrates SNP-mapping with the whole-genome-sequencing procedure into a single step, which enables us to quickly identify *emu* genes from the WGS data. Currently, I am sequencing ten different *emu* strains, and the follow-up analysis of SNP frequencies will pinpoint the emu-causing sequence variants. The identification of genes involved in the *emu* enhancer pathway enables us to better understand nuclear migration in worms and ultimately in humans as the components are likely conserved.

Electrocatalytic Hydrogen Evolution by a Low Valent Iron Cluster

An D. Nguyen
Sponsor: Louise A. Berben, Ph.D.
Chemistry

The use of aqueous media for electrocatalytic H_2 generation at neutral pH and modest potentials is a key challenge in developing molecular electrocatalysts. Electrocatalysis is an appealing method for harnessing solar radiation for energy use because it can be employed to facilitate conversion of photogenerated electrons (i.e. solar radiation) into chemical fuels. We have found that the water soluble cluster [diglyme$_2$Na][$Fe_4N(CO)_{12}$] catalyzes hydrogen evolution at neutral and basic pH. As a complement to this study, $Fe(NO_3)_3$ and $Na_2[Fe(CO)_4]$ were tested as electrocatalysts for hydrogen evolution at -1.1 V vs. SCE in neutral pH using a glassy carbon electrode. Measurements were used to analyze electrodeposition in order to characterize the elements plating on the glassy carbon electrode during the electrolysis of both $Fe(NO_3)_3$ and $Na_2[Fe(CO)_4]$. We found that $Fe(NO_3)_3$ and $Na_2[Fe(CO)_4]$ gives lower Faradaic yields for hydrogen evolution than [diglyme$_2$Na][$Fe_4N(CO)_{12}$]; therefore, [diglyme$_2$Na][$Fe_4N(CO)_{12}$] serves as a more efficient electrocatalyst for hydrogen evolution.

Effects of Hyperglycemia on Blood-Brain Barrier N-K-Cl and NHE Expression

Andrew Nguyen
Sponsor: Martha ODonnell, Ph.D.
Physiology and Membrane Biology

Stroke is the fourth leading cause of death in the United States. Ischemic stroke, the most prominent type of stroke, involves reduction of blood flow in cerebral arteries; most often by blood clot formation, thrombosis, in cerebral arteries most commonly from vascular disease. Ischemia induces edema formation, which is accumulation of water in the brain. Various studies have provided evidence that edema formation can be attributed to a heightened influx of sodium ions from blood into the brain through the blood-brain barrier (BBB) endothelial cell Na^+ transporters. Furthermore, the risk of stroke for individuals is significantly increased with diabetes, which causes high blood sugar (hyperglycemia). My study analyzes the relationship between blood glucose levels and the expression of BBB Na transporters, in particular Na/H exchange and Na-K-Cl cotransport. For this, I use bovine cerebral microvascular endothelial cells (CMEC) cultured in astrocyte-conditioned medium, which induces the BBB phenotype in the cell tissue culture. The cells are exposed to hyperglycemic media for various times and then the abundance of NKCC and NHE is evaluated by Western blot analysis using antibodies that specifically recognized NKCC and NHE.

N_2O Emissions with Different Management Practices in Agricultural Fields

Karin Nguyen
Sponsor: Martin Burger, Ph.D.
Land, Air, and Water Resources

A growing sector of research within the environmental science field focuses on exploring methods that effectively limit anthropological emissions of nitrous oxide (N_2O). Nitrous oxide is the leading greenhouse gas emitted from agricultural activity. Based on comprehensive agricultural practices already in use, the experimental focus of this research observes N_2O emissions with different management practices in processing tomato production in California's Central Valley. At the University of California, Davis' Long Term Research on Agricultural Systems (LTRAS) various rates of nitrogen fertilizer application, drip versus furrow irrigation, and cover crop were managed and compared to conventional fields. After two irrigation cycles, the following observations were made: fields with higher amounts of nitrogen fertilizer showed increased amount of N_2O emissions; higher amounts of N_2O emissions were also observed in fields with cover crop history compared to fields left fallow in the wintertime (i.e. conventional fields); and finally drip irrigation resulted in less N_2O emissions than furrow irrigation. Overall, these results suggest that nitrous oxide emissions can be reduced through alternative management practices.

Afflicted Solace

Minh-Chau Nguyen
Sponsor: Adele Zhang, M.F.A.
Design

Heart disease is the leading killer in women. The red dress has become a national symbol for raising heart health awareness. To connect the heart health campaign to design and visual culture, I created "Afflicted Solace", a red dress revealed at the UC Davis Women's Heart Health Forum on February 3, 2012. Last year my father suffered a *myocardial infarction*, which I came to learn is a medical term for heart attack. The frustration with grasping my father's situation and the emotional grief my family experienced inspired me to create a red dress that purposes a solution to the disconnection between medical jargon and emotional reaction. In order to portray the human heart as a complex organ and its physical process during a heart attack, I used interconnected seams to represent structural support and cords covered in dark red fabric to express collapsed arteries. For emotional pain, I extended the cords to symbolize intensified blood flow from adrenaline during mental shock. My red dress functions as a visual device that serves as a bridge for heart health education and human emotion.

Activation of Hedgehog Signaling is Associated with the Proliferation and Invasion of Liver Cancer Stem Cells

Samantha K. Nguyen
Sponsor: Jian Wu, Ph.D.
Internal Medicine

Hedgehog (Hh) signaling is a pathway that causes epithelial cells to undergo epithelial mesenchymal transition (EMT), a mechanism where cancer cells acquire metastatic capability. Our group has shown that cancer stem cells (CSC) identified with specific markers display different chemosensitivity and invasive capability. The purpose of this research is to continue previous studies and evaluate the chemosensitivity and invasiveness of CSCs based on their CSC marker profile and correlation with Hh signaling. We used a Matrigel invasion assay and a cell proliferation test to determine the invasion of $CD133^+/EpCAM^+$ and $CD133^-/EpCAM^-$ Huh-7 cells. Furthermore, we treated these cells with LDE225, an inhibitor that blocks Hh signaling. To confirm that Hh signaling had been inhibited, we performed immunohistochemical staining of CSC markers and EMT. Our results suggest that $CD133^-/EpCAM^-$ Huh-7 cells tended to be more invasive compared to $EpCAM^+/CD133^+$ Huh-7 cells in a Matrigel invasion assay. There was a noticeable decrease in proliferation of $CD133^-/EpCAM^-$ Huh-7 cells in the presence of LDE225 compared to $CD133^+/EpCAM^+$ Huh-7 cells. In conclusion, our data suggest that Hh signaling is activated in $CD133^-/EpCAM^-$ hepatoma subpopulation. Thus, inhibiting this pathway may reduce the metastasis and proliferation of this subpopulation.

Interpreting Petrology with the Multispectral Microscopic Imager

Alicia Noel
Sponsor: Robert Zierenberg, Ph.D.
Geology

Future robotic planetary missions require the ability to select samples that offer the most scientific value for astrobiological goals. This involves *in-situ* analysis of sample mineralogy and microtexture, and requires sophisticated techniques that are beyond current robotic capability. The Multispectral Microscopic Imager (MMI), an arm-mounted rover instrument developed for future robotic missions, provides microscopic images at a hand lens scale with a 21-band visible-to-shortwave-infrared reflectance spectrum for each pixel, allowing for correlated analyses of microtextures and mineralogy. The goal of this project was to assess and demonstrate the capabilities of the MMI by collecting spectral data on four unknown rock samples to determine the petrogenesis. Spectral data were analyzed with ENvironment for Visualizing Images (ENVI) software to create spectral end-member maps and reflectance profiles for each sample, which were then used to determine sample petrogenesis based on correlated microtexture and mineralogy. These results have been compared to analyses with definitive methods of geologic analysis in order to evaluate the MMI capabilities.

Social Functions: The Dramaturg as Social Commentator in Michael Barakiva's Ensemble Theatre Workshop

Christina Novakov-Ritchey
Sponsor: Robin L. Gray, M.F.A.
Theatre and Dance

In 1927, German playwright Bertolt Brecht (1898-1956) formed a dramaturgical collective with director Erwin Piscator (1893-1966) that focused on the social function of the stage and the power of theater to address controversial issues. During the interwar period the Brecht-Piscator dramaturgical model suggested, "*man portrayed on the stage is as significant as a social function.*" This paper analyzes the practical application of the Brecht-Piscator dramaturgical social model as it applies to a contemporary ensemble theater workshop. My experience as dramaturg for the 2011 *Zona Rosa Project* at U.C. Davis will form the basis for this first-person case study. The production, created through a workshop collaboration between myself, fellow students, faculty and the visiting director, was inspired by the true story of Francisco Estrada Valle, who was slain in Mexico in 1992 after taking an activist role in the gay rights movement and the AIDS crisis. The production, performed before an interactive audience, provides a valuable model for assessing the possibilities of social commentary when approaching emotionally charged issues of gender, sexuality and HIV/AIDS. As a study in applied dramaturgy, this paper synthesizes connections between the historical roots of dramaturgy with its contemporary application as a vehicle for positive social change.

Maternal Exposure to Poly I:C and Its Influence on Immune Function and Behavior in Offspring of Exposed C57/B6 Mice

Tamanna M. Noyon
Sponsor: Paul Ashwood, Ph.D.
Medical Microbiology & Immunology

Autism spectrum disorders (ASD) are neurodevelopment disorders characterized by impairments in verbal and non-verbal communication, social interactions and the presence of restricted or repetitive behaviors. The causes of ASD are unknown, however genetic and environmental factors play a role. Our study tracks the influence of viral infections during pregnancy on the development of altered pattern of behaviors and immune function in the offspring. The model mice, C57/B6 are injected with polyinosinic-polycytidylic acid (Poly I:C), a double stranded RNA molecule, on gestation day 12.5 to induce immune activation similar to that seen during viral infections. The offspring of these mice are then tested for changes in social, repetitive and communicative behaviors using a variety of standardized behavioral measures. Changes in response by brain immune cells, namely the microglia and, in peripheral immune cells following stimulant treatments are measured by determining cytokine production. Cytokines transmit important signals between immune cells and between immune cells and cells of the central nervous system. Results from the tests track the influence of maternal immune activation on development. Upon completion, this study will provide a better understanding of environmental factors in the pathogenesis of ASD, and assist in identifying novel treatment avenues.

Resolution of Spatial Attention in Children with Chromosome 22q11.2 Deletion Syndrome

Angad S. Oberoi
Sponsor: Tony J. Simon, Ph.D.
Psychiatry

This study assesses a hypothesis for nonverbal cognitive impairments in children with chromosome 22q11.2 deletion syndrome. Dr. Tony Simon proposes that these impairments can be accounted for by "hypergranularity": an increase in grain size and decrease in resolution of mental representations of spatiotemporal information. Due to the crucial role of information in space and time, aberrations further limit visual attention and acuity of stimuli, especially peripheral visual stimuli. A series of experiments was conducted that delineated the resolution and capacity of spatial attention, one of which was the Useful Field of View experiment. It has been established that the periphery of the visual field results in low-resolution mental representations, compared to the center of the visual field. Compounded by hypergranularity, this should then noticeably exaggerate the effect in children with the deletion syndrome, especially with stimuli farther from the center of the visual field. If confirmed, this proposed basis describes another limitation caused by this disorder and has major implications concerning treatment methods and intervention points of 22q11.2 deletion syndrome and other related neurodevelopmental disorders.

Association Between Preexisting Dengue Fever Antibodies and the Occurrence of Symptomatic Illness Due to DENV-4 Infection in Iquitos, Peru

Sandy Olkowski
Sponsor: Thomas Scott, Ph.D.
Entomology

Dengue fever is a mosquito-transmitted disease caused by infection with any of four distinct viral serotypes (DENV 1-4). Antibody induced by infection with one serotype appears to influence the clinical outcome of subsequent infections. In general, however, these modifying effects are poorly understood, even though they are potentially critical determinants of transmission dynamics and disease severity. We analyzed data from an on-going longitudinal study of DENV transmission in Iquitos, Peru, to evaluate this relationship between the history of infection and disease outcome. Iquitos has been the site of intense DENV transmission since the early 1990s. In 2008, DENV-4 was introduced in the city and became the dominant serotype from 2008-10. During that time, 1,596 participants in the longitudinal cohort seroconverted to DENV-4. Of these, 8.3% experienced a clinical case of dengue fever as detected by active door-to-door surveillance. We found that primary and secondary infections resulted in a higher rate of symptomatic illness (17.0 and 15.0%, respectively) than third infections and fourth infections (5.4% and 4.3%, respectively). These date suggest that there may be a cumulative protective effect of preexisting antibodies against symptomatic illness. Further research is needed to determine if these results are replicable for infections with other serotypes/genotypes.

Effects of Soil Surface Litter on the Germination of *Boechera constancei*

Rachael L. Olliff
Sponsor: Susan P. Harrison, Ph.D.
Environmental Science and Policy

Boechera constancei (formerly *Arabis constancei*) is a threatened mustard plant species found only in California. This rare plant occurs almost exclusively on serpentine soil, where it may benefit from lower competition for light. Supporting this notion, *B. constancei* has been observed to preferentially grow in areas with low leaf litter. The accumulation of leaf litter on the soil surface may limit the success of *B. constancei* by restricting access to light. In this study, I evaluate the effects of three litter depths (low, medium, high) on germination success of *B. constancei*. Seed collected from nine local populations is used to determine whether certain populations show greater tolerance for litter depth. Results from this study will be used to evaluate current litter management options (including manual tree removal and prescribed burning), and to develop a species management plan for the conservation of *B. constancei*. In addition, data collected from this experiment will be available for use in model simulations to illustrate the demography of this plant species.

Ultra-Stable Thermal Enclosure for the Integration of X-Ray Optics-Heat Transfer

Tyler M. Ono
Sponsor: Cristina Davis, Ph.D.
Mechanical and Aeronautical Engineering

The use of X-rays are a crucial part of the continuing study of the black holes and the heavenly bodies. The Next Generation X-Ray Optics (NGXO) team at NASA is in the process of developing a x-ray observatory to study these space phenomenon using very thin mirrors. These mirrors are 0.4 millimeters thick and are able to focus the x-rays, but are easily susceptible to small changes in temperature creating a distortion in the mirrors. A senior design team from University of California Davis is developing a thermal enclosure prototype that will be able to control the temperature inside to allow proper installation of mirrors. Analytical calculations for heat transfer in the system are done for specific cases, from a simple case to a complex case of the actual system to test feasibility of each design. Using these as a proof of concept, the design of the thermal enclosure prototype will be built around the design goals to maintain the mirror's shape.

Transient Optical Absorption Plant Spectrometer: Measurement of Electron Decay Time During Photochemical Excitation

Mark A. Opfell
Sponsors: Andre Knoesen, Ph.D.
Electrical and Computer Engineering &
Steven Theg, Ph.D., Plant Biology

Various aspects of a plant's health including the plant's ability to convert carbon dioxide to oxygen in the presence of light (photosynthesis) can be monitored by stimulating a sample with light pulses. The purpose of the plant spectrometer is to measure the light that is transmitted through a sample during the monitoring process. The optical signal gives a measurement of the rate of light absorption by the plant's chlorophyll, essential for photosynthesis. Converting from photons to electrons is necessary to detect the optical signal. The conversion is done by an optical frontend which consists of a large-area photodetector, and an electronic amplifier, which together converts photocurrent into an electrical voltage signal. I designed, and prototyped several revisions of the optical frontend and detected high frequency optical test signals. I processed the resulting signal and optimized it for computer based data analysis and display. My use of the optical frontend and signal processing board allowed me to successfully transform the optical signal into measured data on a computer. The ability to process optical measurements and analyze them from a computer reduces the difficulty in measuring the health of biological samples, and automates experimental data collection.

Language and Identity: A Closer Look at Korean and Chinese College Students

Vanessa J. Orey
Sponsor: Vaidehi Ramanathan, Ph.D.
Linguistics

Transnational students are increasing at UC Davis and their identities within American society are important to address. By recognizing diverse populations with unique personal and educational backgrounds, we can understand which factors influence individual experiences overseas. This study broadly examines the relationship between linguistic ideologies, the ways in which a nation perceives the utility of a particular language, and international identity, how the students see themselves in America and in the world. This involves the convergence of several overlapping factors such as formal instruction of English language in the home country, familial upbringing, and overall impressions of American culture. Through interviews and surveys with Korean and Chinese international students, I explore how they identify with various domains of American culture including goals related to career, romance, and money. This data is briefly compared with non-international students as well to reveal ideological similarities. Qualitative in nature, my study also explores their attitudes regarding formal educational policies, international media, and interactions with native English speakers. Such views are important to hear and understand since they inform our larger linguistic ideologies. The paper concludes with a discussion of what such localized findings mean for international trade affairs and US-China and US-Korea relations.

Identification of Novel Targets Involved in the Autophagy Regulatory Network

Ahmet T. Ozdemir
Sponsor: Ted E. Powers, Ph.D.
Molecular and Cellular Biology

Target of Rapamycin (TOR) is an evolutionary conserved and well-studied protein kinase that assembles into two nutrient-sensing complexes. Collectively, they regulate spatial and temporal aspects of cell growth. Hyper activation of the TOR pathway is linked to diabetes, aging and namely cancer. While TORC1 signaling has been extensively studied, the signaling network of rapamycin-insensitive TORC2 remains elusive. A known downstream target of TORC2 is the AGC kinase YPK. Recent efforts have sought to identify direct targets of YPK, as its mammalian counterparts are common chemotherapeutic targets. Few YPK targets are known, and there appear to be others yet to be identified. The TOR signaling network has been extensively linked to the regulation of autophagy. In light of this regulation, I aim to identify novel YPK targets within the autophagy signaling network. Of current interest is VPS34, a class III PI3-kinase critical for the regulation of autophagy. VPS34 may be a direct target of YPK, as it contains several conserved motifs known to be phosphorylated by AGC kinases. In the yeast model *S. cerevisiae*, I will utilize an analog sensitive allele of YPK developed by our lab to determine whether VPS34 is a direct target for YPK phosphorylation.

Modeling Human Milk Oligosaccharide Metabolism by the Human Infant Colon Microflora

Daniela Palmer
Sponsor: Rick Grosberg, Ph.D.
Evolution and Ecology

Human milk oligosaccharides (HMOs) are a substantial component of breast milk, however, they do not directly nourish the feeding infant. A possible explanation for this phenomenon is that the HMOs are secreted to preferentially nourish beneficial bacteria in the infant's gut. We present a model of HMO metabolism by the bacterial community of the human infant colon. This model accounts for crossfeeding, a process in which HMOs are partially degraded by certain bacteria and intermediate oligosaccharides are made available to the environment. Additionally, it accounts for a new crossfeeding mechanism identified in recent literature in which *Bifidobacterium longum* subsp. *infantis* excretes smaller HMO constituents after ingesting large HMOs. We parameterize the model using time series of single taxon metabolism of HMOs *in vitro*, and use it to predict the relative abundances of bacterial taxa in a multi-species environment. These predictions can be directly compared to empirical time series data, and may be used as a framework for future models and a guide for empirical studies.

The Neural Correlates of Willed Attention

Stefan Paquet
Sponsor: George R. Mangun, Ph.D.
Psychology

Selective attention is a core cognitive ability that allows us to act within a dynamic environment by allowing us to concentrate our mental resources on important stimuli while ignoring unimportant stimuli. When cued to attend to a region of space, stimuli presented at that region receive processing benefits in the form of increased neural activity within the contralateral visual cortex. However, all previous research on this attentional effect has used an informative external cue to direct attention. Because attention in the everyday environment often requires choice, it is important to examine the neural correlates of visual attention without the aid of an informative external cue. Therefore, we have designed a study where participants may choose, rather than be told, where to attend to. Using electroencephalographic (EEG) recordings from human subjects, we developed a novel paradigm to directly isolate the neural correlates of willed attention. We present data demonstrating that willed attention has similar effects in the visual cortex as cued attention, yet different effects in the frontal network of attentional control.

Maternal Depressive Symptomatology and Its Effects on the Emotional Development of Preschoolers

Alyssa C. Parsons
Sponsor: Ross A. Thompson, Ph.D.
Psychology

Past research shows that mothers' depressive symptoms can have a profound detrimental effect on the emotional development of their children (Harris, 1994). However, less research investigates how maternal depression affects children's emotional development. The current project examines two processes by which maternal depressive symptoms may impact preschoolers' emotional development: the attachment relationship and maternal evaluations of the child. Using a sample of 65 mothers and their four-year-old children, we assessed maternal depressive symptomatology using maternal reports on the Center for Epidemiological Studies' Depression Scale (CES-D). Attachment security and dependency were measured using the Attachment Q-Sort (Waters, 1995). Maternal evaluations of children were observed during conversations about a recent time the child helped someone. Preliminary analyses suggest that maternal depressive symptoms were negatively correlated with mother-child attachment security (r=-.22) and positively correlated with greater child dependency (r=.21). Maternal depressive symptomatology was negatively correlated with the proportion of positive evaluative statements mothers made (r=-.38), which in turn was positively correlated with children's emotion understanding (r=.41). These findings help us gain further insight into the complex relationships between mothers' depressive symptoms, their subsequent behavior in interactions with their children, and the impact this has on their children's emotion understanding and development.

Interconnect Technologies for High Energy Physics: Gold Ball Bonding

Jacob M. Pasner
Sponsor: Mani Tripathi, Ph.D.
Physics

Within both industry and research the use of gold ball bonding represents a well developed interconnect technology for integrated circuitry. The basic premise is to use 1mil gold wire to create a small gold "bump" which is then bonded to a silicon chip using ultrasonic technology. However, while this technology is very common the needs of detectors in High Energy Physics applications call for a more developed understanding of the entire process of bonding with gold balls. Specifically the resistance of bonds needed to be dramatically decreased to allow for high efficiency detectors, an important concept for precision detectors in High Energy Physics. Through the construction and use of a clean room facility at the UC Davis Physics department, the group experimented with the bonding process by changing variables like: the amount of gold used, pressure of the application of the gold ball, force used during the actual bonding of one chip to another, and the material used for the substrate (first metallic layer) of the silicon chips. By considering these elements in experimental procedure the group was able to achieve 10X lower resistance values for bonds between silicon chips. This result was successfully implemented with multiple silicon chip technologies.

Effects of Trans-10, Cis-12 Conjugated Linoleic Acid on the Mammary Glands of Male Mice

Carly T. Paul
Sponsor: Russell C. Hovey, Ph.D.
Animal Science

Fatty acids in the diet can affect development of the mammary glands, and, thus, influence the progression of breast cancer. Trans-10, cis-12 conjugated linoleic (t-10, c-12) acid is a fatty acid that decreases body fatness and suppresses mammary tumorigenesis in ovary-intact females. A diet high in t-10, c-12 CLA also promotes the progression of tumors in ovariectomized females. These data emphasize the need for a deeper understanding of the effects of t-10, c-12 CLA on the mammary glands. The objective of this study was to investigate the effects of this fatty acid on the mammary glands of male mice. Initially, it was necessary to identify a strain of mice where mammary glands are commonly present, leading to a determination that 129/SVE males commonly have primitive mammary structures. Male 129/SVE mice were fed either a control diet or one containing 1% t-10, c-12 CLA for 21 days starting at 22 days of age. Mice fed t-10, c-12 CLA had further ductal outgrowth than those fed the control diet. The promotion of mammary gland neoplasia by t-10, c-12 CLA could have implications for the progression of breast cancer in individuals with low levels of estrogen, including men and women entering menopause.

Variation Between *Cryptococcus gattii* Strains in Crossing the Blood-Brain Barrier

Diana C. Pearson
Sponsor: Angela Gelli, Ph.D.
Pharmacology

Cryptococcus meningoencephalitis, caused by *Cryptococcus spp*., is a common and devastating fungal disease of HIV-infected patients. *Cryptococcus gattii* infects mostly immunocompetent individuals, and there are many ongoing infections in the Pacific Northwestern United States with several deaths occurring every year. *Cryptococcus meningoencephalitis* occurs when *C. gattii* spreads through the central nervous system by infecting brain tissue through crossing the blood-brain barrier. The sibling species, *Cryptococcus neoformans*, has been studied extensively and current evidence suggests that it crosses the blood-brain barrier by a predominately transcellular mechanism. Using a transcytosis assay with the immortalized human brain endothelial cell line HCMEC/D3 as a model of the blood-brain barrier, I seek to study variations between different strains of *C. gattii* compared to *C. neoformans*. These differences will be key to better understand the ability of *C. gattii* to infect the central nervous system and will aid in future treatments regarding diseases associated with *C. gattii*.

Creative Process

Kirsten A. Pearsons
Sponsor: Robin Hill, B.F.A.
Art Studio

This collection of artwork is the product of my participation in the Integrated Studies 'Creative Process in Contemporary Art' class led by Professor Robin Hill. At the beginning of the quarter I thought it was just going to be a fun class to balance out my science classes – I wasn't expecting to get anything out of it that would pertain to my academic focus. How could an art class relate to chemistry, biology, or agricultural sciences? But, as the class progressed, I found myself integrating science into my art more and more. The ends of art and science are indeed different, but the means of achieving those ends are comparable. The creative process can be, and has to be, applied in the sciences. Both artists and scientists ask questions, follow procedures, and reflect upon their work. After all, what is creativity if not applied curiosity? Working with the occasional mistakes that arise can lead to beautiful works or discoveries. Overall, these projects made me think outside the 'correct answers' – while I certainly learned about contemporary art, I definitely learned more about my personal thought process.

Distribution and Population Dynamics of *Tribolium castaneum*

Sharon Perera
Sponsor: Alan Hastings, Ph.D.
Environmental Science and Policy

Tribolium castaneum, more commonly known as the Red Flour Beetle, is a model insect in the study of population dynamics. Its ability to move through a landscape provides invaluable insight to the movement patterns of many other creatures. However, relatively little research has been done to show the shape of the distribution graphs. In this experiment we proceeded to gather population census data from the flour beetles in our man-made landscapes. This census data is averaged and compiled into a graph in order to extrapolate whether the graph has a 'thin-tail' or 'fat-tail' kernel shape. In a 'thin-tail' kernel, the graph tapers off gradually until it reaches zero. The 'fat-tail' graph tapers off to a certain set point and then continues to maintain this set point until it reaches the end of the landscape; unlike a 'thin-tail' graph it does not taper off quite so much. This model has many applications and is useful for population biologists as well as wildlife conservationists who wish to track or predict the numerical distribution of creatures in a given landscape.

Measuring Triacylglycerol Content and Enzyme Activity in Microalgae to Improve Lipid Production for Biofuels

Catherine H. Pham
Sponsor: Annaliese Franz, Ph.D.
Chemistry

This research utilizes quantitative microplate assays to measure triacylglycerol (TAG) content of purified and crude lipid extracts from microalgae. Microalgae have the potential to produce a more sustainable and alternative fuel source through their lipids, which can be transesterified to biodiesel. My project focuses on lipid quantification using a microplate assay and investigation of the lipase enzyme that breaks down triacylglycerols. The first colorimetric microplate assay uses lipase and other enzymes to quantify the amount of TAGs present in lipid extracts from microalgae. This assay was optimized for pure standards as well as algae lipid extracts by adjustments in incubation times and temperatures. The assay is an efficient method to perform multiple analyses at once with replicates. Since different algae strains grown under different conditions have varying saturation and TAG quantities, UV-Vis absorption readings of color changes are measured to create standard curves for different species. For example, algae strains with more saturated TAGs will have higher absorbance readings. My current and future work includes identifying the presence of lipases in microalgae and observing changes in lipase activity by a spectrometric assay.

Temperature Effects on the Active and Resting Metabolism of Hardhead Minnows

Alexandra Pietrzyk
Sponsor: Nann Fangue, Ph.D.
Wildlife, Fish and Conservation Biology

California's freshwater systems are home to a diverse array of organisms that can be adversely affected by anthropogenic changes. Hardhead minnows, *Mylopharodon conocephalus*, are one such species; hardhead habitat in the foothills has been altered by hydroelectric power generation facilities that modify the thermal environment resulting in a displacement of biota to different elevations. Although hardhead are listed as a species of special concern (CDFG and U.S. Forest service), little is known about their life history which impedes the development of appropriate conservation measures. In a series of laboratory experiments, resting and active metabolic rates of hardhead acclimated to water temperatures of 11°C, 18°C, and 25°C were quantified by measuring oxygen consumption. Additionally, upper thermal tolerance limits (i.e. critical thermal maxima) were investigated to aid in the development of fish distribution models based on habitat temperatures. Preliminary results indicate that hardhead metabolic rate increases with increasing acclimation temperature and during active swimming. Because hardhead are a relatively sensitive species, this data may be used to assess the overall quality of local thermal habitats and to determine suitability criteria applicable to many fish species.

Virtual Projections of Ideal Urban Landscapes

Julia M. Plotts
Sponsor: Patsy E. Owens, M.L.A.
Environmental Design

The reasons why people love a landscape or place are diverse. It may be for either aesthetic or utility reasons that certain landscapes are preferred over others. Within the field of Environmental Perception, researchers and planning professionals have worked to identify landscapes that elicit strong attachments and deduce certain archetypal preferences. Public preferences can play a key part in the design of a city. Thus, the purpose of this study is to discern between individual ideals and sustainable urban planning goals. This study identifies urban landscape preferences and determines how these preferences were formed. Subjects played a simulation video game in which they built their ideal city. Post game play the subjects were asked to fill a survey that was used to determine their biases in urban planning. Their city designs and surveys were compared to identify cultural ideals and urban or rural housing experiences that played into their design.

Transport of Free Radical into Supported Lipid Bilayers

Maria J. Prada
Sponsor: Nitin Nitin, Ph.D.
Food Science and Technology

Many bioactive compounds found in natural foods are not readily soluble in water and are poorly absorbed by the body. To enhance the beneficial effects of these food bioactives, they are typically packaged in emulsions; aqueous suspensions of nanoscale oil droplets stabilized by lipid emulsifiers. While these structures are completely natural and digestible, they suffer from problems with stability stemming from oxidation and free radical degradation. To understand these processes and how nanoscale emulsions might be better preserved, we have constructed a system based on supported lipid bilayers (SLBs) to investigate how radicals penetrate into the lipid emulsifier surface and how composition and other physical parameters effect this transport. In this experimental design, unilamellar vesicles of various lipid composition are formed with mechanical extrusion and fused to a glass substrate for microscope imaging. The planar geometry allows for the adsorption and attachment of additional layers to assess protective effects. Transport of radicals is measured based on changes in fluorescence intensity of peroxyl radical sensitive dyes encapsulated in the lipid. Results show that the physical state of SLBs can significantly limit the rate of transport of free radical into the lipid core.

Dose Response Study: Fructose and Cardiovascular Disease

Kimberly Y. Prado
Sponsor: Kimber Stanhope, Ph.D.
Molecular Biosciences

High fructose corn syrup (HFCS) has replaced half of the sugar calories consumed in the United States. Recently, the USDA's Dietary Guidelines for Americans and the American Heart Association's Nutrition Committee released recommendations for sugar intake that conflict. The first recommended an upper limit for added sugar intake of 25% of total energy, while the second recommended a maximum of approximately 5% of total energy. To address these conflicting guidelines, researchers at the University of California Davis are investigating the effects of HFCS on risk factors for Metabolic Disease. 48 adults (ages:18-40 years;BMI:18-35 kg/m^2) resided at the CCRC for 3.5 days of baseline testing while consuming energy-balanced diets containing 55%E complex carbohydrate. For 12 outpatient days they consumed usual ad libitum diets along with 3 servings/day of glucose, fructose or HFCS-sweetened beverages that provided 25%E requirements. Subjects then returned to the CCRC and consumed energy-balanced diets containing 25%E of their assigned sugar-sweetened beverages/30%E complex carbohydrate during 3.5 days of inpatient intervention testing. The results showed subjects consuming HFCS and fructose had increased plasma concentrations of postprandial Triglycerides, Apo lipoprotein B, and Low Density Lipoprotein-cholesterol, risk factors for cardiovascular disease, while subjects consuming glucose did not.

Purification of a Protease Displaying Trypsin-like Activity in Rat Liver

Shreya Pramanick
Sponsor: Aldrin V. Gomes, Ph.D.
Neurobiology, Physiology and Behavior

The 26S proteasome is a multi-catalytic protease responsible for maintaining concentrations of certain proteins and degrading misfolded proteins in eukaryotic cells. It contains three catalytic subunits: the beta 1 subunit displaying caspase-like activity, the beta 2 subunit displaying trypsin-like activity, and the beta 5 subunit displaying chymotrypsin-like activity. It is difficult to determine the 26S proteasome trypsin-like activity in the liver because there are other proteases that mimic its catalytic characteristics. MG132, the most commonly used proteasome inhibitor, was found to inhibit a non-proteasomal trypsin-like protease in liver. Epoxomicin, a more specific proteasome inhibitor than MG132 was not able to inhibit the non-proteasomal trypsin-like protease in liver. The object of this study is to isolate the non-proteasomal protease(s) that displays trypsin-like activity, so that the liver 26S proteasome can be more specifically targeted in proteasome assays. Gel filtration chromatography was able to separate the proteasome from the non-proteasomal trypsin-like protease. Further purification of the non-proteasomal trypsin-like protease was carried out using ion-exchange chromatography. Zymogen gel analysis suggests that the non-proteasomal protease is a small molecular weight protease. Characterizing the protease that is displaying non-proteasomal trypsin-like activity is important for proper measurements of proteasome trypsin-like activity in liver.

Undocumented Minors Lone Journey to the U.S.

Adriana P. Ramirez
Sponsor: Miroslava Chavez-Garcia, Ph.D.
Chicano Studies

It is important to recognize that minors under 18 also attempt to cross the U.S-Mexico border. Some children make this journey unaccompanied by their parents. Consequently, minors are more vulnerable to extortion, rape, and abuse. If these children are aware of the dangers they are exposed to, then why do undocumented minors attempt to cross the U.S-Mexico border unaccompanied? Why do these cases seem to increase in recent years? My hypothesis is that increased militarization of the U.S-Mexico border caused a spike on the number of unaccompanied minors crossing the border. With the increase of border security, smuggler rates have increased due to riskier conditions. As a result, undocumented migrants are reluctant to return to their home country. Parents, then, may decide to hire a smuggler to guide their children across the border. This research is a qualitative and quantitative case study of undocumented minors that have crossed the border with out their parents. The number of undocumented migrants was estimated from the border patrol data source, and centers for undocumented minors. Additionally, interviews were conducted of individuals who fit the profile. Interviews of unaccompanied minors from documentaries, journals, and newspapers, were used as supplement qualitative data.

The Effect of Water Quality on Larval Distribution of the *Anopheles gambiae* Complex from Cameroon and Mali

Steven A. Ramsay
Sponsor: Gregory Lanzaro, Ph.D.
School of Veterinary Medicine

Anopheles gambiae and *An. arabiensis* are the two most important malaria vector species of mosquitoes in Africa. Previous research has suggested that water quality can have an effect on mosquito diversity. The goal of my research is to examine the role of water quality across eight different sites on mosquito larval species identity. Mosquito larvae were collected in the summer of 2011, from seven sites in Cameroon and one in Mali. Water quality data recorded from each site included temperature, pH, conductivity, and total dissolved solids. I will extract the DNA and run the Scott species determination PCR and the Favia molecular form diagnostic PCR to determine molecular form of *An. gambiae* s.s.. Correlations will be performed to determine if any of the water quality parameters are related to the species and/or molecular forms collected.If there are significant differences among species or forms with respect to certain water conditions, it would allow researchers to predict which species will lay their eggs in an area. It may also provide information related to the ecological factors giving rise to the new species in *An. gambiae* s.s.. In this way, species specific vector controls can be used more effectively.

A Systematic Review of Antihypertensive Medications for Chronic Systemic Hypertension in Children

Dominica Randazzo
Sponsor: Stephanie Nguyen, M.D., M.A.S.
Pediatric Nephrology

Systemic hypertension, also known as high blood pressure, is not only found in adults but occurs in 4% of children. Therefore, it is important to review the efficacy of antihypertensive medications used to treat chronic systemic hypertension in children. This systematic review will evaluate double-blind, randomized, placebo controlled trials that have been published between 1950 and September 1, 2011 to assess which medications have the greatest effect on children's blood pressure. The literature search included PubMed, Cochrane library and Biosis. Abstracts published in national meetings and the National Institute of Health (NIH) clinical trial registry were searched to identify published and unpublished studies. A total of 12 published trials met all of the study selection criteria, representing 6 different classes of antihypertensive medications used in children. Overall there were few randomized placebo control trials in children. The drug classes with the largest effect on blood pressure included Angiotensin Converting Enzyme (ACE) inhibitors and Angiotensin II Receptor Blockers (ARBs). However, 2 complete but unpublished studies were found which might represent a publication bias, leading to bias in the overall published literature. Further studies are required to determine the safest and most effective approach to treat chronic systemic hypertension in children.

Identification of Novel Cancer-Targeting Ligands for Neuroblastoma

Priya Rangan
Sponsor: Dr. Noriko Satake, M.D.
Pediatrics

Neuroblastoma is a pediatric cancer that arises when neuroblasts continue to divide instead of growing into nerve cells. It is the most common extracranial tumor in children, and approximately 700 new cases are diagnosed each year in the USA. Patients who are diagnosed as having low-risk or intermediate-risk disease have a good chance of cure. But those who are high-risk have an extremely low likelihood of cure with only a 30% survival rate, even if intensive treatments are used. Since this is the current situation, a new approach to treatment is necessary. Targeted therapies are currently being studied and applied to experiments involving all types of cancer. We are currently developing a new targeted therapy for neuroblastoma using a cell-specific ligand and a nanoparticle as a drug delivery system. Upon successful delivery, medicine can be directly administered into the cancer cells. Using the one-bead-one-compound (OBOC) combinatorial library method developed by Dr. Kit Lam, we have identified a neuroblastoma-specific ligand. The identification of this novel ligand will allow us to design targeted therapies for neuroblastoma.

An Autonomous Pulse Oximetry System for Dynamic Measurement of Vital Signs: Hardware Implementation

Habid Rascon-Ramos
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Accurate and reliable diagnostic tools are key to effective and low cost health care. We are building a clinical device to measure the oxygen saturation and pulse rate of patient in a noninvasive manner. The device automatically determines the appropriate settings for measurement and dynamically corrects for changes. Two LEDs, one red and one infrared, shine through a finger. An LED driver controls the amount of light produced by the LEDs. Digital to Analog Converters control the driver. The unabsorbed light passes through a photo detector, which generates a photo current. A differential transimpedance amplifier converts the photocurrent to a voltage so that the signal can be filtered. The transimpedance amplifier is designed to eliminate noise from the pulse oximeter signal. The signal then goes through a sample and hold circuit, followed by low pass filter, a DC subtractor and DC shifter, and a programmable gain amplifier. Finally, a switched capacitor filter cleans up the signal.

Pakistan Foreign Relations: A Historical Look at Contemporary Issues

Ahmad Raza
Sponsor: Natalia Deeb-Sossa,
Chicano/a Studies

The war on terror has led to significant changes in the nature of foreign relations in South Asia. There were some drastic changes following the United States decision to invade Afghanistan and dismantle the Pakistani-backed Taliban government. I will take a look at Pakistan's historical relations with the United States, and the various factors which have driven it. I will also look at other dynamic relations in the region, specifically Pakistan's relations to its neighbors Afghanistan, Iran, China and its long time rival India. My research project will focus on the many factors, both domestically and internationally, that affect relations between these countries. Some examples of factors that I will consider are: the type of regime in the country, the significant regional events that could drive countries closer or farther apart and the perceived interests of a country during a time period. There are also some variable which I will consider, such as non-state actors and third-parties which influence relations between countries.

A Woman's Touch: The Dichotomy Between Passivity and Activity for the New Woman within Naturalistic Literature

Kelley Rees
Sponsor: Gregory Dobbins, Ph.D.
English

The literary theory of naturalism harbors a decidedly deterministic style. At the same time this movement was garnering recognition in the late eighteen hundreds, the conception of the New Woman, a socially conscious, equality-driven individual, was taking form in texts of the period. Nevertheless, with naturalism's oppressive traits clouding many writings, which also house this new feminist ideal, the question of the pair's compatibility seems fitting. Is a woman within the deterministic setting of naturalism able to hold and actively brandish any autonomy in shaping her fate? In addition, women's socioeconomic status within such texts asserts influence over their ability or desire to don the role of the New Woman. In looking at women belonging to tiers of class structure as disparate as Edith Wharton's Lily Bart in *The House of Mirth* and George Bernard Shaw's Mrs. Kitty Warren in *Mrs. Warren's Profession* to Rebecca Harding Davis' slum-dwellers in *Life in the Iron Mills*, I hope to examine how each woman's particular economic circumstances contribute to or curb her active choices in advancing societal norms towards the acceptance of the New Woman or in affirming the patriarchal and capitalistic paradigms of the era.

Interactive Musical Stairs

Richinder S. Rehal
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

What makes people interested in learning about electronics? Can interactive exhibits gain the attention of their users? Our goal is to create an electronics exhibit that engages users through the use of sensory feedback. We want to show that we can spark interest in the workings of an electronic device by making it physically and mentally interactive, keeping its cost low, and keeping its design relatively simple. We have incorporated all these principles into an exhibit called Musical Stairs. Users interact with the exhibit by stepping on stairs, generating an auditory response in the form of musical notes. For example, this could simulate playing a piano. We want users to feel intrigued and curious to know the basics of how the exhibit works. Our results will show whether we were successful in stimulating this level of technical interest. Most consumer electronics hide their inner workings, but we wish to allow people to see past this curtain of abstraction. The Musical Stairs project is a team effort by EE-Emerge. The team consists of the following members: Richinder Rehal, Varn Khanna, Dante Gamboa, Weilian Lin, and Carmen Siu.

A Sedimentary Investigation of Tomales Bay, CA: Sources, Sinks, and Human Impacts

Marissa A. Reis
Sponsor: Tessa M. Hill, Ph.D.
Geology

Tomales Bay (Northern California, 38°N, 122°W) is an estuary that receives sediment transported mainly from the drainage of nearby watersheds. Watershed use in Tomales Bay has varied since settlement of Europeans in the 1800's and is reflected by variations in sediment grain size and content. Currently, Tomales Bay is being protected and monitored for quality, enhancing the exploration of the direct correlation between land use and sediment deposition. Surface sediment samples acquired from eight locations in August 2011, and seven locations in February 2012, were analyzed for grain size, percent carbon, and total organic carbon. Sediment cores dating back ~500 years were sampled at 10 cm resolution and analyzed for the same properties. A preliminary comparison of core and surface samples (2011) indicates that the bay experienced grain size decrease near the central bay and an increase near the Walker Creek tributary during the beginning of potato farming (1850-1890 AD). A grain size increase near the central bay with a decrease near Walker Creek correlates to a period of intense logging (1800-1900 AD). Continuing investigations of new sediment samples (2012) aim to understand how land use management affects watershed processes and water quality in estuaries like Tomales Bay.

Reversible Phagocytosis: A Unique Trait of the Eosinophil Leukocyte

Rachel Rieger
Sponsor: Volkmar Heinrich, Ph.D.
Biomedical Engineering

Eosinophils make up 1-6% of white blood cells. They have been shown to engulf bacteria and parasites, and initiate and propagate inflammatory responses in the pathogenesis of asthma and allergies. However, little is known about the detailed chemotactic and phagocytic behavior of eosinophils during one-on-one encounters with pathogenic invaders. To contribute to a comprehensive understanding of the immunophysics of these cells, we examine the time course of interactions of initially passive eosinophils with antibody-coated beads and fungal particles using dual-pipette micromanipulation. We discover that unlike any other phagocyte, eosinophils are capable of regurgitating previously engulfed particles. To test our hypothesis that this surprising behavior is due to mechanical limitations, we quantify the relationship between the surface area and the cortical tension of these cells. Our experiments confirm that indeed, a higher mechanical effort is required to increase the surface area of eosinophils in comparison to neutrophils (a closely related leukocyte).

Sighting Existential Poltergeists: Vision, Technology, and Horror in American Suburbia

Arielle Robbins
Sponsor: Nathan Brown, Ph.D.
English

From video games and social media profiles to MRIs and surveillance video, we as a visual society are moving into a future where we cannot continually perceive our bodily wholeness. In my presentation, I connect this aspect of modern visuality to the re-emergence of existentialist problems in the U.S. suburbs of the 1980s through the film *Poltergeist*. Using Jean-Paul Sartre's 1938 novel, *Nausea*, as a starting point for urban existentialism, I trace the cultural movement from visible to invisible sources of anxiety. To truly embrace American ideals of individualism and freedom, *Poltergeist's* characters must ignore the underlying economic and class structures operating on and around them. I argue that this ignoring then takes shape as existential angst in the American home, where individuals turn to visual technologies and the fantastic to process and relieve their anxieties. Since sight, however, is an imperfect sense, overt social emphasis on vision continually leads to existential dissatisfaction. American cultural dependence on "sight" is essentially unsustainable and, like the house in *Poltergeist*, will eventually consume itself.

Study of a Microbial Ridge Found in an Archaen Microbialite

Rebecca L. Rodd
Sponsor: Dawn Y. Sumner, Ph.D.
Geology

Microbialites from Gamahaan Formation in South Africa dated to 2521 +/- 3 million years ago are crucial to study because they are evidence of very early microbial formations. Microbialites are rocks with complex organic structures left behind by microbial communities that are preserved in calcite cement. This study focuses on classifying these structures and interpreting their formation in context of the ancient environment. To do this, rock samples are reconstructed into a 3D volume in the KeckCAVES, which shows the structure of organic inclusions. I identified a microbial ridge extending upward from the laminated mat below. The ridge is 3.77 mm high and the slope ranges from 1.6 to 3.56 from the mat surface to the ridge top. The slope increase is a result of the ridge forming into a tall peak. This structure has not been seen in any other ancient microbialites, but similar ridges appear in modern microbialites in lakes in Antarctica. Data on the modern microbialites is being collected for comparison. Comparing the modern and fossilized microbial structures provides insight into microbial growth and the environmental conditions under which they formed.

Enclosure for the Integration of X-Ray Optics- Heating Element

Laura Rodrigues
Sponsor: Cristina Davis, Ph.D.
Mechanical and Aerospace Engineering

As a part of NASA's Next Generation X-Ray Optics (NGXO) project, they are studying x-ray radiation to further investigate the behavior of black holes and the life progression of stars. In order to see the radiation, they are creating a new telescope with curved mirrors that focus the incoming rays. These mirrors are very thin (4mm) and are susceptible to deformation by being exposed to heat; even the heat from a human body is enough to critically warp the mirrors. To prevent deformation, the mirrors are to be placed in a thermally controlled box, designed by UC Davis students, that remains at a constant temperature. Since this temperature is always above room temperature (room temperature ranging from 18-21°C with the enclosure temperature ranging from 19-23°C), a heating element needs to be used to heat the incoming air. A resistive heating element will be used to warm the incoming air as it passes through a tube and into the box. This project concerns the design and testing of heating the inlet airstream using silicon heating pads with the goal of heating the incoming air evenly to prevent any temperature variation.

The Two Faces of Microfinance

Juliana Romano
Sponsor: Luis E. Guarnizo, Ph.D.
Human and Community Development

For the last two decades, microfinance as a poverty alleviation strategy has become the panacea of international development. Microfinance is based on the assumptions that the poor are inherently entrepreneurial, that the poor always pay back, and that capital is the most significant barrier to poverty alleviation. To enforce payment, microloans are disbursed within solidarity groups that are mainly comprised of women. During summer 2011, I worked with *Freedom from Hunger* (FFH), in which I evaluated whether or not microloans enhanced food security for clients living in Peru. This method of evaluation involved 95 surveys and 25 impact stories from randomly selected clients who acquired loans in 2008. Contrary to my hypotheses, I discovered that my results were not homogeneous. In theory, if the clients expand their savings, they can invest, innovate, and accumulate profits while paying off their loans. In practice, markets are not so equalizing or effective as to ensure equal outcome for every individual, despite equal access to micro-loans. In Peru, some clients enhanced their livelihood through entrepreneurship, while others could not pay off their loans in the midst of health and agricultural crises.

Online Giving and Fundraising Strategies for University Research Laboratories

Kayla E. Rouse
Sponsor: Bernie May, Ph.D.
Animal Science

During the last decade, the prevalence and effectiveness of fundraising through online giving has dramatically increased. Currently, UC Davis research laboratories rely primarily on funding from grants and contracts. Online giving in support of specific laboratories is rare. The College of Agricultural and Environmental Science at UC Davis has recently established a new mechanism allowing primary investigators to solicit funding directly. Online giving may prove to be an indispensable direct source of funding for University research laboratories. I developed a fundraising website for the Conservation Genetics Fund that supports the work of Dr. Bernie May's Genomic Variation Laboratory in the Department of Animal Science. Through literature reviews and collaboration with the members of the laboratory, I combined traditional fundraising tactics with new online trends to create the website. The website template and principles underlying development of online giving for this laboratory are potentially relevant to other departments and research laboratories within the UC system.

Andrew Wyeth's Traditional Persona: The 'American artist' or the 'American man'

Brittany L. Royer
Sponsor: Diana Strazdes, Ph.D.
Art History

Andrew Wyeth, best recognized for his haunting masterpiece, *Christina's World*, 1948, stimulates a contradiction in American art in the 1940s through 1960s. Wyeth's realism creates a misfit boundary: contemporary success with non-contemporary methods. Noted for his realist style, Wyeth's work alludes to traditional artists such as Albrecht Durer and Winslow Homer. Even though Wyeth reached the height of his career at the same time as 'revolutionary' American abstract expressionist, Jackson Pollock, Wyeth's work never strayed from a realist quality. Art historians and critics have often struggled to place Wyeth's work in the progression of art history and indeed he has generally been left out of art of the mid20th century. However, Wyeth's own work and success in his time, was indisputable. This paper will explore the concept of the traditional American artist in the era of abstract expressionism and how Wyeth's identity as an artist largely depended on his public image of the 'American man'. While Pollock offered a revolutionary persona, Wyeth provided stability and reassurance- offering the security of an American identity to his own time.

The Social Life of the Beat

Julia Ruble
Sponsor: Bettina Ng'weno, Ph.D.
African American and African Studies

Dancehall is the most popular style of modern music among the marginalized population of Jamaica. It rises out of reggae, yet dancehall is far more than just music. Deeply embedded in Jamaican life, dancehall has become a culturally significant source of self-identification. This study seeks to understand how Jamaican dancehall musicians innovate and produce style, art and culture through dancehall music, and analyze how dancehall culture is produced, disseminated and consumed. This research will look at the production and physical creation of dancehall music and analyze aspects of commercial musical and social worlds. Interviews on location in music studios in Jamaica and participant observation provide the basis for information about music production, influences, meaning and significance of dancehall music. By looking at cultural transmission through music as a social process, this study seeks to add to the limited body of research concerning the complex nature of commodification, appropriation and dissemination of culture through dancehall music.

"The Google-powered "Art Project": Does it Diminish the Effect of Art?"

Corey M. Ruecker
Sponsor: Blake Stimson, Ph.D.
Art History

Relevant even to the most casual art consumer is the way one reacts or feels in response to art. This response to art is art's effect, and the sum total of art's effect on a viewer is the art experience. In order to expand the art experience Google engineers and select art museums have made use of Google's mapping technology to allow virtual access to works of art from around the world. This Google-powered software is called "Art Project." One may think that "Art Project" would be beneficial to the overall art experience. However, as learned from theorists like Theodore Adorno, I argue that there is a need for direct contact with art in order for art's effect to be felt. Since "Art Project" does not permit direct contact, "Art Project" cannot make known art's full effect. Thus, "Art Project" as it does not permit direct contact with art, diminishes the effect of art. The diminishing of art's effect entails an unsatisfying art experience. If "Art Project" entails an unsatisfying art experience, then I do not believe that "Art Project" should be used to enhance the art experience, as art's effect is important to even the most casual art consumer.

Maternal Immune Activation Alters Ultrasonic Vocalization in BTBR and C57BL/6j Mice

Joshua A. Rushakoff
Sponsor: Robert Berman, Ph.D.
Neurological Surgery

To explore potential gene-environmental interactions in the etiology of autism, the current study examined the effects of maternal immune activation (MIA) on communication and social behavior in two mice strains. Recent studies have linked MIA during pregnancy with an increased risk for autism. Given that impaired language development and social communication are two principle characteristics of autism, we examined ultrasonic vocalization (USV) in BTBR and C57BL/6j offspring of MIA dams. BTBR and C57 mice were administered the viral mimic Poly(i:c) on day 12.5 of pregnancy via intraperitoneal injection. On postnatal day (PND) 4 through 16 (qod), one male and one female from each litter were separated from their mother, and USV was measured using ULTRAVOX. Injection of Poly(i:c) increased vocalizations in both C57 and BTBR mice on PND 10 ($p<0.05$). In addition to differences between strains, the combination of strain and treatment differences produced additive effects on the total number of calls. These findings further support the hypothesis that MIA during pregnancy alters offspring language development and provide a novel model for studying the combined effects of genetic and environmental interaction in the development of autism-like behaviors.

Carbamate Protection of Acetylcholinesterase from Inhibition by Organophosphorus Ester Pesticides

Francisca J. Rusli
Sponsor: Barry W. Wilson, Ph.D.
Animal Science

Acetylcholinesterase (AChE) is a pesticide sensitive enzyme present in vertebrate nervous systems and mammalian red blood cells (RBCs) that plays an important role in nerve impulse conduction. Organophosphorus ester (OP) pesticides act by inhibiting AChE activity. They are widely used as agricultural tools against insects, and can be harmful to farmers, farm workers, and other animals. The U.S. Army uses a carbamate, pyridostigmine bromide (PB), to protect soldiers from military OP agents. Previous experiments show that PB can protect AChE from OP pesticides. It is hypothesized that other carbamates will protect AChE against pesticide inhibition. AChE was studied by treatment of bovine RBCs obtained from the UC Davis dairy herd. RBCs are incubated with the carbamates such as aldicarb, carbaryl, PB, and physostigmine. This is followed by treatment with different OPs in the active oxon form: malathion, chlorpyrifos, and diazinon. AChE activity levels were determined with the colorimetric method of Ellman. The ability of a carbamate to protect AChE is assessed by comparing activity levels in the treated cells to those in appropriate controls.

Allelic Sweeps in *Giardia* May be Indicative of Ploidy Variation in the Trophozoite Populations

Sheeda Saba
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Microbiology

Giardia intestinalis is a parasitic protist that is binucleate in its pathogenic trophozoite stage. Based on mitotic observations of trophozoites and the assumption of trophozoite asexuality, the nuclear genomes of *Giardia* trophozoites should diverge over time through the independent accumulation of single nucleotide polymorphisms (SNPs). The high number of SNPs in GS trophozoites (Assemblage B) is in accord with this paradigm. However, recent work has shown that Assemblage A and E trophozoites display low numbers of SNPs, calling into question the assumption of trophozoite asexuality altogether. In retrospect, the high allelic heterozygosity seen in the GS strain could be indicative of a higher mutation rate rather than asexual divergence. We used high throughput sequencing to track *de novo* SNPs in a GS trophozoite population over time. Of the *de novo* SNPs that arose between time points, 10 had an allelic frequency > 50%, a scenario that is impossible under the canonical assumptions of trophozoite asexuality and nuclear diploidy. Based on current research, we believe the canonical assumption of nuclear diploidy in all trophozoite nuclei is incorrect; such ploidy variation between nuclei can provide insight into the mechanisms maintaining high and low allelic heterozygosity in different *Giardia* strains.

Shifa Community Clinic Healthy Breast Program: Knowledge, Attitude, and Barriers to Breast Cancer Screening among South Asian and Middle Eastern Women

Nazeela Sabir
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Obstetrics and Gynecology

Middle Eastern and South Asian women in the United States may underuse cancer screening tests and face important barriers to mammography screening. Shifa Community Clinic's "Healthy Breast Program", supported by Susan G. Komen foundation, sought to increase breast cancer screening utilization among multiethnic, minority, and low-income women (age ≥ 40 years). To understand racial/ethnic disparities in breast cancer screening, Shifa Community Clinic trained health coaches to educate, motivate, and recruit medically underserved Middle Eastern and South Asian women. In a cross-sectional, community based convenience sample, a self-administered questionnaire was distributed to 300 women. Of those, 217 provided information on socio-demographic characteristics and knowledge about breast cancer screening. Interventions included educational workshops about screening, prevention, and early detection in the target community. Overall mammography rates were below national average among Middle Eastern and South Asian women. Knowledge gaps about breast cancer screening and lack of awareness about available public programs were associated with lower screening rates in the target population. To improve mammography screening utilization among immigrant Middle Eastern and South Asian women, resources should be allocated for community-based educational interventions to promote awareness about breast cancer screening, prevention, and detection to improve the health of minority women.

Characterization of a Protease Associated with Non-Proteasomal Caspase-Like Activity in Liver

Ridhi Sachdev
Sponsor: Aldrin Gomes, Ph.D.
Neurobiology, Physiology and Behavior

The proteasome, a multi-catalytic protease complex, breaks down normal and damaged proteins in the cells to keep the cell functioning properly-maintaining homeostasis. MG132 is the most commonly used inhibitor of the proteasome. However, recent reports suggest that MG132 also inhibits other proteases including calpains and some cathepsins. It is likely that the caspase-like activity of the proteasome in tissues like the liver is currently being incorrectly measured as MG132 is the most common inhibitor used in proteasome activity measurements. Epoxomicin, another inhibitor, is the most specific proteasome inhibitor available. Epoxomicin is not known to inhibit any other proteases besides the proteasome. My experiments involve characterizing the non-proteasomal caspase-like activity in mouse liver which degrades the proteasomal substrate used for determining caspase-like activity of the proteasome. Gel filtration chromatography was able to separate the proteasome from the non-proteasomal caspase-like protease. Further purification of the non-proteasomal caspase-like protease was carried out using ion-exchange chromatography. Characterizing the protease that is displaying non-proteasomal caspase-like activity is important to reduce errors associated with measurements of proteasome caspase-like activity in liver.

Multiple Factors Working in Concert Regulate Blood Pressure Over a Hibernation Bout in the Syrian Hamster

Marissa Saenz
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Pharmacology

Although blood pressure (BP) is regulated as hamsters enter hibernation, the detailed relationship between BP, heart rate (HR), and baroreflex sensitivity (BRS) is unknown. We tested the hypothesis that multiple factors, arranged in a specific temporal pattern, regulate BP over a hibernation bout. BP was recorded in Syrian hamsters (*Mesocricetus auratus*) throughout hibernation. Five-minute averages of systolic BP, HR and spontaneous BRS were analyzed. The time for a decrease or increase from 90% to 10% ("fall or rise time") of SBP, HR, and BRS were determined. On entry into hibernation fall time of HR (194±17 min) and BRS (211±21 min) were significantly ($p<0.01$) shorter than that of SBP (295±34 min). During the initial phase of entry into hibernation, BP and HR significantly decreased while BRS was maintained, indicating HR may be an important factor in regulating BP. During the later phase of entry, SBP continued to fall and BRS fell rapidly, indicating factors other than simply HR regulate BP. During arousal from hibernation, BRS recovery lagged behind BP and HR, and the rise time of HR, SBP and BRS were not significantly different. Results indicate that multiple factors, arranged in a specific temporal pattern, regulate BP over a hibernation bout.

Sleep Problems in Infants at Risk for Autism Spectrum Disorder

Darpanjit Saggal
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Psychiatry

Sleep problems are a major concern for children with Autism Spectrum Disorders (ASD). Previous studies suggest that siblings of children with ASD may also be at elevated risk for sleep problems. In the present study we compare the rates of sleep problems across two groups of children: a high-risk group (children with an older sibling with ASD) and a low-risk group (children with typically developed older siblings). This study includes 39 children assessed at 24 or 36 months of age. Parents completed the Child Sleep Habit Questionnaire (CSHQ) to assess sleep problems. The CSHQ includes 33 likert-type items that are combined to assess overall sleep problems and common childhood parasomnias. This project focuses on comparing the rates of sleep problems in both low and high risk children. We hypothesized that parents of high-risk children will report more sleep problems than parents of low-risk children. Our findings may help identify a new area of screening/intervention in siblings of children with ASD.

Hypocrisy Inc.: The Politics of State Recognition in the Post Cold War Caucasus and Eastern Europe

Sergey Saluschev
Sponsor: Miroslav Nincic, Ph.D.
Political Science

In the reality of the post Cold War world, the Western liberal democracies display an inconsistent record of fulfilling their professed commitment to human rights, freedom and justice. Particularly, recognition of right of national self-determination is, perhaps, one of the most salient of such cases. In my thesis, I first establish a theoretical link between democracy, as a political regime, and right of national self-determination. Further, I argue that recognition of breakaway entities is a product of political alliances and strategic geographic calculations, which ultimately allow the Western liberal democracies to secure and advance their national interests. I use Case Study and Comparative Analysis research design with the focus on the countries of Eastern Europe and the Caucasus mountains. The findings of the research vindicate connection between democracy and right of national self-determination and expose the gap between idealistic rhetoric and callous political calculations which aim to advance national interest. I conclude with the summary of the findings and stress the need for creation of a transparent international agency that can address separatist claims in a more objective fashion. Finally, I state that the current policy of selective recognition is hypocritical and extremely detrimental to the cause of human rights.

The Causes of Male Sterility in the *Drosophila melanogaster* x *D. simulans* Hybrids

Emmanuel Sanchez-Ramos
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Evolution and Ecology

One of the fundamental characteristics that define two organisms of different species is that they cannot interbreed to form viable and fertile offspring. The hybrid male offspring between *Drosophila melanogaster* females and *D. simulans* males can be made viable if rescued by the *Lhr* mutation. However there is no known mutation that rescues these hybrid males from sterility. It has been found that hybrid sterility in males is often caused by a dysfunction in gene expression. Certain genes in the spermatogenesis pathway have been shown to be mis-expressed in *D. melanogaster /D. simulans* hybrids males. Previous experiments have used whole flies or whole testis to study patterns of testis-specific gene expression but these studies lack the resolution to determine at what stage in spermatogenesis the mis-expression is occurring. Finding what causes sterility in hybrids would offer information to explain how species evolve. I will examine gene expression levels in specific cell types and stages of spermatogenesis using a new transgenic method that isolates the nuclei of specific cell types. This approach will allow us to determine the specific time and tissue where the sterilizing mis-expression is occurring during spermatogenesis.

The Effect of Subducting-Plate Age on the Formation of Bending-Induced Faults in Subduction Zones

Jessie K. Saunders
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Geology

In a subduction zone, outer rise faults form on the subducting plate as a result of bending of the tectonic plate. When oceanic lithosphere is subject to such bending, the way the plate responds to these stresses depends on the strength and rigidity of the plate, which are characteristics that generally increase as the plate cools with age. By comparing escarpment length, escarpment height, dip direction, and fault spacing at the western Kuril Trench (120 million years old) and at the Middle America Trench (17 million years old), the effect of plate strength (age) on the formation of these faults is observed. Analogue experiments suggest that increased layer thickness (age) suppresses elastic interactions that are the basis of power-law scaling relationships for faults. Comparing these results with data from subduction zones can lead to better understanding of the hydration and serpentinization of the lithosphere, as well as leading to improved models for subduction zone dynamics.

Gulf of Alaska and California Bamboo Corals: A New Archive of Climate Change

Wilson Sauthoff
Sponsor: Tessa Hill, Ph.D.
Geology

Deep sea bamboo coral communities form along seamounts and continental margins with near global distribution. Deep ocean trawling, coral trading, and ocean acidification threaten these corals and associated species. Much like tropical corals, bamboo corals record surrounding ocean geochemistry as the coral skeleton is precipitated outwards from an internal core, sometimes displaying growth banding similar to tree rings. These records of ocean chemistry present reliable proxy records of changes in seawater conditions, such as productivity, nutrient content and temperature. Analysis of ocean variability may provide important indications of past frequency of recently discovered climate oscillations, such as El Niño or Pacific Decadal Oscillation. Four bamboo coral specimens from the California margin and Gulf of Alaska provide insight into latitudinal and temporal differences in sea surface productivity and nutrient availability. Past oceanic conditions are reconstructed using isotopic composition ($\delta^{18}O$) for temperature, and trace element profiles (Sr/Ca, Ba/Ca) to interpret past ocean nutrient levels and productivity. Microscopic and photographic techniques supplement elemental analysis to gauge growth in corals exhibiting visible growth banding. This research adds to the scientific understanding of natural, short-term climatic variability in the Pacific Ocean, and tests for evidence of anthropogenic changes in the deep ocean environment.

Novel pruritogens in the Sprague Dawley Rat

Emma Schatz
Sponsor: Earl Carstens, Ph.D.
Neurobiology, Physiology and Behavior

Itch is an unpleasant sensation eliciting the desire to scratch. Our current understanding of the mechanisms underlying itch is incomplete, and antipruritic therapies are limited. A better understanding of itch is needed to develop novel treatments, especially for types of itch not relieved by antihistamines. To identify potential pruritic (itch-evoking) or algogenic (pain-evoking) qualities of novel compounds, we employed a new "cheek" model using adult male rats. In this model, intradermal injection of pruritogens evokes hindlimb scratching, while algogens evoke forelimb wiping, directed to the site of injection in the cheek. We tested the known pruritogen serotonin (5-HT), the known algogen allyl isothiocyanate (AITC, the pungent component of mustard oil), the Mas-related G-protein-coupled receptor (Mrgpr) agonist BAM8-22, the peptide endothelin-1 (ET-1), and the amino acid beta-alanine. Intradermal injection of BAM8-22 elicited minimal scratching, but ET-1 elicited both scratching (similar to 5-HT) and wiping (similar to AITC). Beta-alanine also evoked scratching behaviors similar to 5-HT. Thus these compounds may serve as useful tools for elucidating mechanisms and pathways involved in complex itch conditions typically unresponsive to antihistamines such as uremic pruritus, a chronic itch condition common in end-stage renal patients with poor quality of life and few effective treatments.

Immobilizing HIV-1 Envelope glycoprotein gp140 by ELISA Assay

Alicia Schlenz
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Molecular and Cellular Biology

HIV infects human T-lymphocytes via essential binding of the HIV viral envelope to two endogenous receptors on T-lymphocyte membranes. Binding of gp120 (a glycoprotein on the viral surface envelope (Env)) to CD4 (the cognate receptor on the host cell) exposes the coreceptor binding site (CrBS) and allows its recognition by anti-CrBS antibodies, such as 17b. Binding of CD4 is thought to elicit a conformational change in gp120 that is required for effective membrane fusion and infection of a host cell. Existing cryo-EM (cryo-electron microscopy) structures lack agreement as to the exact conformational changes in gp120 upon CD4 binding. To confirm the conformational changes in HIV-1 gp120, immobilization and labeling of gp140 (trimeric, soluble versions of Env bound gp120) will allow for a detection of conformational changes in gp140 that correlate to those of Env bound gp120 upon CD4m binding. An ELISA (enzyme linked immunosorbent assay) experiment will be used to quantify binding of CD4 and 17b to gp140 and confirm immobilization of gp140. The immobilized gp140 protein will subsequently be used in biophotonic assays to depict conformational changes. Additional data on conformational changes of gp140 and gp120 may provide useful implications for HIV vaccine development and design.

Gothic Monsters: Male Creators as a Threat to Patriarchy in *Frankenstein, Dracula, The Great God Pan,* and *The Strange Case of Dr. Jekyll and Mr. Hyde*

Sara Schoch
Sponsor: Colin Milburn, Ph.D.
English

British Gothic literature of the nineteenth century dramatically reinvents depictions of the creation of monstrosity by shifting primary reproductive power to the male. This is often interpreted as a means to perpetuate female subjection to men by portraying women as so disempowered that they have lost their stake in the process of reproduction, a previously irrevocable biologically and spiritually imbued power. I argue, rather, that such attempts to envision a society in which this female power has been stripped away represent a subversion of patriarchal norms. Textual depictions of men, in their attempts to assume complete reproductive authority, as incapable of producing viable offspring construct these patriarchs as a threat to the traditional family, rather than champions for its preservation. I will explore the ways in which, through their reappropriation of reproductive power from female to male, these texts upset the traditional assignment of blame for monstrous creation and argue that the texts' focus on the destructive power of these father figures actually strengthens conceptions of the importance of the maternal female by making males alone culpable for these monstrous creations.

Green Fluorescent Protein Tagging of Novel Cytoskeletal Proteins in *Giardia intestinalis*

Albert C. Sek
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Microbiology

The unicellular parasite *Giardia intestinalis* causes the gastrointestinal disorder giardiasis, which affects millions each year in the United States and worldwide. Infection begins with accidental ingestion of the environmentally-resistant cyst form from contaminated food or water. In the stomach, *Giardia* begins to excyst into a flagellated 'trophozoite' form and utilizes a suction cup-like structure, the ventral disc, to attach and colonize the small intestine. The ventral disc is a complex cytoskeletal structure consisting of many interacting proteins. Understanding the components that comprise the ventral disc and the interactions of ventral disc and other cytoskeletal proteins is critical in understanding how attachment occurs. We detergent-extracted *Giardia* trophozoites to isolate giardial cytoskeletons, and then analyzed them to identify the sequences of individual proteins in the preparation. Many are novel proteins not found in other organisms. We cloned a number of the genes encoding these novel proteins, fusing a green fluorescent protein (GFP) gene to the C-terminal end. Expression of each fluorescently labeled cytoskeletal protein in *Giardia* allows us to determine its localization in live or immunostained cells, a first step toward understanding its function in the cell. Using this approach, we have discovered novel proteins localizing to the flagella, axonemes, and disc.

Effects of Triclocarban on Embryos of Chronically Exposed Qurt medaka (*Oryzias latipes*)

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School of Veterinary Medicine

Triclocarban (TCC) is a synthetic antibacterial agent commonly incorporated in personal care products and disinfectants. Its frequent use and long environmental persistence have been observed with its accumulation in surface waters and sediments. Recent research has found that TCC is bioconcentrated in fish, which directly or indirectly may be involved in the disruption of a variety of endocrine related functions resulting in unintended biological effects. The objective of this study is to investigate effects of TCC on embryo development in medaka fish (*Oryzias latipes*). Sexually mature male (♂) and female (♀) chronically exposed to 5 ug/L TCC for 4 months were cross bred with unexposed control ♂ and ♀. Embryos were collected at day 1 of fertilization to examine reproductive effects of TCC. Evaluation will be done through microscopic observation of embryo development. Hatching success will be quantified. These endpoints will show if chronic exposure of TCC at environmentally relevant levels cause changes in fish reproductive performance. It is imperative to understand toxic environmental contaminants such as TCC in order that critical steps can be taken to protect aquatic and human health.

Where Are All the Mexican Students?

Ashley Severson
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Sociology

Statistics show that Mexican American and Mexican immigrant students in the United States are less likely to achieve higher education and upward social mobility than other racial/ethnic groups. Current research lacks longitudinal studies that compare students' long term academic success with their educational expectations. Few studies have examined Mexican American and immigrant students' perceptions of their schooling experiences and the relation of these experiences to higher education and social mobility. My research examines the social context and individual experiences of Mexican American (second, third plus generation) and Mexican immigrant (first generation) students at three public high schools in two northern California school districts. Data is drawn from observations and interviews with students and staff. In specific, I investigate the following paradox: the students' high aspirations for post-secondary education on the one hand. And on the other hand, the lack of necessary preparation to fulfill these goals, which is itself often a byproduct of teachers and staffs' inattention to these students' educational needs. My study hypothesizes that the current educational system, organized by an ideology that higher education is possible for all students, implements few programs to enable Mexican American and immigrant students to succeed.

Analyzing Plsp1 and Its Role in Protein Processing in Arabidopsis Chloroplasts Using Chimeric Protein Constructs

Garrett W. Shafer
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Plant Sciences

Plastidic type I signal peptidase (Plsp1) is necessary for proper thylakoid development in *Arabidopsis thaliana* and shown to process proteins in two locations, Toc75 in the envelope and OE33 in the thylakoid lumen. The investigation questions whether it is the envelope-located Plsp1, or thylakoid-located Plsp1, or both that is necessary for proper thylakoid development. We hypothesize that the N-terminal sequence of the inner envelope protein TGD2 can direct Plsp1's C-terminal catalytic domain only to the envelope and thus can be used to test the research question – If envelope-localized Plsp1 is important, producing the TGD2N-Plsp1C protein should rescue the seedling-lethal *plsp1*-null mutant. Three constructs encoding chimeric proteins that contain the targeting and transmembrane domain of TGD2, joined to the catalytic domain of Plsp1, were introduced into transgenic plants that were heterozygous for the *plsp1*-null mutation. Screening is being done for presence of the construct through DNA extraction and PCR. Protein extracts from the transgenic plants are being analyzed through Western blots screening for Plsp1, Toc75, and OE33 to demonstrate construct localization and catalytic functionality. The outcome of this research addresses the question about Plsp1, and advances our general understanding of protein targeting mechanisms and membrane development.

Sonic Hedgehog Signaling During Spinal Cord Development: Participation of Gli Transcription Factors

Harsh Sharma
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Physiology and Membrane Biology

Sonic hedgehog (Shh) is a morphogenetic protein that recruits Gli transcription factors in progenitor cells to pattern the spinal cord and dictate cell fate. However, our previous work has shown that Shh signaling also operates in postmitotic spinal neurons and induces changes in cell differentiation through an electrical activity-dependent mechanism. Here we investigate whether recruitment of Glis by Shh changes throughout development in the *Xenopus* embryonic spinal cord. To assess expression of Glis, we obtained nuclear and cytosolic extracts from neural plates and neural tubes for Western blot assays. Results show a stage-dependent expression of Gli2 in the nucleus. To determine whether Shh signaling recruits Glis at different developmental stages, we performed dissociated cell cultures from neural plates and neural tubes. We then added SAG, an agonist of Shh coreceptor Smoothened and processed samples for immunocytochemistry. Results show that SAG increases the percent of Gli2-immunopositive nuclei in neural plate cell cultures. In contrast, SAG does not change the number of Gli2-immunopositive nuclei in neural tube-derived cultures. These results suggest that Shh signaling switches from the canonical, Gli-dependent, to a Gli-independent pathway when spinal cells transition from the progenitor to the neuronal stage.

Mean Girls and Gossip Girls: Incidence and Mitigation of Social Aggression Among Female Adolescents

Dominique Sheth
Sponsor: Robert Faris, Ph.D.
Sociology

Gossiping, name-calling, and exclusion are hallmarks of adolescent female relationships, though these hostile interactions and the injuries they produce are often overlooked or normalized by both students and adults in the classroom and on campus. Working from literature that suggests non-physical aggression is the most common form utilized by girls, I examine the incidence of social, verbal and online aggression using survey data from 185 students and 40 faculty members of an all-girls private high school. Analyzing student trends of reporting to school officials and attitudes towards intervention by faculty members, I consider the possible ways by which schools can mitigate non-physical violence and create a safer and more positive learning environment for students. My preliminary findings suggest that social aggression is widespread both at school and online, and yet even the most injurious of these incidents are rarely reported to faculty and the school administration. Preliminary results suggest that student trust and rates of reporting are lowered by ineffective and unproductive protocols for faculty mediation and a widespread belief among students that resources and support are unavailable from school-affiliated adults.

A Structural Study of a Novel Histone-Targeting SUMO-ligase

Bogdan Shevchenko
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Dermatology

Kaposi's sarcoma herpesvirus (KSHV) exists in two forms: latent (silent) and lytic (destructive). During its latent stage, KSHV produces a protein called latency-associated nuclear antigen (LANA) which we have identified as a small ubiquitin-like modifier (SUMO) –ligase, the first of its kind. This means that LANA can change the activity of both the human and the KSHV genome by enhancing SUMO-modification of histone (DNA-compacting) subunit proteins H2A and H2B. In short, LANA may regulate gene expression by affecting local histone modification, which potentially causes cancer. To reveal mechanistic insights, we need to find its 3D structure. We have already shown how mutating parts of LANA changes its histone binding activity, now we are expressing and purifying its ends (N and C termini) using wild-type and mutated sequences, so that we can determine its structure by NMR analysis. Once known, the structure of LANA can be used to pinpoint other histone SUMO-ligases (by structural similarity) and to study how KSHV depends on the functions of LANA. This can aid in developing preventive measures against cancers and other diseases associated with KSHV.

China's Presence in Africa: Twenty-first Century Neocolonialism?

Emerald P. Shilengudwa
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African American and African Studies

Over the past few years, we have seen an increase in Chinese presence in and aid to a huge number of African countries. In 2007, Africa registered a 5.8 percent economic growth, its highest ever, in part due to Chinese investment. China offers 'mutual-benefit' aid with a 'noninterference in domestic affairs' approach to African states foreign policy. Most argue that their "mutual benefit" aid is a new form of colonialism similar to that of the West, where African states were exploited and reaped few benefits. With this, the question arises whether China's current activity in Africa should be described as neocolonial. Neocolonialism is "the policy of a strong nation in seeking political and economic hegemony over an independent nation or extended geographical area without necessarily reducing the subordinate nation or area to the legal status of a colony". This paper will argue that the current China-Africa relationship is not neocolonial, but is also not beneficial for African countries in the short and long run.

Rhetoric, Reputations, and Rabbits: Mary Toft and the Medical Culture in Eighteenth-Century Britain

Harry Shontz
Sponsor: Katie Harris, Ph.D.
History

In September 1726, Mary Toft, the wife of a poor shopkeeper, claimed that she had given birth to a rabbit. By the time she confessed to the fraud in early December of that same year, she had supposedly given birth to sixteen more rabbits. The news of these marvelous births quickly spread across England, and many prominent medical practitioners, both doctors and midwives, visited Mary Toft, some to validate her claim and some to refute it. Two prominent "medical men," James Douglas and Nathaniel St Andrè were among those on opposite sides of the dispute. Douglas, the epitome of the eighteenth-century medical professional, did not believe Toft, while St Andrè, who exemplified an increasingly obsolete understanding of medical credentials, fell victim to her trickery. Through a close reading of their writings, and those of other medical practitioners involved in the case, this study contextualizes the Mary Toft affair in the evolving field of early modern medicine and the rise of medical professionalization in the early eighteenth century.

Modern Man: The Redefinition of Courage, Honor, and Masculinity in World War I Poetry

Dean Shreve
Sponsor: Gregory Dobbins, Ph.D.
English

This project examines the personification of industrialized weaponry and its impact on masculine identity in the poetry of World War I. Attempting to rationalize the experience of attrition, the poems of Owen, Sassoon, and others, constantly refer to weapons as a separate entity, intent on carnage, and distinct from the opposing forces that deploy them. When the weapons become an unidentifiable and unpredictable assailant, the "warrior" becomes a passive victim and the classical interpretations of honor, which rely on the personal struggle and domination of one over another, become irrelevant. In refuting the ideology of courage and honor, many of the poets attack the pedagogical foundations taught through the classical works of antiquity. This strategy becomes ineffective when the critics and the poets themselves are forced to qualify their authority in terms of the concept they deny. The most significant shift is not in the denial, but in the transference of compassion as an equally masculine trait. While the previous form of combat required an abstinence from mercy, the new industrial format of war requires the sacrifice of self for others and compassion becomes a requirement for courage and masculinity.

Flame Synthesis of Iron Oxide Nanoparticles and Dynamics in a Uniform Magnetic Field

Diego P. Silva
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Mechanical and Aeronautical Engineering

Dynamics of magnetic nanoparticles in a uniform magnetic field is investigated analytically and experimentally. Iron oxide nanoparticles are synthesized in a atmospheric hydrogen-air co-flow diffusion flame. The iron precursor used in the synthesis is iron pentacarbonyl. The setup consists of a coannular tubular burner centered through the middle of a wind tunnel. Particles formed in the flame are exposed to a uniform magnetic field generated by a permanent horseshoe magnet placed axially above the burner. The magnet is designed and built in-house. The magnetic field generated by the magnet is characterized using Vizimag simulation software and simulation results are compared to measurements. The flame is centered within the gap between the poles of the magnet. The laminar air flow in the wind tunnel results in a steady, laminar flame. Particles in a uniform magnetic field form linear chains. In order to study the evolution of chain formation, the position of the magnetic field is varied as a function of the height above the burner. Particles, after they pass through the magnetic field are collected thermophoretically on transmission electron microscopy grids. The morphology of the particles from electron microscopy images are compared to a theoretical model.

Growing Art: Manipulations of Pigmented Fungi

Nicole A. Sitkin
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Plant Pathology

Fungi are often considered dirty, dank and malevolent. Yet they are essential to the functioning of terrestrial ecosystems, responsible for the discovery of antibiotics, and crucial to alcohol and cheese production. Fungi can even be beautiful. In order to highlight the positive aspect of these organisms, I am manipulating the growth of pigmented fungi to produce art. The colors, rate of growth, and growth structures for six strains have been observed under conditions varied by manipulating three variables: light source, proximity to the source and pH of the growth medium. Ambient, fluorescent, and long-wave UV light sources were used. Culture plates were placed at one of two distances from the fluorescent source. The pH of the growth medium was adjusted to either pH 5, 6, 7 or 8. The fungi showed varying sensitivities to these environmental factors. The nature of the pigments produced, the patterns in which pigments appear, as well as the structure of the colonies produced varied in response to one or more of the tested factors. The capacity to manipulate the appearance of these fungi will be exploited to produce recognizable, aesthetically pleasing images. Further studies must also be done on methods of preservation and presentation.

Psychological Impact of Childbirth Experience on Mexican Women: An Observational Approach

Claire C. Sloan
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Chicano Studies

With skyrocketing rates of teen birth, cesarean section, and maternal and neonatal death, Mexico has many factors that contribute to women's psychological stress during and after childbirth. In addition, sub-par hospital conditions and lack of psychosocial support may increase the risk for Mexican women to experience birth-related psychological trauma. This paper aims to explore the determinants and outcomes of birth and postpartum psychological health, specifically in Mexican women. I hypothesize that due to current financial constraints, a strictly science-based medical education, and an understaffing and overbooking of patients in public hospitals, Mexican hospital personnel may lack compassionate behavior towards their patients. This, in combination with a traumatic birth, may lead to psychological distress and other behavioral disorders in childbearing Mexican women. To analyze this hypothesis, I use personal observations from a public hospital in Oaxaca, Mexico, as well as a review of current literature on psychological birth trauma and postpartum post-traumatic stress symptoms. The information from this paper may be used to promote behavioral, educational and policy change in Mexican maternity care centers, which may improve the mental health of childbearing women.

Assessing Episodic Memory without Awareness: What Can the Eyes Tell?

Kelsey E. Sloat
Sponsor: Simona Ghetti, Ph.D.
Psychology

The hippocampus is a region both critical for memory function and sensitive to environmental insults such as stress, hypoxia, and diabetes, particularly in children. Reliable diagnostic measures specific to hippocampal disruption are problematic since measures of memory performance result from the distinct contribution of multiple brain regions. Specifically, two major classes of memory processes support performance. The first, binding processes, function to bind the various features of an event into a memory; these are the purview of the hippocampus. The second, controlled processes, monitor the contents of memory and guide encoding and retrieval operations via organizational strategies; these are the purview of the pre-frontal cortex. Both binding and controlled processes contribute to memory performance, complicating diagnostic specificity to hippocampal disruption. Recent eye-tracking research in adults has revealed that eye movements within the first 1000 milliseconds of a test probe are sensitive to memory for items previously seen together, and that these eye movements are largely the result of the hippocampus-mediated binding processes. The present research aims to establish age-related differences in memory performance as indexed by hippocampally-mediated eye movements in children. It is hoped that the present method will be extended to provide a future diagnostic measure of hippocampal dysfunction.

Genocide or Crime Against Humanity?

Ashley R. Smith
Sponsor: Keith D. Watenpaugh, Ph.D.
Religious Studies

By understanding the logistical requirements for a genocide, and the circumstances under which a genocide can occur, academic articles and books argue for both sides of the case for a genocide occurring over the last 60+ years in Palestine/Israel. The argument for each side is very strong, some believing this situation to fall more closely under crimes against humanity, some claiming that the events that have taken place fall under the criteria for both a cultural genocide and a biological genocide, and some academics claim them as war crimes. I aim to look at both sides of this argument and form an unbiased and factual account of the events taken place in the state of Israel and surrounding areas such as the West Bank and Gaza. Then I will briefly compare these events to acknowledged genocides such as have taken place in Rwanda, Kurdistan, Armenia, and the most well known Holocaust of the Jewish population in Europe.

Theory of Interstitial Hydrogen Impurities in Semiconducting Germanium

Justin C. Smith
Sponsor: Warren E. Pickett, Ph.D.
Physics

Germanium is one of the purest materials that can be produced, with purity down to one part in a billion. Prior work has theorized that hydrogen is the key defect in these ultrapure samples, but has been hard to detect. These defects often have magnetic moments, and this should be the case with hydrogen due to its single electron in the 1s orbital. Semiconductor germanium forms in the diamond crystal structure, and in our initial studies the hydrogen defect is located in the center of the diamond cube resulting in one hydrogen atom per eight germanium atoms. Using this model, density functional theory is applied via the local density approximation. Because the H 1s state is highly localized and expected to have one electron, the extension of LDA, LDA+U, for such states must be used. By studying the electronic band structure and magnetism we can determine the effect that hydrogen has on the well-understood germanium electronic properties. From the electronic structure and the character of individual bands we can deduce the significance of the hydrogen impurity. Further techniques used are fixed spin moment magnetism, calculating the density of states and "supercell" calculations which reduce the concentration of hydrogen atoms.

Engineering Artificial sRNA for Conditional Gene Repression in *Escherichia coli*

Kiah A. Smythe
Sponsor: Yohei Yokobayashi, Ph.D.
Biomedical Engineering

Developing synthetic RNA molecules that can predictably and externally control gene expression is an important aim for synthetic biologists. Regulatory RNAs such as small RNAs (sRNA) contribute to myriad processes from physiology to developmental control as well as adaptation in not only bacteria but also in archaea and eukaryotes. Usually associated with a chaperone protein called Hfq, these sRNAs act on their target mRNAs *in trans* by imperfect base-pairing thereby reprogramming gene expression at the post-transcriptional level. In this study, we describe our work on engineering aptazyme modulated synthetic sRNAs that can control *fliC* (Flagellin) gene expression in *Escherichia coli*. Our novel RNA switch is composed of a theophylline-inducible allosteric ribozyme fused to a *fliC* targeting artificial small RNA that allows ligand dependent production of sRNA in *E. coli*. Such compact and modular ligand-responsive sRNA based regulators will be useful for dynamic control and fine-tuning of endogenous gene expression in bacteria for applications in synthetic biology.

"In Some Bluebeard's Castle": The Supernatural and the Domestic in Nineteenth Century British Literature

Kaileigh A. Snyder
Sponsor: Kathleen Frederickson, Ph.D.
English

The supernatural is considered a defining characteristic of Gothic and Gothic-inspired literature. These supernatural elements cause distress and fear for the fictional characters (and even for the readers) of the Gothic novel. Because women wrote many Gothic tales, these fears often concern gender. As opportunities for women gradually increased, women questioned their traditional roles and responsibilities as wives and mothers. As a result, the supernatural begins to illustrate female concerns over societal pressure to remain in these roles. However, the supernatural also reveals anxiety over leaving these traditional roles behind. By reading Charlotte Brontë's *Jane Eyre*, I argue that supernatural forces lead Jane away from the role of wife and caretaker, but also eventually back to assume this role. Consequently, these supernatural forces demonstrate conflicting anxiety over succumbing to these roles and simultaneous fear of absence or removal from the domestic sphere. Similarly, through reading Mary Shelley's *Frankenstein*, I consider the supernatural force created when women are removed from their role in reproduction, and the anxieties that arise as a result. By exploring these connections, I hope to illuminate the cultural and historical importance of Gothic literature, which has often been dismissed and satirized as sensationalized pulp fiction.

Identifying Pch2 Binding Protein Partners in *Saccharomyces cerevisiae*

Ryan D. Solis
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

In eukaryotic organisms, meiosis serves as a universal step in the cell cycle that enables the creation of haploid gametes from diploid cells. This process promotes genetic variation by enabling pairing and crossover among homologous chromosomes to form new allele combinations. Within prophase I, self-induced double stranded breaks (DSBs) occur resulting in crossovers between specific chromosome pairs. To further continue in the meiotic pathway, the repair of each DSB is critical for the accurate segregation of chromosomes. Failure to repair DNA may lead to improper segregation and nondisjunction. In budding yeast, Pch2 protein is important for sensing and signaling the accuracy in DSBs repair. It is speculated that Pch2 works in combination with other protein complexes and can arrest the cell in response to chromosome crossover errors. My Goal is to identify what proteins physically interact with Pch2 during meiosis. Using a yeast two-hybrid screen, we have identified Mga1 and Sqs1 as potential Interactors. Mga1 is similar to heat shock transcription factor and Sqs1 is responsible for stimulation of the ATPase and helicase activities of other proteins. Further characterization and experimentation remains in progress.

Targeting the Causes of Military Sexual Trauma

Laila M. Soudi
Sponsor: Jeffrey Sherman, Ph.D.
Psychology

For some, the wars in Iraq and Afghanistan have resulted in indelible physical and emotional scars, but for as many as 15% of female soldiers, it is the result of atrocities committed by fellow members of the military that may be breaking our soldiers' spirits. Previous research has disclosed the prevalence of Military Sexual Trauma (MST), defined as military personnel harassing, assaulting, or raping another military service member or civilian in OEF/OIF cohorts of veterans. Such previous studies have failed to provide reasons for such a high prevalence, however. This study seeks to investigate the precise causes of Military Sexual Trauma. Employing a mixed-method, microgenetic design, I examine both perpetrators' reasoning in committing sexual assaults as well as clearly-defined side effects of Military Sexual Trauma during active duty and the readjustment/post-deployment period. As discussed, understanding the aforementioned justifications and consequences of sexual trauma may have positive policy and practice implications.

Prevalence of Selected Avian Haemosporidians in Vector Populations of Mosquitoes and Black Flies in California and Washington

Sarah L. Staley
Sponsor: Anton Cornel, Ph.D.
Entomology

Haemosporidians are a group of parasitic protists that affect a diversity of hosts, including mammals, reptiles, and birds, and are vectored by blood-sucking insects, such as mosquitoes, biting midges, and black flies. This study investigated several species of potential haemosporidia vectors from Washington and California to determine whether these populations are actively transmitting three genera of haemosporidians (*Plasmodium, Haemoproteus,* and *Leucocytozoan*) that cause avian malaria. We performed DNA extractions of black fly and mosquito specimens and amplified the parasites' mitochondrial Cytochrome b gene by nested PCR. To ascertain the presence of parasite DNA, gel electrophoresis was used. Results of this on-going investigation will clarify the prevalence of these parasites in the suspected vector populations, and will determine whether these vectors are infected and transmitting *Plasmodium*, *Haemoproteus*, or *Leucocytozoan* to wild and domesticated bird populations along the West Coast. Current prevalence levels will serve as a priori data to measure future effects of climate and habitat change on the transmission and prevalence of these parasites, particularly for those that have pathogenic properties.

Nano-Capsule Delivery for Diagnostics and Therapeutics Using HEV-VLP Cysteine Mutants Conjugated to Maleimide-Bound Ligands

Marie C. Stark
Sponsor: R. Holland Cheng, Ph.D.
Molecular and Cellular Biology

Virus-like particles (VLPs) can serve as nano-platforms for a variety of applications such as diagnostics and therapeutics. This study aims to generate a nano-capsule using Hepatitis E Virus-VLP (HEV_VLP) that can conjugate ligands that direct its delivery in living systems. HEV is a non-enveloped, single stranded, positive-sense RNA virus that infects humans via fecal/oral transmission. When a HEV capsid containing a C-terminal 52-amino-acid deletion and a N-terminal 111-amino-acid deletion is expressed, the recombinant HEV capsid protein self-assembles into a noninfectious HEV_VLP. HEV_VLP is produced at high yield in insect cells, easily purified, and retains conformation in the mucosal system. On the exposed HEV_VLP protrusion domain, we have mutated a cysteine (HEV_VLP-cys) because cysteine's thiol group stably bonds with maleimide. Consequently, HEV_VLP-cys can direct its nano-delivery using maleimide-bound ligands. The large size of maleimide will favorably reducing HEV immunogenicity/antigenicity. We will test HEV_VLP-cys delivery by conjugating our particle to maleimide-bound LXY ligands that recognize breast/ovarian cancer cells. After assays to confirm LXY-peptide exposure, we will test HEV_VLP's diagnostic/ therapeutic capacity in mice with breast cancer tumors.

Identifying a Mechano-sensing Module for Detecting Cancer Cell Invasion

Amanda N. Steele
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Biomedical Engineering

The formation of secondary tumors is initiated by cancer cell migration. When cancer cells migrate away from the original tumor, they generate traction forces to grab onto the surrounding matrix and neighboring cells to pull themselves forward. The ability to sense mechanical forces is vital to cell physiology. It is therefore important to understand the molecular basis of mechano-signaling. A previous study determined that zyxin, a protein at cell adhesions, is recruited at force-bearing sites of migrating cells, and the short repeats at the end of zyxin (LIM domain) was sufficient for this force-induced accumulation. My goal is to analyze how the LIM domain senses force using LIM mutants and a miniature force sensor. Since the LIM domain consists of three independent LIM motifs, I generated LIM mutants that contained various number of LIM motifs. I found that one or two LIM motifs did not accumulate, but three or more LIM motifs accumulated at the force-bearing sites. Therefore, at least three LIM motifs are required for force-induced accumulation. Furthermore, I found that additional LIM motifs (6 or 9 motifs) had similar behavior to the normal LIM domain. These artificial LIM motifs may be used as a non-invasive force detection probe.

Pronoun Change and Voice in Shakespeare's Sonnets

Harry E. Stoddard
Sponsor: Richard Levin, Ph.D.
English

Attempts to qualify the drama of Shakespeare's Sonnets have overlooked how pronoun usage and changes construct voice and interact with other rhetorical patterns. Extending Barthes' definition of gossip in A Lover's Discourse: Fragments to an analogue in lyric, I argue that sonnets 33-35 and 138-141 address the object of desire with uniform pronoun usage except in 35, 139, and 141, where a shift from the lover's "you" to the narrative "he/she," signals a dissatisfaction with the object of love, thus distancing the beloved from the speaker as well as from him/herself. If drama consists of instructions for speaking in an assumed voice aloud to other actors, to the audience, and to oneself, whereas lyric is aligned to private, virtual speech, then the abrupt shift from the second to the third person pronoun mimics a dramatic turning inwards by which the speaker moves from participating in the lover's discourse to creating a narrative about someone. Not only does estrangement arise from the beloved's trespass or disgrace; the speaker perpetuates it through re-naming the beloved, thus making estrangement a structural and rhetorical effect.

Policy and Accountability: The National Polar-orbiting Operational Satellite System (NPOESS)

Anna J. Stolitzka
Sponsor: Kathryn S. Olmsted, Ph.D.
History

In 1994, under President Clinton's presidential directive, a tri-agency partnership between the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DoD), and the National Aeronautics and Space Administration (NASA) endeavored to construct a unified, next-generation satellite program: the National Polar-orbiting Operational Satellite System (NPOESS). Although historically, the U.S. has sponsored two different systems that have separated military and civilian objectives, President Clinton's proposal for NPOESS sought to unite the two systems to increase functionality and cost efficiency. By February of 2010, however, the program had repeatedly failed to meet deadlines, and costs had soared to $14 billion—well over the initial budget. My project encapsulates the disintegration between senior management and the engineers who worked on the frontlines of implementation, which I argue led to the program's dismantlement. My paper seeks to further uncover the challenges of NPOESS, identify policies that have created successful interagency programs, and effectively recommend a new course for satellite convergence.

Effects of Predation on Incubation Behavior in Waterfowl

Monica Stupaczuk
Sponsor: John Eadie, Ph.D.
Wildlife, Fish and Conservation Biology

The majority of research on waterfowl nest incubation has been descriptive, investigating the timing of incubation onset, incubation constancy, and nest temperature for waterfowl species nesting in North America. However, few studies have framed waterfowl incubation behavior in terms of parental investment. Females must make tradeoffs in investing in either current or future offspring, and incubation behavior provides a useful index of this tradeoff. Furthermore, predation risk has been shown to alter female investment in current offspring by reducing expected benefits. To assess the effects of predation on incubation behavior, we analyzed data collected from iButton temperature loggers, placed in Mallard and Gadwall nests on Grizzly Island Wildlife Area, CA in 2009 and 2010. To address how females respond to direct risk of predation, we compared the frequency and duration of incubation breaks before and after partial nest depredations. We found that females took significantly fewer breaks per day and increased the time spent on the nest following a partial depredation. In contrast with previous work, our results suggest that some females may invest more in current offspring following a partial depredation, perhaps in an attempt to decrease the length of time the remaining eggs are exposed to predators.

Assessing the Economic Impact State Resources Have on Immigrant Labor

Vanessa A. Suarez
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Economics

For decades the United States has been recognized throughout the world as the "Land of Opportunity," allowing immigrants to come in search of a better life. Throughout these years a highly controversial issue has been the increasing presence of undocumented immigrant workers. With the intent to drive away illegal immigrants, some states have been making several aspects of their life difficult. This paper will focus on contributing factors to immigrant labor and the economy, as well as the Mexican immigrant's ability to attain basic standards of living. This research evaluates the impact of factors such as health care, education, employment and public transportation laws on the labor market outcomes of illegal immigrants. Data will be collected from all 50 states and compared using a regression analysis. The result of this research will reveal whether the difference in policies between states impacts the economic opportunities and economic outcomes of immigrants in the state. The data collected from all 50 states will attempt to predict what the overall economic effect would be if all states prohibit immigrant labor.

The Use of Grape Seed Extract to Minimize Lipid Oxidation in Turkey Meat During Post-Mortem Storage

Lok Ting Maria Suen
Sponsor: Annie J. King, Ph.D.
Animal Science

According to the United States Department of Agriculture, over seven million tons of grapes are produced annually in the US. Often overlooked is the possible use of waste generated from grape processing. Seeds, part of the solid mass from grape processing, are a good source of antioxidants. They can be extracted and purified into grape seed extract known as concentrated tannins, which are high quality antioxidants with abundant phenolic compounds. Previous studies proved the effectiveness of grape seed extract (GSE) in minimizing lipid oxidation (breakdown of unsaturated fatty acids) in poultry meat during storage. In one study, different levels of GSE ranging from 0.5-5.0% (wt/wt) were added to turkey meat to determine anti-oxidative effectiveness. The effectiveness of GSE started to diminish when over 2.5% (wt/wt) of the antioxidant was added. The purpose of this experiment was to extend the previous work by determining the lowest effective amount of GSE that can be added to poultry meat to minimize lipid oxidation. Turkey meat with three levels of GSE added (1.0%, 0.5%, and 0.25% wt/wt) and three conditions (fresh, fresh and salted, and heated) was evaluated by SafTest methodology to determine the effectiveness of each GSE concentration at each condition.

Computer Simulations of Photoelectron Holographic Images

Xiaolan Sun
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Physics

The project of Diffractive Femtosecond Photoelectron Holography was started by the Max Planck Advanced Study Group in Germany with a goal of creating a "molecular movie" to see a real time chemical reaction. Upon reviewing the theoretical paper published by them, we have noted some inadequacies concerning the calculation of diffraction patterns which are necessary for analyzing the anticipated experimental results. Therefore, in order to investigate these inadequacies, this project aims at producing time-independent photoemission holographic images based on diffraction patterns that are believed to have been correctly calculated. The holographic images can be understood as the images of molecular structures with specific positions of each atom. These images can be obtained by performing a Fourier-Transform like procedure on a set of diffraction patterns. The holographic image of chloro-benzene, the molecule of interest in the original study, should match its known molecular structure in order to prove that the diffraction pattern used in my simulation is correct and this analysis can produce correct holographic image for any given diffraction pattern. As a result, it will be an important tool for simulating the time-dependent holographic movies and analyzing the diffraction patterns generated by the real experiments in the future.

Uncovering Novel YPK Targets via Calcineurin Signaling Networks

Riddhima Suri
Sponsor: Ted E. Powers, Ph.D.
Molecular and Cellular Biology

Target of Rapamycin (TOR) is an evolutionarily conserved protein kinase that assembles into two distinct serine/threonine protein complexes that serve to regulate temporal as well as spatial aspects of cell growth. TOR signaling is frequently deregulated in many metabolic disorders such as cancer. It is therefore a highly important pathway for the development of novel chemotherapeutic drugs. While the TORC1 pathway has been extensively studied, the signaling network for TORC2 remains elusive. A known downstream target of TORC2 is the AGC kinase YPK. While two targets of YPK have recently been found, there appear to be others yet to be identified. TOR has been shown previously to negatively regulate Calcineurin, and our lab recently linked this regulation via YPK. In light of these findings, I currently aim to identify novel YPK targets within the Calcineurin signaling network. PMC1, a vacuolar Ca2+ ATPase, regulates Calcineurin in the presence of elevated cytosolic Ca2+. PMC1 may be a putative YPK target, as it contains several motifs known to be recognized and phosphorylated by AGC kinases. My aim will be to determine whether PMC1 is a direct target for YPK in the yeast model *S. cerevisiae*.

Acetylcholinesterase is Protected by Carbamates from Inhibition by Organophosphorus Ester Pesticides

Ka Yan Michelle Tam
Sponsor: Barry Wilson, Ph.D.
Animal Science

Acetylcholinesterase (AChE) is a pesticide sensitive enzyme present in the vertebrate nervous system and mammalian red blood cells that is an important target of organophosphorus ester (OP) pesticides. The widespread use of OP pesticides as an agricultural tool against insects can be harmful to farmers and other animals. The U.S. Army uses a carbamate inhibitor of AChE, pyridostigmine bromide (PB), to help protect soldiers from military OP agents. Previous studies show that PB protects the enzyme from OP pesticide inhibition. In this experiment, it is hypothesized that other carbamates will also show protection for AChE against pesticide inhibition. Cow red blood cells (RBC) obtained from the UCD Animal Science Department dairy herd are used to study whether other carbamates will similarly protect the enzyme. The RBCs will be incubated with carbamates, such as aldicarb, carbaryl, pyridostigmine bromide, or physostigmine, and then treated with different active oxon forms of the OPs malathion, chlorpyrifos, or diazinon. The colorimetric method of Ellman will be used to measure AChE activity. The protection from carbamate is measured by comparing activity levels in the treated cells to those in appropriate controls.

Finite Element Analysis of a Concrete Canoe

Justin Tan
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Civil and Environmental Engineering

Finite element analysis (FEA) is a numerical method of structural analysis that allows engineers to simulate static and dynamic loads on a structure by breaking up the structure model into many partitions, called elements, and then solving simultaneous equations that govern each partition's strain and stress. FEA is commonly used for the analysis of complex and large-scale structures due to the computational advantage computers have when solving large sets of equations but the applications of FEA are numerous. The primary objective of this research is to utilize FEA in order to accurately simulate the dynamic response of a concrete canoe due to paddler inputs and buoyancy effects. A 3D model of the 2012 UC Davis concrete canoe was imported into the FEA program SAP2000 for structural analysis; paddler loads were modeled as time-varying surface pressures and water forces were modeled as linearly-increasing surface pressures. The results of the analysis will be vital to improving the design of the canoe as well as to develop a structurally sound concrete mix. Future studies will focus on improving the accuracy of the model by changing the support conditions and the addition of prestressing tendons and/or structural ribs depending upon the final design.

Development of Gold Nanoparticle–Embedded PDMS Composites for Multifunctional Mechanical and Chemical Sensing

Jeff J. Tang
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Civil and Environmental Engineering

Structural systems of various fields of technology (*e.g.*, civil infrastructure, aeronautical structure, and naval vessels) are susceptible to different types of damage (*e.g.*, strain, corrosion, and impact). Although many advanced sensing technologies have been developed for damage detection, they are disadvantageous for several reasons: 1) single modal sensing, 2) low flexibility, and 3) high energy demand. The objective of this study is twofold: 1) fabricating highly flexible gold nanoparticles (GNP)-embedded polydimethylsiloxane (PDMS) optical sensing composites and 2) validating multifunctional sensing capabilities for detecting strain and chemical presence. First, to embed GNPs within PDMS matrices, gold chlorides are reduced by PDMS to form GNPs, which are then dispersed using sonication. Then, thin film GNP-PDMS composites are fabricated by puddle-coating the uniformly dispersed composites on PVC disks. Lastly, multifunctional strain and chemical sensing capabilities of the GNP-PDMS thin film composites are validated using ultraviolet-visible (UV-Vis) spectrophotometer. The applied strain on the GNP-PDMS thin films can be measured by the intensity change of the light absorption by the thin film based on the Beer-Lambert Law. When a chemical is introduced to the GNPs, plasmon resonances of the chemical combined-GNPs are altered and display peak shift, signaling the presence of chemical damage.

"Ann Prepare Lavni" Haitian Creole for "Let Us Prepare the Future"

L. Carolina Tavárez
Sponsor: Linda Egan, Ph.D.
Spanish and Portuguese

Historically, Haiti's education system has been underfunded, with little (8%) government support. This project is directed at Haiti's costly Foreign Language (FL) programs and the way these interact with the Haitian economy. The plan is to train FL teachers in Barbe Pagnol and equip them with the most up to date knowledge and tools, which will provide a free, higher FL education. Two teachers will be tested on their respective language, before and after completion of the course. Teachers will apply their new knowledge in the classroom, with 30 former students as test subjects. The lessons will be filmed. Afterwards teachers will watch the videos together, offering positive critiques of one another's performance. This qualitative pilot should subsequently be implemented in Haiti. Developing the language abilities of the students now in school will improve the effectiveness of the work force later. Ideally, it will foster in students the commitment to improve communicative ability, cognitive development and cultural awareness, with the ultimate goal being job opportunities.

Space Allowance for Holstein Bull Calves Influences Innate Immune Responses After Castration

Alexandra N. Taylor
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Animal Science

The objectives of the study were to determine if space allowance in wooden hutches influences innate immune responses of Holstein bull calves after castration. Calves were randomly assigned at 4 d of age to either conventional (Cnv; 0.46 m^2 space; n=18), Medium (Med; 0.70 m^2 space; n=17), or Large (Lrg; 1.39 m^2 space; n=18) hutches. Calves were surgically castrated at 24 d. Whole blood (WB) samples were collected at -1, 1, 5, and 12 d relative to castration. All calves spent more time resting on the day of castration, but 2 d later, Lrg spent less time resting than the other calves ($P < 0.05$). The d before castration, Cnv-calves had the greatest WB-killing (WBK) of *E coli*, but 1 d after castration, WBK in Cnv-calves decreased to percentages lower than Med or Lrg calves ($P < 0.05$). The Lrg-calves had the least TNF-α from WB stimulated with endotoxin 1 d after castration ($P < 0.05$). Lrg-calves also had suppressed neutrophil oxidative burst responses compared to the other calves ($P < 0.01$). Modifying wooden hutches to the maximum space did not seem to positively influence calf innate immune function during castration, when there is a great risk of infection.

Ovipositor Development and its Effect on Fruit Susceptibility in *Drosophila suzukii, D. biarmipes*, and *D. subpulchrella*

Lisa M. Teixeira
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

While most species of *Drosophila* fruit flies lay their eggs in decaying fruit, *D. suzukii* has evolved the ability to oviposit in live unripened fruit. The innovation that distinguishes *D. suzukii* from other *Drosophila* species and makes it a global agricultural pest is an elongated, pointed, and serrated ovipositor that carries a row of sharp sturdy bristles. *D. subpulchrella*, the closest relative of *D. suzukii*, has a similar serrated ovipositor, while *D. biarmipes*, the sister species of the *suzukii* / *subpulchrella* clade, has a more typical rounded ovipositor. My research goal is to determine whether the interspecific differences in ovipositor morphology affect each species' oviposition preferences and their ability to infest live fruit. I am testing the hypothesis that the preference for laying eggs in live fruit evolved after the evolution of a serrated ovipositor. This research will help scientists and farmers determine whether *D. subpulchrella* is capable of becoming an agricultural threat similar to *D. suzukii*.

A Tall Tower Wind Analysis in California

Rolando Tejeda
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Aerospace Engineering

In their search for alternative energy, energy suppliers around the world have spurred the rapid growth of wind-energy technologies. The United States is one of the leading entities to successfully establish a large scale program of wind energy. California's position, in particular, along the coast of the Pacific allows it to take advantage of the benefits that wind energy has to offer. However, despite the leaps and bounds that have occurred in recent years, there is still room for improvement. This research will characterize wind behavior (diurnal, nocturnal, monthly, seasonal) by using non-traditional tall towers that are at least 1600 feet above ground level in order to bring about greater precision on wind impact variability and better assessment for the correlation of wind behavior versus energy production. The results can then be convey to determine whether there is anything to be gained by building wind turbine towers at greater height and if so, at what height.

Evolutionary Patterns of Centromeric Tandem Repeats in 253 Plant and Animal Species

Natalie Telis
Sponsor: Ian Korf, Ph.D.
Molecular and Cellular Biology

Centromeres attach chromosomes to spindle microtubules during eukaryotic cell division, and are therefore essential for chromosome inheritance. In many plants and animals, centromeres are characterized by megabase-sized regions of tandem repeats. Though these regions are crucial for chromosome inheritance and expected to evolve slowly, centromeric tandem repeats are among the fastest evolving regions in eukaryotic genomes. Although repeats are abundant, it is often impossible to assemble them into contiguous stretches of DNA, and thus are often omitted from published genomes. We use a mixture of first generation (Sanger), second generation (Illumina and 454) and third generation (PacBio) sequencing data to study the evolution and structure of regional centromeres in animals and in plants. To characterize sequences and further understand the evolution of the eukaryotic regional centromere we analyzed candidate centromere repeats from 253 different plant and animal species. We have confirmed previously described centromere repeat sequences and describe many new centromere sequences. We have also characterized several levels of higher order structure of centromeric repeats in many species. Centromere tandem repeats do not share any common properties, suggesting that their repeated character is the important property for centromere function.

Uncovering the Development of Hippocampal Subfields

Abbie Thompson
Sponsor: Simona Ghetti, Ph.D.
Psychology

Episodic memory, the capacity to remember the events of our lives and their associated contextual details, critically depends upon the hippocampus. The hippocampus is comprised of several sub-regions that exhibit distinct cytoarchitecture: the dentate gyrus (DG), subiculum (SB) and cornu ammonis (CA) subfields 1, 2, and 3. Research has demonstrated that the overall hippocampal volume shows little developmental change over childhood and adolescence; however, the anterior third of the hippocampus declines in volume while the posterior third increases in volume. Little is known about this change, except that there is continued myelination in several subfields across development. The aim of the current study is to understand the development of the subfields in the anterior and posterior portions of the hippocampus through MR imaging that collects high-resolution structural images, which allow for volumetric segmentation. It is expected that this study will replicate research that anterior and posterior extents of the hippocampus will show opposite developmental trends. Since this is an initial survey of hippocampal subfield development, few a priori predictions can be made. This research will provide insights for future examinations on the functional implications of these developmental changes on memory.

The Education Divide: A Case Study of At-Risk Youth, Education, and Community

Alycia Thompson
Sponsor: Kali Trzesniewski, Ph.D.
Human and Community Development

The North Roseville R.E.C. Center is an after-school program and family services center for at-risk youth. Through the design and implementation of a tutoring program, this research sought to improve the low academic achievement prevalent among attendees of the R.E.C. Center, as well as to assess the greater relationship the youth had with education and their community. Overall, in over two hundred occurrences the program helped fifty K-12 students with their school work. Additionally moderate positive changes in behavior were seen, as well as heightened interest in education. However, tutoring alone proved not to be enough as the environmental and social stressors the students were experiencing were inhibiting their abilities to focus their mental and emotional energy on education. Therefore, the scope of the research was forced to grow larger and include providing socio-emotional support through connection with the school district and outside social services. To measure the results of the research mixed methods were employed, including recordings of observations and interactions made by the researcher, staff, volunteers, and tutors; student evaluation surveys; collection and analysis of data related to the background of students in the study; and a review of topical journal articles and books.

Simulated Photon Yields of WIMPs in the LUX Detector

Daniel P. Thorngren
Sponsor: Mani S. Tripathi, Ph.D.
Physics

From measurements of gravity, there appears to be a substantial amount of previously unobserved mass in the universe, called dark matter. The leading hypothetical description of dark matter is that of weakly interacting massive particles (WIMPs). These particles would not interact in most of the usual ways, but would still be able to exert a gravitational pull, so it is important to determine their mass. They would, on rare occasion, collide with the nuclei of normal atoms, transferring energy. Detecting these collisions is the purpose of LUX, the Large Underground Xenon Experiment. LUX is essentially a tank of liquid xenon about a meter in depth, which has sensitive cameras called photomultipliers (PMs) at its top and bottom. Particle interactions in the detector cause scintillation (production of light) and knock electrons off of nuclei. These are then detected by the photomultipliers for analysis. Using the particle physics simulation program LUXSim, I have made estimations of the quantity of light produced per WIMP for a range of masses. It is seen that the average produced light from a single WIMP ranges from hundreds of photons on average for WIMPs of ~1000 GeV to less than one photon for WIMPs of <10 GeV.

"It Is Better to Light a Candle Than to Curse the Darkness:" How Has Amnesty International Transformed Grassroots Human Rights Advocacy?

Hannah Tigerschiold
Sponsor: Keith Watenpaugh, Ph.D.
Religious Studies

From its roots in enlightenment ideas, to present day UN intervention and NGO activity human rights has gone from being a little understood concept to a primary aim in modern international society. Amnesty International is one of the oldest and largest Non-Governmental Organizations devoted to the promotion and protection of human rights globally. I argue that the unique structure of this organization, with its individual focus, has transformed human rights advocacy from the activity of lawyers and government officials, to the work of conscientious individuals from across the world. Advocating human rights is no longer reserved exclusively for those with power, and can now be performed by any literate individual with access to Amnesty's message. The success and growth of Amnesty is undeniable and in an age of new rights advocacy, where economic, social and cultural rights are increasingly important, Amnesty International has evolved its campaigns in line with changing norms. This broadening of scope overlaps with the missions of established NGOs, and potentially alienates some of Amnesty's original supporters. Amnesty has certainly transformed grassroots human rights advocacy, but its role in the future evolution of human rights remains to be seen.

Achievement Motivation and Mortality Salience: Differences by Independent and Interdependent Self-Construal

Madison K. Titone
Sponsor: Cynthia L. Pickett, Ph.D.
Psychology

In psychology, the mortality salience hypothesis of terror management theory posits that inducing mortality salience will result in increased cultural worldview defense, but there is little research on the effects of mortality salience on achievement motivation. In the current research, it was hypothesized that inducing mortality salience would polarize achievement motivation type (collective vs. individual) depending upon self-construal, such that individuals high in independence would become more motivated to achieve individual goals when primed with mortality salience and individuals high in interdependence would become more motivated to achieve collective goals. Participants were randomly assigned to a mortality salience prime or control prime condition and their achievement motivation for collective and individual goals was assessed. A significant three-way interaction between mortality salience, achievement type, and self-construal revealed that among control participants individual achievement motivation increased as levels of independence increased, and collective achievement motivation increased as levels of interdependence increased. However, rather than exacerbating these effects, mortality salience tended to reverse them. The implications of this finding and possible confounds to the current study are discussed.

Search for NMSSM Higgs Bosons at the LHC

Kyle M. Tos
Sponsor: Maxwell Chertok, Ph.D.
Physics

It is an exciting time in physics today due to the research being done at the Large Hadron Collider in Geneva, Switzerland. The experiments are pushing the mass reach daily and searching for the Higgs boson in ways previously impossible. By using Madgraph, which is a Monte Carlo based event generator for collider processes in particle physics, I have analyzed a theoretical model that is generating great interest presently. The model I am looking at is NMSSM (Next to minimal supersymmetric standard model) Higgs production and decay. By using the software packages Madgraph, Root, and ExRootAnalysis, I have analyzed supersymmetric Higgs models, using kinematic selections, geometric selections, and algorithms, that are directly useful and related to current research in the field. The goal of my research is to improve the signal retention and background rejection for this exotic signal, which will either result in the discovery of new physics, or, if we do not observe significant discrepancies in data with respect to background predictions, allow us to set maximally stringent limits on these phenomena.

The Circadian Clock Regulates Plant Growth Response to High Temperature Pulses

Huy D. Tran
Sponsor: Julin N. Maloof, Ph.D.
Plant Biology

Temperature is an important environmental factor in plant development. However, the interaction of plant growth and temperature is not well understood because most prior research has been performed under constant temperature. My research focuses on the effect of temperature on the plant circadian clock and cell elongation in Arabidopsis. In order to investigate temperature regulation of growth, I am studying the changes in plant growth rhythms of two different ecotypes (Col and Ws), three transgenic overexpression lines (*CCA1-OX*, *PIF4-OX*, and *PIF5-OX*), and the double mutant *pif4_pif5*. I used time-lapse photography and diurnal manipulation to examine growth rhythms and circadian clock interactions. I found that under low/high temperature pulses (4 hours at 19°C: 4 hours at 28°C), peak growth in wild-type and *PIF4/5-OX* occurs once every 24 hours. My data shows that the clock gates plant growth response to temperature pulses, suggests that heat could regulate PIF4 and/or PIF5 proteins to induce elongation and the circadian clock controls the temperature signaling in *PIF4/PIF5-OX*. Future experiments include testing the effect of a single heat pulse on plant growth at different times of the day, using western blots, and performing QRT-PCR

Sustainable Fashion: Bridging Zero-Waste Clothing with Architecture

Helen X. Trejo
Sponsor: Ann Savageau, M.F.A.
Design

While the current fashion industry encourages mass production, consumption, and the rapid disposal of clothing, zero-waste is a branch of sustainable fashion that strives to eliminate waste from the production stage. The purpose of my study is to propose effective ways of maximizing no waste design strategies by combining sustainable fashion theory with creative practice in a zero-waste collection. I studied historical no waste techniques such as hand-weaving, patterns of traditional garments from around the world, and the work of current zero-waste designers Timo Rissanen and Holly McQuillan. My collection is inspired by sentimental architecture, the home my father built for my family in Los Angeles. By comparing the protective purpose of clothing to the protective purpose of a home as first degree cover and shelter, my unique zero-waste collection aims to expand the purpose of clothing as durable goods constructed for prolonged use. My goal is to convey that clothing and its use parallels the significance and functions of a home. Hand-embroidery, natural dyeing, and laser cutting give greater value to excess fabrics and recycled polyester. With my creative collection, I am contributing to the emerging field of zero-waste and helping re-define what sustainable fashion is.

Expanding the Do-It-Yourself Movement in Fashion: Natural Colorants on Clothing

Nidia K. Trejo
Sponsor: Susan Avila, M.F.A.
Design

Environmentally-benign and socially responsible methods of textile coloration are currently not widespread. The textile dye industry widely uses synthetic dyes because the dyes allow for the mass production of colored textiles and a variety of colors. However, synthetic colorants pose an environmental risk because they may generate toxic fumes that pollute the air and waste water run-off that contaminate masses of water. Additionally, synthetic colorants create a health risk to dye applicators. With my research I introduce a modest solution to the health dangers posed to humans and the environment since the discovery of the first synthetic dye in the mid-19th century. I am creating a fashion collection using naturally abundant colorants, derived from fruits, vegetables, and herbs. I integrate the light, soft, feminine essence of flowers in the silhouettes of my designs to follow the organic colors I achieve. With this collection I intend to promote safe dye practices, broaden public awareness about easily accessible colorant resources for home use, and contribute to the sustainable, empowering, Do-It-Yourself movement.

Mitochondrial DNA Analysis of *Nathalis iole*: Population Histories of Intercontinental Range Expansion During the Great American Interchange

Andrew Tremain
Sponsor: Arthur Shapiro, Ph.D.
Evolution and Ecology

Understanding the distribution of related taxa across time and space is a major goal of biology. The enigmatic biogeography of the butterfly genus *Nathalis*, basally rooted in the sulphur butterfly subgroup *Coliadinae*, has raised considerable interest in the past. *Nathalis iole* has a dichotomous distribution spanning contrasting biomes, North American lowlands and Columbian alpine. The only other member of *Nathalis* is *N. plauta*, found in the Andes. I am analyzing the genetic variation of the mitochondrial genome across North and South American *N. iole* and comparing the diversity to the out-group *N. plauta*. I expect the diversity of North American *N. iole* to nest within that of South American *N. iole*, diagramming the founder population that moved north from South America during the Great American Interchange 3 MYA. The disjunct distribution of *N. iole* is hypothesized to have resulted from geologic events, namely the formation of the Isthmus of Panama, and climate change during the Pleistocene and Holocene. Understanding how organisms adapt to such changes in their physical environment, both by range changes and by genetic changes (i.e., evolution) helps us understand how current and accelerating global change is likely to impact the biosphere.

Differentiating Clinical Grade Stem Cells to Functional Hepatocytes

Artem Trotsyuk
Sponsor: Mark Zern, M.D.
Internal Medicine

The demand for livers for liver transplant and the shortage of liver donors has increased in the last decade. Alternative clinical therapies are being developed. One such alternative is the transplantation of hepatocyte-like cells that might replace whole organ transplantation. The present study involves the differentiation of human embryonic stem cells (hESC) along a hepatocyte lineage and their transplantation into *in vivo* models, including mice and non-human primates. I am testing a hypothesis that a more refined protocol will produce relatively homogeneous cell populations from hESC, demonstrating the phenotype of mature primary human hepatocytes. Preliminary results demonstrate that hEH closely resemble hPH in their ability to express liver-specific genes. This is evident through quantitative reverse transcriptase -polymerase chain reaction (qRT-PCR) analysis of mRNA levels, ELISA analysis of albumin protein in the media and flow cytometry sorting of albumin positive cells. Additionally, a visual examination of the hEH with indocyanine green staining demonstrates that the hEH are functioning in both cellular uptake and secretion, closely resembling hPH. A successful differentiation protocol produced functioning hepatocytes from hESC. Cellular analysis supports the hypothesis that a more refined protocol will produce a more homogeneous population of hEH resembling mature hPH.

Investigation of the $[4Fe\text{-}4S]^{2+}$ Coordination Sphere in the DNA Glycosylase *AfUDG*

Aisha D. True
Sponsor: Sheila S. David, Ph.D.
Chemistry

One of the most common DNA mutations is the deamination of cytosine to form uracil. Uracil, which is not a normal DNA base, leads to a transition mutation from a C-G base pair to a T-A base pair if it is not removed. Uracil DNA glycosylases (UDGs) recognize and remove the uracil base, leaving an abasic site so other enzymes in the base-excision repair (BER) pathway can insert the correct base. Family 4 UDGs contain an iron-sulfur cluster, held in place by four cysteine ligands, which helps maintain the active site's structure. In a family 4 UDG in *Archaeoglobusfulgidus* (AfUDG), these cysteine ligands were altered one at a time to alanine, histidine, or serine using site-directed mutagenesis to evaluate how changes in cluster coordination affect stability and activity of AfUDG. The rate of glycosidic bond cleavage by mutated forms of AfUDGwas measured under single-turnover conditions to determine the effects quantitatively. Preliminary results suggest that while some alterations affect enzyme stability, they have varied effects on enzyme activity. This suggests that the iron-sulfur cluster cofactor plays a more involved role in damage recognition and catalysis, minimally by affecting enzyme stability, and potentially through alterations in DNA binding interactions.

The Role of Argin/MuSK Signaling and Gene Expression on Neuromuscular Junctions

Sarah T. Truong
Sponsor: Michael J. Ferns, Ph.D.
Physiology and Membrane Biology

Neural control over muscle contraction is mediated by synaptic connections between motor neurons and skeletal muscle fibers called neuromuscular junctions. These are highly specialized structures,with neurotransmitter release sites in the presynaptic nerve terminal being precisely aligned with aggregates of the transmitter receptor in the postsynaptic muscle membrane. Our laboratory studies a signaling factor called argin that directs the formation of this synapse, and hypothesize that it acts in part by inducing the expression of synaptic genes in specialized nuclei in the muscle fiber. In a previous gene array gene, they identified genes that may be up- or down- regulated in argin-deficient muscle compared to wild type muscle. We are validating some of these genes using RT-PCR. This involves isolation of mRNA from muscle cells or tissue, reverse-transcribing the mRNA into cDNA, PCR amplification using gene-specific primers. We have established PCR conditions for each candidate gene transcript. Recently, we are testing whether the genes are expressed in cultured muscle cells and if they are up- or down- regulated in argin-deficient muscle. Any genes identified in this way are good candidates to contribute to the formation and function of the neuromuscular junction.

Brucella flagellin Fails to Induce Pyroptotic Cell Death *In Vitro*

Alan Tubbs
Sponsor: Renee Tsolis, Ph.D.
Medical Microbiology & Immunology

The recent discovery of pyroptosis, a novel form of cell death, has opened a new field of inquiry in to how mammalian cells detect and respond to intracellular pathogens. Central to this new understanding are inflammasomes, multi-protein complexes dominated by the Nod-like Receptor (NLR) gene family. Inflammasomes represent one arm of a cell's innate response to infection, regulating cytokine production and cell death via the cysteine protease Caspase-1. It is believed that pathogen associated molecular patterns (PAMPs) like flagellins and PrgJ are responsible for activating Caspase-1 via NLRC4. While this is true for most intracellular pathogens, such as *Salmonella typhimurium* or *Legionella pneumophila*, others have evolved to suppress or avoid caspase activation, like *Brucella abortus*, the etiological agent of Malta Fever. We constructed flagellin chimeras using *fliC* sequences from both *S. typhimurium* and *B. abortus*. These hybrid proteins, in addition to full length versions from *B. abortus* and *L. pneumophila*, were expressed in immortalized macrophages in order to assess whether *B. abortus* flagellin was cytotoxic. We establish that FliC from *B. abortus* does not induce pyroptosis *in vitro*.

Parent-Infant Synchrony: A Quantitative Definition of Early Childhood Social Interactions

Andrew S. Tubbs
Sponsor: AJ Schwichtenberg, Ph.D.
Psychiatry

Synchrony, the temporal relationship in parent-infant social interactions, is a critical construct for predicting development throughout early childhood. Synchrony is preceded by matching biological rhythms between infants and caregivers, and evolves into higher level coping mechanisms and symbolic play. Evaluation of synchrony, however, has been difficult because there is no standard system by which parent-child interactions are rated. In the present study, we attempted to define a quantitative index of synchrony. Twenty one-year-old children and their mothers were selected and qualitatively segregated into two categories of synchrony, good and poor, based on a three minute play session. These dyads were then micro-coded using the Noldus behavior coding system for gaze, positive and negative affect, and vocalization. We plan to analyze specific combinations of codes, based on previous research, to quantify synchrony in these dyads. By quantifying synchrony, our research may provide a tool for future studies, interventions and clinical assessments.

Creative Process in Contemporary Arts

Allison R. Tzeng
Sponsor: Robin Hill, B.F.A.
Art Studio

Our contemporary arts class focused on developing individual creativity in various art forms, branching into a diverse array of media such as wire sculpture, ink drawings, and gouache paint. We took inspirations from many sources in order to effectively harness the creative process; the class participated in field trips to the Crocker Art Museum as well as the de Young Museum to compose narratives on the art exhibits. The UC Davis arboretum also became a source of inspiration for the sculpey and wire project, during which we had to replicate a geometric shape from nature. Outside of the art projects, the class assembled every Sunday evening in order to watch educational movies regarding well-known artists, ranging from Vic Muniz, Richard Tuttle, to renowned art collectors Herb and Dorothy. The class culminated in the completion of five main projects: an ink-and-butcher paper map of our lives, an illuminated manuscript, a sculpey and wire sculpture, a modpodge-assembled collage, and a body-themed individual project.

Caravaggio's Break from Tradition in His Imagery of John The Baptist

Cristina I. Urrutia
Sponsor: Diana Strazdes, Ph.D.
Art History

As a Baroque artist working during the religious fervor of the Counter-Reformation, Caravaggio created a series of paintings all featuring St. John the Baptist. Traditionally, images of saints were depicted with attributes that allowed saints to be easily identified by worshippers. Caravaggio breaks with this tradition by modifying or even eliminating these attributes to show St. John as an ambiguous figure. The artist chooses to break with this traditional representation of St. John through a modern method: he borrows the nude poses from the Renaissance artists Michelangelo and Leonardo da Vinci, but removes them from their original context and adapts them for his own meaning. Caravaggio's unconventional representations also depict the saint in a solitary state in quite meditation, reflecting the artist's idea that salvation is an internal reflection that must be accomplished silently and alone. Throughout the multiple versions of St. John the Baptist, Caravaggio presents the saint not as a divine figure but as a common soul whose suffering is parallel to the suffering of Christian worshipers.

Can Search Engine Count Data Reveal Shortcomings in Primate Research?

Eric K. Van Cleave
Sponsor: Andrew Marshall, Ph.D.
Anthropology

The Internet allows users to access vast amounts of information through public search engines. Previous studies have used search engines to infer the amount of information and human interest in a topic by measuring the number of search results reported for a given query. Studying information patterns in this way can assist primate conservation efforts by allowing us to identify biases in primate research. In this study, we recorded search results obtained from the Google and Google Scholar search engines to estimate the total amount of information, scholarly information, and academic publications available on the web for each primate species. We then compared these results with each species' IUCN threat status to identify taxa that are understudied in relation to their extinction risk. These conclusions can inform conservation efforts in two ways. First, we propose that research and funding be directed to those taxa that are understudied in relation to their extinction risk, especially when we have identified a strong bias against a taxon or region. Second, search engine count results can reveal patterns of human interest that may contribute to the ongoing debate about using primate species to attract attention to conservation causes.

Specific Binding to Extracellular Matrix Affects Cartilage Growth Factors

Victoria T. Van Dinh
Sponsor: Dominik Haudenschild, Ph.D.
School of Medicine

Cartilage oligomeric matrix protein, or COMP, is a 524 kDa extracellular matrix protein located in cartilage, ligaments and tendons. COMP is an important component of the extracellular matrix and interacts with collagens, aggrecan, matrilins, fibronectin and other components of cartilage extracellular matrix. COMP expression is activated by transforming growth factor beta 1 (TGFβ1), which is an effective inducer of chondrogenesis. Our earlier studies showed that COMP binds to TGFβ 1 and that binding to COMP enhances the activity of TGFβ 1. The purpose of this study is to expand this observation to other growth factors important for cartilage. We are testing the binding of COMP to additional growth factors and will study the influence of this binding on cell proliferation and chondrogenic differentiation. We have purified recombinant COMP to near homogeneity by Nickel-NTA agarose affinity chromatography and conducted solid-phase binding ELISAs to investigate the binding of soluble COMP to TGFβ 1. We confirmed that COMP binds TGFβ 1 in a dose-dependent manner, maximally at a concentration of around 4.6 nM COMP, and we are currently investigating the binding of COMP to bone morphogenetic protein 7 (BMP 7) and fibroblast growth factor (FGF).

Potentials for Community and Interdisciplinary Outreach via Practice-as-Research

Mitchell R. VanLandingham
Sponsor: Bella Merlin, Ph.D.
Theatre and Dance

The centerpiece of this research will be a production of the musical *Rent* as practice-as-research. This research will determine the possibility of making such a canonized theatrical work socially relevant to new audiences. I hypothesize that this is possible, if *Rent* is performed so that it directly addresses its pressing issues, buoyed by its popularity, much the same way that Brecht used familiar stories in his plays to act as vehicles for socially important ideas. For the interpersonal community, *Rent's* character-subjects (i.e., the LGBT community, people with HIV/AIDS, and other stigmatized groups) face the same stigmatization today as when the piece was created. Furthermore, UC Davis has recently been the setting of hate crimes against marginalized groups, showing the necessity of *Rent's* message in an academic setting. Research will be conducted through various ways: documenting the artistic process; conducting fora after performances between the creative team and audiences; and hosting a public symposium, where experts in theatre, gender studies, and medicine can discuss the piece's interdisciplinary reach. This presentation will offer period and contemporary context for *Rent*, hypotheses about interpretation possibilities, and literature reviews supporting those hypotheses, with plans for presenting further findings after *Rent's* performance in May 2012.

The Role of Living Cells in Maintaining Water Transport Processes in Plant Xylem

Jennifer A. Vergara
Sponsor: Andrew McElrone, Ph.D.
Viticulture & Enology

Water is transported from plant roots to leaves via the xylem, a complex vascular tissue that conducts water and nutrients. Xylem contains conduits (i.e. hollow tubes that are dead at maturity) and living parenchyma cells that help maintain the functioning of water transport capacity in the xylem. The flow in xylem conduits can be obstructed by vascular pathogens, tyloses (balloon-like parenchyma cell outgrowths that fill conduits) or air bubble accumulation called embolism that forms when the plant is under stress. In this study we will investigate how living parenchyma cells "decide" to repair embolism or to terminate the function with tyloses when subjected to a variety of stressors. We will utilize the following three methods to evaluate the molecular mechanisms underlying these responses: high-resolution computer tomography, the laser capture micro dissection and RNA sequencing. Upon completion, we expect to obtain molecular signatures from the parenchyma cells that underlies the response of the cells.

Decellularized Liver Matrix as a Biological Scaffold for Fetal Hepatocyte Transplantation

Akshita Verma
Sponsor: Jian Wu, Ph.D.
Internal Medicine

Primary hepatocyte transplantation is an alternative approach in the treatment of liver failure. Decellularized liver matrix (DCLM) is a biological scaffold from which a new functioning liver is proposed to be built. With limited organ donors available, this technique acts as an alternative by creating a functional scaffold rich in extracellular matrix (ECM), capable of retaining hepatic function upon recellularization. The purpose of this research is to continue our past studies on decellularizing mouse and rat livers and to assess the plausibility of using DCLM as a scaffold for hepatocyte transplantation. We decellularized rat livers by perfusion through the portal vein with detergents including SDS and Triton-X100 to wash away cellular components. Additionally, we performed an immunohistochemical staining analysis to determine the maintenance of ECM components (collagen IV, laminin and fibronectin). Recellularization of the liver was then conducted using human fetal hepatocyte cells (FH). Our results presented a liver scaffold completely stripped of its cellular components, while retaining its ECM. Our study is still in process regarding the retention of functional hepatocytes in DCLM, however, past studies have confirmed that the DCLM is a perfect environment for FH. Thus, this technique is considered as a plausible approach for tissue engineering.

Effects of Smoothing Methods on Diffusion Tensor Magnetic Resonance Imaging in Aging Brains

Varsha Viswanath
Sponsor: Owen T. Carmichael, Ph.D.
Neurology

Diffusion tensor magnetic resonance imaging (DTI) is a method for measuring the integrity of axon fiber tracts that connect disparate brain regions into distributed cognitive networks; however, DTI has low signal-to-noise ratios (SNR), necessitating the use of smoothing algorithms to enhance SNR. A variety of smoothing techniques have been developed, but it is unclear whether smoothing has any impact on the study of brain aging, specifically, on axon tract degeneration that occurs late in life. Further, no guidance exists about which smoothing methods best elucidate these changes. We smoothed DTI images from 154 older adults using three smoothing methods hypothesized to have complementary strengths: Affine and Log-Euclidean smoothers best enhance highly organized tracts, while Euclidean smoothers clean up background regions. Results show that smoothing increased the strengths of expected associations between DTI data and clinical variables such as age, cognitive function, and the diagnosis of dementia. However, no particular smoothing method was uniformly superior in strengthening these associations, possibly due to their complementary noise removal advantages. This data suggests that DTI smoothing enhances studies of brain aging, but further research is needed to determine which smoothing technique is optimal.

Investigation of the Correlation Between the Structure and Magnetism of Lanthanum-Based Oxides

Chi Hieu L. Vo
Sponsor: Yayoi Takamura, Ph.D.
Chemical Engineering and Materials Science

Complex oxide thin films using antiferromagnetic (AFM) materials such as the (La,Sr)FeO_3 family of perovskite oxides are crucial in driving the innovation of recording and storage media. It is primarily important to be able to control the interfacial and internal interactions between layers in order to dictate the properties. Specifically, in this study multilayered films of $La_{0.5}Sr_{0.5}TiO_3$ (LSTO) and $La_{0.7}Sr_{0.3}FeO_3$ (LSFO) of thin (3 unit cells) and thick (6 unit cells) repeat units were grown on varying substrates using pulsed laser deposition with similar growth conditions. Nondestructive x-ray diffraction techniques were used to characterize the epitaxial quality of the layers. Particularly, reciprocal space mapping allowed identification of the strain state and x-ray reflectivity provided an estimation of the thickness and interfacial roughness of the films. More comprehensive AFM measurements using synchrotron radiation allowed us to make judgments on the spin axes and domain structures. Engineering of the lattice strain on multilayered films using certain substrates imparts distinctive characteristics on the material as a whole.

Waiting for Technology: Futurism's Plans Examined Against Its Products

Erin Vong
Sponsor: Diana Strazdes, Ph.D.
Art History

In the early 20th century, Futurism began to take hold across Italy. This avant-garde movement of art and literature emphasized the importance of moving forward and testing the boundaries of not simply aesthetics but every aspect of life. It has been the focus of much interest among historians of art and architecture due to the forcefulness of the ideas that its adherents promoted. In a country that took great pride in its lengthy and bountiful history, here were members of its society that shook off the past in preference for the unseen future. But with their grand ideas for technology that did not yet exist, how could they represent these concepts in their art? Architects like Antonio Sant'Elia approached this contradiction by drawing up cities that were never built, while Umberto Boccioni molded unique shapes into his sculptures. These two artists set out to create images of the future while relying on materials of the present. Using their manifestos, as well as close examinations of their work, I intend to unravel the connection—or disconnect—between Futurism's intent and the art it produced.

LHRH Ligand Facilitates the Targeted Drug Delivery of Micellar Nanoparticles to Breast Cancer

Michael N. Vu
Sponsor: Kit S. Lam, M.D., Ph.D.
Biochemistry and Molecular Medicine

Micellar nanoparticles present a promising system of delivering chemotherapy drugs to tumor sites while reducing adverse side effects. We have recently reported a novel disulfide cross-linked micelles (DCMs) drug delivery system with minimal premature release of the loaded drugs. Here we attempt to further improve the targeting specificity of this delivery system for the treatment of breast cancer. Breast cancer cells have been proven to overexpress luteinizing hormone-releasing hormone (LHRH) receptors. We hypothesize that conjugating the DCMs with LHRH peptide ligands will facilitate the specific targeting of DCMs to breast cancer cells. The binding specificity and cellular uptake of the LHRH conjugated DCMs (LHRH-DCMs) to the MDA-MB-231 human breast cancer cell line were determined by the confocal microscopy and flow cytometry, respectively. Further *in vitro* cytotoxity studies were conducted by treating cells with LHRH-DCMs loaded with the chemotherapy drug paclitaxel (PTX). Results have shown improved *in vitro* anti-cancer activity of PTX loaded LHRH-DCMs when compared to non-targeted DCMs. Studies involving *in vivo* biodistribution, tumor targeting and therapeutic efficacy of PTX loaded LHRH-DCMs in the breast cancer xenograft mouse model are in progress.

In Vivo Cytotoxities of Novel Amiloride Congeners in Their Treatment of Intracerebral Glioma in a Xenograft Model

Thanh Vu
Sponsor: Fredric Gorin, M.D./Ph.D.
Neurology

Malignant gliomas (brain tumors) proliferate and infiltrate the surrounding brain tissue following treatment with surgery, radiation therapy, and chemotherapy and contain proliferating and non-proliferating cancer cells that can reactivate the cell cycle. Conventional anticancer treatments lack the cytotoxic mechanisms to target gliomas in cell cycle arrest, which is one reason why some glioma cells circumvent current treatments. Thus, there is considerable need for research to develop new therapeutic agents that prevent glioma recurrence by targeting glioma cells which have undergone cell cycle arrest. Previous experiments have shown that the drug amiloride, is selectively cytotoxic to proliferating and non-proliferating gliomas. The lab group has used human glioma cell lines to identify novel small molecules that are more potent than amiloride. The most efficacious compounds will be tested in our intracerebral glioma xenograft mouse model to determine *in vivo* efficacies. I am testing whether these lead compounds are effective treatments against human gliomas using a mouse intracerebral xenograft model. Initial results indicate that one of our amiloride derivatives delays glioma growth by several days.

A Sustainable Schoolyard: Reviving Agriculture Stewardship and Fostering Healthy Youth Development

Choua Vue
Sponsor: Patsy E. Owens, M.L.A.
Environmental Design

Schools in poor urban neighborhoods are plagued with physical and environmental deterioration, limited access to resources for youth development, and lack safe places for recreation. School gardens have the potential to positively engage youth in relationship and interpersonal skill development while mobilizing them to enhance environmental awareness and appreciation. This research project proposes a design for a green space at Luther Burbank High School to promote constructive activities that can provide interdisciplinary education enrichment for classroom instruction and foster developmental assets through agriculture stewardship. Data collection from interviews with school administrators, instructors, and student leaders provide background on the school's academic culture, student population profile, and assists in identifying two main functions for the garden: firstly, garden areas for supporting academic endeavors and enrichment; secondly, recreation areas for outdoor gatherings and retreat. Existing climatic conditions and inventory of plantings, structures, and utilities is assessed. This data is evaluated to determine opportunities and constraints for a conceptual design. Development of a sustainable design will provide various benefits for food, education, life skills, and recreation through garden features that contribute to the physical and mental wellness of urban youths.

Effects of Unions on California Agriculture: 1990-2010

Robert K. Wagner
Sponsor: Philip L. Martin, Ph.D.
Agricultural and Resource Economics

Between 1990 and 2010, value of California fruit and nut, Vegetable and melon, and horticultural specialty crops such as mushrooms and flowers increased $12.551 billion, more than doubling, from $10.574 billion to $23.125 billion. Average hourly earnings of hired field workers in California rose from $5.84/hour in 1990 to $10.10/hour in 2010 for a total increase of 73%. This thesis examines the impacts of unions on California fruit, vegetable and horticultural agriculture as well as on worker wages using a combination of union reports, government reports, and personal interviews with growers who currently have or have had union contracts. Evidence shows that union impacts are declining because of decreased union membership due to the fact that California farm worker unions are unable to create enough value for their members. United Farm Workers dues are 3% of gross income, while their contracts often do not create enough benefit to cover this cost. In addition, the impact is declining because growers are treating their workers better and they are increasing their use of farm labor contractors.

The Falsity of Social Structure in Sophocles' *Oedipus* Tragedies

Winona E. Wagner
Sponsor: Scott McLean, Ph.D.
Comparative Literature

Known as the paragon of ancient Greek tragedy, Sophocles' interpretation of the well-known myth of *Oedipus* goes beyond the story's obvious lesson concerning the acceptance of one's fate and warning against attempts to escape destiny. Over the course of *Oedipus Rex* and *Oedipus at Colonus* - his two plays on Oedipus - Sophocles emphasizes Oedipus' being cast out of the network of socially constructed society and plunged into the wildness of untamed Nature. Through binary images such as light/dark, urban/natural, and blind/sight Oedipus' expulsion from society is depicted as a movement from artificially structured falsity to stark reality and truth. The constant underlying tones of truth versus artificiality found in these plays illuminate their assertion that human society is an artificial construct and that truthful reality is only found through an abandonment of that construct, which is so often used as a distraction from the harsh but true reality of the natural world.

Excitatory Response of Histamine in Hamster Hippocampal CA1 Cells is Not Mediated by H1 Receptors

Alaha Wahab
Sponsor: Barbara A. Horwitz, Ph.D.
Neurobiology, Physiology and Behavior

Previous research indicates that histamine (HA), a neuromodulator in the brain, has excitatory effects on hippocampal neurons of Syrian hamsters (*Mesocricetus auratus*), providing neuroprotection against ischemic damage. Furthermore, it has been demonstrated that HA primarily exerts its effect on CA1 pyramidal cells by increasing population spike amplitudes (PSAs) and decreasing the latency period. We hypothesized that HA mediates these effects through the H1 receptor pathway. To test this, PSAs were recorded every minute throughout the experiment with a glass recording electrode placed in the CA1 pyramidal cell layer of hippocampal slices while stimulating Schaffer collateral/commissural fibers. The protocol was divided into seven phases, each lasting 15 minutes, with the perfusate being oxygenated cerebral spinal fluid (Ox-aCSF): (1) Ox-aCSF, (2) Ox-aCSF + H1 blocker (pyrilamine, 20 µM), (3) Ox-aCSF, (4) Ox-aCSF + HA (10 µM) + H1 blocker, (5) Ox-aCSF, (6) Ox-aCSF + HA, (7) Ox-aCSF. The data showed that HA increased PSA and decreased latencies and the addition of pyrilamine did not prevent these changes. These results suggest that HA response is not mediated by H1 receptor, thereby negating our hypothesis. Further studies will be focused on examining the effects of H2 and H3 receptor blockers on the histamine response.

We Are the 99 Percent: A Look at the Linguistic Landscape of the Occupy Movement

Jim Walker
Sponsor: Robert Bayley, Ph.D.
Linguistics

The field of linguistic landscapes is traditionally concerned with the use of written language in multilingual settings. This includes virtually all forms of written language that one can find in an urban setting including billboards, store signs, street signs and protest signs. One of the most visible forms of written language in the urban sphere is the plethora of protest signs found in large public demonstrations. In this paper I want to extend the theory of linguistic landscapes to examine the use of written language in protest movements, specifically the occupy movement. My question is how does the Occupy Movement appropriate public space and use language to promote their message? Does their message change with the location of the protest? And if so does this change in location and message affect the language of the protest? This study would focus on three cities, New York, Davis, and Oakland. To conduct an analysis of these three cities, I will focus on written and spoken words, images, and video. I believe that due to the leaderless nature of the Occupy movement, each city will have similar goals but distinct manners of expressing them.

The Effects of Telomere Structure on Nuclear Architecture During Meiosis

Kelsey Walters
Sponsor: Sean Burgess, Ph.D.
Molecular and Cellular Biology

In meiosis, cells undergo DNA replication and two rounds of division, allowing diploid organisms to form haploid gametes or spores. In the first division, homologous chromosomes pair and segregate from one another. Defects in segregation result in nondisjunction, leading to aneuploidy, a major cause of human birth defects. During meiotic prophase, telomeres attach to and cluster at the nuclear envelope in a configuration called the bouquet. Ndj1 is a protein required for telomere binding to the nuclear envelope. Our laboratory recently found that Rif1, a structural component of telomeres, co-purifies with Ndj1, however, loss of Rif1 shows no effect on meiotic progression or decrease in spore viability. My goal is to understand how telomere structure contributes to bouquet formation using the budding yeast, *Saccharomyces cerevisiae*. Rif1 and Rif2 genetically interact with each other and synergistically function to maintain proper telomere length and structure. I will test the hypothesis that either the *rif2*Δ single mutant and/or the *rif1*Δ*rif2*Δ double mutant will affect bouquet formation and phenocopy *ndj1*Δ. To assay this I will look at spore viability, meiotic progression, and fluorescently tagged telomeres to see if they form the bouquet. I expect that altering telomere structure will disrupt bouquet formation.

Location-Based Wiki for Davis, CA

Jason Wang
Sponsor: Raju Pandey, Ph.D.
Computer Science

The thesis will explore multitier applications using both mobile and web technologies. The canon for this exploration will be the development of a mobile application, a collaborative, crowd-sourced location-based wiki for Davis, CA. The project will deal with such complexities as: developing and designing native mobile applications (e.g. for iOS, Windows Phone, etc.) with several features, developing and scaling a web service to communicate with multiple platforms, human-computer interaction, in addition to persistent shared storage and all issues encountered in the development of such systems (concurrency, performance tuning, ranking algorithms, testing, scaling, caching, etc.). Features of the applications should include: editable shared maps, editable shared location data (including photos, which can be uploaded and downloaded by users), allowing users to filter what data is displayed (e.g. just coffee shops, veterinary clinics, etc.), intelligent display of data given the users zoom level on the map (ranking), the ability to see multiple past versions of the location data and restore past versions with the click of a button, and location voting. Further, the application will attempt to make use of currently available location data for Davis, CA, from such sources as the Davis Wiki, SimpleGeo, Wikimapia, and others.

Determining Optimal Glucose Concentrations in Medium for Saccharification and Fermentation Processes Using *Neurospora crassa* Mutant

Rebeccah A. Warmack
Sponsor: Julia Fan, Ph.D.
Biological and Agricultural Engineering

Maximizing the efficiency of the fermentation process during the production of ethanol from cellulosic materials is key in order to prevent excess cost and waste. The objective of this study is to characterize and optimize the cellobiose production from a *Neurospora crassa* mutant F5 that has six out of seven copies of the beta-glucosidase knocked out. This mutant grew slowly when the conidia was directly inoculated to Avicel in Vogel's medium. It seemed that knocking out multiple copies of bgl slowed the germination of this strain. We propose to add glucose to Avicel in Vogel's medium to assist growth. The goal is to determine the optimal glucose amount that should be added to the starting medium to obtain maximal yield of cellobiose from cellulose. In this study, several fermentation flasks with varying amounts of glucose added to the Vogel's medium were prepared. The fermentation was initiated by inoculating the conidia to each flask. Samples were taken at different time intervals to measure the cellobiose concentration in each flask. The optimal glucose addition amount was decided based on this data.

Post-Homeric Representations of Achilles and Patroclus in Greek Literature

Celsiana M. Warwick
Sponsor: Seth L. Schein, Ph.D.
Comparative Literature

Although Homer's *Iliad* does not portray the Greek warriors Achilles and Patroclus as lovers, they were characterized as such by many later authors in antiquity. Beginning in the fifth century B.C.E., about 250 years after the composition of the *Iliad*, a number of extant Greek texts attempt either to redefine Achilles' and Patroclus' friendship as a sexual relationship, or to argue against such redefinition. Previous scholarship has focused on the difficulty of adapting the Iliadic Achilles and Patroclus to the paradigm of pederastic homosexuality that was normal in the Athenian upper classes in the fifth and fourth centuries, and on their inherent incompatibility with such a dynamic. The aim of this paper is to offer a survey of Classical and Hellenistic texts which comment on the nature of Achilles' and Patroclus' relationship, while paying particular attention to how each interpretation reflects the literary agenda of the work in which it is contained. My emphasis will not be on the "misreading" of Homer, but on the ways ancient authors creatively re-interpret the *Iliad* in order to present Achilles and Patroclus as the quintessential example of whichever type of bond between men they wish to praise, deconstruct, or otherwise evaluate.

EU Aid Contributions and ACP Colonial Ties

Madeline A. Weeks
Sponsor: Jeannette Money, Ph.D.
Political Science

There is a growing debate regarding the study of international aid allocation and its effectiveness. What compels states to give foreign aid? And what indicators determine aid levels? Do African Caribbean Pacific (ACP) countries with colonial ties receive greater European Union (EU) aid contributions? This paper evaluates the relationship between the select set of 79 ACP countries with which the EU has laid out special relations and development assistance policies towards these countries. Drawing upon the state-interest and constructivist theories of international relations, I argue that despite pushes to increase EU level control over aid allocation the formation of foreign aid policy remains a policy arena in which states maintain significant control. To support this argument I hypothesize that ACP countries with colonial ties are more likely to receive greater EU aid contributions. I use a statistical regression analysis of data collected on foreign aid allocation at the supranational EU level from the European Development Fund (EDF) and at the nation-state level bilaterally through Official Development Assistance (ODA) disbursement. Overall, the findings of this research reveal both normative implications regarding indicators of aid allocation and the interaction of state level interests on the formation of EU aid policies.

Effects of Wall Thickness on Frequencies of Flat Plates and Cylindrical Shells

Monica Wilson
Sponsor: Nesrin Sarigul-Klijn, Ph.D.
Mechanical and Aeronautical Engineering

Thin walled structures are utilized in multiple applications of engineering such as aircraft and spacecraft structures primarily to reduce weight. However, these engineering systems also experience complex dynamic loads such as torsional, axial, and buckling loads that can ultimately cause failures under dynamic environment. The purpose of this study is to better understand mode couplings resulting from the structural wall thickness reduction and to establish a critical thickness boundary. Two case studies were considered: A cantilevered plate and a cylindrical shell container structure. The second case study is an empty cylindrical shell with uniform thickness with one open end. The cylindrical structure will be studied under various wall thicknesses for free vibration response using commercial finite element software MSC Software: Patran/Nastran. The finite element analysis results will be presented as a function of wall thickness, frequency and mode shapes. The results from computational simulations will be compared to experimental measurements from in house experiments being conducted by our DynaaTECC (Dynamics, Acoustics, Aeroelasticity, Theory, Experiments, Computations, Control) research group. Experimental and computational results will be compared in terms of frequency and mode shape values.

Evolution of Sexual Differentiation in Insects via Alternative Splicing Mechanisms

Margaret A. Wittman
Sponsor: Artyom Kopp, Ph.D.
Evolution and Ecology

Sexual differentiation is among the first processes all developing animals undergo. Insects are an excellent model to study mechanisms of sexual determination and differentiation because of their short generation time and ease of genetic manipulation. Among holometabolous insects, a member of the DMRT protein family, doublesex (dsx), plays a key role in the development of sexually dimorphic traits. Due to alternative splicing, this protein has the same DNA binding domain at the N-terminus, but different C-terminal regulatory domains in males and females. The male-specific protein isoform promotes male-specific characters, while the female-specific isoform promotes female-specific traits. This splicing mechanism has been described only in holometabolous insects. By comparing the holometabolous and the more basal hemimetabolous insects, I will determine when this mechanism evolved. By utilizing degenerate PCR, I have found dsx sequences in the stick insect and the cockroach. I will use these sequences to test whether these insects produce different dsx isoforms in males versus females. If the answer is positive, I will expand my research to even more basal lineages of insects and crustaceans. Once the origin of alternative dsx splicing in insects is identified, further analysis will be performed to determine how this splicing mechanism arose.

A Checkered Past: The "Disappeared" Afro-Argentines

Rosana Womack
Sponsor: Andres Resendez, Ph.D.
History

During the colonial period tens of thousands of African slaves arrived at the port of Buenos Aires in Argentina during the Transatlantic Slave Trade, and were forced to disperse throughout the Viceroyalty of the Rio de la Plata. Over time, many of these African slaves gained their freedom and became an actively vocal presence within Argentine society as "Afro-Argentines." Through military service, newspapers, mutual aid societies, and their influence on Argentine music and dance, the Afro-Argentines left an indelible mark on Argentine culture. However, during the later half of the 19th century, they "disappeared" as a distinct racial minority within Argentina. Through a working bibliography of primary and secondary sources, archival research, and statistical data, the current research will address the historical problem of the "disappeared" Afro-Argentine population during the second half of the 19th century. Particular focus will be placed on the demographic, cultural, and racial conditions leading up to their "disappearance," while also examining how the Afro-Argentines experienced and contributed to their population's decline during this era.

Transient Optical Absorption Plant Spectrometer: High Current Switching on a Printed Circuit Board

Eric Wong
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

A plant spectrometer allows plant researchers to study the photochemical reactions such as photosynthesis of a plant. Accuracy of a plant spectrometer is dependent on the capability of a photodetector to detect changes in electron energy levels. The objective was to build the electronics and user interface for a plant spectrometer that accurately measures the photochemical event that raises the electrons in chlorophyll to a higher energy level. My main objective was to develop the light emitting diode (LED) driver and implement it onto a printed circuit board. The LED driver is responsible for creating at least a 20 microsecond light pulse using at most 1 Amp of current through a LED to excite the electrons to a different energy level. Certain traces on the printed circuit board were made wider for high current. Position of certain components was taken into account so that current and voltage does not degrade as it travels a longer distance. The integrity of the current will provide the most accurate results. In addition, the current is adjustable for the red and green LEDs and the period at which the LEDs pulse at, making it beneficial for researchers to adjust settings specific to their research.

Effects of Corneal Refractive Therapy on the Bulbar Conjunctival Microcirculation

Karen Y. Wong
Sponsor: Anthony Cheung, Ph.D.
Pathology

The increasing prevalence of myopia, also known as nearsightedness, combined with aggressive deterioration of the visual acuity is a refractive error that may lead to legal blindness, retinal dystrophies, and amblyopia. Traditional lenses, such as ophthalmic glasses, and corrective surgeries act to correct visual acuity but do not reduce and stabilize myopia. Thus, signs of moderate to severe deterioration of visual acuity prompt the use of Corneal Refractive Therapy (CRT), a contact lens designed to temporarily flatten the cornea to stabilize and reduce myopia. This study investigates the possible consequences of physical stress on the eye associated with CRT lenses. We hypothesize that the use of CRT lenses may contribute to significant microvascular adaptations in the bulbar conjunctiva. Twelve subjects using CRT lenses and ten historical control subjects (non-contact lens users) are observed using computer-assisted intravital microscopy, a non-invasive, objective technique designed to assess and quantify real-time morphological and dynamic changes in the bulbar conjunctival microcirculation. These findings may contribute to the understanding of CRT lenses as an effective and safe method of controlling myopia.

Crossing Kingdoms: Analysis of the Functions of Mystery Genes in *Caenorhabditis elegans* Identified as Homologs of Plant Radiation-Induced Genes

Meilin Wong
Sponsor: Anne Britt, Ph.D.
Plant Biology

Genomic stability in eukaryotic cells is preserved through many pathways, including changes in transcription, sister chromatid cohesion, cell cycle progression, and even the induction of cell death. Radiation-induced DNA damage can disrupt genomic stability, and the failure to repair DNA lesions may result with chromosomal breaks and rearrangements, inviability, and a variety of human diseases including cancer and genetic defects. Studies in plants have shown a variety of genes that respond to chromosomal breaks and DNA damages, but there are a vast number of IR-induced genes with unknown functions. These "mystery" genes may play important roles in maintaining genomic stability in animals. For a variety of reasons, *Caenorhabditis elegans* (a nematode worm) is an excellent model system in which to study the repair of and response to chromosome breaks. It is also very easy to generate gene "knockdown" worms by feeding the worms RNAi constructs encoding the *C. elegans* homologs of the plant IR-induced genes. Our work should provide new insights into the roles of completely novel genes in the maintenance of genomic stability in both plants and animals.

Analysis of Nucleosome Occupancy at R-loop Forming Regions in 15q11-13

Spencer Wong
Sponsor: Janine LaSalle, Ph.D.
Medical Microbiology & Immunology

Prader-Willi Syndrome, an autism-spectrum disease, is caused by paternal deletions of an imprinted region of chromosome 15 called 15q11-13. A large-scale chromatin decondensation of a subset of 15q11-13 that encodes for the gene SNRPN and a cluster of repeated small nucleolar RNA (snoRNAs) has been shown to occur in neurons and to be dependent on transcription of the snoRNAs . Our hypothesis is that R-Loops (DNA:RNA hybrids) are responsible for the chromatin decondensation by changing nucleosome occupancy in the region of the repeated snoRNAs. To test this, I transfected cell lines with R-loop forming regions, under the control of a doxycycline-inducible promoter. Because DNA wraps around protein complexes called nucleosomes, we are able to compare the DNA bound to each nucleosome in the cell lines, using chromatin immunoprecipitation (ChIP) followed by quantitative-PCR (qPCR). I measured the induction of expression following treatment with doxycycline using qPCR, and quantified the histone occupancy at R-loop forming regions upon the induction of transcription. R-loop forming regions showed a decrease in histone occupancy upon the induction of transcription, as compared to non-R-loop forming regions. By decreasing histone occupancy, R-loop formation seems to be one mechanism by which the chromatin decondensation occurs.

Error Analysis: Past Tense in Taiwanese Student Writing

Elizabeth Wu
Sponsor: Julia Menard-Warwicke, Ph.D.
Linguistics

English as a Second Language (ESL) students are people who possess a first language other than English. These students may come from a variety of backgrounds as they differ in their native country and the time of immigration to the United States. The period of the student's life in which they immigrated to the United States in particular may possess a relationship with the diverse types of errors in their writing. This currently ongoing research project aims to discover if there is a correlation between the type of second language student and their past tense writing errors through examining and analyzing the writing samples of Taiwanese second, third and fourth-year students, who were born in America, or immigrated to America during different periods of their lives. Through researching the types of writing errors which relate to the student's time of immigration, the project can provide suggestions for writing errors for ESL teachers to focus on when instructing their students.

Relations Between Sleep Duration and Negative Affect in Toddlers

Susie Xiong
Sponsor: A.J. Schwichtenberg, Ph.D.
Psychiatry

Previous studies highlight the roles of sleep in emotion regulation but direct empirical tests of this association are limited. Sleep deprivation studies report elevated rates of negative affect expressions in adults. Additional studies highlight intense negative emotions and fewer positive emotions in children with sleep problems. However, it is unclear if negative affect expressions vary as a function of normative sleep variations. Within this study participants included nineteen toddlers who were 24 or 36 months of age. Sleep duration estimates were derived from actigraphic recordings (a small sensor worn by the child which is strapped on their ankle). To assess negative affect regulation children completed the Lab-TAB transparent box task. Based on prior research, we hypothesized that children with shorter sleep durations would exhibit more negative affect during the Lab-TAB transparent box task. Understanding the relations between sleep and negative affect expression may help elucidate a mechanism through which sleep affects development.

Effects of Initial Seeding Density of Self-Assembled Meniscus-Shaped Fibrocartilage

Timothy Yeh
Sponsor: Kyriacos A. Athanasiou, Ph.D.
Biomedical Engineering

The fibrocartilages of the body are largely avascular tissues that are frequently compromised from disease or trauma and possess limited capacity for self-healing. Thus, methods of tissue engineering fibrocartilage are being investigated, and, in particular, a promising scaffoldless self-assembly process is being explored. Self-assembly can produce tissue with quantifiable mechanical properties and appropriate biochemical content, yet the dependence of self-assembled fibrocartilage on initial cell seeding density is unstudied. Here we examine the properties of self-assembled fibrocartilage grown at different seeding densities in the shape of the rabbit knee meniscus. Results display a range of physical and biochemical properties among constructs seeded with 2.5, 10, and 20 million cells per construct. Construct thickness at 1, 4, and 7 days of culture is linearly related to initial seeding density. Next, construct glycosaminoglycan (GAG) content, as evidenced by safranin-O staining, is highest at a density of 10 million cells. Finally, the intensity of collagen staining via picrosirius red decreases at higher densities (10 and 20 million cells per construct). Taken together, these results show that within this range of seeding densities, an optimal concentration of cells may exist for engineering fibrocartilage.

Ligand-induced Conformational Changes in HIV-1 Env Protein gp120 and Env-based Recombinant gp140 Detected by Second Harmonic Generation and FRET

Onur M. Yenigun
Sponsor: Holland Cheng, Ph.D.
Molecular and Cellular Biology

The HIV-1 envelope protein gp120, upon binding CD4, its primary receptor on a T-lymphocyte or macrophage, undergoes a conformational change that exposes a co-receptor binding site to facilitate fusion of the virus envelope and host cell membrane. This is demonstrated by existing X-ray data and quaternary arrangements of recombinant immunogen gp140 in both its native, and CD4-induced states, elucidated via cryo-EM and molecular modeling. These models serve as snapshots of gp140 conformational states before and after binding CD4-mimicking miniprotein, CD4m. Second Harmonic Generation (SHG), or frequency doubling, is a nonlinear optical technique that has recently gained popularity as a method for studying real-time conformational changes in proteins. Gp120 will be labeled with a second-harmonic-active dye at exposed lysines and, via site-directed mutagenesis, cysteines. The use of SHG and FRET (Förster resonance energy transfer), which provides ability to judge distance between two sites, to be genetically engineered and labeled by chromophores, together is practical since SHG labels are fluorescent and will work with FRET. This data, combined with antibody-antigen affinity data from ELISA, could provide evidence for conformational changes upon binding CD4 or, in future studies, either of the co-receptors CCR5 or CXCR4.

Effects of Lipid Oxidation Retardation by Grape Seed Oils in Turkey Meat

Seun Seun Yim
Sponsor: Annie King, Ph.D.
Animal Science

In 2010, California grew 90% or 6.2 million tons out of 6.9 million tons of grapes commercially grown in the United States. Grape seed oil is known to contain high amounts of unsaturated fatty acids, in particular linoleic acid, as well as different phenolic compounds such as gallic acid, catechins, epicatechins, and a variety of tannins. The content of phenolic compounds and antioxidant properties of various grape seed extracts and oils are well researched and reported to have many possible beneficial effects on human health. However, the effects that grape seed oils have on retardation of lipid oxidation (breakdown of unsaturated fatty acids) in various food systems have not been researched. Lipid peroxides are primary indicators of oxidation in foods. Thus, the PeroxySaf™ MSA Kit was used to measure lipid peroxide content to determine how different varieties of grape seed oils, processed at different pressures and temperatures, affect retardation of lipid oxidation in turkey meat heated and stored under several conditions.

The Conversion of α-Ionone to 4-Hydroxy-β-Ionone

Joseph B. Yu
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Chemistry

In our attempt to synthesize Lutein, we investigated using selenium dioxide in the allylic hydroxylation of α-ionone. Direct hydroxylation of α-ionone predominantly yielded 4-hydroxy-β-ionone. This reaction is proposed to proceed through isomerization of the ε-ring of α-ionone to form the β-ring of β-ionone followed by hydroxylation at the Carbon-4 (C4) position. In all conditions tested, formation of 3-hydroxy-α-ionone or 3-hydroxy-β-ionone was not detected. These observations demonstrate that the doubly allylic hydrogen at the C6 position is more reactive than the hydrogen at the C3 and the methyl hydrogens at C5. Carrying out the reaction at -40 °C did not yield any product. Increasing temperatures up to 50 °C resulted in higher product yield, after which formation of more side-products was observed. Yields also typically increased with larger amounts of selenium dioxide. Addition of hydrogen peroxide and *tert*-butyl hydrogen peroxide as selenium dioxide recycling reagents decreased yields of 4-hydroxy-β-ionone. The produced 4-hydroxy-β-ionone using this microwave-assisted reaction can be used as a precursor for the facile synthesis of isozeaxanthin, canthaxanthin and asthaxanthin - carotenoids found in avian plumage.

Using Remote Sensing to Improve Vegetation Mapping in Jiuzhaigou National Park

Pai Hui Yu
Sponsor: Susan L. Ustin, Ph.D.
Land, Air, and Water Resources

Jiuzhaigou National Park (JNP) located in Sichuan, China is a UNESCO World Heritage site as it is an ecologically important site for species richness and plant biodiversity. JNP is home to many endangered and threatened plant and animal species. With an increasing number of yearly visitors to JNP (almost two million visitors in 2004), it is important to detect and manage human impacts and activity on a temporal scale. JNP uses an existing vegetation map based on local knowledge of the park; however, based on field observations it is known that this map has inaccuracies. Therefore, I am using field data points and remote sensing imagery to validate and improve the current vegetation map. Known for the ability to detect landscape features, satellite remote sensing technology measures reflected sunlight in the visible and color infrared wavelength regions and can provide accurate and up-to-date vegetation information. In my study, I will use a variety of remote sensing imagery, specifically, Landsat (30m), ASTER (15m), and QuickBird (0.6m). These images will be pre-processed and vegetation will be classified using the field data points. This project will further improve JNP's current vegetation map which can help in developing a long-term monitoring program.

Effects of Turmeric and Bittermelon Extracts for Wound Healing

Rasiq Zackria
Sponsor: Raja Sivamani, M.D.
Dermatology

The use of alternative medicine, including botanical products and extracts, is increasing among the public. However, there haven't been many studies evaluating their role in wound healing. In this study, we investigated the effects of bittermelon and turmeric extracts on human keratinocytes and fibroblasts, two cells that are vital in wound healing. In particular, we studied effects on their cell motility and viability. Fibroblasts were exposed to 0.05% aqueous extracts of turmeric and bittermelon and their motility increased by 3% in turmeric and unchanged in bittermelon. Keratinocytes were exposed to 0.05% aqueous extracts of turmeric and bittermelon and their motility increased by 14% in turmeric whereas it decreased by 18% in bittermelon. When keratinocytes and fibroblasts were exposed to 0.05% ethanol and 0.05% acetone based turmeric extracts, the cells died while their controls were viable. Our work shows that different herbs have differential effects and these differences can be ascertained in a biologically active assay. To characterize these extracts, they will be analyzed with antioxidant assays and mass spectroscopy. Botanical extracts hold promise for use in wound healing therapies but more research will be needed to compare different extracts and to better understand the role of the extraction solvent.

Microbial Transformation of β-ionone

Gloria Zavala
Sponsor: Krishnan P. Nambiar, Ph.D.
Chemistry

We seek to explore a bio-transformation strategy for the conversion of β-ionone to generate useful intermediates for the synthesis of carotenoids. Use of microorganisms can provide a safe, easy, economical and practical alternative to current commercial synthetic methodologies. We used whole-cell shake cultures of *Streptomyces* grown in minimal medium for the transformation of β-ionone. The minimal medium contains 1.4% ammonium sulfate, 2% potassium dihydrogen phosphate, 1% glucose and 0.3% yeast extract adjusted to pH 7.0 using ammonia solution. *Streptomyces* are bacteria that contain versatile cytochrome P450 for oxidation of compounds. The organism was grown together with 0.1 % (v/v) of the substrate for three weeks and the metabolites generated were regularly monitored. About 100 mL aliquot of the culture were sampled aseptically, saturated with sodium chloride and subjected to liquid-liquid extraction with ethyl acetate to recover the metabolites. Thin layer chromatography on silica using 40% ethyl acetate in hexanes and then 1 % methanol in dichloromethane as mobile phases were used to separate the metabolites. The products identified will be discussed in the report.

Microbial Transformation of Keto-Isophorone

Rosio Zavala
Sponsor: Krishnan P. Nambiar, Ph.D.
Chemistry

Our goal is to investigate the use of *Streptomyces* in the regioselective reduction of keto-isophorone. The desired product- 3-hydroxy isophorone can be used as synthetic intermediate for the synthesis of carotenoids such as lutein. Lutein is an important caratenoid which aids in decreasing the chances of certain eye diseases. We have grown shake cultures of *Streptomyces* in a miminal medium (which contained 1.4% ammonium sulfate, 2% potassium dihydrogen phosphate, 1% glucose and 0.3% yeast extract adjusted to pH 7.0 with ammonia solution) supplemented with 0.1 % (v/v) of the substrate. The progress of the whole-cell bio-transformation experiment was monitored regularly by sampling about 100 mL of the culture for up to three weeks. The formed metabolites from the culture were obtained by liquid-liquid extraction using ethyl acetate after saturation of the culture with sodium chloride. Metabolites were purified by thin layer chromatography on silica using 40% ethyl acetate in hexanes.The final product is yet to be discussed.

Transient Optical Absorption Plant Spectrometer

Vincent W. Zegarski
Sponsors: Andre Knoesen, Ph.D.
Electrical and Computer Engineering &
Steven Theg, Ph.D., Plant Biology

Measurements for physiological studies of biological systems, including the metabolism involving photosynthesis, can be obtained through the use of an optical spectrometer. Dark-interval relaxation kinetic (DIRK) analysis, a technique to study the flux of protons and electrons across the thylakoid membrane, requires short light pulses at differing specific wavelengths to excite and probe plant light-absorbing molecules. Experimental equipment to perform this technique is not, in general, commercially available and requires custom circuitry and computer interfaces to be designed and built. We introduce a new optical spectrometer that pulses red and green light-emitting diodes (LEDs) to activate the photosynthetic electron transfer mechanism and probe the transient relaxation that occurs thereafter. An optical front-end collects the light that is transmitted through the sample and sends the corresponding signal to a programmable microcontroller. The user controls the system, including LED pulse width and intensity, and views collected data through a graphical interface connected to the microcontroller via universal serial bus. By minimizing noise throughout the system, we are able to implement a spectrometer that can precisely measure the transient optical absorption of a plant sample.

Vertical Integration Versus Outsourcing in the Fast Fashion Apparel Industry: A Case Study of Zara, H&M, and Gap

Hui Hui Zhang
Sponsor: Gang Sun, Ph.D.
Textiles and Clothing

The fast fashion apparel industry is traditionally characterized as labor intensive. Outsourcing has been a primary strategy for fast fashion companies in developed nations to minimize production costs. However, Zara, a Spanish fast fashion producer, has adopted the strategy of vertical integration to control its production, distribution, and retail processes, which has resulted in higher profit margin and allowed the company to outgrow two of its largest rivals: H&M, and Gap, becoming the world's largest fashion retailer. This research aims to examine the organizational strategies of Zara, H&M, and Gap. Through comparison and analysis of the empirical evidence, the research demonstrates the pros and cons of outsourcing and vertical integration in the fast fashion apparel industry. The research also investigates the economic and organizational conditions that could maximize the benefits of the two strategies. The results of this research can help fast fashion companies evaluate existing strategies or develop new ones that can better respond to increasingly changing consumer demands.

An Autonomous Pulse Oximetry System for Dynamic Measurement of Vital Signs: Robust Adaptive Control System

Yufei Zhao
Sponsor: Andre Knoesen, Ph.D.
Electrical and Computer Engineering

Accurate and reliable diagnostic tools are keys to effective and low cost health care. We are building a clinical device to measure the oxygen saturation and pulse rate of patient in a noninvasive manner. The device automatically determines the appropriate settings for measurement and dynamically corrects for changes. An adaptive control system is discussed and analyzed by implementing a front-end discrete signal processing moving average filter. The main challenge in such a system is to implement the moving average filter in micro controller that does real time signal processing. A number of issues such as the moving average filter's size and speed, as well as the micro controller's performance in its memory and sampling speed have to be taken into consideration when implementing the adaptive control system. The front end adaptive control system will account for low frequency noise as well as error correcting code to adjust any high frequency noise components that are much faster than a human's pulse rate. This adaptive control system will essentially eliminate the need for human labor to manually adjust for the dynamic change when obtaining pulse-rate and make the system "smarter".

Similarity Analysis of Repetitive Sequences in the *Pinus taeda* (Loblolly Pine) Genome

Jacob J. Zieve
Sponsor: David Neale, Ph.D.
Agricultural and Environmental Sciences

Loblolly Pine (*Pinus taeda*) is one of the fastest growing and thus, economically important gymnosperms for energy and wood product based tree farms. Its genome is estimated at 20 billion base pairs, a large percentage of which is made up of repeating patterns of base pairs called repetitive elements. The repeats analyzed in this study are tandem and interspersed. Tandem repeats occur on specific locations on chromosomes and tend to be shorter sequences. They make quality markers for genes and indicators of genetic diseases. Interspersed elements occur widely throughout the genome, are characterized by how they were created, and their size can vary widely. The primary goal of this study is to compare sequences from Loblolly Pine to existing databases of repetitive elements, specifically those found in other plant species, to discover commonality. The analysis of these repeats will not only help elucidate the structure of the genome of Loblolly Pine and aid in genomic-based breeding efforts for this conifer, but also facilitate the annotation of other conifers. We will use the Tandem Repeats Database (TRDB) and RepBase databases along with their corresponding software, Tandem Repeats Finder (TRF) and RepeatMasker to provide the base data for the comparative study.

ZFNs: An Alternate Method to Generate Mutations

Danielle L. Zumpano
Sponsor: Anne B. Britt, Ph.D.
Plant Biology

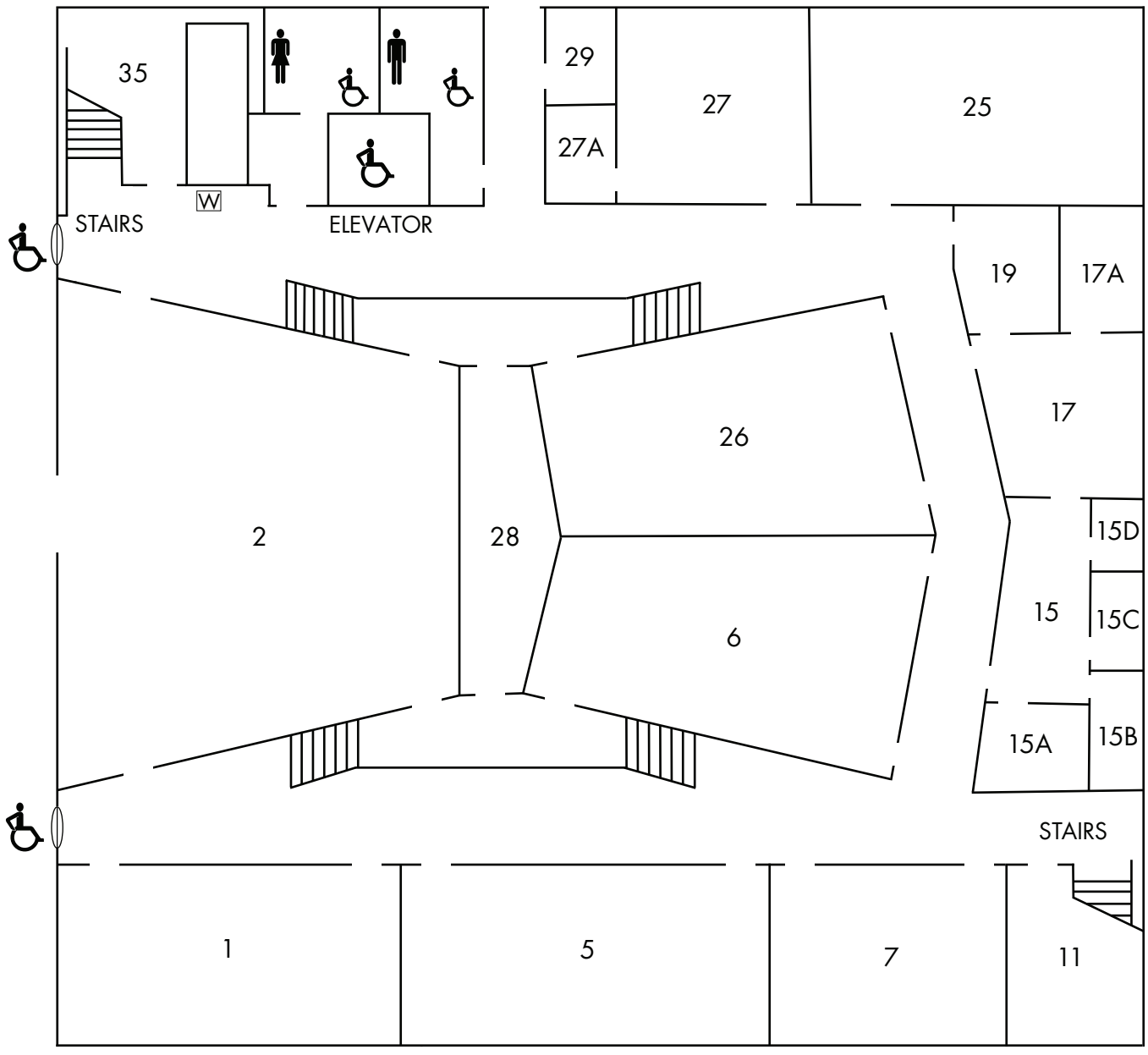
Mutant *Arabidopsis thaliana* are commonly generated by applying a mutagen to seeds. Mutagens damage the DNA and the consequent changes affect the biochemical pathways responsible for maintaining the plant's metabolism and survival. The abundance of mutations makes it difficult to confidently attribute a cell's response to the damage of one specific gene. Having a reliable method to generate a site-specific mutation, without altering any other part of the genome, is key to understanding the roles of specific genes. Zinc-finger endonucleases (ZFNs) are a promising method for generating these specific mutations. ZFNs are composed of an engineered sequence-specific DNA-binding domain and a Fok1 endonuclease domain. By introducing the gene for the ZFN into the model plant Arabidopsis, we will determine whether the ZFN can be activated in vivo using a chemical signal and successfully cleave our target gene *SOG1*. Once the region is cut, inaccurate repair should result in the generation of mutant alleles of *SOG1* without inducing mutations in other genes.

Tomato Pomace Treatment with Heat and Alkaline Solutions

David Zuskov
Sponsor: Annie King, Ph.D.
Animal Science

Tomato pomace, a by-product from tomato processing, has a high concentration of vitamin E (alpha-tocopherol) which is a good antioxidant. Pomace can be used as a source of alpha-tocopherol in broiler (meat-type chicken) diets to decrease lipid oxidation (unsaturated fatty acid deterioration) during heating and long-term frozen storage of post mortem dark meat, thereby prolonging its organoleptic and medical acceptability. However, tomato pomace contains a high level of fiber, up to 31%, which is not easily digested by broilers and can dilute energy content in the feed. The goal of the experiment was to use various procedures for treating tomato pomace and assess the loss in fiber (lignin, cellulose and hemicelluloses). Samples of tomato pomace were treated with varying quantities of $Ca(OH)_2$, heat, and storage times to produce the following treatments: 1% $Ca(OH)_2$ at 33°C for 24h and 48h, 2% $Ca(OH)_2$ at 66°C for 24h and 48h and control samples at 33°C and 66°C.

WELLMAN HALL
FLOOR MAP
Lower Level



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= Front of Classroom

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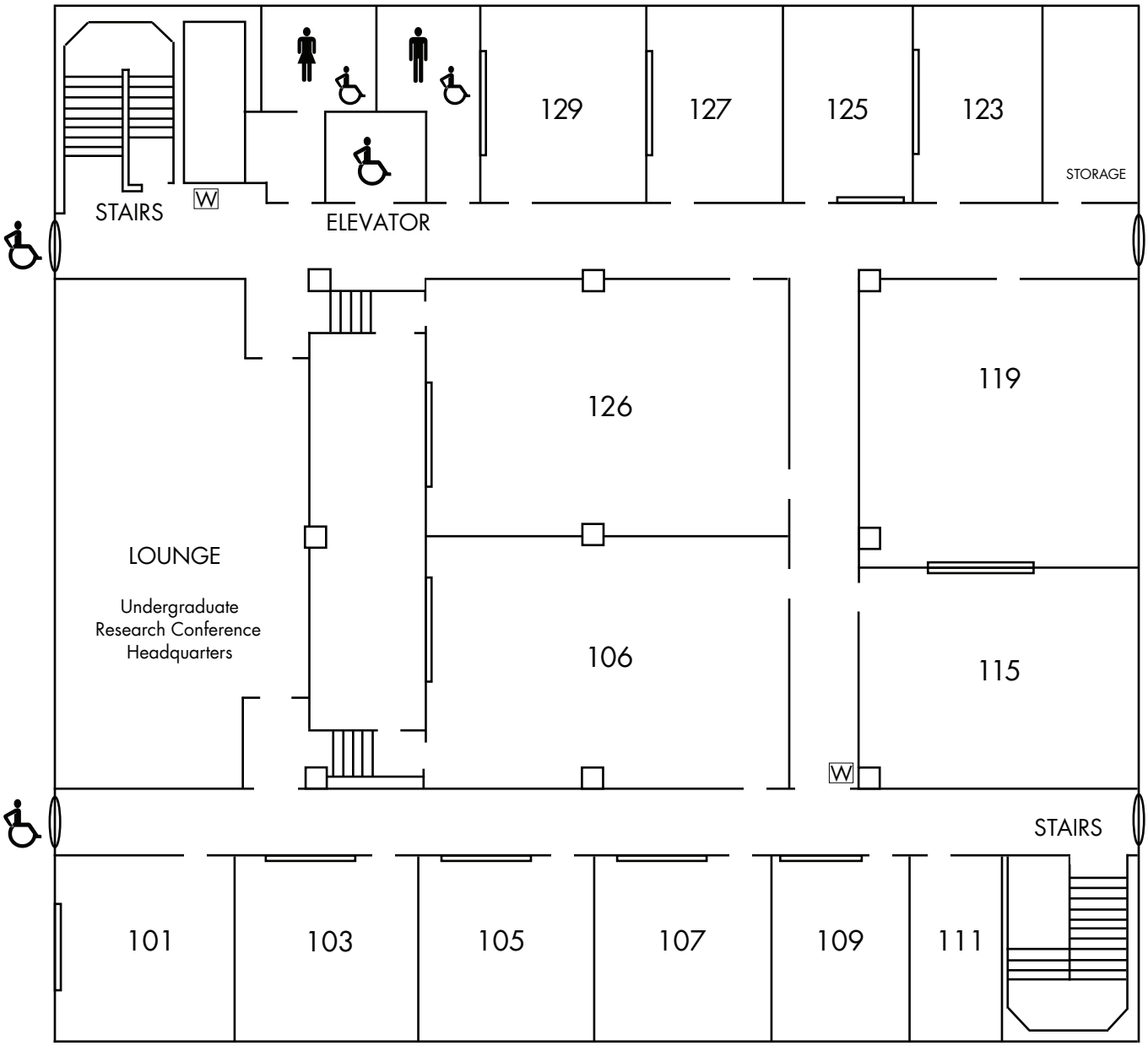
WELLMAN HALL
FLOOR MAP
1st Floor



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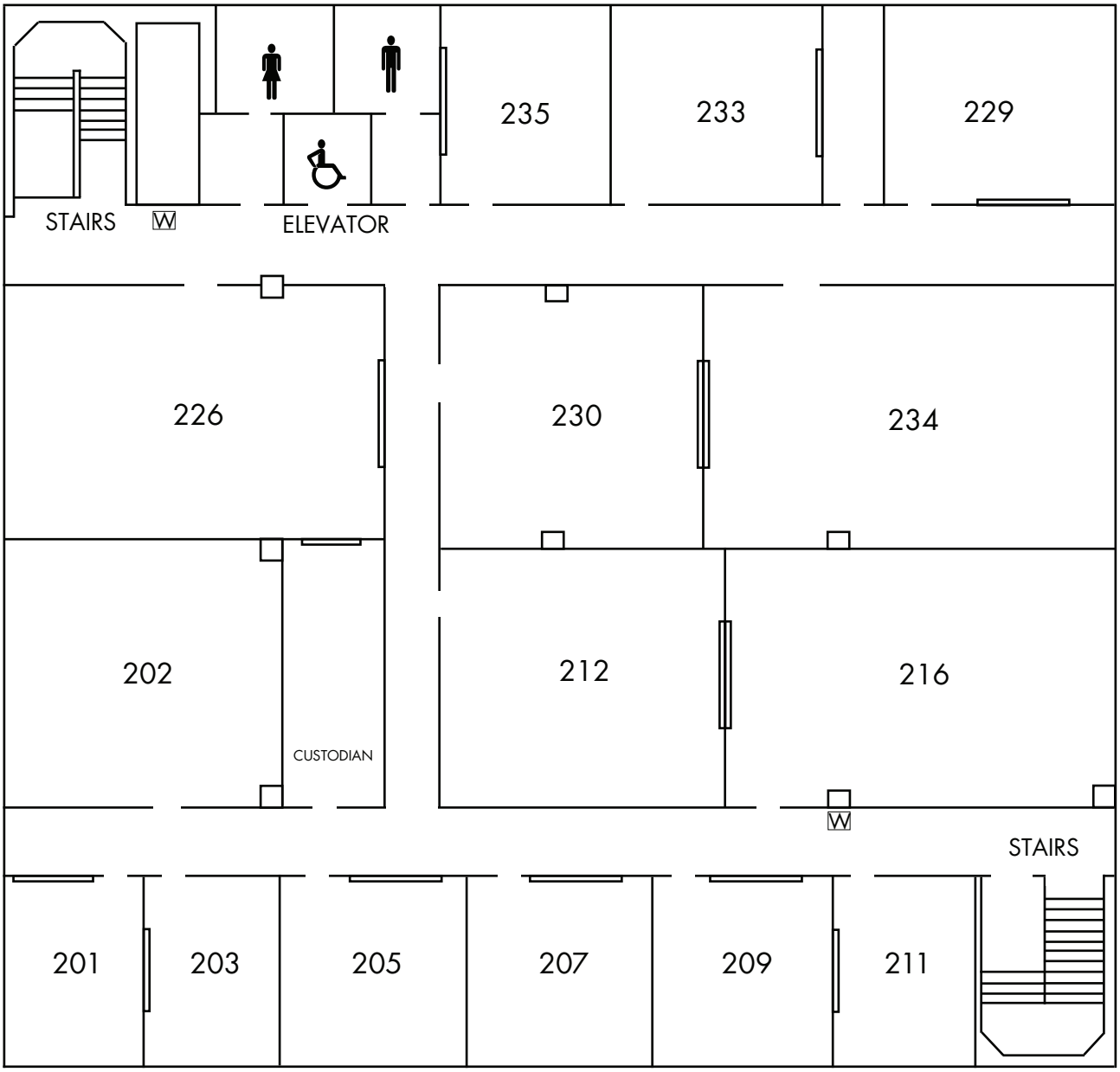
WELLMAN HALL FLOOR MAP 2nd Floor



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