
**36th ANNUAL
CENTRAL
CALIFORNIA
RESEARCH
SYMPOSIUM**

**PROCEEDINGS
OF THE
2015 SYMPOSIUM**

Convened on
Wednesday, April 22, 2015
in the
University Business Center
California State University, Fresno

36th ANNUAL
CENTRAL CALIFORNIA RESEARCH
SYMPOSIUM
PROCEEDINGS
Sponsoring Institutions



Discovery. Diversity. Distinction.

University of California
San Francisco



School of Medicine
Fresno Medical Education Program

California State University, Fresno

University of California, San
Francisco

Fresno Medical Education Program



www.alliant.edu/cspp

California School of
Professional Psychology at
Alliant International University



Fresno City College



American Chemical Society
San Joaquin Valley Section

American Chemical Society
San Joaquin Valley Section

Convened in the *University Business Center*
on the campus of
California State University, Fresno
Wednesday, April 22, 2015

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PREFACE

Welcome to the 36th Annual Central California Research Symposium.

From its inception, the purpose of this symposium has been to bring together investigators, students, and faculty from a variety of disciplines to share the results of their scholarly work. The continuation of these activities in the Central Valley is encouraged by this opportunity for exchange. We hope that all participants will gain new insights from this experience and that learning about the interests of other scholars will enrich their academic journey.

Abstracts for this year's event were reviewed and selected for presentation by the Symposium Coordinating Committee. In this review, the committee looked for a well-written abstract on a topic of scholarly merit.

This year *UCSF Fresno* has provided two cash awards for the best symposium presentations. *California School of Professional Psychology at Alliant International University* has provided two cash awards for the best poster and oral presentations by a student. The *American Chemical Society, San Joaquin Valley Section* has sponsored a cash award for best chemistry presentation. The *Office of the Provost at California State University, Fresno* has provided a cash award for best undergraduate poster and best undergraduate oral presentation. The *Craig School of Business* has provided a cash award for best poster presentation. The *Educational Employees Credit Union* has sponsored an award for best presentation in Mathematical Sciences. The *Davin Youngclarke Memorial Award*, inaugurated in 2008 and sponsored by the *Office of Research and Sponsored Programs at California State University, Fresno*, is awarded to the presenter who best addresses a community issue with use of sophisticated and sound research methods. In addition to providing three cash awards, the *Office of Research and Sponsored Programs at California State University, Fresno* has planned and administered the symposium in cooperation with these institutions.

Presenters and guests are invited to a social hour following the concluding address and student awards ceremony, which will be held in the Alice Peters Auditorium in the University Business Center.

These proceedings are published as a permanent record of the work presented. We hope they will stimulate ideas for future work and subsequent symposia.

PLANNING COMMITTEE

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO FRESNO MEDICAL EDUCATION PROGRAM

Donna Hudson, Ph.D.
Symposium Co-Chairperson

Loren Alving, M.D.
Paul K. Mills, Ph.D.
Michael Peterson, M.D.
Kent Yamaguchi, M.D.

CALIFORNIA STATE UNIVERSITY, FRESNO

Thomas McClanahan, Ph.D.
Symposium Co-Chairperson

Saeed Attar, Ph.D.
Sharon Benes, Ph.D.
Jason Bush, Ph.D.
Alejandro Calderon-Urrea, Ph.D.
Doug Carey
Steve Chung, Ph.D.
Alam Hasson, Ph.D.
Ramakrishna Nunna, Ph.D.
Karl Oswald, Ph.D.
Adnan Sabuwala, Ph.D.
Ellen Shimikawa, Ph.D.
Brian Tsukimura, Ph.D.

CALIFORNIA STATE UNIVERSITY, MONTEREY BAY

Justin L. Matthews, Ph.D.

CALIFORNIA SCHOOL OF PROFESSIONAL PSYCHOLOGY

Siobhan O'Toole, Ph.D.

FRESNO CITY COLLEGE

Carl Johansson
Rick Stewart

EVENT AND PROCEEDINGS COORDINATORS

Millie C. Byers & Maral Kismetian
California State University, Fresno



CALIFORNIA
STATE
UNIVERSITY,
FRESNO

April 22, 2015

MESSAGE TO ALL RESEARCH SYMPOSIUM PARTICIPANTS

California State University, Fresno is pleased to serve as the host campus for the 36th Annual Central California Research Symposium.

This symposium continues to provide a unique forum for the presentation and discussion of scholarly activities of interest to researchers throughout the Fresno region. The program for the symposium reflects our commitment to promoting interdisciplinary research, encouraging scholarly exchange on theoretical and pragmatic topics, and providing an opportunity for both students and research scholars to share common interests. Cooperative efforts such as these benefit the individual institutions involved and ultimately the public that we all serve.

We appreciate your participation in this symposium, and it is my pleasure to extend my warmest welcome to our campus.

Sincerely,

A handwritten signature in blue ink that reads "Joseph I. Castro".

Joseph I. Castro, Ph.D., M.P.P.
President

Office of the President

Harold H. Haak Administrative Center
Henry Madden Library, Suite 4104
5200 North Barton Ave. M/S ML48
Fresno, CA 93740-8014

559.278.2324
Fax: 559.278.4715



**Office of the
Associate Dean**

Medical Education Building

155 N. Fresno St.
Fresno, CA 93701

P: 559-499-6427
F: 559-499-6411

email:
dean@fresno.ucsf.edu

WELCOME

36th Annual Central California Research Symposium April 22, 2015

It is my pleasure to welcome each of you to the 36th Annual Research Symposium. UCSF Fresno is very committed to conducting and supporting research, and this Symposium offers a wonderful venue to be able to review some exemplary local research projects. Every year I am impressed anew by the diversity and quality of the research that is ongoing in the Central Valley and it is exciting to witness the richness of academic activity that is evidenced here today. The studies represented here will lead to an improved quality of life for our communities, something we all care deeply about.

Whether you are attending today as a participant or a visitor, I believe you will feel challenged and energized as you explore the research projects on display.

Sincerely,


Michael Peterson, MD
Interim Associate Dean
UCSF Fresno



April 10, 2015

Dear Symposium Participants,

The California School of Professional Psychology (CSPP) at Alliant International University is proud to be a sponsor of the 36th Annual Central California Research Symposium.

As the largest trainer of doctoral level psychologists in California with a focus on applied research in the behavioral sciences and a commitment to international and multicultural education, CSPP is pleased to support the next generation of researchers in Central California.

This annual symposium celebrates the contributions of a diverse range of disciplines, underscoring the value of research in improving professional services, influencing policy, and changing lives.

Students, we applaud your creativity and dedication and we look forward to learning more about the research you are conducting.

Sincerely,

A handwritten signature in black ink that reads "Dalia Ducker".

Dalia Ducker, PhD

Interim Dean

Concurrent Session A

University Business Center
Auditorium, 191

9:00 a.m. ***Concentration of Selected Organics and Reactive Oxygen Species Generation from PM2.5 Extracts***
James Baroi, Sowmya Tummala, Kennedy-Kiet T. Vu

9:15 a.m. ***Structural Basis of MUC1 Antigen Recognition of a Tumor Specific Therapeutic Antibody***
Mohammadreza Movahedin, Teresa M. Brooks, Cory L. Brooks

9:30 a.m. ***Synthesis of Heterocycle-containing Genistein Analogs as Anti-Prostate Cancer Agents***
Pahoua Xiong, Rubing Wang, Xiaojie Zhang, Eduardo DeLa Torre, Francisco Leon, and Qiao-Hong Chen

9:45 a.m. ***Neutralization of Listeria monocytogenes invasion by Single Domain Antibodies***
Ian Huh, Robert Gene, Jyothi Kumaran, C. Roger MacKenzie, and Cory L. Brooks

10:00 a.m. ***Dairy Emissions Contribute to Air Pollution in the Valley***
Catalina Olea, Reynaldo Luna, Jordana Tatman, Alam Hass

10:15 a.m. Break – University Business Center, Gottschalks Gallery
10:30 a.m. Concurrent Session Resume

Concurrent Session B

University Business Center
Room 192

9:00 a.m. *Alexander and Markov- type Theorems for Virtual Singular Links*
Sarah McGahan and Andrew de la Pena

9:15 a.m. *Grim: Playing Games with Graphs*
Janae Dixon, Richard Adams

9:30 a.m. *On the Inoculation of Computer Networks: Big and Small - Part 1: Small Networks*
Brennen Fagan, Doreen DeLeon

9:45 a.m. *On the Inoculation of Computer Networks: Big and Small - Part 2: Large Networks*
Aramayis Orkusyan, Doreen DeLeon

10:00 a.m. *The Well-Covered Dimension of Generalized Quadrangles with Regular Points*
Hillary Bese

10:15 a.m. Break – University Business Center, Gottschalks Gallery
10:30 a.m. Concurrent Session Resume

Concurrent Session C

University Business Center
Room 194

9:00 a.m. ***Real-Time Video Streaming Using The Kinect***
Carlos Moreno, Yilin Chen, Ming Li

9:15 a.m. ***Pathogenic Streptococcus suis in California Cattle***
Talon Trecek

9:30 a.m. ***Environmental Exposure Measurement of Particle-Bound PAHs during the Walking in the Neighborhoods in Fresno California***
Yai Xiong, Qian Jia, Jaymin Kwon

9:45 a.m. ***Environmental Exposure Measurement of Black Carbon (BC) During the Walking in the Neighborhoods in Fresno California***
Qian Jia, Yai Xiong, Jaymin Kwon

10:00 a.m. ***Does Social Media Related Internet Use Lead to Poor Academic Performance? Evidence from Fresno State***
Mohammad A Rahman and Tyler Launer

10:15 a.m. Break – University Business Center, Gottschalks Gallery
10:30 a.m. Concurrent Session Resume

Concurrent Session D

University Business Center
Auditorium, 191

10:30 a.m. ***Confirmation Bias in the Manipulation of Police Photo Lineups***
Ryan Ditchfield, Peter English

10:45 a.m. ***Disproportionate Minority Contact: Differential Minority Arrest Patterns and Recidivism of First-Time Juvenile Offenders***
Shelby Brisky, Yoshiko Takahashi

11:00 a.m. ***Russians in the Central valley***
Russell Berndt

11:15 a.m. ***U.S.-Mexican Relations, 1920-1940***
Rocio Solis Hernandez

11:30 a.m. ***Crafting the Illusion of Pax Atomica: U.S. Atomic Energy Policy 1943-1950***
Victor R. Rodriguez II

11:45 a.m. Break – University Business Center, Gottschalks Gallery
12:15 p.m. Plenary Session

Concurrent Session E

University Business Center
Room 192

10:30 a.m. ***On Behavior at Infinity of Bounded Solutions of a First-Order Constant-Coefficient Linear System of Differential Equations***
Marat Markin

10:45 a.m. ***Silybin Derivatives: A Class of Potential Anti-Prostate Cancer Agents***
Bao Vue, Sheng Zhang, Xiaojie Zhang, Konstantinos Parisis, and Qiao-Hong Chen

11:00 a.m. ***Substituent Effects on Double Bond Character and Conformation: NMR Studies of Steric And Electronic Effects Using Deet Analogs as a Model System***
Salvador C. Vazquez, Shahram Aghaei, Alexandra D Saxberg, Kalyani Maitra, V. V. Krishnan, Joy J. Goto, Santanu Maitra

11:15 a.m. ***The Effect of Electrolysis on Biofilm Formation***
Kourosh Kolahi, Derek Vargas, Aramais Orkusyan, Armen Martirosian, Mamta Rawat

11:30 a.m. ***Biodegradable Plastic from Food Waste***
William Wright

11:45 a.m. Break – University Business Center, Gottschalks Gallery
12:15 p.m. Plenary Session

10:30 a.m. ***Asymmetric 1,5-Diheteroaryl-1,4-Pentadien-3-ones: A New Class of Promising Anti-prostate Cancer Agents***
Chengsheng Chen, Cristian Sarabia, Xiaojie Zhang, Rubing Wang, and Qiao-Hong Chen

10:45 a.m. ***Design, Synthesis, Purification, Characterization, and Atmopheric Studies of Isoprene Hydroperoxides***
Sivam Patel, Edwin I. Lozano, Vinay Kumar, Alam Hasson, Santanu Maitra

11:00 a.m. ***The Effects of BMAA and L-Serine on Locomotion, Learning, and Short-Term Memory in Drosophila melanogaster***
Shayan Zoghi, Dr. Joy Goto

11:15 a.m. ***Curcumin Analog Groups***
Francisco Aaron Leon

11:30 a.m. ***Determination of the A β 1-42 structure in the presence of β -Methylamino-L-alanine***
Benjamin Tanielian and Joy J. Goto

11:45 a.m. Break – University Business Center, Gottschalks Gallery
12:15 p.m. Plenary Session

Plenary Session

University Business Center
Auditorium, 191

12:15 p.m. Opening Remarks and Welcome

Dr. Thomas McClanahan, California State University, Fresno

Dr. Donna Hudson, University of California, San Francisco
Fresno Medical Education Program

12:25 p.m. ***Optimizing a Vaccination Scheme for an Influenza Virus***
Majerle Reeves and Manuel Lopez

12:40 p.m. ***Still Thirsty in Rural California: The Impact of California AB 685***
Madeline Byers

12:55 p.m. ***Development of Small Organic Molecule Apolipoprotein E Inhibitors for Alzheimer's Therapy***

Irina Kuchkovskaya, Amanda C. Voigt, Nisha M. John, Jhonnathan Brawley, Jaekwang Kim, Hyejin Yoon, Jungsu Kim, Santanu Maitra

1:15 p.m. Break – University Business Center, Gottschalks Gallery
1:30 p.m. Concurrent Session Resume

Concurrent Session G

University Business Center
Auditorium, 191

1:30 p.m. ***LGBT+Convocation and the Experience of Belonging Project***
Jacqueline Alvarez, Victoria Cuevas

1:45 p.m. ***Social and Emotional Loneliness Among University Students***
Arlene Agustin and Maria Cruz

2:00 p.m. ***Where University Students Live Affects Their Attitudes School and Life***
Kayla Fischer

2:15 p.m. ***Barriers to and Motivation for Parent-implemented Behavioral Interventions for Children with Autism Spectrum Disorders***
Amanda Holst and Gregory Savage

2:30 p.m. ***Bedtime For Mommy: Sleep Quality In Mothers With Infants***
Karena Tuel and Kathleen D. Dyer

2:45 p.m. Break – University Business Center, Gottschalks Gallery
3:00 p.m. Concurrent Session Resume

1:30 p.m. ***Comparison of crop load management systems and applied water amounts on vegetative compensation, whole-canopy photosynthesis, and vine performance in procumbent *Vitis vinifera* L. in a warm climate***
Andrew Beebe

1:45 p.m. ***The time-dependent non-Abelian Aharonov-Bohm effect***
Max Bright

2:00 p.m. ***Study Of The Sensitivity For Searches For Excited Bosons (W^*) In Dijet Final States In Proton-Proton Collisions At 13 Tev With The Atlas Detector At The LHC***
Jaryd Ulbricht

2:15 p.m. ***Linear controller design for the voltage regulation of solar energy systems***
Pengyuan Chen, Woonki Na

2:30 p.m. ***Characterizations of Volatile Fatty Acids Production from Food Waste as a feed source for Polyhydroxyalkanoates (PHA) Production***
Michael Nunes

2:45 p.m. Break – University Business Center, Gottschalks Gallery
3:00 p.m. Concurrent Session Resume

Concurrent Session I

University Business Center
Room 194

1:30 p.m. ***The Solar Trap***
Hunter Dias, Keon McDonald

1:45 p.m. ***Synthesis and Characterization of Neodymium and Gadolinium Nanoparticles***
Esteban I. Paredes Aulestia, Maya Castro, Ryan Fukuda, Pei-Chun Ho

2:00 p.m. ***Hardware Implementation of Efficient and Robust Resonant Coupled Wireless Power Transfer System***
Abhijit Suprem

2:15 p.m. ***Investigation into Doped Filled Skutterudite $Pr_{1-x}Nd_xOs_4Sb_12$ Using Finite Heat-Pulse Relaxation Calorimetry***
Taylor McCullough-Hunter, Shoji Hishida, Pei-Chun Ho, Brian Maple, Tatsuya Yanagisawa

2:30 p.m. ***Vehicle Emissions and Life Cycle Analysis Models of Gasoline and Electric Vehicles***
Corey M. Walker and Aly M. Tawfik

2:45 p.m. Break – University Business Center, Gottschalks Gallery
3:00 p.m. Concurrent Session Resume

Concurrent Session J

University Business Center
Auditorium, 191

3:00 p.m.

Curiosity and Changes in Religiosity in College Students
Chee Thao & Kathleen Dyer

3:15 p.m.

The Effects Of Peers On Children's Physical Activity: A Functional Analysis
Tiffany Gonzales

3:30 p.m.

Professional Development For Community College Student Services Practitioners: Capacity, Competency, Diversity
Renee Delpot

3:45 p.m.

Fall Incidence and the Use of Psychotropic, Opioid, or Cardiovascular Medications
Rebeka Garcia

4:00 p.m.

Synthesis and Characterization of Bis(bis(O-ethyl-L-cysteinato)nickel(II))nickel(II)Nitrate
Ryan Dougherty, Melissa Golden, Krish Krishnan

4:30 p.m.

Concluding Session
University Business Center, Auditorium 191
Impacts of Shared Autonomous Vehicles on the Transportation System in Fresno
Casey R. Walker and Aly Tawfik

Proceed to Student Award Presentations and Reception

Concurrent Session K

University Business Center
Room 192

3:00 p.m.

Humanities: A Missing Element in Medical Education
Stacy Han and Honora Chapman

3:15 p.m.

Comparing Caesar, Frontinus, and Josephus
Gabriela Larralde

3:30 p.m.

The Influences of Academic Self-Efficacy and Educational Aspirations for Minority High School Seniors in the Next Step Program
Mary Johnson

3:45 p.m.

I See the Dark: A Closer Look at Black Female Identity
Dejaunique Thomas

4:00 p.m.

Mothers in Israel: Latter-Day Saint Women's Opposition to Second Wave Feminism
Kim Davidson

4:15 p.m.

One Hundred Years Later: The Molokans, A Thriving Pre-Revolutionary Russian Community in California
Leah Buc

4:30 p.m.

Concluding Session
University Business Center, Auditorium 191
Impacts of Shared Autonomous Vehicles on the Transportation System in Fresno
Casey R. Walker and Aly Tawfik

Proceed to Student Award Presentations and Reception

3:00 p.m.

The Characterization of Muscle Sensory Receptor Response to Inflammation

Anusha Allawal and Katherine Wilkinson

3:15 p.m.

Duration of Weed-Free Period in Organic Lettuce: Crop Yield, Economics, and Crop Quality

Sarah R. Parry, Ryan Cox and Anil Shrestha

3:30 p.m.

Understanding phenolic extraction through the physical properties of wine grapes from California

Lauren Barrett , Robin Caillieudeaux, Hend Letaief

3:45 p.m.

A Prospective Observational Study of Ketamine for Sedation of Acutely Agitated Emergency Department Patients

Riddell J, Armenian P, Tran A, Bengiamin R, Hendey G

4:00 p.m.

Acetaminophen Poisoning: National and Local Implications of Toxicology Assessment

Chih-Chiun Jamie Chang, Rais Vohra MD, Michael Levine

4:30 p.m.

Concluding Session

University Business Center, Auditorium 191

Impacts of Shared Autonomous Vehicles on the Transportation System in Fresno

Casey R. Walker and Aly Tawfik

Proceed to Student Award Presentations and Reception

Poster Session I
9:00 a.m. until 10:30 a.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 9:00 a.m. until 10:30 a.m.

(1) ***Differential Effects of Bcl-2 Family Proteins on Oxidative and Fermentative Metabolism***
Jessica Wilson, Laurent Dejean, Bushra Mahmood, Miriam Ahmad, Patricia Olino

(2) ***Screening of Insect Repellants, DEET and DEET-like Analogues, using Drosophila melanogaster as a Model System***
Alexandra D. Saxberg, David Zimmerman, Salvador C. Vazquez, Shahram Aghaei, Dylan M. Manning, Santanu Maitra, Joy J. Goto

(3) ***A Myo10 c-terminal Fragment Associates with Components of Messenger ribonucleoprotein (mRNP) Complexes in the Core Nuclear Region***
Stacy Han and Karine Gousset

(4) ***Spatial Learning Assessment In Split-Brain Periplaneta Americana***
Matthew Pomaville, Austin Lawless, David D. Lent

(5) ***Kinetic And Product Yields Of The Gas-Phase Reactions Of Isoprene Hydroperoxides With Ozone***
Kumar, Vinay; Lozano, Edwin; Maitra, Santanu; Hasson, Alam

(6) ***An Exploration of Mitochondrial Dysfunction in Nematodes through Fat Content***
Chih-Chiun Jamie Chang and Joseph A. Ross, Ph.D.

(7) ***Paternal Mitochondrial Inheritance in Caenorhabditis briggsae***
Hanson Mouanoutoua

(8) ***Reactive Oxygen Species Production in Alveolar Macrophages as a Response to Environmental Particulate Matter: Role of Particulate Matter Content and Composition***
Geil Merana, Clarissa Niino, Anthony Waterston, Annabelle Lolinc, Dr. Alam Hasson, Dr. Laurent Dejean

(9) ***Exploring Speciation in Caenorhabditis briggsae through Mitochondrial Dysfunction in Hybrids***
Joel Rodriguez, Joseph Ross

Poster Session I continued
9:00 a.m. until 10:30 a.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 9:00 a.m. until 10:30 a.m.

(10) ***Analysis of Sperm Motility in *Caenorhabditis briggsae* Hybrids Considered to have Mitochondrial Dysfunction***
John Hobby

(11) ***DNA Extraction Using Maxwell 16***
Carolina Vidal-Kasdorf, Yesheswi Chavan, and Alejandro Calderón-Urrea

(12) ***The Investigation of Chemical Aerosols Attributed to the Cigarette Smoke Aging Process and Their Impact in Cellular Toxicological Studies***
Robyn Verhalen

(13) ***Behavioral Assays to Study Deficits in Spatial Cognition in *Drosophila melanogaster*.***
Joy Aparicio Valenzuela, Daeun Hwang, David D Lent

(14) ***Visual-motor Control and Obstacle Avoidance in Fruit Flies***
Nicole Shinkawa, Shazia Ali, Joy Aparicio Valenzuela, David D Lent, Ulrike K Muller

(15) ***Spatial & Temporal Variation in SJR water $\delta^{18}\text{O}$ and Fish Movement***
Cheyenne Hefley, Steve Blumenshine

(16) ***Embryonic Lethality in Hybrid crosses of *Caenorhabditis briggsae****
Nathan Reetz and Dr. Joseph Ross

(17) ***Effect of *Bcl-2* or *Bcl-xL* Expression Levels on Whole Cell Metabolic Fluxes: a Statistical Study***
Justin King, Bushra Mahmood, and Laurent Dejean

(18) ***Development of a Thermopower Probe***
Arnold Muradyan, Shoji Hishida, Taylor McCullough-Hunter, Pei-Chun Ho

(19) ***50W Proton Exchange Membrane (PEM) Fuel Cell Emulator Using Arduino Uno***
Dhruv Doshi and Richard Musharbash

(20) ***Benchtop Photolithography Tool***
Dr. Zoulikha Mouffak, Adrienne Olaivar, ArNee Vang

Poster Session I continued
9:00 a.m. until 10:30 a.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 9:00 a.m. until 10:30 a.m.

(21) ***Agricultural Applications of Unmanned Aerial Systems for Crop Monitoring***
Andres Castillo, Paul Verrinder, Ankit Pandey, Freddy Lopez

(22) ***Remotely Controlled Prototype End Effector Design for Tree Fruit Picking Applications***
Megan Anastasio, Keith Garabedian, Abhijit Suprem, Tou Thao, Richard Vue, Ger Yang, Nitaigour Mahalik

Poster Session II
11:00 a.m. until 12:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 11:00 a.m. until 12:30 p.m.

- (1) ***The Study of the Courtship Behavior of the Polyphagous Parasitoid Wasp***
Sarah R. Parry, Jun Abe and Jorge M. González
- (2) ***Study of Microparticles Impacts in a Hydroponic Plant-Insect System***
Mauricio De Almeida, Yunyun Chen, Hong Liang & Jorge M. González
- (3) ***Development of Orchard and Vineyard Removal Protocol for Central Valley California***
Frank Baggolini
- (4) ***Behavioral Responses of Parasitoids in the Genus Melittobia (Hymenoptera: Eulophidae) to Volatiles Emitted by Natural and Factitious Hosts***
Dakota Camino, Antonino Cusumano, Jorge M. Gonzalez
- (5) ***Algae Transformation as a Mutagenic Tool of the Oleogenic algae Dunaliella Primolecta***
Chirag Vazirani and Alejandro Calderón-Urrea
- (6) ***Effects of Caffeine on Drosophila expressing Tau Pathology***
April Booth, Auzadeh Jalali, Damaris Lambrecht, and David Lent
- (7) ***Genetic Variability In A Representative ‘Kerman’ X ‘Peters’ Population of Pistachio (Pistacia Vera L.) Orchard Based On Rapd-Pcr Technology.***
A. Nwangwu, E. Bhardwaj, J.A. Ross, Justin Costa, and J.T. Bushoven
- (8) ***Multiplex qPCR for Simultaneous Detection of Listeria monocytogenes and Bacillus cereus***
Yesheswi Chavan and Alejandro Calderón-Urrea
- (9) ***Evaluating the Role of glycine Metabolism in Breast Cancer***
Neha Bhavnani and Jason Bush
- (10) ***The Kinematics of Swimming Locomotion in the Shore Crab *Carcinus maenas****
Claudia Cristina S Velázquez, Ulrike K. Müller, Brian Tsukimura

Poster Session II continued
11:00 a.m. until 12:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 11:00 a.m. until 12:30 p.m.

(11) ***A Comparison Between the Mass-Radius Relation in the Ritter-Kolb Related Objects and Hot Jupiters.***
Simon Gonzalez, Fred A. Ringwald

(12) ***The Experimental Investigation on Zinc Oxide Nanowires Grown by Chemical Vapor Deposition Technique***
Raua Menkabo

(13) ***Studies toward the Development of Silybin Derivatives as Potential Chemotherapeutics***
Sheng Zhang, Bao Vue, Xiaojie Zhang, Konstantinos Parisis, and Qiao-Hong Chen

(14) ***The Effects of Curcumin-Based Compounds on the Viability, Proliferation and Apoptosis of Cancer Cells***
Xiaojie Zhang, Rubing Wang, Guanglin Chen, Laurent Dejean, Qiao-Hong Chen

(15) ***Anti-Proliferative Effects and Structure-Activity Relationships of Alkylated Quercetins***
Kevin Yu, Xiaojie Zhang, Guanglin Chen, Sami AlJabban, and Qiao-Hong Chen

(16) ***Role of Analytical Chemistry in Determining the Driving Force of Tannin Stickiness during Maceration***
Ralph S. Yacco, Aude A. Watrelot, and James A. Kennedy

(17) ***Numerical Study of Effects of Air Volume Fraction on Pressure Drop in Upward Vertical Two-Phase Air-Water Pipe Flow***
Cameron Khalili, Deify Law, Ph.D

(18) ***Design and Experimental Analysis of a Biomedical Prosthetic Knee with Magnetorheological Fluid***
Alan Suarez, Dr. The Nguyen

(19) ***A Reduced Presentation of the Virtual Singular Braid Monoid***
Andrew de la Pena, Sarah Mcgahan, Carmen Caprau

Poster Session II continued
11:00 a.m. until 12:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 11:00 a.m. until 12:30 p.m.

- (20) ***Using Next Generation Sequencing Data for Simultaneous Structural Variant Discovery in Related Species***
Suzanne Sindi, Marisela Torres, Stephanie Ruiz
- (21) ***Efficient Measurement of Not-Uniquely-Mappable Regions for RNA-Seq Data Analysis***
Jennifer Garner
- (22) ***Exploiting Higher Security and Quality on Image Steganography***
Harbhinder Kaur and Jin Park

Poster Session III
1:00 p.m. until 2:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 1:00 p.m. until 2:30 p.m.

- (1) ***Risk perception of drinking water source and quality in low-income Hispanic community in the Central valley***
Sarah Hasan, Samendra Sherchan
- (2) ***How Authority Figures Influence High School Seniors Academic Achievement***
Anissa Robinson
- (3) ***Predicting Successful Outcomes among Substance Abusers in Residential Treatment***
Danielle Baker, Spee Kosloff
- (4) ***High Impact Practices Associated with Higher GPAs of Psychology Transfer Students***
Cirenia Huerta
- (5) ***Attitudes towards e-cigarettes as a function of use and appearance***
Dr. Camille Johnson and Rebecca Sandoval
- (6) ***A Threat to National Security: The Cold War on Drugs***
Brionna Mendoza
- (7) ***Structural and Physiological Responses of *Helianthus annuus* and *Helianthus winteri* to Field and Common Garden Environments***
Phonemany L. Ounkham and John V.H. Constable
- (8) ***Riverbed Substrate Effects on San Joaquin River Lower Trophic Levels***
Julio Perez, Karen Boortz, Steve Blumenshine
- (9) ***Wastewater purification through the use of *Scenedesmus dimorphus*, *Chlorella vulgaris*, and *Dunalielia primolelecta****
Alejandro Hernandez*, and Alejandro Calderón-Urrea
- (10) ***Field experiment to determine if San Joaquin River organic matter production is limited by riverbed material***
Karen A. Boortz, Julio Perez, Steve Blumenshine

Poster Session III continued
1:00 p.m. until 2:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 1:00 p.m. until 2:30 p.m.

(11) ***Exploring Mechanical Advantages Through the Analysis of Mandible Morphologies in Mammals***
Bibler E, Haack K, Han S, Hwang S, Kaur D, Parisis K, Smart A, Tran A, Villalobos J, Zoghi S

(12) ***Determining visual preference in tethered walking flies***
Ben Person, David D. Lent

(13) ***Do Quadrupeds and Bipeds Scale Differently When Looking at Their Arm and Leg Bones?***
Fatima Hidalgo, Jennifer Leyva, Victoria Lieu, Kevin Muthima, Ahmad Nassef, Samantha Smith, Nicholas Tubutol

(14) ***Identification of Endophytes of the Sunflower *Helianthus winteri****
Chayce Hartung, John V.H. Constable, Mamta Rawat

(15) ***Specific Heat Measurements of the Filled Skutterudite $Pr(x)Nd(1-x)Os4Sb12$ Using Relaxation Calorimetry***
Shoji Hishida, Taylor McCullough-Hunter, Pei Chun Ho, Brian Maple, Tatsuya Yanagisawa

(16) ***Parkinson's Tremor Reduction***
Daniel Hairabedian, JoeAngel Miramontes, Cameron Khalili and Johnny Vang

(17) ***A Review on the Applicability of Graphene***
Shervin Zoghi

(18) ***Designing a robot with shape metal alloy (SMA) as actuator and controlling it with Arduino***
Johnny Vang, The Nguyen

Poster Session III continued
1:00 p.m. until 2:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 1:00 p.m. until 2:30 p.m.

- (19) ***New Approach to Measure Early-Age Shrinkage of Cement Paste Grout with Admixtures***
Dr. Akthem Al-Manaseer, Yvette Valadez-Carranza
- (20) ***The Utility of a Brief, Open Source Test of Working Memory to Enhance Concussion Assessment and Management***
Smith, B., Wright, M., Sailor, S., Jackson, C., & Smith, C.
- (21) ***Another School's In-Service Program Evaluation***
Deborah Omolayo
- (22) ***Pesticide Exposure and the Development of spina bifida in the San Joaquin Valley: A Case-Control Study in one Perinatology Practice***
Christina Thabit, Cynthia Cortez, Machelle Wilson PhD, Mallory Novak DO, Brian Morgan MD PhD

Poster Session IV
3:00 p.m. until 4:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 3:00 p.m. until 4:30 p.m.

- (1) ***Is There a Cross-Modal Magnitude Priming Effect on Numerical Estimation?***
Keith A. Edmonds, Paul C. Price, Ph.D.
- (2) ***Confirmatory Factor Analysis on Five Taxonomies of Rated Human Utterances***
Diana Le & Merle Canfield, PhD
- (3) ***College Student Belongingness, Stress, and Academic Engagement:***
Christine Edmondson, PhD.
- (4) ***The Role of Complicated Life Situations on College Student Academic Performance***
Taylor Clayton, Shauna Dauderman, Alex Gonzalez, Christine Edmondson, and Trisha Kivilaslu
- (5) ***HIV-1 Nef induced TNTs are My10 dependent***
Shivalee Gujarathi and Karine Gousset
- (6) ***Conserving Endangered Ecosystems: River Biodiversity***
Steve Blumenshine and Amina Lodhi
- (7) ***Prey Capture Efficiency of Utricularia vulgaris***
Maxwell Hall, Co-Author Dr. Otto Berg
- (8) ***Elucidating the mechanism of chalcone action as nematicidal agents***
Rachel Tamayo-Elizondo, Shoghig Stanboulian, Sosse Kendoyan, and Alejandro Calderón-Urrea
- (9) ***Interaction of the FERM Domain of Myo10 with the Tumor Suppressor p53***
Stacy Han, Shravan Kannan, and Karine Gousset
- (10) ***The Asynchronous Flapping oscillator in House Flies: Mapping the Parameter Space through Application of Weight to Wings***
Alexander Shiglik, Otto Berg
- (11) ***Novel Methods for 3-Dimensional Spheroid Cultures Using Three MDA-MB-231 Breast Cancer Isogenic Variants***
William A. Whalen, B.S., Jason Bush, PhD.

Poster Session IV continued
3:00 p.m. until 4:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 3:00 p.m. until 4:30 p.m.

(12) ***Increasing the Shelf Life of Pomegranate Arils using an Edible Coating***
Chinka Pruthi and Alejandro Calderón-Urrea

(13) ***Nanoscale Co-delivery of Curcumin and Chemotherapeutics to Treat Drug Resistant Pancreatic Cancer***
Matthew Ogbuehi, Delwar Hussain and Jason Bush

(14) ***Real Time Enzyme Kinetics by Quantitative NMR (qNMR) Spectroscopy and Determination of Michaelis–Menten constant using Lambert-W function: An Experiment for Undergraduate Physical Chemistry Laboratory***
Cheetou Her, Aaron P. Alonzo, Justin Y. Vang, Ernesto Torres and V.V. Krishnan

(15) ***Isotope Labeling via Chemical Modification of Antifreeze Glycoproteins (AFGPs) for Structural Study using High-Resolution Nuclear Magnetic Resonance (NMR) Spectroscopy***
Cheetou Her, Salvador C. Vazquez, Santanu Maitra and Krish Krishnan

(16) ***Conformational Equilibrium Dynamics of beta-methyl-amino-l-alanine (BMAA) and Its Carbamate Adducts using NMR spectroscopy***
Aaron Alonzo, Joy J. Goto and Krish Krishnan

(17) ***The Chemical Composition of Third-Hand Smoke***
Divine Yang, Justin Vang, Robyn Verhalen, Erik Rangel, and Dr. Alam Hasson

(18) ***Humanization of Single-Domain Antibodies that blocks invasion of Listeria monocytogenes***
Moeko Toride, Samariah Bautch, Brandy White, Cory Brooks

(19) ***1,5-Diheteroaryl-1,4-Pentadien-3-ones with Bulky Terminals: Synthesis, Cytotoxicity, and Anti-Proliferative Activity of towards Prostate and Cervical Cancer Cells***
Chengsheng Chen, Rubing Wang, Xiaojie Zhang, and Qiao-Hong Chen

(20) ***Quantification of a Pro-Apoptotic Protein Using a Conformation-Specific ELISA***
J.B. Urtecho, Ashley Peton

Poster Session IV continued
3:00 p.m. until 4:30 p.m.

University Business Center
Gottschalks Gallery

Authors will be available for questions from 3:00 p.m. until 4:30 p.m.

(21) ***NMR based Chemometrics of Third Hand Smoke***
Justin Vang, Divine Yang, Kathryn Patterson, Jason Bush, Alam Hasson, Krish Krishnan

(22) ***Understanding the Molecular Nature of Actagro® Agricultural Products: Overview of an Academic-Industry Research Partnership in Fresno***
Maggie Abercrombie, Susan Her, Cheenou Her, Aaron Alonzo, Justin Vang, Jaideep Singh, John Breen, Laurent Dejean, Taha Rezai and Krish Krishnan

Judges for Undergraduate and Graduate Oral and Poster Presentations

Dr. Loren Alving	University of California, San Francisco
Dr. Saeed Attar	California State University, Fresno
Mr. Doug Carey	California State University, Fresno
Dr. Steve Chung	California State University, Fresno
Dr. Paul Crosbie	California State University, Fresno
Dr. Doreen De Leon	California State University, Fresno
Dr. Kathleen Dyer	California State University, Fresno
Ms. Marie Fisk	California State University, Fresno
Dr. Joseph Gandler	California State University, Fresno
Dr. Joy Goto	California State University, Fresno
Dr. Raymond Hall	California State University, Fresno
Dr. Alam Hasson	California State University, Fresno
Dr. Howard Hendrix	California State University, Fresno
Dr. Donna Hudson	University of California, San Francisco
Ms. Susan Hughes	University of California, San Francisco
Mr. Carl Johansson	Fresno City College
Dr. Maritere Lopez	California State University, Fresno
Dr. Marat Markin	California State University, Fresno
Dr. Justin L. Matthews	California State University, Monterey Bay
Mr. Rick Stewart	Fresno City College
Dr. Brian Tsukimura	California State University, Fresno
Dr. Oscar Vega	California State University, Fresno
Dr. Kent Yamaguchi	University of California, San Francisco
Mr. Timothy Yeager	California State University, Fresno

Moderators for Oral Presentations

Mr. Doug Carey	California State University, Fresno
Dr. Carmen Caprau	California State University, Fresno
Dr. Howard Hendrix	California State University, Fresno
Ms. Debbie Neufeld	California State University, Fresno
Mr. Chuck Radke	California State University, Fresno
Dr. Brian Tsukimura	California State University, Fresno

Presentations will be judged based on the following criteria and considerations:

- Merit, creativity, timeliness, and value to an audience of scholars not necessarily from the same discipline
- Authors are encouraged to present their work using terminology suitable for a multi-disciplinary audience
- Results of completed work, as well as work-in-progress, for which there is preliminary data

ORAL PRESENTATION ABSTRACTS

(IN ALPHABETICAL ORDER BY PRESENTING AUTHOR)

Arlene Agustin, Dr. Maria Cruz

Arlene Agustin and Maria Cruz

acagustin23@gmail.com

California State University, San Jose

Department of Psychology

Social and Emotional Loneliness among University Students

This study is making a comparison between students' self-reported experiences on and off the university campus as a college student. We hypothesize that students who are highly involved on the school campus will experience emotional loneliness more than social loneliness. Our second hypothesis states that students will be experiencing both dimensions of loneliness on the college campus more than off the college campus. The implication of this study is that with the increase of enrollment rates in college education, it is interesting to examine if loneliness is still prominent in a college student's life.

Anusha Allawala, Dr. Katherine Wilkinson

Anusha Allawala and Katherine Wilkinson

anusha.baker@gmail.com

California State University, San Jose

Department of Biological Sciences

The Characterization of Muscle Sensory Receptor Response to Inflammation

Inflammatory factors can alter the activity of muscle sensory afferents and may contribute to the development of chronic pain and other sensory disorders. We hypothesized that muscle afferent population responses to stretch will be altered following systemic inflammation caused by a Lipopolysaccharide injection (7.5×10^5 EU/kg; Controls given 200 μ L saline) 18 hours prior to the experiment. The extensor digitorum longus muscle and deep peroneal nerve were dissected out from adult male C57BL/6 mice and placed into an in vitro bath. Muscle afferent activity was recorded with a suction electrode in response to a battery of physiological ramp and hold stretches. The muscle afferent population response to stretch was found to have decreased following inflammation (Multivariate ANOVA, $p < .05$). Identified individual Group Ia/II muscle stretch receptor afferents also showed decreased sensitivity to stretch in the inflamed group. This suggests that inflammation in male mice changes the muscle sensory information, especially the proprioceptive information from the muscle stretch receptors, reaching the central nervous system. This impairment may also help explain some of the mobility disabilities experienced in disease states like obesity and chronic pain that are characterized by inflammation. Future studies will determine how nociceptor (pain sensing) activity is altered by inflammation.

Jacqueline Alvarez, Dr. Carolyn Cusick

Jacqueline Alvarez, Victoria Cuevas
jacquelinealvarez1@mail.fresnostate.edu
California State University, Fresno
Department of Women Studies and Department of Philosophy

LGBT+Convocation and the Experience of Belonging Project

Introduction: Fresno State's diversity and inclusion statement strives to "reduce barriers to success" which exist for a range of persons including barriers due to one's gender identity and sexual orientation. However, the university does not collect any data on the number of or experiences of LGBT+ students, faculty, or staff. Additionally, at annual commencement events at Fresno State include ceremonies recognizing certain racial and ethnic groups including African-Americans, Latinos and International Students. These ceremonies are viewed as a demonstration of the university's commitment to diversity, of the significance of inclusion and belonging in higher education. And, they are important to these populations being recognized for their educational successes as members of those social groups. May 2014 saw the first LGBT+ Recognition Ceremony on Fresno State's campus.

Methods: Our qualitative research uses approximately twenty interviews with organizers, participants, and alumni. Interview questions explore how LGBT+ students, faculty, and staff see the importance of the ceremony, how they understand the university's commitment to diversity and to LGBT+ students in particular, and what "barriers to success" face LGBT+ students at Fresno State.

Results: While the ceremony—which was attended by the President, administrators and faculty, as well as students and their families and friends—may be understood as an extension of the university's effort to achieve diversity and inclusion, the event was entirely student lead and student driven, unlike the other ceremonies that have faculty and administrative support.

Conclusion: Our research benefits the university as the data and analysis that emerges offers a more concrete understanding of the LGBT+ population as well as how to better include and serve them. It presents to the university a population that is as yet officially unaccounted for. We know that this population exists but our research gives insight to their political struggle for equity. As feminist activists who strive to understand the current climate on campus with the purpose of advocating for students, we are also involved in other efforts to create and maintain LGBT+ resources, recognition, and safety. This research then also serves a wider LBGT+ community as we report ongoing efforts at Fresno State.

James Baroi, Dr. Alam Hasson

James Baroi, Sowmya Tummala, Kennedy-Kiet T. Vu

jamesbaroi@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

**Concentration of Selected Organics and Reactive Oxygen Species Generation
from PM2.5 Extracts**

Particulate matter in the atmosphere has been known to cause detrimental health effects and lend to climate change. More specifically reactive oxygen species (ROS) in fine particulate matter, with an aerodynamic diameter of 2.5 microns (PM2.5), are suspected to be significant contributors to the production of oxygenated free radicals such as hydroxyl radicals and peroxides that are harmful to human health and the environment. This study is an attempt to measure the concentration of PM2.5 during the air sampling campaign conducted in Fresno, California in the winter of 2013, determine the concentration of select organic ROS within PM2.5, correlate the concentration of these organics to measured peroxides, compare temporal variations in these concentrations, and determine potential sources of these pollutants.

The experimental setup used a high-volume PM 2.5 sampler to pump ambient air through a Teflon filter and collect PM 2.5. The ROS adsorbed to the PM 2.5 were extracted into an organic solvent and run through gas chromatography with a mass spectrometry detector (GCMS) to identify and quantify the ROS. Once quantified, back trajectories were calculated using meteorological models.

Concentrations of PM2.5 and select organic constituents, such as 9,10-Anthraquinone (as high as 0.5 ng/cubic meter) and 9,10-Phenanthraquinones (as high as 6 ng/cubic meter) have been determined, and analysis of temporal variation does not confirm significant differences in concentrations of quantified organics between morning, afternoon, or night samples.

Ongoing work aims to identify similar organics some of them being markers for different polluting processes such as wood burning and gas cooking to gain a more thorough understanding of the impact of these pollutants on human health and the environment.

Lauren Barrett, Dr. Hend Letaief

Lauren Barrett, Robin Caillieudeaux, Hend Letaief
laurenmb21@mail.fresnostate.edu
California State University, Fresno
Department of Viticulture and enology

**Understanding Phenolic Extraction through the Physical Properties
of Wine Grapes from California**

Cell walls are mainly responsible for the integrity and texture of tissues and therefore determine fruit processing. During winemaking, they constitute a diffusion barrier for phenolic compounds. Consistent with this, characterizing cell wall physical properties is important for a better understanding of the grape skin extractability potential. Grape berries (*Vitis vinifera L.*, cv Merlot and Cabernet Sauvignon) were harvested at maturation from different regions in California from warm interior valley sites, to cool north coast sites. Grape texture and phenolic composition were determined at commercial harvest and wines were produced from the same lots. Results revealed correlations between berry texture and grape total anthocyanin content. It has been determined that skin elasticity and hardness are negatively correlated to an increasing total concentration of anthocyanins in grape skins. Results also showed negative correlations between skin color and skin weight with no varietal effect. Extractability of anthocyanins was more dependent on berry and skin weight than on berry size. Although anthocyanins were higher in northern California grapes, they were less extractible in wines due to higher berry skin elasticity and a higher skin weight.

Andrew Beebe, Dr. S. Kaan Kurtural

Andrew Beebe

abeebe20@mail.fresnostate.edu

California State University, Fresno

Department of Viticulture and Enology

**Comparison of Crop Load Management Systems and Applied Water Amounts on
Vegetative Compensation, Whole-Canopy Photosynthesis, and Vine Performance in
Procumbent *Vitis Vinifera* L. in A Warm Climate**

Preliminary results are being analyzed for interpretation. Currently, the total loneliness score on campus has a mean of 28.94 and the total loneliness score off campus has mean of 22.78. The preliminary results showed a mean difference of 6.16.

Russell Berndt, Dr. Michelle Den Beste

Russell Berndt

rberndt@mail.fresnostate.edu

California State University, Fresno

Department of History

Russians in the Central Valley

This paper, part of a larger research project on Russians in the Central Valley, seeks to examine Slavic life in the Central Valley. There are many different Slavic groups in the Central Valley including Russians, Ukrainians, Belarusians, and Moldovans. These different groups have established several Russian churches throughout the Fresno and Clovis area, many belonging to the Baptist faith. Most research on Russians in the United States has focused on Fort Ross, CA, the Russian River area, and Russian Alaska. Almost no research has examined Russians in the Central Valley. There are three main groups of Russians in the Central Valley: Mennonites, Molokans and Russian Evangelicals (mostly Baptists). My research will focus on the Russian Baptists. There are several Russian Baptist congregations in the Fresno/Clovis area and my oral interviews have concentrated on this group. After interviewing and talking with several individuals I have come to several conclusions. First, many of the Russian families who migrated to the Central Valley came during 1990-94 as the Soviet Union was collapsing. Second, many Slavs feel that church helps them maintain their identity and language. Third, Slavs who leave Russian churches feel that they are losing part of their identity and think it is harder to pass their traditions to their children. Russians in the Central Valley have a rich culture that needs to be shared and which has not been studied. Many lived during the Soviet Union and remember the religious oppression they faced. The church helps Slavs stay connected with their heritage and provides a place for them to pass their culture to their families.

Hillary Bese, Dr. Oscar Vega

Hillary Bese

lillybese@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

The Well-Covered Dimension of Generalized Quadrangles with Regular Points

Generalized quadrangles are a type of geometric incidence structure of points and lines. In this work, we investigate the well-covered dimension, which is a parameter from the field of graph theory, of graphs related to generalized quadrangles. In order to calculate the well-covered dimension, we must first associate the geometric structure to a graph, called its adjacency graph, which is obtained from the structure in a specific way.

The well-covered dimension of a graph is calculated using sets of vertices, called maximal independent sets, in which no two vertices of the set are adjacent and the set contains a maximal number of vertices. We will show that the well-covered dimension of the adjacency graph of a generalized quadrangle with all regular points is zero by finding maximal independent sets of different cardinalities.

Max Bright, Dr. Doug Singleton

Max Bright

neomaxprime@mail.fresnostate.edu

California State University, Fresno

Department of Physics

The Time-dependent Non-Abelian Aharonov-Bohm Effect

According to the preliminary results, students are experiencing loneliness both on and off the university campus, but slightly experience loneliness on the university campus more than off campus.

Shelby Brisky, Dr. Yoshiko Takahashi

Shelby Brisky, Dr. Yoshiko Takahashi
shelbybrisky@mail.fresnostate.edu
California State University, Fresno
Department of Criminology

Disproportionate Minority Contact: Differential Minority Arrest Patterns and Recidivism of First-Time Juvenile Offenders

This study will analyze the disproportionate minority contact as it applies to Fresno County. Juvenile offenders will be the sample population, and the first priority is to establish proof of the disproportionate minority contact at initial contact with law enforcement officials. Furthermore, the study will detect any disproportionality regarding minority juveniles during subsequent, recidivist contact. Because there are contradictory theories regarding the causation of this disproportionate contact, it is important to test the changes in disproportionality over a time period and compare to social variables.

The sample of the study consisted of 1,145 juveniles whose ages were under 15 and were brought into custody at the Fresno County juvenile detention facility from January 1 to December 31, 2010. During 2014, the researchers followed-up on the database and kept track of the three-year activities for those individuals from the first-appeared date on the database. Variables noted included: gender, race, seriousness of first offense, gang affiliation, drug use, family type, TANF use, and the presence of family in the CJS. A chi-square analysis of recidivism and race, as well as minority general population percentage to minority prison population percentage was conducted. A binary logistic regression was conducted to ascertain the relationship of the aforementioned variables and recidivism.

While the chi-square value for race and recidivism was insignificant, the chi-square value measuring disproportionate minority contact at the initial stages was statistically significant. Among the significant variables in predicting recidivism as evident by the binary logistic regression were: serious of first offense, gang affiliation, drug use, family type, and TANF use.

These results insinuate two social phenomena. First, although disproportionate minority contact exists at initial contact with the system, the affect disappears in subsequent contact. Also, several social factors, rather than racial status, predict recidivism amongst Fresno juvenile offenders.

Leah Buchnoff, Dr. Michelle Den Beste

Leah Buchnoff

leahbuchnoff@mail.fresnostate.edu

California State University, Fresno

Department of History

**One Hundred Years Later:
The Molokans, A Thriving Pre-Revolutionary Russian Community in California**

While California's culture is rapidly changing, some religious sects have found a way to preserve their traditions and thrive in a largely secular 21st century context. A pre-revolutionary Russian religious group, the Molokans, continue to practice their historic religion while they work and send their children to public schools. The Molokans appear in Russia's religious record in the mid eighteenth century. They became one of many indigenous religious sects who split from the Russian Orthodox Church and who were persecuted, exiled, deprived of property and imprisoned. In the early twentieth century a group of Molokans left Russia for America, settling in Los Angeles, Mexico, and San Francisco. Some of these Molokans eventually settled in Fresno County, forming a new religious community. This paper will examine the current research on Molokan communities in Fresno County, their history, and their ties to the community in Los Angeles and Mexico. Using extensive oral histories as well as newspaper articles and local artifacts, the paper will examine the lives of Molokans in the Central Valley. It will briefly examine the history of Molokans in Russia and their reasons for leaving Russia at the beginning of the 20th century in order to understand the degree their culture differentiates from life in Russia. It will then examine how life in the community has changed and what has stayed the same. Finally, this paper seeks to place the Molokans as participants in the vibrant immigrant community of the Central Valley. The paper explores individual interpretations of what it means to be a Molokan, the current Molokan community, and how daily life in the Molokan community seeks to preserve tradition. The paper is part of a larger research project which aims to explore the lives of religious Russian communities in the Central Valley.

Madeline Byers, Dr. Thomas Holyoke

Madeline Byers

madelinebyers@mail.fresnostate.edu

California State University, Fresno

Department of Political Science

Still Thirsty in Rural California: The Impact of California AB 685

California's long-lasting drought has caused a number of problems – the object of my research is to analyze which of these problems are impacting my surrounding community. For this reason, my study investigates water policy in California, with a focus on California Assembly Bill 685. This bill, passed in 2012, expresses that there is a fundamental human right to water. California AB 685 requires that when states revise, adopt or establish policies, regulations, or grant criteria they take the human right to water into consideration. My research examines the impact of the bill three years after it was passed. Specifically, my focus is on the economic status of households, groundwater levels, and land fallowing in Tulare County before and after AB 685's implementation. As predicted, the bill has not had a significant impact on alleviating the water problem among these populations: my findings demonstrate that there has been little to no improvement in the economic and environmental indicators of water supply in these areas. However, data regarding subsequent legislation and public awareness of the issue imply that AB 685 was highly successful in its main purpose of gaining attention for the lack of water in the Central Valley as well as serving as a foundation for legislation that would begin to incite future change. California's long-lasting drought has caused a number of problems – the object of my research is to analyze which of these problems are impacting my surrounding community. For this reason, my study investigates water policy in California, with a focus on California Assembly Bill 685. This bill, passed in 2012, expresses that there is a fundamental human right to water. California AB 685 requires that when states revise, adopt or establish policies, regulations, or grant criteria they take the human right to water into consideration. My research examines the impact of the bill three years after it was passed. Specifically, my focus is on the economic status of households, groundwater levels, and land fallowing in Tulare County before and after AB 685's implementation. As predicted, the bill has not had a significant impact on alleviating the water problem among these populations: my findings demonstrate that there has been little to no improvement in the economic and environmental indicators of water supply in these areas. However, data regarding subsequent legislation and public awareness of the issue imply that AB 685 was highly successful in its main purpose of gaining attention for the lack of water in the Central Valley as well as serving as a foundation for legislation that would begin to incite future change.

Chih-Chiun Chang, Dr. Rais Vohra

Chih-Chiun Jamie Chang (CSU Fresno), Rais Vohra MD (UCSF Fresno Medical Center), Michael Levine MD (USC)

jamiechang@live.com

University of California, San Francisco

California State University, Fresno

Department of Emergency Medicine

Acetaminophen Poisoning: National and Local Implications of Toxicology Assessment

Introduction:

Acetaminophen is the most common cause of intentional poisoning in the United States, with variability in treatment patterns. We used nationwide data about acetaminophen poisonings to estimate the additional number of patients that would be treated if we adopted the more conservative UK treatment nomogram in the US. We also examined data from a single medical center (UCSF Fresno) to assess the impact of a bedside toxicology consult service on length of stay for poisoned patients.

Methods:

Patients over 14 years of age with acetaminophen poisoning who presented to one of seven US hospitals with acute acetaminophen ingestion were screened. Patients were selected if acetaminophen levels mandated treatment by the UK nomogram but not in the US system. The number of cases nationally was extrapolated to the total number of annual visits for acetaminophen overdose in the US. From the Fresno population, we examined a 20% sample of patients in two groups (2008-2010 and 2011-2013) to determine the impact of a toxicology consult service, which began in 2011, on length of stay.

Results:

The national study determined that an additional 5.4 cases per 100,000 patients would be treated when applying the revised UK system. Extrapolating this number nationally, an estimated 6951 additional subjects would be treated annually. In the local study, overdose patients had shorter treatment times after the introduction of a toxicology service in 2011. Furthermore, the largest decrease in treatment times occurred during the transition period between 2010 and 2011.

Conclusions:

Adopting the UK nomogram for acetaminophen poisoning treatment in the US would significantly increase the number of patients treated while using more resources, for little clinical benefit. Developing a toxicology consult service can immediately benefit a medical center by improving the efficiency and quality of care for poisoned patients.

Pengyuan Chen, Dr. Woonki Na

Pengyuan Chen, Woonki Na

heavenseed@mail.fresnostate.edu

California State University, Fresno

Department of Electrical and Computer Engineering

Linear Controller Design for the Voltage Regulation of Solar Energy Systems

As the demand for solar energy is dramatically increasing, the solar energy applications have been heavily studied for the last decade. In the solar energy applications, solar panels have received plenty of attentions because any solar panel can conveniently convert the received light energy to electricity without any pollution. However, the potential maximum power generated by any solar panel heavily depends on irradiation, temperature conditions and its voltage level. The voltage level of a solar panel is normally controlled by its connected power conversion system. Especially, the voltage regulation of the solar panel has to consider the nonlinear behaviors of the system. In this research, a small signal model analysis is adopted for investigating the behaviors and linearized model of the power conversion system. Throughout the experimental results, the linearized approximations of the system have been validated. Based on the theoretical analysis, a linear feedback control is designed for the voltage regulation of the designed solar energy system. As expected, the voltage level of the selected solar panel can efficiently trace its reference value. This research provides a practical guideline of the linear controller design for the voltage regulation of solar energy systems.

Kim Davidson, Dr. Blain Roberts

Kim Davidson

kmichaelle91@mail.fresnostate.edu

California State University, Fresno

Department of History

Mothers in Israel: Latter-Day Saint Women's Opposition to Second Wave Feminism

In light of the recent feminist movement known as "Ordain Women" among certain members of the Church of Jesus Christ of Latter Day Saints and subsequent hostility of the official Church and countless female members, this paper will investigate the ways in which the LDS church represented a backlash to the American Women's Liberation Movement of the 1960s and '70s. Ultimately, I will argue that most Mormon women did not consider themselves helpless victims trapped within a misogynistic tradition but empowered "Mothers of Israel" who actively chose to be obedient wives, mothers, homemakers, and subordinate members of the Church. Finding power in motherhood, as "molder[s] of the next generation," they voluntarily embraced a "Gospel Counterculture" wherein they could build microcosms of virtue and righteousness within the sanctity of the home. These women believed the Women's Liberation Movement promoted not the elevation of women but the denigration of the family, which would ultimately culminate in a culture of moral depravity.

This paper presents both the LDS establishment's and many LDS women's positions on the Women's Liberation Movement. It employs official church counsel documented in General Conference papers and Church magazines such as the Liahona, Ensign, and Relief Society periodicals as well as recorded Testimony and Sacrament meetings, oral histories, interviews, and personal writings of LDS women. This juxtaposition of highly corroborating sources indicates that LDS opponents to women's rights were often college-educated and urban women who had ample access to various types of media. Nevertheless, they were vital participants in the backlash to the Women's Liberation Movement, adhering to the patriarchal structure of the Church despite the opportunities the Movement offered them.

Renee Delport, Dr. Susana Hernández

Renee Delport

rdelport@csufresno.edu

California State University, Fresno

Department of Educational Leadership and Administration and Department of Higher Education

**Professional Development for Community College Student Services Practitioners:
Capacity, Competency, Diversity**

As the mission of community colleges expands from access to include success it is important to understand how student services practitioners affect the experience of students. Recognizing diverse student needs coupled with inconsistent educational preparation of student services practitioners, the need is paramount for a highly trained work force that can effectively and efficiently impact student success. Utilizing multicultural organizational development as the theoretical framework, student service managers at three community colleges in California were interviewed for this qualitative study that examined the capacity community colleges have for providing professional development opportunities to student services practitioners, how the colleges use the ACPA/NASPA professional competencies to inform professional development opportunities, and how practitioners are trained to serve diverse students.

Findings of this study discuss how student services managers view their campus' ability to provide professional development opportunities for student services practitioners in terms of capacity, competency, and diversity. In general, the study revealed minimal campus capacity for providing professional development opportunities, low awareness of the ACPA/NASPA professional competencies, and inconsistent value placed on diversity awareness at all campuses. This study seeks to add to the limited body of literature available on community college student services practitioners and the professional development opportunities afforded to them. Based on the findings of this study recommendations are given to impact current practices and future research.

Hunter Dias, Dr. Woonki Na

Hunter Dias, Keon McDonald

hunterdias@mail.fresnostate.edu

California State University, Fresno

Department of Electrical and Computer Engineering

The Solar Trap

Currently, becoming environmentally aware is critical for engineering principles and design. A result of this is that the masses are becoming more aware of alternate forms of energy. To become more environmentally friendly, technology has been influenced to include alternate energy forms. The purpose of this project is to investigate the feasibility of using an alternative energy source to approach a problem. The alternative energy that is intended to be used is solar energy and the application is of a mobile phone battery charging system. The mobile phone battery charging system is powered by energy generated from solar panels integrated into a mobile system, conceptualized and applied into a project.

The purpose of this project is to present the use of solar energy being used to operate as a battery charger. A solar powered battery charger is presented with the use of photovoltaic panels used in a conversion of solar power into electricity. A DC-DC converter is required to control the output power of the photovoltaic panel and in turn, sends current to charge the battery. The output voltage is regulated by the DC-DC converter, depending on the type of converter. A photovoltaic system is required to use this energy continuously. A charge controller is used to control the flow of current through the battery and to protect the battery from overcharging and deep discharging. The principle operation and feasibility of the photovoltaic system will be determined by the presence of sunlight. Optimum irradiance angles will be found by testing different efficiency values. This will provide the best angle and time of day for the best output performance and design of the solar unit. The charging system is designed to charge one or multiple 5V batteries simultaneously via a photovoltaic solar panel.

Ryan Ditchfield, Dr. Peter English

Ryan Ditchfield, Dr. Peter English
ryanditchfield@mail.fresnostate.edu
California State University, Fresno
Department of Criminology

Confirmation Bias in the Manipulation of Police Photo Lineups

Several factors contribute to inaccurate eyewitness identifications of suspects in photo lineups. One recommendation to increase their accuracy is to present the lineup using a double-blind procedure. Here, the administrator of the lineup does not know the identity of the suspect and is thus protected against confirmation bias – the intentional or unintentional communication of information that might influence the witness to select the individual who the police believe committed the crime. Photo lineups consist of six photographs – one of the suspect and five non-suspects (fillers). All of the photographs must be similar to one another but not so similar that the photographs are indistinguishable. Photographs that are too similar make identification difficult; dissimilar photographs make identification too easy. In some cases, suspects possess a characteristic that distinguishes them from the fillers. The presence of this feature may make identification too easy. It is recommended that the distinguishing feature be either replicated across all photographs or concealed on the photograph of the suspect. In this demonstration, we examined the effects of confirmation bias on the concealment of a distinguishing feature on photographs in a lineup. We tested whether participant's knowledge of the suspect caused them to conceal the distinguishing feature differently for the suspect's image versus the filler images. Half of the participants knew the identity of the suspect, the other half did not. Both groups were instructed to conceal the photographs in as similar a manner as possible using a black felt-tip marker. The surface area of the concealed images was measured using the image-processing program ImageJ. Participants who knew the identity of the suspect concealed the characteristic in a manner different manner from participants in the control group ($p < 0.05$), supporting the presence of confirmation bias. Recommendations for further research are made.

Janae Dixon, Dr. Oscar Vega

Janae Dixon, Richard Adams

janaekeysbramlett@yahoo.com

California State University, Fresno

Department of Mathematics

Grim: Playing Games with Graphs

The game Grim is an impartial deletion game played on graphs by two players. A move consists of selecting a vertex and deleting it, along with all of its incident edges. Any vertices that become isolated are also deleted. The player to make the last legal move wins. Some was already known about Grim played on certain families of graphs but given that, not surprisingly, the analysis of the game gets very complex when the number of vertices grows, a new approach was necessary. We have used game theory techniques and a probabilistic approach to investigate what happens when Grim is played on large graphs.

In this talk we will present results about what one should expect when the game is played on large graphs, and the Sprague-Grundy sequences of Grim when played on paths, cycles, and gears. Interesting connections to other games will also be discussed.

Ryan Dougherty, Dr. Melissa Golden

Ryan Dougherty, Melissa Golden, Krish Krishnan

ryan58@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Synthesis and Characterization of Bis(bis(O-ethyl-L-cysteinato)nickel(II))nickel(II)Nitrate

NiN₂S₂ complexes are an important class of complexes often used to model nickel containing metalloenzymes, such as NiSOD, ACS, CODH, NiFe-H₂ase, as well as to model metal ion exchange and transfer in metalloenzymes such as zinc fingers. Zinc Fingers are a large and ubiquitous class of proteins that play crucial roles in gene expression as well as mediate cellular defense against oxidative stress. To date, model complexes using tetradeятate N₂S₂ ligands have been used in order to gain more understanding of possible transmetallation and oxidation products. Although the tetradeятate characteristic of the N₂S₂ ligands adds to the stability of these complexes due to the chelate effect, using tetradeятate ligands limits the geometries and geometrical isomers that may be seen. We hypothesized that a bidentate ligand system (L-cysteine ethyl ester, cysE) may also serve as an effective model for oxidation and transmetallation reactions. Using a bidentate ligand allows us to address if the additional stability of the tetradeятate ligands is necessary. It also allows for the exploration of different molecular arrangements and how that affects reactivity. In previous studies, it was shown that nickel can readily displace the zinc ion in the model complex Zn(cysE)₂. The UV-Vis data indicated the formation of a new complex which had spectral attributes characteristic of a trinuclear nickel complex. Similar UV-Vis spectra were also observed in the oxygenation studies of Ni(cysE)₂, also suggesting formation of a trinuclear species. The synthesis and characterization of bis(bis(O-ethyl-L-cysteinato)nickel(II))nickel(II) nitrate will be presented. By using Job's Method of Continuous Variation and high resolution NMR studies (HSQC, ROESY, NOESY, TOCSY), the stability of the trinuclear [Ni(Ni(cysE)₂)₂]²⁺ in solution is addressed. Job's method confirms the formation of the trinuclear nickel complex in DMF, and the high resolution NMR experiments provide evidence for weak binding of "free nickel" to the Ni(CysE)₂ in DMSO. The synthesis of the trinuclear complex was also confirmed by mass spectrometry, UV-Vis, and elemental analysis.

Brennen Fagan, Dr. Doreen De Leon

Brennen Fagan

rydrion@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

On the Inoculation of Computer Networks: Big and Small - Part 1: Small Networks

As complex computer networks become more integral to our life, it is becoming more important to create effective and efficient defenses against cyber crime. One such method involves the treatment of a computer network as a graph of nodes and edges. For small enough such graphs, we can use centrality measures derived from graph theory and linear algebra in order to identify the most important nodes in a graph. Hence, we can determine which computers on the network to protect first. Unfortunately, it is hard to determine which centrality measures to apply. This talk will discuss one such methodology proposed by the literature and propose one additional methodology, as well as discuss when this new methodology performs better than the current methodology.

Kayla Fischer, Dr. Camille Johnson

Kayla Fischer

kcn_93@yahoo.com

California State University, San Jose

Department of Psychology

Where University Students Live Affects Their Attitudes School and Life

A sample of 300 undergraduate students at San José State University, ranging from ages 18 – 50, will be asked to participate in an online survey. Students are recruited through the on-line participant pool (SONA) consisting of introductory psychology students and introductory business students. These students will receive course credit for participating in the study. Participants will also be recruited through class presentations and randomly approached on the San Jose State University campus premises.

Rebeka Garcia, Dr. Peggy R. Trueblood

Rebeka Garcia

beka08@mail.fresnostate.edu

California State University, Fresno

Department of Physical Therapy

Fall Incidence and the Use of Psychotropic, Opioid, or Cardiovascular Medications

Background: Medications are one identifiable risk factor that can contribute to the incidence of falls. The aim of this study is to assess if the most frequently prescribed medication categories, psychotropic, opioid, and cardiovascular, are associated with the incidence of falls in community-dwelling adults 65 years and older.

Methods: This retrospective observational study used data previously collected from subjects who participated in the SAFE (Senior Awareness and Fall Education) Balance Screening Program, throughout Fresno County from 2007-2014. An in depth review was completed to identify psychotropic, opioid, and cardiovascular medications. Due to the abundance of cardiovascular medications, we further classified this group into 12 subcategories of drug classes. Participants were identified as fallers if they had experienced ≥ 2 falls in the last 12 months. Individuals with ≤ 1 fall served as the comparison group.

Results: A total of 513 participants were included and 31.2% had experienced ≥ 2 falls. A stepwise logistic regression analysis was used to examine the predictors of falls. Data indicated that the overall model was statistically significant ($P < .001$). Furthermore, 70.3% of fallers and non-fallers were categorized correctly when patients were taking psychotropic and opioid medications. Chi square test analysis detected a statistically significant association between reported falls and use of either psychotropic or opioid, but not cardiovascular medications. When cardiovascular drug class was sub-categorized, the use of anti-arrhythmic medication was statically significant. The strongest predictor for falls, however, was use of psychotropic and opioid medications combined. The odds of experiencing a fall were 4.3 times (OR 4.3, CI 1.96-9.64) greater with use of both psychotropic and opioid medication.

Conclusion: Identification of older adults who consume psychotropic and/or opioid medications can allow for patient education on adverse drug reactions, early intervention of fall prevention, or referral to physician/pharmacist for medication consolidation.

Tiffany Gonzales, Dr. Marianne Jackson

Tiffany Gonzales
tigonzales@csufresno.edu

California State University, Fresno
Department of Psychology

The Effects of Peers on Children's Physical Activity: A Functional Analysis

In the United States, 16.9% of children and adolescents from the ages of 2 to 19 are considered to be obese, and one-third of children and adolescents are considered to be overweight or obese (Ogden, Carroll, Kit, & Flegal, 2012). Although physical activity alone may not solve the obesity epidemic, it has the potential to mitigate some of the health risks that individuals are facing. In this study, we examined whether the presence of a peer in the experimental conditions of being alone, contingent attention, and contingent adult interactive play would affect levels of physical activity in three preschool aged children. The experimental conditions were examined with a multielement design with an initial baseline and follow up of the most effective intervention. Each condition occurred three times with a peer present and three times with a peer absent and was presented in a semi-random fashion to minimize interaction effects. Results indicate that all participants had higher levels of physical activity during the interactive play with a peer present condition and lower levels of activity during naturalistic baseline and alone conditions. Additionally, the presence of a peer in the experimental conditions increased levels of physical activity across two or more conditions compared to when a peer was not present.

Stacy Han, Dr. Honora Chapman

Stacy Han and Honora Chapman
danbi@mail.fresnostate.edu
California State University, Fresno
Department of Humanities

Humanities: A Missing Element in Medical Education

Over the last century, science and technology have been revolutionizing medicine, as discoveries in the laboratory lead to new treatments and therapies in the medical field. For this reason, medical education places heavy emphasis on the sciences. But while increasingly advanced technology has led to sophisticated diagnostic and treatment options, satisfaction with physicians is at an all-time low, as patients experience a lack of sufficient doctor-patient interactions. With a science-based medical education, there is a severe deficiency in acknowledgement of the central-most element of medical practice: the person. The human element, provided by both doctor and patient, accomplishes what science cannot, including communication, mutual understanding, and consideration of the human condition. The arts and humanities, as scholarly fields that study and express the human experience in art, poetry, drama, music, literature, and more, encompass everything that it means to be human, from happiness in times of health, to sorrow in times of illness. Thus, the arts and humanities should be fundamental in medical education in order to equip doctors with the ability to communicate with and understand their patients. By reading Homer's works, observing Michelangelo's paintings, and watching Shakespeare's plays, among many others, medical students can gain exposure to discussions of the human condition. This exposure, in turn, can allow physicians to look beyond disease and see the person suffering the illness, leading to more compassionate, patient-centered care with good doctor-patient interaction and improved outcomes for the patient.

Amanda Holst, Dr. Gregory Savage

Amanda Holst and Gregory Savage

amanda.holst@sjsu.edu

California State University, San Jose

Department of Psychology

**Barriers to and Motivation for Parent-implemented Behavioral Interventions for
Children with Autism Spectrum Disorders**

This paper examines the barriers to motivation pertaining to parents delivering and following through with interventions at mealtimes with children who are affected by autism spectrum disorder (ASD). Several studies on treatment methods have been conducted in controlled research settings, but little is known about parents implementing these methods in a home setting. There is also little research showing the relationship between motivation and the barriers to treatment participation. This small case study examining the effectiveness of an evidence-based parent training intervention in a home setting has two aims. The first aim was to assess parent motivation during a six-week training focusing on child behavioral modification and communication. The second aim was to examine the effect of motivation on barriers to the intervention. It was hypothesized that the more instruction parents received, the higher their level of motivation would be. Motivation was assessed three times during the six-week training program using the Parent Motivation Inventory Scale. Parents also completed the Barriers to Treatment Participation Scale, a general survey on mealtime, behaviors, learning styles, and strengths and weakness as a parent. The FAI (Functional Assessment Interview) and a Functional Assessment Direct Observation (FA) were also completed. Findings show that while the children's disruptive mealtime behavior decreased and food intake increased, motivation varied. These findings provide valuable insights into improving motivation for parent-implemented interventions and improving services available to ASD families.

Ian Huh, Dr. Cory L. Brooks

Ian Huh, Robert Gene, Jyothi Kumaran, C. Roger MacKenzie, and Cory L. Brooks
namstyle@mail.fresnostate.edu
California State University, Fresno
Department of Chemistry

Neutralization of *Listeria monocytogenes* invasion by Single Domain Antibodies

Listeria monocytogenes is a gram-positive bacterium that can cause fatal meningitis and trigger abortion of a developing fetus during pregnancy. These bacteria initiate invasion of non-phagocytic cells by deploying the virulence factors Internalin A (InlA) and Internalin B (InlB). The Leucine-Rich Repeat (LRR) domain of InlA/B interacts with receptors on the target cell surface, which leads to internalization of the bacteria. The bacteria can then escape the endosome and replicate in the cytosol. Inhibiting the interaction of internalins with their associated receptors provides a novel therapeutic venue for preventing Listeria invasion and disease. Single domain antibodies (VHH) are derived from unique heavy chain antibodies found in llamas, alpacas, and camels. Due to the convex architecture of VHH binding sites, they can access epitopes unavailable to conventional antibodies, such as enzyme active sites and protein-protein interaction sites. Four VHH (R303, R326, R330, and R419) that bind to the LRR domain of InlB were isolated. Gentamicin protection assays have revealed that R303 and R330 efficiently inhibited Listeria invasion of HeLa cells in vitro. Gel filtration chromatography showed that R419 was not able to form a stable complex with InlB in solution, in which confirmed gentamicin protection assays data that showed R419's poor efficiency in inhibition of Listeria invasion. Furthermore, the x-ray crystal structure of InlB in complex with R303 revealed that R303 binds in a negatively charged cavity on the LRR domain of InlB. Aligning our structure with a structure of InlB complex with its cognate receptor revealed that the VHH directly competes for the same binding site as the Listeria cell surface receptor, leading to invasion inhibition. Our results demonstrate the potential to develop R303 as a new class of prophylactics to prevent Listeria infection.

Qian Jia, Dr. Jaymin Kwon

Qian Jia, Yai Xiong, Jaymin Kwon
qjia@mail.fresnostate.edu
California State University, Fresno
Department of Public Health

Environmental Exposure Measurement of Black Carbon (BC) during the Walking in the Neighborhoods in Fresno California

Central Valley is one of the most polluted air basins in the United States. Air pollution is a serious problem for public health in Fresno especially during the winter. To understand the health effects of the polycyclic aromatic hydrocarbons (PAHs) to pregnant women and children in California, the Children's Health and Air Pollution Study in San Joaquin Valley (CHAPS-SJV) is continuously measuring the spatial and temporal environmental exposure concentrations to multiple air pollutants. As part of CHAPS-SJV, neighborhood exposure concentrations to multiple air pollutants are being characterized by real-time monitoring study that also collect the time-location data for proximity to traffic emission.

The real time concentration of PM2.5, ultrafine particle number concentrations, black carbon, particle-bound PAHs were continuously and simultaneously measured from January to February of 2015. For the first year winter sampling, three zip code areas were chosen because those sites include stationary monitoring stations in Fresno area. The 10 walking routes were randomly selected for representing neighborhoods from the three zip code areas in Fresno. The time-location data was mapped using GPS loggers.

PM2.5 and PAHs were predominantly higher in neighborhood walking air samples compared to indoor air. The sharp elevations of air pollutant concentrations were observed when the air pollutant monitors were closer to roadways with high volume of vehicles. Neighborhood walking air samples were influenced by roadway traffic conditions immediately, such as encounters with diesel trucks, close to freeways and busy roads, near gas station and cigarette smokers, and gardening activity. The Black carbon concentrations will be compared with stationary Black Carbon concentrations and other PM2.5 species that measured continuously in Fresno Stationary Air Monitoring Sites.

Mary Johnson, Dr. Maria Cruz

Mary Johnson

johnsonmary@yahoo.com

California State University, San Jose

Department of Education

The Influences of Academic Self-Efficacy and Educational Aspirations for Minority High School Seniors in the Next Step Program

The purpose of the exploratory research was to identify influences that increase minority high school seniors' academic self-efficacy and educational aspirations in pre college programs. Academic self-efficacy is a person's belief and confidence they can successfully complete an academic task. Educational aspirations are short and long term goals that students set for their education. The study was conducted at a pre-college program in California. There were six participants which included students and staff members of the program. The participants were individually interviewed and shared their personal opinion on the influences of academic self-efficacy and educational aspirations at The Next Step Program. The study results revealed that the influences were motivation, resources, parent involvement, and knowledge. These finding may be useful for understanding the importance of pre-college programs specifically for minority students and how it equips them for higher education.

Kourosh Kolahi, Dr. Mamta Rawat

Kourosh Kolahi, Derek Vargas, Aramais Orkusyan, Armen Martirosian, Mamta Rawat
kkolahi@fresno.ucsf.edu

California State University, Fresno

Department of Orthopaedic Surgery and Department of Biology

The Effect of Electrolysis on Biofilm Formation

Purpose: To explore a novel method of preventing implant infections, we measured the effect of electrolysis on biofilm formation under conditions mimicking orthopedic implants. We hypothesized that incremental amperage exposure would result in a corresponding decrease in bacterial growth.

Methods: *Staphylococcus epidermidis* biofilms were grown on titanium (Ti) and stainless steel (SS) washers, incubating in trypticase soy broth at 37 °C. Washers were exposed to 5, 20, 50, and 100 μ A for 24 and 72 hours. Cells within the biofilm were harvested by sonication and then exposed to PMA dye for the removal of dead bacterial DNA. Quantitative PCR was performed on extracted DNA to ascertain bacterial load.

Results: Washers exposed to 5 and 100 μ A for 24 hours showed no significant difference in bacterial load compared to the control groups, while those exposed to 20 μ A for 24 hours demonstrated a significant decrease: 85% decrease on SS and 80% on Ti (p-value: 0.0011 and 0.00027, respectively). Paradoxically, SS washers exposed to 50 μ A for 24 hours demonstrated a 105% increase in growth (p-value: 0.016). For those washers exposed to current for 72 hours, both the 5 and 20 μ A groups showed a significant decrease in growth. Ti washers exposed to 5 μ A for 72 hours showed a 76% reduction in growth (p-value 0.01) while washers exposed to 20 μ A for 72 hours showed a 90% decrease on Ti and 96% on SS (P-value: 0.04 and 0.03 respectively).

Discussion: Given that a significant decrease in bacterial load was measured under a biologically safe exposure of 20 μ A, the application of direct current to orthopedic implants remains a plausible option. The increased bacterial load measured at 50 μ A contradicts our hypothesis and has not previously been described in the literature.

Irina Kuchkovskaya, Dr. Santanu Maitra

Irina Kuchkovskaya, Amanda C. Voigt, Nisha M. John, Jhonnathan Brawley, Jaekwang Kim, Hyejin Yoon, Jungsu Kim, Santanu Maitra

ukrainian9@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

**Development of Small Organic Molecule Apolipoprotein E Inhibitors
for Alzheimer's Therapy**

The research project is mainly focused on inhibiting apolipoprotein E (apoE) gene expression. APOE is a gene located on chromosome 19 that codes for the apoE, a constituent in very low density lipoprotein (VLDL) responsible for removing and transporting excess cholesterol in the liver and central nervous system. It exists in three alleles: apoE-2, apoE-3, and apoE-4. ApoE-4 has one of the highest links and risks in the onset of Alzheimer's disease due in part to maintaining an imbalance of lipids and poor amyloid precursor protein (APP) processing. Using synthesized organic molecules, the goal is to lower the apoE expression. Preliminary research yielded early lead molecules that lowered apoE production in brain cells. Further refinement allowed the pharmacophore to evolve into new structures of molecules in order to maximize apoE inhibition and incorporate 'drug-like' properties. The original triarylmethyl amine scaffold led to the development of a sulfonamide-based scaffold. One-step synthetic route to react a sulfonyl chloride to a sulfonamide yielded a small focused library of target molecules. A two-step process was also adopted that alkylated a secondary sulfonamide. All the final target molecules were purified by column chromatography. Standard spectroscopic techniques were used to ascertain their identity and purity. The biological assays conducted by our collaborator yielded a number of leads that inhibited apoE production in brain cell lines. Another interesting finding is that these leads increased expression of an ATP-binding cassette transporter protein (AbcA1) responsible for cholesterol efflux associated to high density lipoproteins (HDL), often referred to as good cholesterol. This is a rather rare combination of such highly desired biological activities. Our research team is currently focusing on further optimization of the lead molecules through mouse model studies and pharmacokinetic and toxicological assays.

Gabriela Larralde, Dr. Honora Chapman

Gabriela Larralde

gabriela93@mail.fresnostate.edu

California State University, Fresno

Department of Modern and Classical Literatures and Languages

Comparing Caesar, Frontinus, and Josephus

This work strives to compare the writings of the first century B.C. Roman political and military figure Julius Caesar, the first century A.D. Roman water commissioner Sextus Julius Frontinus, and the first century A.D. Jewish historian Flavius Josephus in their respective works *The Gallic War*, *On the Water Supply of Rome*, and *The Judean War*. This was accomplished through a detailed reading and analysis of these works in their original languages, Latin and Greek, and in translation.

From this study, it becomes clear that, although these writers come from different occupations, decades, and regions, their writings reflect the same typically Roman attitude towards and appreciation of the detailed description of important structures, whether they be military structures and fortifications, the Roman aqueducts, the walls and Jewish temple at Jerusalem. This study enhances previous scholarship on Roman values and identity formation.

Francisco Leon, Dr. Qiao-Hong Chen

Francisco Aaron Leon

aaronleon_15@fresnostate.edu

California State University, Fresno

Department of Chemistry

Curcumin Analog Groups

Curcumin is a diarylheptanoid. It is the principal curcuminoid of turmeric, which is a member of the ginger family. curcumin also has a very impressively low biotoxicity that makes it ideal for medicine. The use of curcumin is commonly used in the died of many asian countries, these countries also have a very low percentage of pancreatic cancer, this lead to the belief that these two are linked and lead to the research. To obtain our target analog group imidazole-2-carbaldehyde, K₂CO₃, DMF, and variable linker bromide chains were added into a round bottom flask and ran on 50*c for 5hrs. Then the reaction mixture then went through a filtration extraction with ether. The ether layer was then washed with crime and dried with MgSO₄. This finished aldehyde product was then added with 1-triphenylphosphoranylidene-2-propanone and toluene in a round bottom flask and was ran overnight. The following day the product was run through an acid base work up. 1M HCL was added into the reaction mixture and extracted with DCM and gasified with saturated sodium choloride. The results then concluded that the product made did not show any extreme results and the IC₅₀ was lower than the original cir curcumin, While the results may not have shown conclusive results the testing of curcumin will still be continued into the year and exploring of multiple aldehydes will be conducted.

Dr. Marat Markin

Marat Markin

mmarkin@csufresno.edu

California State University, Fresno

Department of Mathematics

On Behavior at Infinity of Bounded Solutions of a First-Order Constant-Coefficient Linear System of Differential Equations

For a first-order constant-coefficient linear system of differential equations, it is shown that Cesaro means of every bounded solution of the system converge at infinity. The coefficient matrix having no pure imaginary eigenvalues, every bounded solution of the system converges at infinity.

The inherently qualitative nature of the result affords deriving conclusions about the bounded solutions' behavior at infinity directly from the system, without finding them explicitly and makes it convenient for real-world application and similar to the renowned Lyapunov's stability theorem.

Taylor McCullough-Hunter, Dr. Pei-Chun Ho

1 Taylor McCullough-Hunter, Shoji Hishida, Pei-Chun Ho, 2 Brian Maple, 3 Tatsuya Yanagisawa

taylorhunter@mail.fresnostate.edu

1 California State University, Fresno

2 University of California, San Diego

3 Hokkaido University, Japan

Department of Physics

Investigation into Doped Filled Skutterudite $\text{Pr}_{1-x}\text{Nd}_x\text{Os}_4\text{Sb}_{12}$ Using Finite Heat-Pulse Relaxation Calorimetry

The filled skutterudite compound $\text{PrOs}_4\text{Sb}_{12}$ is the first discovered Pr-based compound to display heavy fermion behavior and unconventional superconductivity at low temperatures ($T_c = 1.85\text{K}$). Since heavy fermion superconducting is already not well understood, there is great scientific interest in understanding the behavior of the filled skutterudite. The compound $\text{NdOs}_4\text{Sb}_{12}$ exhibits ferromagnetism at a Curie temperature near 1 K. Originally, Nd-doped compounds of the form $\text{Pr}_{1-x}\text{Nd}_x\text{Os}_4\text{Sb}_{12}$ were developed to investigate the effect of ferromagnetism on the unconventional superconductivity and heavy fermion behavior of $\text{PrOs}_4\text{Sb}_{12}$. In order to thoroughly understand the low temperature behavior, it is necessary to understand the normal state of the system as well. Therefore, the specific heat of $\text{Pr}_{1-x}\text{Nd}_x\text{Os}_4\text{Sb}_{12}$ (where $x=0.25, 0.5, 0.75, 0.8$, and 1) is measured from 11K-300K to investigate the compounds' normal state properties. The specific heat is measured using relaxation calorimetry of finite heat pulse in a cryocooler system. A MATLAB program is used to generate a curve used to fit the measured specific heat data. From this fitting, estimates of the electronic specific heat coefficient (relating to conduction electrons), Einstein temperatures (relating to the optical modes of atom oscillation in the crystal lattice), and Debye temperature (relating to acoustic modes of atom oscillation in the crystal lattice) are made. The estimated Debye temperatures decrease with Nd concentration, while Einstein temperatures remain constant or increase with Nd concentration. Values of the electronic specific heat coefficient for these compounds are estimated to be 37 mJ/K²-mol. This contrasts with previous low temperature measurements (<10K) of $\text{NdOs}_4\text{Sb}_{12}$ with approximately 520 mJ/K²-mol, and with simple metals, which have an electronic specific heat coefficient between 1 and 10 (mJ/K²-mol).

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Sarah McGahan, Dr. Carmen Caprau

Sarah McGahan and Andrew de la Pena

srmcg@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

Alexander and Markov- type Theorems for Virtual Singular Links

A classical braid is a set of n strings passing between two horizontal bars. These strings may interact with one another but must always travel in the downward direction. If the two horizontal bars are brought together and each pair of string ends are glued together in order, the resulting structure will be a knot or a link which we call the closure of the braid. J.W. Alexander showed that any oriented classical link can be represented as the closure of a braid. In addition, it is well-known that two braids have isotopic closures if and only if they are related by braid isotopy and a finite series of the so-called Markov's moves. These two properties of braids are known as the Alexander and Markov Theorems. Analogous theorems have been proved for the set of virtual links as well as for the set of singular links. In this talk we first introduce the virtual singular braid monoid via generators and relations. We then prove Alexander and Markov-type theorems for virtual singular links.

Carlos Moreno, Dr. Ming Li

Carlos Moreno, Yilin Chen, Ming Li
mmxzbnl@mail.fresnostate.edu
California State University, Fresno
Department of Computer Science

Real-Time Video Streaming Using The Kinect

Microsoft, the huge tech company, strived to revolutionize the gaming industry by creating an interactive system. This resulted in the development of their Kinect system for the Xbox 360. While this remains its primary use, there are many potential applications worth exploring with Kinect. In this research, our objective was to investigate the performance of real-time transmission of Kinect video streams.

To fulfill this objective, we relied on a variety of methods. In particular, we utilized the Point Cloud Library (PCL) to manipulate data captured by the Kinect sensors. This data was stored in a specialized data structure that underwent compression. This compressed data was then sent over the network to a remote server, where it is uncompressed, visualized on screen, and evaluated by professionals such as rehabilitation specialists.

We ran experiments based on different possible configurations, including factors such as frame rate, resolution, compression ratio, and available bandwidth, and how these configurations affected the quality of service. In short, we found an inverse relationship between the compression ratio and available bandwidth (i.e. low bandwidth required a high compression ratio, and vice versa), along with other interesting results regarding other factors.

In conclusion, we found that, as the application progressed, the conditions changed. These changes required an adaptive compression ratio that changed as needed to maintain a certain quality. The Kinect system provided us a means for gaining the visual data while the Point Cloud Library gave us the tools to manipulate the data, which resulted in the development of a program that adapts to changes to maintain a satisfactory quality of service for its users.

Reza Movahedin, Dr. Cory L. Brooks

Mohammadreza Movahedin, Teresa M. Brooks, Cory L. Brooks

mrezamov@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Structural Basis of MUC1 Antigen Recognition of a Tumor Specific Therapeutic Antibody

Antibody mediated immunotherapy of tumors has the potential to revolutionize cancer treatment. The exquisite specificity of monoclonal antibodies (mAbs) allows them to specifically target tumor cells. A universal feature of cancer is aberrant protein glycosylation. Changes in the glycosylation pattern can result in exposure of new carbohydrate epitopes, or reveal cryptic peptide epitopes normally masked from the immune system. As these epitopes are tumor specific, they represent attractive targets for therapeutic mAbs. MUC1 is a membrane glycoprotein of the mucin family found in epithelial cells in a variety of tissues. The protein has a large extracellular domain called the VNTR (variable number of tandem repeats) composed of 20-120 repeating segments of a 20 amino acid sequence. The VNTR region is heavily O-glycosylated in healthy epithelial tissues. However, during neoplastic transformation the VNTR region of MUC1 exhibits truncated glycosylation, exposing peptide sequence and truncated carbohydrate structures. The aberrantly glycosylated MUC1 is overexpressed in the majority of adenocarcinomas. These features render MUC1 an ideal target for antibody-mediated immunotherapy. mAb AR20.5 is a therapeutic antibody currently undergoing clinical development for treatment of pancreatic cancer. The antibody binds a peptide epitope within the VNTR region of MUC1, however it is currently unknown what role antigen glycosylation plays in antibody binding. To further our understanding of how this antibody interacts with antigen, we have purified and crystallized the antigen binding fragment of AR20.5 in complex with a synthetic MUC1 VNTR peptide.. The structure reveals the nature of the interaction between AR20.5 and cancer associated MUC1 furthering our understanding of how VNTR peptide glycosylation may influence antibody binding. Ultimately by understanding epitope recognition and the effects of antigen glycosylation we seek to improve antibody affinity and specificity for development of the next generation of therapeutics antibodies. Our results have potential translational benefits for the improvement of treatment outcomes in pancreatic cancer.

Michael Nunes, Dr. William Wright

Michael Nunes

mikenunes@mail.fresnostate.edu

California State University, Fresno

Department of Civil Engineering

Characterizations of Volatile Fatty Acids Production from Food Waste as a feed source for Polyhydroxyalkanoates (PHA) Production

The aim of this research is to characterize, under laboratory conditions, the volatile fatty acids (VFAs) yield in hydrolysis/acidogenesis phase of anaerobic fermentation. Volatile fatty acids (VFAs) are a natural by-product in the fermentation of organic matter and have some industrial uses. The production of bio-fuels and biodegradable plastics represent two potential major uses. Large quantities of VFAs can be produced from agricultural food waste streams and the low cost of production could make this a viable economic process.

Peach puree, strawberry waste, and tomato waste were evaluated for their VFA production potential using bench-scale sequencing batch reactors (SBR). Naturally occurring mixed culture bacteria, obtained from an aerobic fermentation site, and 6.25-day to 25-day solids retention times (SRT) were utilized. This research seeks to identify optimum feedstocks and reactor loading rates for VFA production. The VFAs produced are ideal precursor compounds for the production of PHA biodegradable plastics.

End of waste/feed cycle VFA concentrations for peach puree were 6.6 to 26 g/L in units of acetic acid equivalents. The strawberry waste yielded 4.8 to 20.6 g/L and the tomato yielded 4.7 to 11.5 g/L in acetic acid equivalents. The 12.5-d SRT showed best results for daily production of peach puree as well as strawberry and tomato wastes. The production of VFA from food waste, at laboratory scale, yielded a viable amount of VFA to warrant further study.

Catalina Olea, Dr. Alam Hasson

Catalina Olea, Reynaldo Luna, Jordana Tatman, Alam Hasson

lina08@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Dairy Emissions Contribute to Air Pollution in the Valley

Volatile organic compounds (VOCs) are pollutants that react with nitrogen oxides in the presence of sunlight to form ozone in the lower atmosphere. Dairies are believed to be a major source of VOCs and greenhouse gases in the region. Accurate emission measurements from these facilities are important to determine their effect on air quality. Ozone levels in the San Joaquin Valley during summer are among the highest in the country. VOC emissions from dairies are highly uncertain ranging from 5.6 to 38.2 lbs per cow per year. Results from our ongoing study at the Fresno State Dairy will be presented. Samples were collected from upwind and downwind from pollution sources at the facility. Isolated samples from feed were collected using a 30L flux chamber. AERMOD model was used to calculate the methane and VOC fluxes from the dairy. Methane concentrations downwind of the dairy lagoon are consistently higher than upwind concentrations. The goal of this work is to more accurately quantify these emissions, and to develop an alternative approach to measure VOC fluxes.

Aramayis Orkusyan, Dr. Doreen De Leon

Aramayis Orkusyan

aramais@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

On the Inoculation of Computer Networks: Big and Small - Part 2: Large Networks

As large, complex computer networks become more prevalent, it becomes imperative to develop effective and efficient defense schemes against the spread of computer viruses. Complex networks have been well studied and many immunization schemes have been proposed. However, most effective immunization schemes either require global knowledge of the networks or require a large fraction of the network to be immunized. In our research, we compare the effectiveness of several length random walk inoculation schemes as an extension of the acquaintance immunization scheme proposed by Cohen et al.

Computer models were used to simulate the spread of viruses over networks immunized by the random walk inoculation schemes. Results from simulations demonstrated that immunization using longer length random walks reduced the total number of nodes infected in the networks and increased the time required before the onset of epidemic. Furthermore, it was shown that using mixed-length random walks lead to a more efficient inoculation scheme requiring fewer nodes to be immunized.

Esteban Paredes Aulestia, Dr. Pei-Chun Ho

Esteban I. Paredes Aulestia, Maya Castro, Ryan Fukuda, Pei-Chun Ho

estebanpa@mail.fresnostate.edu

California State University, Fresno

Department of Physics

Synthesis and Characterization of Neodymium and Gadolinium Nanoparticles

Magnetic nanoparticles, due to their reduced size and magnetization properties, have many potential applications, such as for biomedicine and for magnetic information storage. We synthesize gadolinium and neodymium particles by applying the reverse micelle method. This method consists of using a surfactant with a large nonpolar-solvent-to-polar-solvent ratio to form spherical structures around a reactant. Most studies related to the reverse micelle method use water as the polar solvent, but the use of water is not suitable for our project since both Gd and Nd are highly reactive in water. Instead, we employ methanol as our polar solvent. Heptane is used as our nonpolar solvent; AOT and DDAB are used as surfactant molecules. A solution containing a reducing agent is then added to produce the desired Nd and Gd nanoparticles. Our samples are analyzed using light microscopy, SEM (Scanning Electron Microscopy) and EDX (Energy Dispersive X-ray spectroscopy). Particles in the submicrometer scale containing elemental Nd and Gd were obtained. The synthesis procedure is currently being revised, in order to produce cleaner samples and particles of smaller size.

Sarah Parry, Dr. Anil Shrestha

Sarah R. Parry, Ryan Cox and Anil Shrestha
sarahparry13@mail.fresnostate.edu
California State University, Fresno
Department of Plant Science

**Duration of Weed-Free Period in Organic Lettuce:
Crop Yield, Economics, and Crop Quality**

Lettuce is the number one crop in terms of acreage of organically produced crops in California. Estimates show that organic lettuce is produced in about 33,431 acres in California. Weed management in organic cropping systems has been cited as a major challenge. Organic cropping systems generally rely on mechanical, physical, or cultural methods of weed control and hand weeding is often an important component. Therefore, weed management accounts for a substantial portion of farm budgets in organic systems. Critical period for weed control (CPWC) is an important component of integrated weed management systems. CPWC is the period in a crop's growth cycle during which weeds must be controlled to prevent yield losses due to irreversible damage through competition. A sub-component of CPWC is duration of weed-free period, which is the minimum amount of time the crop needs to be kept weed-free to avoid crop yield and quality loss. Knowing the duration of weed-free period in a crop is useful in making decisions on the need for weed control. The determination of duration of weed-free period is even more so important in organic cropping systems in crops such as lettuce, which rely on substantial amount of hand weeding. Therefore, the objective of this project were to determine the effect of duration of weed-free period on 1) crop yield, 2) weed biomass, and 3) crop quality of transplanted organic lettuce. The experiment was conducted in the certified-organic plot at the California State University, Fresno in Fall 2014. Romaine lettuce was grown for 8 weeks, with 8 different durations (weeks) of weed-free periods [0 (no weed control), 1, 2, 3, 4, 5, 6, 7 (weed-free entire 8 weeks)]. The plots were kept weed-free by hand weeding once a week. The experiment was designed as a randomized complete block with four replications. All standard organic production practices were followed. Data were collected on total fresh weight (crop yield), hand weeding costs, weed density, weed biomass, crop quality rating, chlorophyll concentration (SPAD units) of the leaves at harvest, and anthocyanin content. The crop was rated for quality using a 1 to 4 scale (where 4 = excellent, 3 = good, 2 = fair, and 1 = poor). Leaf samples from each plot were taken for analysis of anthocyanin content using a high-performance liquid chromatography (HPLC). Data were analyzed using non-linear regression models at a significance level of 0.05. Results showed that the critical weed-free duration for lettuce yield was up to four weeks after transplant. The marketable quality of the lettuce based on visual ratings and SPAD readings showed a similar trend. However, total stand counts and diseases incidences were not affected by the duration of weed-free period. The major weed species in the plots were lesser swinecress (*Coronopus didymus*) and burning nettle (*Urtica urens*). Weed biomass data also showed that there was not much benefit in controlling weeds beyond four weeks after lettuce transplant. Therefore, it can be concluded that a weed-free duration of four weeks after transplanting will be sufficient to produce quality Romaine lettuce with optimum yields and weed management costs in organic production systems.

Sivam Patel, Dr. Santanu Maitra

Sivam Patel, Edwin I. Lozano, Vinay Kumar, Alam Hasson, Santanu Maitra

sivamp7494@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Design, Synthesis, Purification, Characterization, and Atmospheric Studies of Isoprene Hydroperoxides

Isoprene is a volatile organic compound (VOC) that is emitted in large quantities by many plants species. The atmosphere has free-floating components from anthropogenic and biogenic sources. They release free radicals such as hydroxyl, nitrous oxide, and ozone that react with isoprene and can potentially form secondary organic aerosols (SOA), impacting the air quality and climate. Hydrogen peroxide is one of the main nighttime atmospheric pollutants, with isoprene being the primary substrate. Isoprene and other isoprene by-products can react with hydrogen peroxide and form isoprene-based peroxide entities. These compounds may continue to react with other reactive chemicals to contribute to a highly complex atmospheric chemical reaction scheme. We proposed a synthetic route to produce isoprene hydroperoxides for mechanistic and kinetic studies in order to better understand the complex atmospheric chemistry that can play havoc in living species including humans. Synthesis of these compounds is achieved by reacting epoxides with hydroperoxy nucleophiles, causing the epoxide ring to open and hence forming the desired product. Due to the very unstable nature of these compounds, isolation and characterization of very pure large samples have been challenging. We have however successfully synthesized, purified, and characterized some of the target compounds. Further studies need to be done to gain more knowledge on atmospheric chemistry and how isoprene interacts with the other reactive species in the air.

Dr. Mohammad Rahman

Mohammad A Rahman, Ph.D. and Tyler Launer, BS

mrahman@csufresno.edu

California State University, Fresno

Department of Public Health

**Does Social Media Related Internet Use Lead to Poor Academic Performance?
Evidence from Fresno State**

This study examined the relationship between internet usage and academic performance of undergraduate students at Fresno State. The objective of the study was to understand the nature of relationship between internet habits and academic performance of Fresno State students and whether excessive use of internet and social media adversely affected Grade Point Average (GPA) scores.

Data for the study was obtained through a survey conducted on 188 students in six randomly selected courses at the undergraduate level. A linear regression analysis was conducted to examine the significance and relationships between the dependent variable, GPA and independent variables age, gender, employment and marital status, choice of major and hours spent studying.

The analysis showed that time spent on social media related internet use negatively impacted students' academic performance which conformed to similar findings in other studies. Age was also found to be inversely correlated with academic performance. As expected, time spent studying was positively associated with GPA scores.

It is important that students and academic personnel should be aware of the perils associated with spending excessive time online. Findings from the study has implications on initiatives to use social media as a mode of teaching at the undergraduate level in Fresno State. Further research in this area should focus on qualitative research on identifying how social media related Internet usage leads to worse academic performance.

Majerle Reeves, Dr. Doreen DeLeon

Majerle Reeves and Manuel Lopez

majerle@mail.fresnostate.edu, solorio9@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

Optimizing a Vaccination Scheme for an Influenza Virus

In its efforts to combat seasonal influenza, for years the CDC has advocated distributing the flu vaccine in such a way that children and the elderly are prioritized. In this research, we seek to determine whether or not the current flu vaccination scheme is optimal and if so, what is the best way to immunize a population. We use data from recent flu activity in the United States and inter-regional travel to create a model of flu activity within California. The model is then used to optimize the distribution of vaccines. Our experiments show that the current vaccination scheme is correct in prioritizing children and elderly, but that a more concerted effort should be made to vaccinate children and the elderly. In particular, we find that vaccinating 80% of children, 0% of adults and 80% of the elderly will lead to a lower overall infection rate that is about half of the current infection rate. Furthermore, the proposed scheme requires that about 15% less of the population be vaccinated. Conclusions reached give public health authorities a strategy to keep levels of influenza infections to a minimum given cost and supply limitations in distributing the flu vaccine.

Victor Rodriguez II, Dr. Jonathan Roth

Victor R. Rodriguez II

oldsoul1492@gmail.com

California State University, San Jose

Department of History

Crafting the Illusion of Pax Atomica: U.S. Atomic Energy Policy 1943-1950

Perhaps the most significant technological achievement of World War II was the atomic bomb. The United States, the first country to create and use this weapon, was also the first to demonstrate its destructive power on the Japanese cities of Hiroshima and Nagasaki in August of 1945. By committing this act, the U.S. not only unleashed the most powerful energy source discovered by humankind, it also fortified its position in the postwar era as one of two superpowers, the other being the Union of Soviet Socialist Republics (USSR). Until 1950, America relied on its atomic monopoly as a tool of leverage in drafting military, political, and international policy. Under the illusion of Pax Atomica, or atomic peace or peace in an atomic era, the United States established an international policy of cooperation and sharing of nuclear information, which conflicted with domestic legislation designed to ensure the protection and secrecy of the nation's atomic weapon. Thus, this irony in policy revealed that ultimately the U.S. sought to use nuclear power as a means to maintain its position as a superpower.

Methodology

My methodology for researching this paper consisted of reading, note taking, and writing in an analytical and critical fashion. An array of primary sources and secondary sources were used. The primary sources used were personal correspondence, meeting notes, government memorandums and documents, Congressional bills, personal journals, and memoirs. The secondary sources included biographies of key figures in the Truman administration and State Department, along with monographs by established historians such as John Bledsoe Bonds, Gregg Herken, and Raymond P. Ojserkis. General histories were also used to assess the military perspective during this era: such as America's Armed Forces: A History by James M. Morris, and The American Way of War: A History of United States Military Strategy and Policy by Russell F. Weigley were used.

Acquiring sources required the utilization of the Dr. Martin Luther King Jr. Library, San Jose State's Burdick Military History Project, and multiple online databases. The library allowed me to obtain secondary and primary source material from its own collections and through Link Plus. The Burdick Military History Project gave me access to numerous secondary sources on military history. Online databases included nuclearfiles.org, trumanlibrary.org, and atomicarchives.com. Through these sites, government correspondence, congressional bills, memorandums, and personal papers were used.

Cristian Sarabia, Dr. Qiao-Hong Chen

Chengsheng Chen, Cristian Sarabia, Xiaojie Zhang, Rubing Wang, and Qiao-Hong Chen

cristiansinaloa@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Asymmetric 1,5-Diheteroaryl-1,4-Pentadien-3-ones: A New Class of Promising Anti-prostate Cancer Agents

1,5-Diheteroaryl-1,4-pentadien-3-ones with two identical terminal aromatic rings has been established by our group as an optimal scaffold for the in-depth development of curcumin-inspired anti-cancer agents. As part of our ongoing project to engineer more effective curcumin-based anti-prostate cancer agents, seven asymmetric 1,5-diheteroaryl-1,4-pentadien-3-ones were designed to investigate the effect of the structural symmetry on their anti-proliferative activity. The target compounds have been successfully synthesized through two sequential Horner-Wadsworth-Emmons reactions of 1,3-bis(diethylphosphonato)acetone with appropriate aromatic aldehydes. Their structures have been characterized by extensively analyzing their ¹H and ¹³C NMR spectra. Their anti-proliferative effects towards both androgen-independent prostate cancer cell lines (PC-3 and DU145) and androgen-dependent prostate cancer cell line (LNCaP) have been evaluated using WST-1 cell proliferation assay. The synthesis, anti-proliferative potency, and structure-activity relationships of asymmetric 1,5-diheteroaryl-1,4-pentadien-3-ones will be presented.

Rocio Solis Hernandez, Dr. William E. Skuban

Rocio Solis Hernandez

rhsolis@mail.fresnostate.edu

California State University, Fresno

Department of History

U.S.-Mexican Relations, 1920-1940

This project analyzes the complex nature of U.S.-Mexican relations between 1920 and 1940, and demonstrates the influence of U.S. foreign policy on the revolutionary Mexican government. Delving into a variety of sources that range from political documents, biographies, newspapers, journal articles, and monographs, this work considers the Cristero Rebellion one of the most significant counterrevolutions in twentieth-century Latin America and argues that both the United States and Mexico's failure to smoothly transition the Mexican government to a democracy led to great social upheaval in Mexico. U.S.-Mexican relations during the Cristero Rebellion lie at the core of this analysis because the counterrevolutionary movement fully demonstrates Mexican officials' attempts to consolidate the new revolutionary government, people's perceptions of the new government, and the U.S. response to the Mexican government's implementation of the Constitution of 1917.

Abhijit Suprem, Dr. Nagy Bengiamin

Abhijit Suprem

asuprem@mail.fresnostate.edu

California State University, Fresno

Department of Electrical Engineering

Hardware Implementation of Efficient and Robust Resonant Coupled Wireless Power Transfer System

Wireless Power Transfer (WPT) was first explored in the late 19th century by Nikolai Tesla, who demonstrated that inductive coupling can be used to power electronic devices without the need for wires. This project explores efficacy of two different schemes for strongly-coupled resonant wireless power transfer in the mid-range: (i) 4-Coil n-to-N ($n=4$, $N=10$) step-up/step-down, and (ii) 4-Coil N-to-n step-down/step-up. Four coils were designed by selecting a desired radius, wire gauge, and number of turns with analytical methods. The inductance was calculated for two 4-turn coils and two 10-turn coils (for step up/down). The resonance frequency was selected to be 100kHz and the capacitances required for each coil to resonate at this frequency were determined. Finally, the coils were tested for resonance at 100kHz and refinement was made via fine-tuning the resonators. Two experiments were conducted with each configuration (n-N and N-n). The first experiment concerns impedance matching to ensure maximum power transfer. The second experiment is a study of peak transfer efficiency versus distance. In each experiment, the voltage across a load was measured as distance between the transmitter and receiver was varied. The results demonstrate the increased transfer efficiency due to impedance matching. The peak for step-up/step-down is achieved at ~18cm, which qualifies as mid-range as it is approximately equal to device dimensions (19cm diameter for coils). The transfer peaks at 7cm for step-down/step-up, which is close to the device and cannot qualify as mid-range. This research has demonstrated that high-voltage/low-current power transmission integral for efficient rWPT. It was observed that the n-N step-up/step-down configuration is more practical than the N-n step-up/step-down rWPT as resonant coupling occurs between two resonators at high-voltage/low-current state. It was also observed that the peak voltage in the n-N configuration is slightly lower than the peak voltage in the N-n configuration.

For the n-N configuration, the viable transfer distances are between 4cm to 22cm. In this range, the efficiency is at or greater than 30%, which is adopted as a cutoff. The selected cutoff is low to compensate for mechanical irregularities and low Q-factors of the coils (See Table 1). It is necessary to improve Q-factor by 1 order of magnitude to significantly improve efficiency (current Q is ~35 for n-N; more appropriate Q value is ~300-1000). Higher values for the Q-factor can be achieved with low-resistance Litz wires. Further, Figure 7 (n-N data) shows that the source and load voltages change with distance. It can be inferred that there is a relationship between the source/load voltages and the distance between the coils. This relationship remains to be determined. With the results presented, it is possible to design a more robust model for rWPT in the mid-range by considering orientation insensitivity.

Benjamin Tanielian, Dr. Goto

Benjamin Tanielian and Joy J. Goto
bentan@mail.fresnostate.edu
California State University, Fresno
Department of Chemistry

Determination of the A β 1-42 structure in the presence of β -Methylamino-L-alanine

Recent studies have shown that a possible cause for ALS/PDC is correlated to the environmental exposure or consumption of the cyanobacteria neurotoxin, β -Methylamino-L-alanine (BMAA). BMAA has been shown to misincorporate for serine (Dunlop, 2013). We hypothesize that misincorporation of BMAA in place of L-serine may cause misfolding of either the Amyloid Precursor Protein (APP) or potentially the A β 1-42. There are two potential serine sites for potential BMAA misincorporation, at positions 8 and 26 in the amino acid sequence of A β 1-42.

The *E. coli* were grown in lysogeny broth (LB) and minimum essential media (MEM) in order to determine the concentration of BMAA that would affect the growth of the bacteria. The LB culture and MEM culture grown in concentrations of 0, 5, 10, 50, 100, and 500 μ M BMAA which showed different effects on the growth of the *E. coli*.

In order to determine if BMAA is misincorporating for L-serine, an *E. coli* system using the pColdAbeta expression vector has been used to express A β 1-42 in the absence and presence of BMAA. The A β 1-42 was grown in concentrations of 0, 10, and 100 μ M BMAA and purified by running the collected cell lysate through a Ni-His column. SDS-PAGE was performed on the collected column elution samples to verify protein expression as well as to visually determine if there are differences in the migration patterns of the purified peptide in the presence or absence of BMAA. Circular dichroism (CD) was performed on the purified A β 1-42 in order to determine if the presence of BMAA caused any changes to the helical structure of the protein.

R.A. Dunlop, P.A. Cox, S.A. Banack, J.K. Rodgers (2013), PLOS One 8(9)
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Chee Thao, Dr. Kathleen Dyer

Chee Thao & Kathleen Dyer, PhD

chthao14@gmail.com

California State University, Fresno

Department of Child, Family, and Consumer Sciences

Curiosity and Changes in Religiosity in College Students

INTRODUCTION: The purpose of this study is to examine the relationship between curiosity in undergraduate college students and changes in their religious belief and practice. We hypothesized that there is a correlation between religiosity and curiosity at each point in time. Secondly, we hypothesized that students who report a dramatic change in religiosity from time 1 to time 2 would have higher curiosity scores than those whose religiosity remained unchanged.

METHODS: Undergraduate college students (N=480) across various courses completed surveys during the fall semester of 2013. Participants who provided contact information were then contacted to complete a follow-up survey through Qualtrics during fall 2014 or early spring 2015. About half of the original participants completed the follow-up survey (N=222). Students' curiosity was assessed using the Curiosity and Exploration Inventory II (CEI-II) (Kashdan et. al, 2009), and the Epistemic Curiosity Questionnaire (EC) (Mussel, 2010). Current religiosity was measured with the Religiosity Questionnaire (Rohrbacher and Jessup, 1975) at both time 1 and time 2.

RESULTS: The first hypothesis was not supported. At both time 1 and time 2, there was no statistically significant correlation between religiosity and curiosity.

Second hypothesis, though, was supported. Most students in the sample either remained religious (n=147) or lost religion (n=43). Those who lost religion have higher scores on both measures of curiosity than those who remained religious (CEI: 36.1 vs. 33.9; EpCur: 31.4 vs. 29.4).

CONCLUSIONS: Those who lose religion appear to represent a more curious group of students than those who do not. We suggest that intellectual curiosity may be the path by which students question and sometimes abandon religion, and explore other possible explanations for this relationship.

Dejaunique Thomas, Dr. Ruth Wilson

Dejaunique Thomas

dejaunique.thomas@sjsu.edu

California State University, San Jose

Department of African American Studies

I See the Dark: A Closer Look at Black Female Identity

The research article examines the different factors such as school experiences, the media, societal labels, and obstacles based on race and how it affects the development of collegiate Black/African American female identity. The study involved a total of seven San Jose State University (SJSU) students who answered three questionnaires and participated in an interview. Although SJSU, a university known for its diverse student population, only 3% of its students identify as Black/African American. As a result some students may struggle with their sense of ethnic identity. The seven participants shared their experiences with coming to terms with their racial identity, in order to contribute to current or working knowledge existing about Black female identity.

Keywords: Black identity, female identity, societal labels, family and school experiences.

Alexander Tran, Dr. Jeffrey Riddell

Riddell J, Armenian P, Tran A, Bengiamin R, Hendey G

alexdriddell@fresnostate.edu

University of California, San Francisco

California State University, Fresno

Department of Emergency Medicine

A Prospective Observational Study Of Ketamine For Sedation Of Acutely Agitated Emergency Department Patients

Benzodiazepines and typical antipsychotics have long been used to sedate agitated ED patients. Slow onset of action, need for dose titration, respiratory depression, and long recovery time are significant limitations that necessitate the study of other agents such as ketamine. This study was designed to determine whether ketamine is faster than benzodiazepines and typical antipsychotics in sedating agitated ED patients. Secondary objectives were to determine the adverse events and necessity for re-dosing of sedative medications.

This prospective observational study took place in an urban academic ED. Subjects were between age 18-65 requiring chemical sedation for acute agitation. Medication, dose, and route were chosen by the treating physician. Each provider documented a subjective time that agitation was controlled and sedation levels at 0, 5, 10, and 15 minutes using a previously validated 6-pt sedation scale. Information was entered into a spreadsheet and descriptive statistics were calculated.

83 patients were included. Adequate sedation was achieved most quickly with ketamine alone, with a median time to sedation more than twice as fast as the next fastest medication. 75% (95%CI 60-86%) of those receiving benzodiazepines alone, 55% (95%CI 32-72%) of those given ketamine alone, and 33% (95%CI 12-65%) of those given haloperidol alone required subsequent medication doses. 11 patients (13.4%, 95%CI 8-23%) had adverse events, 4 had hypotension (2 benzodiazepine, 1 ketamine, 1 haloperidol) and 4 required intubation (2 haloperidol, 1 benzodiazepine, 1 ketamine). Adverse events occurred in 4 (17%, 95%CI 7-37%) patients receiving haloperidol, 3 (14%, 95%CI 5-35%) receiving ketamine, and 4 (10%, 95%CI 4-24%) receiving benzodiazepines.

Ketamine provided rapid sedation for violent and agitated ED patients with an adverse event rate similar to other agents. A large randomized trial is warranted to compare the safety and efficacy of different sedation agents.

Talon Trecek, Dr. Quinn McFrederick

Talon Trecek

talon@mail.fresnostate.edu

California State University, Fresno

Department Biology

Pathogenic Streptococcus suis in California Cattle

Streptococcus suis is an emerging zoonotic pathogen. *S. suis* has become an established pathogen amongst swine globally and one of the most common causes of meningitis and septicemia in South East Asia. In recent years *S. suis* has been the cause of unusually lethal outbreaks in China and Vietnam. Recently human cases of meningitis caused by *S. suis* have been identified in the U.S. *S. suis* populations are also found in a variety of mammals, most commonly as commensals. Pathogenic *S. suis* strains have been isolated from diseased cattle, however a persistent pathogenic population in cattle has not yet been described. Over the past 14 years *S. suis* have been isolated from cases of meningitis and septicemia from Californian cattle by the U.C. Davis California Animal Health and Food Safety (CAHFS) lab in Tulare. If these isolates are from swine then it opens the possibility that cattle can serve as a reservoir for strains of human concern.

The objective of this study is to characterize 20 *S. suis* isolates from cases of septicemia and meningitis in cattle and evaluate their threat to public health. In particular, answering the question of whether or not cattle can serve as a reservoir to *S. suis* strains that are pathogenic to humans. To achieve this objective 7 genes from each of the 20 samples were isolated by PCR for multi-locus sequence typing (MLST) to a global streptococcus suis database. MLST is a very stringent and relatively quick method of identifying strains and their phylogenetic relationships. The 7 selected genes from each isolate are being sequenced in order to achieve this study's main objective. Some of the 20 isolates have already turned up untypable by this method. This indicates that these isolates are not a single population but could represent multiple divergent populations.

Karena Tuel, Dr. Kathleen D. Dyer

Karena Tuel and Kathleen D. Dyer, PhD

karenatuel@mail.fresnostate.edu

California State University, Fresno

Department of Child, Family, and Consumer Sciences

Bedtime for Mommy: Sleep Quality in Mothers with Infants

Introduction: The goal of the current study is to determine if there are differences in maternal sleep for mothers of infants when they practice bed-sharing versus solitary sleeping.

Methods: We assessed maternal sleep by actigraphy and sleep log in mothers of infants for approximately one week. Mothers also completed a survey about sleep history, sleepiness, and demographics. We compared sleep of those bed-sharing with an infant to those solitary sleeping.

Results: Complete data are available for 17 mother-infant pairs. Babies range in age from 2 to 11 months, with an average of 5 months of age. All are first or second born. Sleep log data indicate that 7 mothers spent all six nights of the study, and 3 spent 5 of the 6 nights bed-sharing with the baby at least one hour per night. Four mothers spent 0 nights bed-sharing and 1 each spent two and three nights bed-sharing. Thus, there was a lot of variability in sleep location in the sample.

Participants reported on 84 individual nights of sleep, during 50 of which the mother and baby spent at least one hour sleeping together in the same bed, and during 34 of which there was no bed-sharing.

Sleep efficiency

-Bed-sharing: 82%

-Solitary Sleeping: 80%

-Statistical Significance: $F=1.535$, $p=.219$

Sleep latency

-Bed-sharing: 8.5 minutes

-Solitary Sleeping: 11.8 minutes

-Statistical Significance: $F=1.187$, $p=.279$

Total Sleep Time

-Bed-sharing: 384 minutes

-Solitary Sleeping: 374 minutes

-Statistical Significance: $F=0.477$, $p=.492$

Subjective # of maternal wakings

-Bed-sharing: 1.97

-Solitary Sleeping: 2.38

-Statistical Significance: $F=1.710$, $p=.194$

Subjective # of infant wakings

-Bed-sharing: 2.35

-Solitary Sleeping: 1.09

-Statistical Significance: $F=24.542$, $p<.0001$

Conclusions: Mothers did report significantly more child wakings on bed-sharing nights as compared to solitary sleeping nights. However, it appears that co-sleeping mothers get no less sleep and no worse quality of sleep for those wakings.

Jaryd Ulbricht, Dr. Yongsheng Gao

Jaryd Ulbricht

ulbrichj@mail.fresnostate.edu

California State University, Fresno

Department of Physics

Study Of The Sensitivity For Searches For Excited Bosons (W*) In Dijet Final States In Proton-Proton Collisions At 13 Tev With The Atlas Detector At The LHC

The recent Large Hadron Collider (LHC) beam upgrade in center-of-mass energy from 8 TeV to 13 TeV has required upgrades to the Monte Carlo simulations used to search for new physics in the dijet final state. Monte Carlo simulation studies are performed, using as a baseline for a new physics signal excited bosons (W*) of resonant masses ranging from 200 - 4000 GeV with CalcHEP and Pythia8. The samples are validated by comparing kinematics at various center-of-mass energies.

The search for excited bosons is motivated by the hierarchy problem. This presentation will introduce excited bosonic states and the resulting signal characteristics. The sensitivity for observing or setting limits on a W* signal is also studied using the Bump Hunter algorithm to find peaks in the invariant mass distribution of the two largest transverse momentum jets.

Sal Vazquez, Dr. Santanu Maitra

Salvador C. Vazquez, Shahram Aghaei, Alexandra D Saxberg, Kalyani Maitra, V. V.

Krishnan, Joy J. Goto, Santanu Maitra

salvadovr@csufresno.edu

California State University, Fresno

Department of Chemistry

Substituent Effects On Double Bond Character And Conformation: NMR Studies Of Steric And Electronic Effects Using Deet Analogs As A Model System

N,N-diethyl-o-toluamide, or ortho-DEET, makes a great model system for studying the effects of amide bond rotation in response to different substituents. It has been previously shown that certain substitutions at DEET's ortho position have given rise to a third conformation. This higher energy, "trapped", conformation is due to a combination steric interactions and electronic effects. By altering the size, and electron withdrawing/donating ability of the substituents, the amide's double bond character can be varied with the modulation of the rotation about the bond. The wide range of conformations arising out of the molecular dynamics are identified and quantified by a number of analytical techniques. 1D and 2D NMR spectroscopy, variable temperature (VT) NMR, computational analysis, and X-ray diffraction techniques have been used to study various DEET analogs in this presentation. Investigating these rotational and conformational differences are crucial to our understanding of how DEET analogs interact with their biological receptors in insects. Fruit flies are being used as model systems to ascertain the pest repellency of the DEET analogs. Correlating fine conformation of a DEET analog with biological repellence potency, we hope to draw meaningful conclusions about any structure-activity relationship and apply the knowledge for better understanding of pest-repellents.

Bao Vue, Dr. Qiao-Hong Chen

Bao Vue, Sheng Zhang, Xiaojie Zhang, Konstantinos Parisis, and Qiao-Hong Chen
baov@csufresno.edu

California State University, Fresno
Department of Chemistry

Silybin Derivatives: A Class Of Potential Anti-Prostate Cancer Agents

The current FDA-approved first-line treatment for castration-resistant prostate cancer can barely prolong maximum 2-3 years of survival for a prostate cancer patient. Even worse, the reason that approximately 30,000 men die each year of castration-resistant prostate cancer in the USA is because they becomes refractory by the inevitable progression of resistance to first-line treatment with docetaxel. It is thus an urgent need to search for an effective treatment for this medical unmet disease. Silybin, extracted from milk thistle (*Silybum marianum*), is a naturally occurring hybrid molecule of flavonoid and lignan. It has a long history used as treatment for mushroom poisoning and as dietary supplements, suggesting its positive and non-toxic profile. This has been supported by its phase I clinical trial data in advanced prostate cancer patients. The in vitro and in vivo investigations have demonstrated its therapeutic potential for prostate cancer. The effectiveness of silybin as a potential anticancer therapeutic is however discounted by its low potency and bioavailability. Hence, structure modifications of silybin to synthesize new chemical entities with enhanced potency and bioavailability are highly desired. In our research laboratory we have successfully synthesized several classes of silybin derivatives, including 7-O-monoalkylsilybins, 7,20-O-dialkylsilybins, 7-O-alkyl-2,3-dehydrosilybins, 3,7-O-dialkyl-2,3-dehydrosilybins, 7-O-alkyl-2,3-eliminated hydrocarpin derivatives, and 7, 20-O-dialkyl-2,3-eliminated hydrocarpin derivatives. These compounds have been characterized by extensively interpreting their 1D- and 2D-NMR spectra. Their anti-proliferative activities towards three prostate cancer cells have been evaluated and their structure-activity relationships have been explored. 7-O-Alkyl-2,3-dehydrosilybins have been established as an optimal scaffold, exhibiting 12-fold better inhibitory activity as compared with parental silybin. These results had demonstrated the potential of silybin derivatives in treating prostate cancer.

Keywords: silybin, prostate cancer, anti-proliferative activity

Casey Walker, Dr. Aly Tawfik

Casey R. Walker, EIT; Aly Tawfik, PhD

crwalker96@mail.fresnostate.edu

California State University, Fresno

Department of Civil and Geomatics Engineering

Impacts of Shared Autonomous Vehicles on the Transportation System in Fresno

Shared autonomous vehicles (sometimes referred to as self-driving taxis) are expected to revolutionize the way we live. The far-reaching impacts of shared autonomous vehicles (SAVs) will affect every industry in which transportation is a factor. One major impact of SAVs will be on total vehicle miles traveled (VMT). Total VMT is one of the – if not the – most significant measure characterizing the performance of transportation systems. It has direct relationships with congestion, urban sprawl, energy consumption, accidents and fatalities, and air pollution and greenhouse gas emissions; among others. This work models and analyzes the impacts of SAVs on total VMT in Fresno city.

Socioeconomic and transportation data was gathered from the Fresno Council of Governments as well as the City of Fresno, and processed using ESRI's ArcGIS and Microsoft Excel. A simulation-based model was further developed using Python scripting tools in ArcGIS (ArcPy) to analyze the change in total VMT caused by shared autonomous vehicles, taking into account the percentage of trips completed using SAVs (modal share), the number and location of SAV stations in the city (supply of SAV stations), and the number of SAVs available in every station (SAV fleet size).

Preliminary results indicate the significant impacts of: 1) modal share of SAVs, 2) supply of SAV stations, and 3) SAV fleet size on the total VMT in Fresno city. Primarily, this is due to the added distance traveled by empty vehicles before and after picking and dropping riders, respectively.

This work demonstrates that SAVs have the potential to increase the total VMT in Fresno, which could in turn increase congestion and pollution. Also, the paper identifies the relationships between the amount of SAV travel in the transportation system and the total VMT in the system, and ends with policy recommendations that could curtail such effects.

Corey Walker, Dr. Aly M. Tawfik

Corey M. Walker and Aly M. Tawfik, PhD

cwalker.engineering@gmail.com

California State University, Fresno

Department of Civil and Geomatics Engineering

Vehicle Emissions and Life Cycle Analysis Models of Gasoline and Electric Vehicles

In addition to air pollution emissions, the transportation sector in the US is responsible for more than 25% of greenhouse gas emissions. Due to the negative impacts of these emissions, primarily on health and the environment, literature of vehicle emissions models is rich. Yet, attempts to synthesize and contrast models of this literature are scarce. Contrasting models of gasoline and electric vehicle emissions is particularly beneficial due to the significant differences between these two technologies; specifically with respect to emissions. Accordingly, this presentation adopts a life cycle analysis approach - beginning with the extraction of fuels to the recycling of vehicles - to synthesize and explore the development and structure of some of the most common emissions models. The presentation starts with a brief discussion of the emission models measurement techniques, then explores and contrasts state-of-the-art vehicle emissions models. Four groups of emissions models are included in this synthesis: 1) Macro-scale models: MOVES2014 and EMFAC; 2) Meso-scale models: VT-Meso, MOVES2014, and MEASURE; 3) Micro-scale models: VT-Micro and CMEM; and 4) Electric life cycle models: MOVES2014 and GREET. The presentation highlights the positive effects of life cycle analyses on estimates of vehicle greenhouse gas emissions from both gasoline and electric vehicles. The presentation ends with a discussion of the shortcomings of current vehicle emissions models, limitations of their usage and application, and suggestions for future work.

William Wright

William Wright

wfwright@csufresno.edu

California State University, Fresno

Department of Civil & Geomatics Engineering

Biodegradable Plastic from Food Waste

Volatile fatty acids (VFAs) can be utilized as building blocks in the production of biodegradable plastic. Currently most plastics are manufactured from petroleum, but questions about the recalcitrant nature of petro-based plastics has motivated a search for biodegradable alternatives. One of the more promising alternatives is made from PHA polyester polymer that is naturally produced in bacteria that use VFAs as their source of food.

Peach puree was evaluated for VFA production rate, composition and yield potential using 6 bench-scale mixed batch reactors operated in parallel. Naturally-occurring mixed-culture bacteria were used as inoculum. The reactors were operated for 6 months using repeating feed/ waste cycles of 5 and 10 d, solids residence times (SRT) ranging from 6.25 to 25 d, and organic loading rate values ranging from 1.5 to 5.9 g-VS/L•d. The reactors were given 30 to 50 d to approach or achieve pseudo-steady state response before conditions were changed. Feedstock volatile solids averaged 3.7%. Temperature was 21.5 °C.

Results indicate that the naturally low pH of the feed (3-4) was a major factor in VFA production because it favored the production of acetic acid over lactic acid and inhibited VFA-consuming reactions. End-of-cycle VFA concentrations averaged 13 g/L acetic acid equivalents with the predominant species acetic acid. Lactic acid was produced at similar levels. VFA production was relatively constant over the wide range of SRT/ organic loading rates used. Daily VFA production rate averaged near 1.0 g-AA/L•d. The data suggests that a large fraction of the volatile solids was converted to VFAs at a 25-d SRT.

Food waste is available in large quantities and is often a burden to food processors and society. The innovative approach used in this study is expected to lead to the commercial production of high-value biodegradable plastic from inexpensive food waste feedstock.

Pahoua Xiong, Dr. Qiao-Hong Chen

Pahoua Xiong, Rubing Wang, Xiaojie Zhang, Eduardo DeLa Torre, Francisco Leon, and Qiao-Hong Chen

xpahoua@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

**Synthesis of Heterocycle-containing Genistein Analogs as
Anti-Prostate Cancer Agents**

Prostate cancer is the second-leading cause of cancer-related deaths in the United States. There is no effective therapy when prostate cancer becomes metastatic and refractory to conventional treatments. For this reason, the identification and exploration of new agents that reduce prostate cancer cell growth are of paramount importance. The increased risk of prostate cancer in the first generation of Asian men emigrating to the United States suggests a chemopreventive effect of traditional Asian food. Genistein, a phytoestrogen isolated from soy beans, has been identified and is indeed in clinical trials as a candidate for prostate cancer prevention and treatment. It is in clinical trials, however, its efficacy in clinic has been limited by the poor bioavailability.

The aim of our research project is to develop more effective analogs of genistein for the potential clinical use to treat advanced hormone-refractory prostate cancer. Our hypothesis is that various heteroaromatic rings can serve as potential bioisosteres for phenyl rings in genistein. Also, the incorporation of a basic nitrogen might improve bioavailability of genistein analogs. We have synthesized six new pyrazole analogs. To better understand the structure-activity relationships of the genistein analogues, three known analogs without a N-containing heteroaromatic ring were also synthesized. The chemical synthesis of the analogs was achieved through a four-step reaction sequence with Suzuki-Miyaura coupling reaction as a key step. The cytotoxicity of these analogs was evaluated against two human androgen-independent prostate cancer cell lines (DU-145 and PC-3) and one human androgen-sensitive prostate cancer cell line (LNCaP). The synthesis, cytotoxicity, and structure-activity relationship of genistein analogs will be presented.

Yai Xiong, Dr. Jaymin Kwon

Yai Xiong, Qian Jia, Jaymin Kwon
alwayshappy5@mail.fresnostate.edu
California State University, Fresno
Department of Public Health

Environmental Exposure Measurement of Particle-Bound PAHs during the Walking in the Neighborhoods in Fresno California

Central Valley is one of the most polluted air basins in the United States. Air pollution is a serious problem for public health in Fresno especially during the winter. To understand the health effects of the polycyclic aromatic hydrocarbons (PAHs) to pregnant women and children in California, the Children's Health and Air Pollution Study in San Joaquin Valley (CHAPS-SJV) is continuously measuring the spatial and temporal environmental exposure concentrations to multiple air pollutants. As part of CHAPS-SJV, neighborhood exposure concentrations to multiple air pollutants are being characterized by real-time monitoring study that also collect the time-location data for proximity to traffic emission.

The real time concentration of PM2.5, ultrafine particle number concentrations, black carbon, particle-bound PAHs were continuously and simultaneously measured from January to February of 2015. For the first year winter sampling, three zip code areas were chosen because those sites include stationary monitoring stations in Fresno area. The 10 walking routes were randomly selected for representing neighborhoods from the three zip code areas in Fresno. The time-location data was mapped using GPS loggers.

PM2.5 and PAHs were predominantly higher in neighborhood walking air samples compared to indoor air. The sharp elevations of air pollutant concentrations were observed when the air pollutant monitors were closer to roadways with high volume of vehicles. Neighborhood walking air samples were influenced by roadway traffic conditions immediately, such as encounters with diesel trucks, close to freeways and busy roads, near gas station and cigarette smokers, and gardening activity. The particle-bound PAHs concentrations are compared with stationary PAHs concentrations and other PM2.5 species that measured continuously in Fresno Stationary Air Monitoring Sites.

Shayan Zoghi, Dr. Joy Goto

Shayan Zoghi, Dr. Joy Goto

szoghi@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

The Effects of BMAA and L-Serine on Locomotion, Learning, and Short-Term Memory in *Drosophila melanogaster*

Age-matched virgin female flies (groups of 10 each) were collected and BMAA and L-Serine fed (0 and 12.5 mM) for three days in a temperature-adjusted and light maintained (12h dark: 12h light) incubator. The locomotor ability was individually tested and measured for each fly using the simple tap-down method. A traditional T-maze apparatus to test learning and memory of flies was used. The flies were trained to associate the light chamber with the odor depressant within 10 conditioning trials. The short-term memory of flies was then measured after 6 hours of the initial training. Data analysis was applied using a Chi-Square test for analysis.

The results from the experiment indicate that the type of food administered to fruit flies can impact their learning and short-term memory functions. On days 1,2, and 3, there was no significance found in locomotor functions in control, 12.5 mM L-serine, 12.5 mM BMAA+L-Serine, 12.5 mM BMAA. Among the treatments, L-serine had the highest success rate of climbing past the 8-cm mark in 10 seconds. On day 3, there was significance found for 12.5 mM BMAA treated flies, while the other 3 treatments had a higher success rate of associating the light source with the quinine depressant and thus remaining in the dark chamber during the allotted time. After 6 hours passed from initial testing, 12.5 mM BMAA flies that previously showed learning success were significant for memory deficits on days 2 and 3 with respect to remembering the detrimental effects of quinine-moistened filter paper. These results indicate that flies treated with BMAA show a similar pattern of cognitive learning and memory deficits, similar to that of humans exposed to neurotoxic levels of BMAA. L-Serine has the potential to possibly relieve the effects associated with BMAA.

POSTER PRESENTATION ABSTRACTS

(IN NUMERICAL ORDER BY POSTER BOARD NUMBER)

Jessica Wilson, Dr. Laurent Dejean

Jessica Wilson, Laurent Dejean, Bushra Mahmood, Miriam Ahmad, Patricia Olino

jwilson5356@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 1

**Differential Effects of Bcl-2 Family Proteins on Oxidative and
Fermentative Metabolism**

Apoptosis is known to be a programmed cell death which is inhibited during cancer. The Warburg Effect characterizes cancer cells as having a marked shift away from oxidative metabolism toward fermentative metabolism, in order to allow for a rapid multiplication and tumor formation. If the existence of connections between metabolic shifts and cancerogenesis is now widely accepted, that between apoptosis and metabolic regulations remains to be defined. In this context, anti-apoptotic Bcl-2 family proteins are interesting candidates to fulfill this role as they are both transcriptionally over-expressed in certain cancers and were also shown to positively affect mitochondrial respiration. In this study, we propose to examine the effect of anti-apoptotic Bcl-2 family proteins, such as Bcl-2 and Bcl-xL, on oxidative metabolism and fermentative metabolism. To do this, we first measured the effects of Bcl-2 or Bcl-xL (Bcl-2/xL) overexpression on the net fluxes of lactate production and glucose consumption by the pre-lymphocyte cell line FL5.12. We also measured and compared the activities of key metabolic enzyme markers such as citrate synthase (CS), lactate dehydrogenase (LDH) or glyceraldehyde-3-phosphate dehydrogenase (G3PdH) in these different genetic contexts. Our preliminary findings indicate that lactate production is enhanced in both Bcl-2- and Bcl-xL-overexpressing cells. However, the flux ratio between lactate production and glucose consumption remain unaffected; suggesting that both fermentative and oxidative part of carbohydrate metabolism are stimulated by high Bcl-2/xL levels. Only the specific activity of G3PdH is significantly increased in cells which over express Bcl-2. On the other end, the cell line which overexpresses Bcl-xL exhibits a significant increase in LDH, CS and G3PdH enzymatic specific activities. Despite these changes, the LDH (fermentative) / CS (oxidative) activity ratio remain similar in all the cell lines; reinforcing the postulated that both fermentative and oxidative metabolisms are stimulated by high Bcl-2/xL levels.

Alexandra Saxberg, Dr. Joy Goto

Alexandra D. Saxberg, David Zimmerman, Salvador C. Vazquez, Shahram Aghaei, Dylan M. Manning, Santanu Maitra, Joy J. Goto

alexsaxberg@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 2

Screening of Insect Repellants, DEET and DEET-like Analogues, using *Drosophila melanogaster* as a model system

Insect repellants benefit and mostly protect humans by repelling potential disease-carrying insects such as mosquitoes with West Nile virus (Helliker, 2000). The active ingredient in many insect repellants include, N,N-Diethyl-meta-toluamide (DEET) which has been found to have adverse side effects. As a response to these effects, a safer active ingredient is needed. Our lab tests DEET and DEET-analogues using fruit flies as a model system for mosquitoes. The odor receptor in fruit flies (*D. melanogaster*) are similar to those found in the common disease carrying mosquitoes (*A. gambiae*). DEET acts by altering the characteristics of odor-gated ion channels in wild type odorant receptors. DEET inhibits activity or suppression of normal odorant receptor activity in insects, therefore acting as a molecular confusant (Pellegrino, 2011). Our collaborator, synthesizes these compounds and DEET-analogues with chemical ligands that have the potential of fewer health concerns in the hopes of yielding a safer yet efficient insect repellent. The assay used to test the repellent characteristics of each compound is closely related to an experiment found in the article, Isolation of a Deet-Insensitive Mutant of *Drosophila melanogaster* (Diptera: *Drosophilidae*) (Reeder, 2001). If a significant amount of flies (< 50%) are outside of the filter paper (i.e. do not cross the threshold of repellent to the food) we designated the compound as a repellent. I have determined the optimum concentration of 10% DEET in ethanol (95%), significantly (n=8 trials) repels a majority (average = 19/20) of the tested flies after 3-5 hours. Thus far, three compounds have been tested: N,N-diethyl-4-methylbenzamide, N,N-diisopropyl-3-methylbenzamide, and N,N-diethyl-3-dimethylbenzamide.

Stacy Han, Dr. Karine Gousset

Stacy Han and Karine Gousset

danbi@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 3

A Myo10 c-terminal Fragment Associates with Components of Messenger ribonucleoprotein (mRNP) Complexes in the Core Nuclear Region

Myosin X (Myo10) is an unconventional myosin molecular motor protein implicated in aggressive, invasive cancer, prion and neurodegenerative disorders, and various pathogenic diseases. Myo10 also plays an important role in filopodia and tunneling nanotube (TNT) formation, spindle assembly and orientation, and serves as a link between integrins and the cytoskeleton. Myo10's tail region further points to its unique role within the cell with its vast array of domains including a MyTH4 microtubule binding domain.

Apart from its known functions, several studies using immunofluorescence microscopy have shown that Myo10 localizes to distinct punctuates in the perinuclear region (PNR) (which encompasses a portion of the space within the nuclear bi-layer) and the core nucleus (cNuc). The function of this subcellular localization, however, is currently unknown. Here we used a newly described cell fractionation technique (to separate the cNuc from the PNR), immunoprecipitation, and mass spectrometry to help unravel the role of Myo10 in the cNuc by determining its binding partners in this location. Using this fractionation technique we show that Myo10 in the cNuc has a different western blot band pattern than the cytosolic and PNR fractions, with a ~110 kDa molecular weight c-terminal band (cMyo10) predominating in the core nuclear fraction and with an almost complete loss of the full length protein. Interestingly, the cMyo10 found in the cNuc corresponds to a c-terminal fragment of Myo10 processed by calpain.

Mass spectrometry analysis showed that cMyo10 is associated with numerous known components of messenger ribonucleoprotein (mRNP) complexes including, Nucleolin, DDX5 (mRNP export), Top1 (mRNP assembly), Matr3 (mRNA stabilization), and Nop2 (pre-rRNA processing). These results in combination with previous work describing Myo10 MyTH4/microtubule anchoring point to a role for the cMyo10 in the anchoring of proto-mRNP granules in the cNuc during mRNP assembly and processing.

Matthew Pomaville, Dr. David D. Lent

Matthew Pomaville, Austin Lawless, David D. Lent

mpomaville@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 4

Spatial Learning Assessment in Split-Brain *Periplaneta americana*

One of the greatest challenges facing neuroscientists today is understanding the processes by which the brain operates. This study examines the effect of a procedure to separate the two cerebral lobes of a *Periplaneta americana* (the common American cockroach) on spatial learning of a simple conditioned response. This split-brain procedure allows the creation of an experimental and a control specimen in the same organism.

This study was conducted on two experimental groups composed of mature, male *Periplaneta*. Group one received the procedure to separate the brain lobes while group two received a “mock surgery” involving all steps except the actual incision to separate the brain lobes. The cockroaches were then placed into a restraint tube in the testing arena. In the arena, the cockroaches were presented with a repeated combination of a white and green light at an angle of approximately 30°, as well as a burst of food scent from the position of the green light. Reactions to the training were measured using antennal movements towards the scent source. The cockroaches were then presented with a series of lights with the same angle of separation, position, or orientation as the conditioned lights.

The results of this testing have shown that in split-brain models, the angular association between the reference light and the conditioned light can elicit a response even if the position of the lights is changed relative to the position of the cockroach. The rate of response is equivalent or higher than that of intact-brain cockroaches, showing little to no loss of ability due to the split-brain surgery. From this data, it can be stated that cockroaches with split brain lobes can be used in studies involving learning and memory in which experimental and control samples are needed from the same organism.

Vinay Kumar, Dr. Alam Hasson

Kumar, Vinay; Lozano, Edwin; Maitra, Santanu; Hasson, Alam

vinayk257@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 5

**Kinetic and Product yields of the Gas-Phase Reactions of Isoprene
Hydroperoxides with Ozone**

Isoprene is a volatile organic compound (VOC) that is emitted into the atmosphere by plants and trees. It has the largest emission rate of any VOC and is very reactive, and therefore has a major impact on the chemical composition of the atmosphere. Isoprene Hydroperoxides are formed in the atmosphere from the chemical degradation of isoprene, where it can react with different sources in our atmosphere such as ozone or nitrogen oxides, leading to the formation of different aldehydes and alkanones. The atmospheric chemistry of these compound is very important due to its potential to produce aerosol particles and to mediate ozone formation by affecting atmospheric levels of nitrogen oxides. Isoprene Hydroperoxide was injected into a 25L Teflon bag containing air. Changes in chemical composition with the addition of Ozone was monitored using the Proton Transfer Reaction Mass Spectrometry and the concentration or the purity of the Isoprene Hydroperoxide was confirm by using the High Pressure Liquid Chromatography and Nuclear Magnetic Resonance. Reaction rates were determined using the relative rate technique and some reaction products were monitored to evaluate the reaction mechanism. The major aldehydes formed from this reaction were formaldehyde and methacrolein. The implication of these results will be discussed.

Chih-Chiun Chang, Dr. Joseph A. Ross

Chih-Chiun Jamie Chang and Joseph A. Ross

jamiechang@live.com

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 6

An Exploration of Mitochondrial Dysfunction in Nematodes through Fat Content

Charles Darwin's concept that a population evolves through variation in reproductive success between its members is explored in this study using two populations of the model organism *Caenorhabditis briggsae*. The two populations are HK104, a temperate strain from Japan, and AF16, a tropical strain from India. When mating these two strains, inter-population hybrids show a developmental delay in the second generation. My experiment explores whether hybrid breakdown occurs due to genetic incompatibilities between mitochondrial and nuclear genomes. To accomplish this, I study the fitness of mitochondrial-nuclear hybrids, which are nematode strains with an AF16 nuclear genome and the HK104 mitochondrial genome or vice versa. This project seeks to determine whether mitochondrial-nuclear hybrids show a decrease or increase in fitness when compared to the pure strains, HK104 and AF16. One way to estimate fitness is to measure the amount of fat in nematodes through Nile Red staining. The motivation for studying fat levels is that a dysfunction in the interaction of mitochondrial and nuclear genomes could cause malfunctions in metabolic processes such as converting fats into fatty acid precursors for the citric acid cycle. The hypothesis is that hybrid nematodes would have higher fat content to compensate for this metabolic defect. This viewpoint on mitochondria-induced dysfunction might illuminate the early genetic processes of species formation. To administer the Nile Red stain, nematodes are fed bacteria containing the dye, which stains fat compartments. Fluorescence emitted by the dye is quantified by the program ImageJ; autofluorescence given off by control worms that did not ingest the stain is subtracted from experimental measurements to yield quantitative fluorescence intensity data. The data from mitochondrial-nuclear hybrids are analyzed in comparison to the pure strains. Fat content was measured separately through localized fluorescence in the pharyngeal region and alimentary canal of nematodes to pinpoint in which body regions any fat differences are occurring. Localized fluorescence also helps target the feeding machinery of the worm while controlling for worm length. The CP132 strain of mitochondrial-nuclear hybrids had significantly higher fat content in the alimentary canal region than AF16, HK104, CP131, and CP133 ($p < 0.05$). There were no significant differences in pharyngeal fat content between any of the strains tested. Previous studies have shown that CP132 does have fitness defects due to higher reactive oxygen species levels and smaller brood sizes. Thus, this study shows that an increase in fat content can be a valuable supplement to confirm patterns of characteristic dysfunction seen in mitochondrial-nuclear hybrid nematodes. Fat content can be analyzed as an additional fitness defect that allows identification of the early processes of species formation.

Hanson Mouanoutoua, Dr. Joseph Ross

Hanson Mouanoutoua

hmouanoutoua@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 7

Paternal Mitochondrial Inheritance in *Caenorhabditis briggsae*

Mitochondria are semi-autonomous organelles that have their own genome (mtDNA) and play essential cellular functions including oxidative phosphorylation, citric acid cycle, lipid metabolism, and urea cycle. Inheritance of mitochondrial DNA varies among species, but for some species, mtDNA is typically inherited from the mother. However, species with maternally inherited mtDNA may occasionally exhibit mtDNA inherited from the father. Many genes necessary for mitochondrial function are found integrated in the nuclear genome. Therefore, accurate synchronization between mtDNA and nuclear DNA is necessary for normal cell function and ultimately the fitness of the organism. The purpose of this study is to identify whether paternal transmission of mtDNA can be detected in *Caenorhabditis briggsae* using the polymerase chain reaction (PCR) technique. Two strains of *C. briggsae*, HK 104 and AF16 were crossed until the tenth generation. Genomic DNA and mtDNA were obtained from these two populations and compared to the parental strains for similarities and differences. Further study is needed to determine whether paternally inherited mitochondrial DNA adversely affects the fitness of *Caenorhabditis briggsae*.

Geil Merana, Dr. Laurent Dejean

Geil Merana, Clarissa Niino, Anthony Waterston, Annabelle Lolinco, Dr. Alam Hasson, Dr. Laurent Dejean

blitzbreaker@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 8

Reactive Oxygen Species Production in Alveolar Macrophages as a Response to Environmental Particulate Matter: Role of Particulate Matter Content and Composition

Reactive oxygen species (ROS) are produced from aerobic respiration and metabolism. ROS are typically involved in cell signaling, differentiation, and programmed cell death. However, excessive ROS production and impaired antioxidant processes can lead to peroxidation of essential biological macromolecules such as lipids, proteins, and nucleic acids. The resulting oxidative stress is involved in the development of respiratory illnesses and in disruptions of the female reproductive system. These diseases have been linked to exposure to particulate matter (PM) as PM from the air environment commonly contains combustion particles, trace metals, and organic compounds. Therefore, our goal is to study the effect of PM exposure on the ROS production of alveolar macrophages, the body's first line of defense against PM. More specifically, we aim to explore differences in the influence of PM on ROS production due to factors such as: the site from which the PM filter was collected, the collection time of day and duration, as well as the total PM mass and the chemical components of the sample. We began our study by comparing two geographically-isolated PM collection sites in California: Fresno and Claremont. First, we obtained and extracted filters exposed to PM in the Fresno area (6-hour morning, 12-hour overnight, and 150-hour samples) and the Claremont area (6-hour morning and 12-hour overnight samples). We then used a microplate-based, DCFH-DA fluorescence assay to determine the effects of these PM extracts on ROS production in the NR8383 (rat alveolar macrophage) cell line. ROS ratios were obtained by dividing the raw fluorescence values—in Relative Fluorescence Units or RFUs—of PM-treated cells, by the RFU values of cells treated with extracts from blank filters. We normalized the ROS ratios to account for the different extracted particle masses, and analyzed the final ROS ratios per μg of particle. Our preliminary results indicate that: (1) PM extracted from morning collections trigger a specific ROS response higher than from those extracted from overnight collections; and (2) PM extracted from the collections performed on the Claremont site induced higher specific ROS response than those collected on the Fresno site. Taken together, these results suggest that PM composition influences more the ROS response of alveolar macrophages than the total amount of PM in a given environment; and a more complete determination of the molecular compositions of PM extracts coming from our Claremont and Fresno sites is currently underway.

Joel Rodriguez, Dr. Joseph Ross

Joel Rodriguez, Joseph Ross

jrod9876@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 9

Exploring Speciation in *Caenorhabditis briggsae* through Mitochondrial Dysfunction in Hybrids

The objective of this study is to investigate how two populations can diverge from one another to eventually produce two species. One method of identifying and studying how speciation starts is to find cases where hybrids between two populations of the same species have reduced fitness compared to the parental strains. It has been hypothesized that two *Caenorhabditis briggsae* populations produce less-fit hybrids because the hybrids suffer from mitochondrial dysfunction resulting from a mitochondrial-nuclear genetic incompatibility. To investigate this hypothesis, hybrid and parental population fitness was assessed by measuring the brood sizes of these strains. These experiments revealed a difference in brood size between the inter-population hybrids and one of the two parental strains. These data support the hypothesis that a genetic incompatibility exists between the two genomes. This reduction of hybrid fitness might represent a mechanism for speciation. Future efforts will focus on investigating the ATP concentrations of hybrid populations as another assessment of fitness.

John Hobby, Dr. Joseph Ross

John Hobby

john.hobby@gmail.com

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 10

**Analysis of Sperm Motility in *Caenorhabditis briggsae* Hybrids Considered to have
Mitochondrial Dysfunction**

Speciation is an intriguing line of study for evolutionary biologists concerned with identifying the mechanisms required for a species to bifurcate. A contributing factor to potential speciation is the mating between groups of populations within a species that show morphological or developmental differences. The nematode, *Caenorhabditis briggsae*, provides an excellent opportunity to study these effects on hybrids produced from two different parental strains exposed to unique environmental conditions. The temperate and tropical parental strains, HK104 and AF16 respectively, have been shown to produce dysfunctional offspring. It has been suggested that this effect might result from mitochondrial dysfunction caused by an incompatibility between the nuclear and mitochondrial genomes. This study focuses on obtaining evidence for abnormal mitochondrial function by observing sperm motility rates in multiple hybrid strains produced from the HK104 and AF16 parental strain controls. Motility is energy consuming, and efficient ATP production in the mitochondria is expected to be required to meet the energy needs of the sperm cell. Our hypothesis states that, if mitochondrial deficiency results in reduced ATP production in the hybrid strains, then we expect to observe lower male sperm motility in those strains. Our data indicate successful sperm activation in vitro from multiple hybrid strains, but no significant deviations in sperm motility have been observed. Lack of effect might be due to experimental artifacts. Continued research will refine the chemical sperm activation technique. The observation of lower motility rates would suggest that there is a fitness disadvantage in hybrid strains and illuminate a possible genetic mechanism contributing to the process of speciation.

Caroline Kasdorf, Dr. Alejandro Calderon-Urrea

Carolina Vidal-Kasdorf, Yesheswi Chavan, and Alejandro Calderón-Urrea

carolinevidal@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 11

DNA Extraction Using Maxwell 16

Purification of DNA and identification of specific “marker” genes or DNA sequences are essential activities to develop diagnostic protocols. Isolation and detection of the genomic DNA is highly significant in the food industry, agriculture-based industries, environmental analysis, and testing for the presence of microorganisms such as *Escherichia coli* and *Salmonella typhimurium*. In recent years, though molecular and sequencing technologies have improved dramatically, standard DNA extraction protocols have seen very little advances. It is therefore very important to develop a DNA extraction protocol that generates good quality DNA and sufficient quantity in a relatively simple, inexpensive and quick procedure. In this study, the automated Maxwell® 16 System designed by Promega Corporation (Fitchburg, Wisconsin) was used for extracting DNA with minimal hands-on time and labor. With Maxwell 16 platform, one can isolate 16 samples of genomic DNA simultaneously within less than 30-45 minutes. The Maxwell 16 system is a magnetic particle processor that uses paramagnetic particles (PMPs) to purify samples. The sample is mixed and lysed by rapid up- and- down movement of the plunger on target sample with substantial capture and release of MagneSil paramagnetic particles (PMPs). The MagneSil particles then bind to the nucleic acid, which is passed through pre-filled cartridges containing reagents necessary for purification. The Maxwell 16 instrument is often designed for forensic analysis of DNA samples from cells, blood and/or tissue. We tested the Maxwell 16 to automatically extract and quantification DNA from various sample matrices, such as environmental and fruit samples. When used at up to three fold dilution of the overnight bacterial culture, the system provides good quantities as well as good quality (280/26 ratio) of DNA. However, when too much or too little bacteria is used the quantity and quality of DNA decreases. Also, the Maxwell 16 and its various kits which include DNA IQ Casework Pro Kit, Maxwell 16 Cell LEV DNA Purification Kit, Maxwell 16 Cell DNA Purification Kit seem to work well when extracting DNA from gram-negative bacteria (*E. coli* and *S. typhimurium*) but was less effective when isolating DNA from gram-positive bacteria (*Listeria monocytogenes*, and *Bacillus cereus*). In conclusion, the Maxwell 16 system and its cartridges is useful but has limited applicability.

Keywords: Maxwell 16 system, DNA extraction protocol

Robyn Verhalen, Dr. Alam Hasson

Robyn Verhalen

robynverhalen@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 12

The Investigation of Chemical Aerosols Attributed to the Cigarette Smoke Aging Process and Their Impact in Cellular Toxicological Studies

Various studies, especially those observing first and secondhand smoke, have confirmed the hazards of tobacco smoke on health. Tobacco smoke that exists in the atmosphere and includes mainstream and side-stream smoke has been termed secondhand smoke (SHS) or environmental tobacco smoke (ETS). When these particles linger, even in the absence of active smoking, humans may be exposed to these persistent ETS compounds—this has been termed thirdhand smoke. Thirdhand smoke is remaining tobacco residue that comes in contact with indoor surfaces and/or can undergo chemical transformations when exposed to atmospheric species like ozone and nitrous acid. Recent work suggests that thirdhand smoke is an emerging environmental health risk and may be more toxic than SHS. Our aim is to quantify the effect of thirdhand smoke residue exposure on various cell lines. More specifically, the goal is to evaluate changes in the cytotoxic effect of smoke residue when exposed to ozone.

Thirdhand smoke filter extracts have been tested on three cell lines, A549 (human lung epithelial), CCL-3 (chinese hamster lung fibroblast), and TK6 (human spleen lymphoblast) using a microplate-based colorimetric WST-1 assay which measures cellular proliferation, viability, and cytotoxicity by the level of mitochondrial dehydrogenase activity. Smoke extract is applied at varying concentrations (2.5%, 2%, 1.5%, 1%, 0.75%, 0.5%, 0.25%, 0.1%, 0.05%, and 0.01%) and subsequently measured for absorbance using a plate reader at 440nm. Cell proliferation ratios were obtained by dividing the control blank; these are then normalized to account for the trial specific extracted particle masses and recorded in mg/ml. As expected, higher concentrations of thirdhand smoke residue inhibited cell proliferation most significantly. The mean IC₅₀ values (inhibitory concentration to reduce cell response by half) for trials exposed to ozone and for standard trials (without ozone) are 0.0762959 ± 0.0240824 mg/ml and 0.265037 ± 0.0810673 mg/ml respectively. Thus, the toxicity of the smoke residue is higher when exposed to ozone.

Joy Aparicio Valenzuela, Dr. David D Lent

Joy Aparicio Valenzuela, Daeun Hwang, David D Lent

japava@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 13

Behavioral Assays to Study Deficits in Spatial Cognition in *Drosophila melanogaster*

The fruit fly, *Drosophila melanogaster*, has proven to be a useful model organism in the study of many human disease processes. The fruit fly has become a commonplace in both genetic experiments and neurobiological experiments. Nearly 70% of disease-associated human genes have a fly homolog or transgenic model, which makes neurodegenerative disease research with this organism very feasible. While many neurobiological aspects of disease have been studied in fruit flies, there is yet no solid measure of complex behavior associated with neurodegenerative diseases. Often we can only use basic measures to view decline in behavior and a quantitative measure of cognition in fruit flies is lacking. Most insects, including fruit flies, have very good learning abilities and lend themselves well to behavioral studies. Experiments here quantified the behavior of flies in a place learning/spatial memory assay in order to elucidate cognitive traits. Using GAL4-UAS and GAL80 temperature sensitive mutants to express disease-associated proteins (e.g. Tau & ABeta42) in specific brain regions allowed for the study of aspects of spatial cognition and cognitive decline in fruit flies. Training flies in a place memory assay provided insight into issues of visual perception, visual learning and short-term memory. The use of long-term probe trials provided better understanding of processes of consolidation and long-term memory. This assay demonstrates variable rates of learning, variable disruption in short-term and long-term memory. These differences were attributed to differential expression of the ectopic proteins in the mushroom bodies and central complex of the flies. These brain regions were found to be individually important in certain elements of perception and learning. However, only when both regions were functionally intact was more complex spatial cognition revealed. This is one of the first studies to focus on cognitive decline in *Drosophila*. This has significance in that it relates to the overexpression or misregulation of proteins that cause neurodegeneration and dementia. By learning more about the molecular pathways and the quantitative expression levels of disease associated proteins in the nervous tissue of fruit flies and correlating that with a quantitative measure of spatial cognition, we can further enhance our understanding of neurodegenerative diseases in humans.

Nicole Shinkawa, Dr. David Lent

Nicole Shinkawa, Shazia Ali, Joy Aparicio Valenzuela, David D Lent, Ulrike K Muller

Shinkawa13@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session I

Poster Board No. 14

Visual-motor Control and Obstacle Avoidance in Fruit Flies

In insects, the central complex has been found to be important in the selection of motor programs and in coordinating multi-joint movement. Importantly, the central complex has been shown to, in part, represent visual information and be critical in visuo-motor integration. By understanding mechanisms of visuo-motor control mediated by the central complex we can better understand how animals interact with their environment. For functional analysis of the neural basis of the visuo-motor integration programs *Drosophila melanogaster* offers sophisticated methods for the genetic manipulation of a small subset of neurons. The primary focus of this study is the set of neurons that comprise the ellipsoid body, which is associated with locomotor control. The GAL4/UAS system was used to create mutant activation lines with TRP_A1 channels inserted into the ellipsoid body. TRP_A1 is a heat and voltage gated channel activated at ~25° C, causing neurons to fire tonically. Inactivation lines were created using GAL4/UAS expressing Kir2.1 channels, a potassium inward rectifier that hyperpolarizes neurons, along with GAL80_{ts}, that suppresses the activity of GAL4 unless the temperature is above ~32° C. The first set of experiments involved developing multiple mutant lines to uncover the most efficient constructs. For the activation line, one GAL4/UAS cross was made and for the inactivation line, three different lines of GAL80_{ts} crossed with the GAL4/UAS system were generated and then exposed to heat treatment. This led to the identification of the optimal constructs for the behavioral experiments. To examine the role of the central complex in the visual guidance of locomotory behavior, we have developed an arena in which we can observe and track individual wild-type and mutant flies as they perform normal vertical walking following a tap down protocol. As flies perform their vertical walking, they encounter an obstacle with high visual contrast, which requires them to maneuver around. We quantified the behaviors by investigating the distance from the barrier where the fly first initiates the turn, the time it takes to initiate to turn, and the radius at which it turns in order to explore how the central complex mediates visually guided locomotion in flies. Heat induced changes in the neural activity in the ellipsoid body neurons resulted in flies responding differently to the visual obstacle compared with control flies.

Cheyenne Hefley, Dr. Steve Blumenshine

Cheyenne Hefley, Steve Blumenshine
CheyenneH2010@mail.fresnostate.edu

California State University, Fresno
Department of Biology

Poster Session I

Poster Board No. 15

Spatial & Temporal Variation in SJR water $\delta^{18}\text{O}$ and Fish Movement

The San Joaquin River has experienced significant change since the building of the Friant Dam in 1942. As a result, habitat conditions for native fish species has deteriorated while allowing non-native fish species to thrive. In 2006 the San Joaquin River Restoration began which is to help restore and maintain fish populations in “good condition”. Therefore, the purpose of this project is to focus on the response of native species to river restoration efforts. We can use oxygen isotope ratios within the water to those found within the fish tissue to better understand fish distributions as the restoration progresses.

Previous temperatures records from assessment of the mine pit habitat in the San Joaquin River in 2013 shows the oxygen stable isotope ratio increases as the temperature increases. This is indicative of oxygen stable isotope ratio ($^{18}\text{O}/^{16}\text{O}$ ratio) cycle which is linked to water temperatures. This means during warmer temperatures water is rich in oxygen-18, while cooler temperatures are rich in oxygen-16. These oxygen isotope ratios can also be seen in animal tissues and is often used to track migratory patterns of a variety of species.

Water was collected from varying points along the river during three different months, which characterized different seasons and water releases from Friant Dam. For comparison, fish were collected using small minnow traps. Water and fish tissue samples were sent to UC Davis for oxygen stable isotope analysis.

The preliminary data for June 2014 showed that the water temperatures at upriver sites were cooler compared to those downriver sites which were warmer. This data was confirmed to be accurate by comparing it to the data kept by the California Data Exchange Center for various sites in the study area of interest for the month of June 2014. The other preliminary data that was obtained were the oxygen isotope ratios from a previous study done in 2013 and from the June 2014 water samples. The data from 2013 showed that as temperatures increased the oxygen isotope ratios increased. The June 2014 data resembles patterns seen from the 2013 study data in terms of oxygen isotope ratios in relation to water temperatures. The fish oxygen stable isotope analysis should result in a ratio that is comparable to the ratio of one of the water samples that were taken. This can then help gain a better understanding of how to use stable isotope analysis of oxygen to determine the distribution of fish species in future studies.

Nathan Reetz, Dr. Joseph Ross

Nathan Reetz and Dr. Joseph Ross
nreetzfc@mail.fresnostate.edu
California State University, Fresno
Department of Biology
Poster Session I
Poster Board No. 16

Embryonic Lethality in Hybrid Crosses of *Caenorhabditis briggsae*

Caenorhabditis briggsae is an excellent model system for the study of genetics and speciation. They are simple organisms with relatively small, fully sequenced genomes and short generation times. Most importantly for the ease of genetic research, as a hermaphroditic species, they can be crossed or selfed to control what traits are present in subsequent generations. In the study of speciation, it is important to look at dysfunction caused by the cross of two organisms. Two *C. briggsae* strains are currently being used to explore speciation: HK104, a temperate (20°C) strain from Japan, and AF16, a tropical (25°C) strain from India. The F1 (first offspring generation) Hybrids of these strains show reduced fitness in many traits including brood size and lifespan. This F1 dysfunction might be produced by a genetic incompatibility between strains that represents the onset of speciation. One trait that could be studied further to identify the genetic basis of species formation is embryonic lethality. This study attempts to explore two main questions. Does the hybrid F1 generation show a decreased number of embryos that surviving to hatch? Are these strains genetically adapted to their native temperatures, and does temperature therefore affect embryonic lethality in hybrids?

To answer these questions, this study counted unhatched eggs at both 20°C and 25°C for each pure strain to provide baseline egg lethality at both temperatures. This provided the control for the experiment. HK104/AF16 and AF16/HK104 F1 generation hybrid eggs were then observed at 20°C and 25°C. These results were compared with the baseline data using a χ^2 test to determine if the hybrids are experiencing increased embryonic lethality. Results showed that there was a significant increase in embryonic lethality in both hybrid crosses. More replicates are needed to ensure the lack of statistical. Additionally, analysis of the obtained data regarding temperature effect would be beneficial.

To answer these questions, this study counted unhatched eggs at both 20°C and 25°C for each pure strain to provide baseline egg lethality at both temperatures. This provided the control for the experiment. HK104/AF16 and AF16/HK104 F1 generation hybrid eggs were then observed at 20°C and 25°C. These results were compared with the baseline data using a χ^2 test to determine if the hybrids are experiencing increased embryonic lethality. Results showed that there was a significant increase in embryonic lethality in both hybrid crosses. More replicates are needed to ensure the lack of statistical. Additionally, analysis of the obtained data regarding temperature effect would be beneficial.

Justin King, Dr. Laurent Dejean

Justin King, Bushra Mahmood, and Laurent Dejean

jking@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session I

Poster Board No. 17

**Effect of Bcl-2 or Bcl-xL Expression Levels on Whole Cell Metabolic Fluxes:
A statistical study**

The proper understanding and use of statistical tools are essential to biochemical and molecular biological applications. A statistical method to objectively determine outliers in whole cell lactate production and glucose consumption kinetics was developed to better understand the involvement of anti-apoptotic proteins Bcl-2 family proteins Bcl-2 and Bcl-xL as a function of time and gene expression levels. In this study, we present a preliminary comparison of both fluxes of glucose consumption and lactate production in Bcl-2 or Bcl-xL over expressing cells. These fluxes were either calculated using a classical analytical method vs. a statistical analysis using Interquartile Range determination which allows for an objective/non-biased outliers determination in each set of kinetics. When appropriately validated, this last approach should allow for a more systematic study of the effects of anti-apoptotic Bcl-2 family proteins on cell metabolism in physiological and pathophysiological conditions.

Arnold Muradyan, Dr. Pei-Chun Ho

Arnold Muradyan, Shoji Hishida, Taylor McCullough-Hunter, Pei-Chun Ho

muradyan14@mail.fresnostate.edu

California State University, Fresno

Department of Physics

Poster Session I

Poster Board No. 18

Development of a Thermopower Probe

A design for the thermopower puck is currently being developed to accurately measure the Seebeck coefficient of a sample from 10K to 300K. Seebeck coefficient is regarded as one of the many important factors for developing efficient thermoelectric coolers and thermoelectric generators, which are used as a source of energy that is environmentally friendly. Seebeck coefficient is determined by dividing a measured voltage difference by temperature difference between two extremities of a sample. In the previous design there was a serious problem with measuring temperature difference accurately. The current design consists of a differential thermocouple which is incorporated into the puck to record change in temperature. Measurement of accurate temperature difference between hot and cold extremities within a sample allows Seebeck coefficient to be calculated with minimal error. The homemade Type T thermocouple, which is a combination of Copper and Chromel wires, is connected to a nanovoltmeter in order to measure change in voltage that is induced in it. This voltage measurement allows calculation of temperature gradient, and with Cernox thermometer the temperature of the cold reservoir is obtained. This thermocouple setup gave results with approximately 1.5% error at room temperature. We are currently calibrating the homemade thermocouple to provide us with less than 3% error in temperature gradient measurement from 10K to 300K.

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Dhruv Doshi, Dr. Woonki Na

Dhruv Doshi and Richard Musharbash

dhruvdoshi@mail.fresnostate.edu

California State University, Fresno

Department of Electrical and Computer Engineering

Poster Session I

Poster Board No. 19

50W Proton Exchange Membrane (PEM) Fuel Cell Emulator Using Arduino Uno

This project introduces the development of a PEM Fuel Cell Emulator that mimics the behavior of an actual fuel cell for testing with real systems. The theoretical equations of the Fuel Cell are modeled using MATLAB environment to derive the voltage and current relationship curve and the power to current relationship curves. The voltage and current polarization curve data is stored in the ATMega328 microcontroller using the Arduino Uno Board. The emulator focuses only on the steady state behavior of the fuel cell and does not take into account the variables such as changes in hydrogen and oxygen pressures and temperatures. The whole system is emulated by the use of a 10KHz frequency based buck converter where the duty cycle of the converter is controlled by the microcontroller with the use of polarization curve data stored in it. The ACS712 Hall effect current sensor is used to measure the current at the load and send it to the microcontroller and derive the corresponding PWM Duty cycle. Project still being under testing, the results achieved so far have been correct and produce the right voltage corresponding to correct current values for different resistances at the load. Therefore buying an actual fuel cell for testing electrical power systems can cost a lot and the PEM Fuel Cell Emulator provides a cheaper alternative for testing power systems such as hybrid systems involving PEM fuel cells.

ArNee Vang, Dr. Zoulikha Mouffak

Dr. Zoulikha Mouffak, Adrienne Olaivar, ArNee Vang

arneevang@mail.fresnostate.edu

California State University, Fresno

Department of Electrical and Computer Engineering

Poster Session I

Poster Board No. 20

Benchtop Photolithography Tool

There is an increasing demand for optimizing the tools for nanopatterning techniques in the electronics industry. Current wafer patterning at the micrometer and nanometer scales is accomplished using photolithography, a specialized process that incorporates a significant amount of resource-intensive components, such as gas cooling lines and high-voltage power supplies. The cost of a lab-grade photolithography tool is typically of the order of tens of thousands of dollars, a prohibitive price for many organizations that wish to prototype the fabrication of nanostructures. The availability of a more cost-friendly implementation of photolithography is crucial to the research and development of new technologies in nanoscale devices. In this work, we built a scaled down version of this fabrication system, the benchtop photolithography tool, that is expected to replicate certain nanopatterning techniques for approximately \$500—a fraction of the cost of a typical mask aligner. An automated benchtop photolithography tool can be designed, fabricated, and programmed for prototyping and for research purposes. We use a USB 32-Bit Whacker PIC32MX795 Development Board that drives a programmable touchscreen, a UV LED array, a shutter, and a UV sensor, allowing us to have the desired high precision UV exposure. This integration of a microcontroller to operate the peripheral components of the benchtop tool will semi-automate the small-scale photolithography process.

Paul Verrinder, Andres Castillo, Dr. Gregory Kriehn

Andres Castillo, Paul Verrinder, Ankit Pandey, Freddy Lopez

Pverrinder@gmail.com

California State University, Fresno

Department of Electrical and Computer Engineering

Poster Session I

Poster Board No. 21

Agricultural Applications of Unmanned Aerial Systems for Crop Monitoring

The purpose of this project is to use an Unmanned Aerial Vehicle (UAV) for the acquisition and analysis of a variety of data central for farming operations. This data ranges from images of the crops and fields being monitored along with the real time data collected by the ground sensors: temperature, relative humidity, and soil moisture content. A smart network of wireless sensors will be deployed on the fields for monitoring and collecting real time data. A UAV (hexcopter) will fly above the canopy and it will collect data from the ground network, and the collected data will be transferred to a remote workstation on a daily or semi-daily basis.

A microcontroller functions as the brain of the module and it controls external sensors and saves data as a text file directly onto an external memory source (SD card). The data is transferred wirelessly by using one of the two protocols i.e. IEEE 802.15.4 (zigbee) or IEEE 802.11 (wifi). The drone will be capable of distinguishing amongst multiple modules and creating separate directories for each individual module. The microcontroller will enter sleep states to extend battery life and will only remain active when collecting and sending data to the drone.

Currently, the microcontroller is capable of: controlling a temperature and humidity sensor, actively enters and exits sleep states, transmits packets of data via ZigBee, determines location and time via GPS, saves collected data to an SD card as a text file and creates a new file on a monthly basis.

We hope to incorporate industry grade moisture sensors as well as develop alternate modules in order to test other wireless communication means and power consumption. The end product should optimize power consumption efficiency in order to achieve a 3-4 month battery life.

Keith Garabedian, Dr. Nitaigour P. Mahalik

Megan Anastasio, Keith Garabedian, Abhijit Suprem, Tou Thao, Richard Vue, Ger Yang, Nitaigour Mahalik

garabedian_1988@mail.fresnostate.edu

California State University, Fresno

Department of Industrial Technology

Poster Session I

Poster Board No. 22

**Remotely Controlled Prototype End Effector Design for
Tree Fruit Picking Applications**

Californian farmers have been dragging machines into the fields since long. In harvesting area, technology systems have played an integral role in improving efficiency, productivity and in-time solutions. In this project we have developed an end-effector (fruit picker) prototype that can be utilized in a robotic or mechanized tree-fruit harvester. The project's goal was to develop the prototype by selecting appropriate materials and engineering tools and engage motivated students for solving design problems. The end-effector is innovative in that it can be used for multiple fruits such as orange, peach, apple, and pears. The end-effector can be capable of pulling the fruits off the tree by utilizing twisting mechanism through electronics and control systems. The end-effector can also be controlled remotely. The design (structural, mechanical, configurability, and flexibility) required a strongly modular concept to achieve fast and cost effective approach. It incorporates plug-and-play electrical and electronics systems and tool sets. To grasp the fruit, the design uses Commercial Electric Flood light gripper that has been modified to fit our requirements. A Traxxas 180 degree servo was used. The servo's rotation pulls the grappling angled arms to close around the fruit. Once the arms have closed, the base spins using the HobbyTown 360° continuous servo to remove the fruit. The continuous servo is mounted to the main base that is linked to the inner base by a small rubber belt. The rubber belt uses the friction of the base to spin the inner shell. The Hobby King hand-held radio control system was used to control both servos. The remote control allows the user to control the end effector without having to physically turn on or off certain components. The design will be shown at the presentation. The methods for solution focused product development in educational research to gain a better understanding of technology systems can enhance the capacity building and advanced skill set of the interested students. Six students were involved in this project.

Sarah Parry, Dr. Jorge González

Sarah R. Parry, Jun Abe and Jorge M. González

sarahparry13@mail.fresnostate.edu

California State University, Fresno

Department of Plant Science

Poster Session II

Poster Board No. 1

The Study of the Courtship Behavior of the Polyphagous Parasitoid Wasp

The courtship behavior of the polyphagous wasp *Melittobia australica* (Hymenoptera: *Eulophidae*) was observed, studied and compared with a similar species (*M. hawaiiensis*) that appears to belong within its own "species-group." *Melittobia* is a genus of ectoparasitoid wasps that commonly attack pollinating bees, as well as other hymenopterans and even some dipterans. Cross breeding experiments of the two species as well as Scanning Electron Microscope pictures were done with the purpose of establishing differences among them both. Since they are so similar morphologically, a study of their courtship was also planned. All species in the genus exhibit a complex courtship. Each species displays unique behaviors during courtship in such a way that they can be used to separate cryptic species. Even though the courtship of *Melittobia australica* is known, not much detail is recognized for the morphologically similar species *M. hawaiiensis*. Cultures of *M. australica* and a similar species we suspect is *M. hawaiiensis* were kept in an incubator at 25 °C. Female pupae were extracted from wasp's cultures. Once emerged, virgin females between 24 to 48 hours old were coupled with experienced males (2-5 days old) extracted from cultures. Fifty courtships per species were recorded with a digital microscope-video camera. Results show that there are behavioral differences in the two species during courtship.

Mauricio De Almeida, Dr. Jorge Gonzales

Mauricio De Almeida¹, Yunyun Chen², Hong Liang² & Jorge M. González¹
almay@live.com

California State University, Fresno

Department of Mechanical Engineering, Texas A&M University

Department of Plant Science

Poster Session II

Poster Board No. 2

Study of Microparticles Impacts in a Hydroponic Plant-Insect System.

Pollution involves significant amount of micro particles in air and water. To date, it is still not clearly understood the effects of the interactions of many microparticles with the environment and organisms. A closed hydroponic system was built to study movement and distribution of microparticles of oxides, commonly particles found in polluted areas, within a Substrate-Plant-Insect chain, in an effort to try to understand their effects of within such a system and possibly the environment. The system included the use of a hydroponic “container” (and Hydroponic “substrate”) to grow Cabbage (Brassica oleraceae; Brassicaceae) that was fed to Green Stink Bugs (Nezara viridula; Hemiptera: Pentatomidae). Plants were taken from the general growing system into a smaller, and closer hydroponic “substrate” using only water and the microparticles to be tested. The plants were then exposed to starving insects. After testing time, plants and insects were collected and fixed. Then, they were tested using a MicroCT scan to detect the particles internally in the studied organisms. Some particles were found inside the plants but not inside the insects that fed on them. Since the green stink bugs are phloem feeders, the presence of such microparticles inside the plants seem to indicate that they flow through the Xylem vessels.

Frank Baggolini, Dr. Balaji Sethuramasamyraja

Frank Baggolini

fbagg@mail.fresnostate.edu

California State University, Fresno

Department of Industrial Technology

Poster Session II

Poster Board No. 3

Development of Orchard and Vineyard Removal Protocol for Central Valley California

California has an estimated 2,550,500 acres of vineyards and orchards generating billions of dollars in revenue. Every orchard and vineyard had a fixed production age. When its time to consider orchard or vineyard removal there can be several factors to consider. The differences of processes and techniques can be as different as the trees in the orchard. This research aims at providing an overview of what's available and how a farmer/grower can make the best decisions for their farm/ranch.

To study the orchard removal practices in San Joaquin Valley, California and design a protocol for vineyards and orchards. Observations at several different fields, under varying weather conditions, soil types and involvement with different species of trees or vines.

Outline the options that growers/farmers have and to help them create dialogs with potential contractors.

A protocol has been developed to facilitate growers/farmers and potential contractors for services. Awareness created for Growers/Farmers and information shared after job completion with post interviews.

Dakota Camino, Dr. Jorge M. Gonzalez

Dakota Camino, Antonino Cusumano, Jorge M. Gonzalez

dkcamino@mail.fresnostate.edu

California State University, Fresno

Department of Plant Science

Poster Session II

Poster Board No. 4

Behavioral Responses of Parasitoids in the Genus *Melittobia* (Hymenoptera: *Eulophidae*) to Volatiles Emitted by Natural and Factitious Hosts

Responses of macropterous females of seven species belonging to four species-groups of the ectoparasitoid genus *Melittobia* (Hymenoptera: *Eulophidae*) to direct cues emitted by some natural as well as laboratory hosts were investigated using a Y-tube olfactometer. To locate the different hosts the wasps exploit their odors. These parasitoids did not respond in the same way to the direct volatiles emitted by all the offered hosts. Our results indicate that odors emitted by the hymenopterans tested elicit a stronger response by the different species of *Melittobia*. However, a limited attraction was found to dipteran hosts, suggesting that parasitization of these hosts may be incidental, due to the broad host plasticity of *Melittobia* wasps. Our preliminary results are part of our efforts to better understand the evolutionary trends that have led to the formation of the species-groups and their interrelationships.

Chirag Vazirani, Dr. Alejandro Calderón-Urrea

Chirag Vazirani and Alejandro Calderón-Urrea

cav110292@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session II

Poster Board No. 5

Algae Transformation as a Mutagenic Tool of the oleogenic algae *Dunaliella primolecta*

Microalgae have emerged as a solution to two important societal challenges; waste water treatment and biofuel production. Microalgae, have been identified and used as a high potential feed stock for biofuel production due to their cellular lipid (triglycerol) content, faster growth rate and better photosynthetic efficiency as compared to plants. They also have the ability to treat waste water (Decrease Chemical Oxygen Demand) as it contains organic (C- rich compounds), inorganic supplements (N, P & K), and high salt content. Some of these components have been shown to promote algal growth. The use of microalgae for waste water treatment is less expensive compared to the conventional method of activated sludge process. The coupling of microalgae growth with waste water is an effective way of waste water remediation and a cost-effective method for micro algal biofuel production. One species of algae that can grow well in high saline concentration and produce good enough amount of lipid is *Dunaliella primolecta* (*D. primolecta*). However, present analysis show that the amount of lipid accumulated by *D. primolecta* is not high enough for large scale use and its ability to eliminate C-rich compounds (as measured by the Chemical Oxygen Demand -COD- test) is not adequate to treat waste water.

The aim of this project is to genetically modify *D. primolecta* using an Agrobacterium tumefaciens mediated transformation method to generate a large number of mutants. These large number of mutant algae can be screened for their efficiency in reducing the chemical oxygen demand (COD) of waste water. We hypothesize that a genetic transformation will cause a mutation in the genome of the algae such that, the mutant gene will code for an enzyme that is responsible for / or controls the algae's ability to increase/decrease the COD of waste water. The specific steps in this project include 1) Transform *D. primolecta* using an Agrobacterium tumefaciens; a protocol to do this was developed in Dr. Calderon-Urrea's lab; 2) Screening of the transformed cells and calculating the percentage decrease in COD level of wastewater; 3) Develop a small scale pilot experiment to see if COD can be lowered with the selected strains in the greenhouse/field. My long term objective is to generate transgenic cell lines of *Dunaliella primolecta* and combine its effect for reducing the COD level in waste water and produce greater amount of triglycerol which can be used for biofuel production.

Preliminary data will be presented on the efficiency of transformation and the isolation of 192 transgenic algae lines. The transformed lines will then be screened for their ability to reduce the COD in waste water. The transformed line which causes greatest reduction in COD of waste water will be freezed and eventually scaled up.

April Booth, Dr. David Lent

April Booth, Auzadeh Jalali, Damaris Lambrecht, and David Lent

venabili@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session II

Poster Board No. 6

Effects of Caffeine on *Drosophila* expressing Tau Pathology

Alzheimer's disease is the most frequently encountered form of dementia. Tau pathology is a common occurrence in the regions of the brain affected by Alzheimer's disease. Research indicates that the administration of caffeine to mammalian model organisms (such as mice or rabbits) expressing Tau pathology reduces deficits in learning and memory and neuronal damage. There is also evidence that there is a negative correlation of the expression of Alzheimer's Diseases in aging patients with increasing caffeine consumption from beverages such as coffee. Such work has not been studied extensively in the simpler model organism *Drosophila melanogaster*. Studies in *Drosophila* could be a useful model to study the basic mechanisms of how caffeine could have an effect on Alzheimer's pathology. The genetic tools available in *Drosophila* permits for controlled expression of proteins associated with Alzheimer's disease. This can be done in large numbers of flies that can be tested simultaneously, providing a high throughput model system. In this study, the effects of the early administration of caffeine on learning, memory, and longevity in *Drosophila* expressing Tau pathology in the mushroom bodies and the ellipsoid body will be evaluated. The mushroom bodies and the ellipsoid body are thought to be the regions of the *Drosophila* brain responsible for learning and memory and are analogous to regions of the brain attacked during Alzheimer's (the hippocampus and striatum, respectively). Spatial learning and memory will be studied using a heat maze learning assay, and associative learning and memory will be studied using a T-maze assay. Preliminary data indicates that caffeine exposure could increase the longevity of *Drosophila* expressing Tau pathology. This work could support the use of *Drosophila* as a high-throughput system to study behavior and the underlying neural deficits associated with AD as well as the effects of caffeine on Alzheimer's pathology.

Anthony (Tony) Nwangwu, Dr. John T. Bushoven

A. Nwangwu, E. Bhardwaj, J.A. Ross, Justin Costa, and J.T. Bushoven

Anwangwu@csufresno.edu

California State University, Fresno

Department of Biology and Department of Plant Science

Poster Session II

Poster Board No. 7

**Genetic Variability in a Representative ‘Kerman’ x ‘Peters’ Population of Pistachio
(*Pistacia vera L.*) Orchard based on Rapid-PCR Technology**

In 2013 there were approximately 250,000 acres of pistachios (*Pistacia vera L.*) grown in 22 counties throughout California. Many of these orchards are planted primarily with male *P. vera* ‘Peters’, and female ‘Kerman’ trees. In recent years, growers have observed spatial and temporal variation in growth and fruiting density in these orchards. Field analyses of Fresno State’s pistachio orchard confirmed the presence of such phenotypic variations. These may be due to the prevailing environmental conditions, rootstock variability, or perhaps random mutagenesis that occurred during scion clonal propagation over the past 50 years. The objective of this study was to examine the latter possibility as the presence of superior/inferior ‘Kerman’ trees is not well documented. Total genomic DNA were isolated using either the CTAB method or QIAGEN DNeasy ® Plant Mini Kit and compared. The concentration and purity of isolated DNA products were analyzed using Nanodrop 2000 spectrophotometer. The method of Williams et al. (1990) was used for Random Amplified Polymorphic DNA Polymerase Chain Reaction (RAPD-PCR) with minor modifications. PCR products were size separated using gel electrophoresis and stained with the novel nucleic acid stain GelRed. The advantages of the Kit over CTAB method were observed through the purity index ratio (A260/A280). The purity index ratio for DNA products isolated from either method were significant ($P \leq 0.05$). Three out of the seven RAPD primers that were screened revealed strong reproducible polymorphic fingerprints. A total of 72 scorable bands were produced, with an average of 24 bands per primer, of which 40 bands (53.7%) were polymorphic. Our results are applicable to the expanding California pistachio industry for breeding programs and conservation of existing germplasm.

Keywords: Pistachio, RAPD-PCR, Genetic Polymorphism

Yesheswi Chavan, Dr. Alejandro Calderón-Urrea

Yesheswi Chavan and Alejandro Calderón-Urrea

yesheswichavan@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session II

Poster Board No. 8

Multiplex qPCR for Simultaneous Detection of *Listeria monocytogenes* and *Bacillus cereus*

Foodborne diseases have caused a tremendous impact in the United States resulting in 9.4 million illnesses each year. Almost 200 diseases are transmitted through food pathogens, ranging from mild gastroenteritis to serious lethal hepatic and renal disorders. Detection of these pathogens in food samples has become a major concern for food and health associated industries. Conventional methods for detection of food pathogens include culture and colony counting method, or immunological and nucleic acid methods which are sensitive and inexpensive, but are highly restricted by assay time. Also, some of these techniques rely on further specific microbiology and biochemistry tests for confirmation of results. This approach requires large amount of sample and reagents, and can only detect one pathogen per sample making the process time consuming and inefficient. In order to overcome these drawbacks, a reliable and sensitive diagnostic method is needed that can be used for simultaneous detection of two or more pathogens in a single food sample.

Isolation and detection of gram positive bacterial pathogens like *Listeria monocytogenes* (*L. monocytogenes*) and *Bacillus cereus* (*B. cereus*) has become more challenging due to its thick outer cell structure made up of peptidoglycan layer. Quantitative Polymerase Chain Reaction (qPCR) which is known to be rapid, cost efficient and high sample throughput technology was traditionally used for detecting one pathogen at time. A recent advancement in the qPCR technique is the multiplex qPCR approach which uses TaqMan chemistry that allows simultaneous detection of two or more target species in the same reaction mixture. The aim of this project is to utilize multiplex qPCR technology to simultaneously detect and diagnose the two most commonly found gram positive bacteria *L. monocytogenes* and *B. cereus* in food samples. The specific objectives of this study includes: 1) Selection of target genes having unique sequences specific to *L. monocytogenes* and *B. cereus*, 2) Design primers and two distinctly dye-labeled probes (Fluorescent TaqMan probes), each specific to the target genes. 3) Detection and standardization of automated multiplex qPCR of two strains in same sample mixture. 4) Test the protocol on spiked food samples. Hence, a standardized protocol will be developed for effective detection of *L. monocytogenes* and *B. cereus* using the multiplex qPCR assay. This technique is less labor intense and highly cost efficient. The decreased processing time and the ability to monitor multiple pathogens make multiplex qPCR a rapid and highly significant technique for the food industry.

Keywords: Multiplexing, qPCR, Taqman assay

Neha Bhavnani, Dr. Jason Bush

Neha Bhavnani, Jason Bush PhD.
nehabhavnani@mail.fresnostate.edu
California State University, Fresno
Department of Biology
Poster Session II
Poster Board No. 9

Evaluating the Role of Glycine Metabolism in Breast Cancer

Cancer cells require a readily available pool of amino acids to synthesize new proteins to rapidly multiply and grow. There is strong evidence that the non-essential amino acid, glycine is critical to cancer cell proliferation. The mechanistic role of glycine metabolism is not well understood in breast cancer and may vary depending on estrogen receptor (ER) status. Our broad goal is to investigate the correlation between glycine metabolism and the estrogen receptor status of breast cancer cells. In this study, we evaluated the effect of different concentrations of supplemental glycine (0 mM, 0.4 mM & 4 mM) on breast cancer cell lines MCF-7 (ER+) and MDA-MB-231 (ER-). MCF-10A, a normal mammary epithelial cell line was cultured in 0.25 mM, 0.65 mM, and 4.25 mM glycine to differentiate the effect of glycine on tumorigenic and non-tumorigenic cells. We observed an inhibitory growth effect after a 72-hour with higher concentrations of glycine in tumorigenic cells, but a proliferative effect was observed in normal breast epithelial cells. Semi-quantitative Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) was performed to quantify gene expression, and significant shifts were observed in four major genes involved in the glycine synthesis pathway. Two of these genes, Serinehydroxymethyltransferase (SHMT2) and Methylenetetrahydrofolate dehydrogenase (MTHFD2) are native to the mitochondria while MTHFD1 and SHMT1 are found in the cytoplasm. Overall we observed that SHMT2 and MTHFD1 were expressed at elevated levels while MTHFD2 and SHMT1 were expressed at reduced levels. Furthermore, we performed 1D-1H-NMR spectroscopy and multivariate statistical analysis of cell samples to identify potential differences in metabolite profiles across these breast cells in response to increased glycine concentration. Taken together, these results suggest that understanding glycine metabolism may be a promising biochemical strategy to target in breast cancer.

Claudia Cristina Velázquez, Dr. Brian Tsukimura

Claudia Cristina S Velázquez, Ulrike K. Müller, Ph.D., Brian Tsukimura Ph.D.

cvelazquez@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session II

Poster Board No. 10

The Kinematics of Swimming Locomotion in the shore crab *Carcinus maenas*

Studies on locomotion of walking and swimming of crustaceans have been conducted on adults, and studies on crustacean larvae have focused on the swimming mechanics of crustacean larvae of brine shrimp, the American lobster, the calanoid copepod, but very few studies exist for crab zoeae (larvae). The majority of the crab studies have focused on the adult crab with few focusing on the locomotion of crab larvae. Although there are several studies of the swimming mechanics of the swimming appendages of crustacean larvae, none have elaborated on the swimming mechanics of the swimming appendages of the green shore crab *Carcinus maenas* (*C. maenas*) larvae.

The intent of this study was to examine the swimming locomotion of the crab larvae, in particular that of the green shore crab by elaborating on the investigation of Ford et al., 2005. Egg bearing *C. maenas* were purchased from the Woods Hole Marine Biological Laboratory Aquatic Resources Division and were maintained in the lab. Once larvae hatched, larvae were maintained in lab and fed rotifers and Artemia for use in video recordings. High speed video recordings of swimming, and sinking of stage one green crab larvae were recorded to obtain swimming and sinking kinematics of the whole larva and its appendages. Analysis of recordings for swimming locomotion were performed using MATLAB software, and ImageJ. We were able to obtain body, maxilliped and natatory setae kinematics and display the swimming gait of the green crab larvae used throughout swimming. However, further studies of the mechanics of stage I-IV larvae and megalopae are required to fully understand crab locomotion.

Simon Gonzalez, Dr. Fred A. Ringwald

Simon Gonzalez, Fred A. Ringwald

simon4com@mail.fresnostate.edu

California State University, Fresno

Department of Physics

Poster Session II

Poster Board No. 11

**A Comparison Between The Mass-Radius Relation in the Ritter-Kolb Related Objects
and Hot Jupiters.**

Binary star systems related to cataclysmic binaries and low-mass X-Ray binaries from the Ritter-Kolb catalog were selected to search for detached, eclipsing binaries with known radius, mass, and spectral type of the secondary star. These observed measurements, along with their uncertainties of mass and radius, are graphed on a mass versus radius plot. A well-defined theoretical mass-radius relation line is plotted along with these values. Our results are compared with a similar plot of hot Jupiters with known radius, mass and uncertainties. Hot Jupiters are large gas planets that orbit their parent star closer than Mercury orbits our Sun. We conclude that our stars do not exhibit the same inflation of radius that hot Jupiters do.

Raua Menkabo, Dr.Daqing Zhang

Raua Menkabo

Raua87@mail.fresnostate.edu

California State University, Fresno

Department of Physics

Poster Session II

Poster Board No. 12

The Experimental Investigation on Zinc Oxide Nanowires grown by Chemical Vapor Deposition Technique

Zinc oxide (ZnO) semiconductor became an interesting nanomaterial in the past years. The ZnO is from II-VI group binary semiconductor crystals. The crystal structure of ZnO is typically wurtzite in nanoscale formation where each anion is surrounded by four cations at the corners of a tetrahedron, and vice versa. ZnO nanomaterial captured more and more attention in Nano science community because of its direct wide energy bandgap ($E_g \sim 3.37 \pm 0.01$ eV) at room temperature and large exciting binding energy (60meV), that made them unique properties for potential applications in electronics, optics, sensors, energy storage and catalysis.

Tubular furnaces via chemical vapor deposition (CVD) method were used to fabricate ZnO nanowires. The nanowires were grown on a silicon substrate at deposition temperature 1000 oC and last about an hour and fifteen minute. Then the grown samples were examined by using a LEICA DM4000M (optical microscope), HITACHI S-3500N (scanning electron microscope, SEM) equipped with energy dispersive X-ray spectroscopic system (EDS), and a PANalytical X'pert PRO diffractometer (XRD). From those measurements were acquired optical and SEM image, EDS spectra and distribution, and crystal structure of ZnO grown nanowires.

The as-grown nanowires were observed with the naked eye as a white layer deposits on the silicon substrate. To reveal a close examination of the growth of nanowires an optical microscope and SEM were been used. The sizes of nanowires started from 25 -750nm in diameter and up to 1.5mm .in length. The ESD spectrum and element-mapping image shows the chemical components of the nanowires including zinc, oxygen (forming the body of the nanowire), carbon (surface contamination), Aluminum (from the sample holder), and silicon (substrate). Furthermore, XRD spectrum shows that the crystal structure of nanowire is wurtzite ZnO, since all the peaks match the standard Bragg reflection of ZnO wurtzite model (ICDD database, ref code :01-089-1397). Further researches will concentrate on the electrical and optical properties of long nanowire, such as testing the electric conductivity and building a network circuit for electronic or sensing purpose.

Sheng Zhang, Dr. Qiao-hong, Chen

Sheng Zhang, Bao Vue, Xiaojie Zhang, Konstantinos Parisis, and Qiao-Hong Chen
shengzhang2014@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session II

Poster Board No. 13

Studies toward the Development of Silybin Derivatives as Potential Chemotherapeutics

Silybin is a naturally occurring flavonolignan extracted from milk thistle seeds. Its potential to treat prostate cancer has been evidenced by the experimental data derived from cell-based and animal studies. Its good safety profile has been suggested by its long use as dietary supplements, which has been confirmed by a phase I clinical study. As part of our ongoing project to engineer silybin derivatives with enhanced potency and bioavailability, we started to explore the optimal functional groups in silybin for our chemical modifications and to optimize the reaction conditions for our target compounds. Consequently, eighteen alkylsilybins have been synthesized by alkylation of commercially available silybin with the appropriate alkyl halide. The optimized reaction conditions (solvents, temperatures, and concentrations) for the synthesis of each specific alkylsilybin have been identified. Their structures have been elucidated based on their 1D and 2D NMR data. Their antiproliferative activity has been evaluated towards both hormone-dependent (LNCaP) and hormone-independent prostate cancer cell lines (PC-3 and DU-145) using WST-1 cell proliferation assay. Our findings clearly suggest that 7-OH and C2-C3 in silybin serve as the optimal functional groups for further structure manipulations, through which the silybin derivatives with markedly improved potency and bioavailability will be achieved.

Xiaojie Zhang, Dr. Qiao-hong Chen

Xiaojie Zhang, Rubing Wang, Guanglin Chen, Laurent Dejean, Qiao-Hong Chen

zhangxiaojie87@gmail.com

California State University, Fresno

Department of Chemistry

Poster Session II

Poster Board No. 14

The Effects of Curcumin-Based Compounds on the Viability, Proliferation and Apoptosis of Cancer Cells

A novel class of curcumin-based anticancer agents, exhibiting better cytotoxicity than curcumin against two androgen-independent prostate cancer cell lines (PC-3 and DU-145), has been recently presented by us in European Journal of Medicinal Chemistry. Interestingly, the four most promising compounds are also more cytotoxic potent than curcumin against an aggressive cervical cell line (HeLa) and demonstrate no discernible cytotoxicity towards MCF-10A normal mammary epithelial cells. The aim of the current research is to explore the in-depth cell death mechanisms of these promising curcumin-based agents. To achieve this goal, we started with a systematic exploration on their effects on cell membrane integrity and cell proliferation. The cytotoxicity of this panel of curcumin analogs (32 compounds) towards HeLa cell line were tested using trypan blue dye exclusion method with a cell viability counter (Beckman). We observed that all of these compounds showed much higher inhibitory activities than curcumin at 10 μ M and 1 μ M concentrations. Nine compounds were selected for further evaluation of their IC₅₀ values, which fall into the range from 0.22 μ M to 0.95 μ M (IC₅₀ value for curcumin is 10.7 μ M). The in vitro anti-proliferative effect of six most promising compounds towards three prostate cancer cell lines (PC-3, DU-145, and LNCaP; both androgen-dependent and androgen-independent) and of nine most promising compounds against HeLa cells was measured with a WST-1 based assay through a plate-reader (Synergy HT). All IC₅₀ values for these selected compounds are less than 1 μ M, while curcumin's IC₅₀ values are greater than 14.5 μ M. Two compounds have been selected for further exploration of their effects on two cell death pathways (apoptosis or necrosis), which is being tested with Annexin-V/ Sytox double staining method through flow cytometry. In this presentation, we will present their anti-proliferative activity towards prostate and cervical cancer cell lines, as well as cytotoxicity against the HeLa cells. This work was financially supported by California State University-Fresno, CSUPERB New Investigator Award, and New California Ventures, LLC mini-grant.

Kevin Yu, Qiao-Hong Chen

Kevin Yu, Xiaojie Zhang, Guanglin Chen, Sami AlJabban, and Qiao-Hong Chen

kevin800102@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session II

Poster Board No. 15

Anti-Proliferative Effects and Structure-Activity Relationships of Alkylated Quercetins

Quercetin, widely distributed in various diets and plants, is a naturally occurring flavonoid structurally characteristic of five hydroxyl groups at 3,5,7,3',4'. Quercetin has been demonstrated to regulate proliferation and cell death pathways leading to cancer. The anticancer activities of methylated quercetins have been explored, but there is very little studies about other alkylated quercetins and their in vitro anti-proliferative activities. So far, no clear structure-activity relationships of alkylated quercetins have been crafted regarding their anti-proliferative effects. As part of our ongoing project, we are working to develop quercetin-based natural products for the potential treatment of advanced metastatic castration-resistant prostate cancer. We aim to design and synthesize quercetin derivatives with improved potency and a better pharmacokinetic profile for the potential treatment of advanced metastatic prostate cancer. We started this project with the structure-activity studies on alkylated quercetins regarding their anti-proliferative activities towards human prostate cancer cell lines. A group of quercetin derivatives, including mono-, di-, tri-, and tetra-alkyl (propyl and butyl) quercetins, have been synthesized from commercially available quercetin. Their chemical structures have been characterized by extensively analyzing their 1D and 2D NMR spectra. Their anti-proliferative activity towards three human prostate cancer cell lines (PC-3, DU-145, and LNCaP) has been assessed using WST-1 proliferation assay. In this poster, we will present the synthesis, anti-proliferative activities, and structure-activity relationships of these alkylated quercetins.

Ralph Yacco, Dr. James Kennedy

Ralph S. Yacco, Aude A. Watrelot, and James A. Kennedy

yacco.ralph@gmail.com

California State University, Fresno

Department of Viticulture and Enology

Poster Session II

Poster Board No. 16

**Role of Analytical Chemistry in Determining the Driving Force of Tannin Stickiness
during Maceration**

As a major constituent of red wine, tannins contribute astringency and are a significant contributor to overall wine quality. Studies have shown that tannin structure variation can lead to variation in wine perception and effectively managing this aspect of wine production is a consistent area of interest for the wine industry. Beginning with the development of an analytical method designed to predict tannin activity (stickiness), a collection of additional analytical methods designed to understand tannin structure (size and composition), were used to investigate tannin structure-activity relationships. Using this approach, the goal of this project has been to understand how wine production operations lead to tannin structure variation and subsequent activity. In order to do so, a large data set comprising samples collected throughout wine fermentation and maceration, from multiple participating Napa wineries, were analyzed using the methods described above. The results indicated a strong positive correlation between tannin stickiness and its molecular size (presented as molecular mass). It was also determined that tannin stickiness was positively correlated with an increase in molar percentage of epicatechin-3-O-gallate and gravimetric recovery.

Given that tannin stickiness is defined as the energy of non-covalent interaction between tannins and a hydrophobic surface, significant variation was observed in this study. Taken together, this study has shown that during maceration operations, tannin stickiness is mainly determined by the size of the tannin polymer.

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Cameron Khalili, Dr. Deify Law

Cameron Khalili, Deify Law, Ph.D

cameron_kh@mail.fresnostate.edu

California State University, Fresno

Department of Mechanical Engineering

Poster Session II

Poster Board No. 17

**Numerical Study of Effects of Air Volume Fraction on Pressure Drop in Upward
Vertical Two-Phase Air-Water Pipe Flow**

Two-phase gas-liquid flow occurs when both the gas and liquid phases exist in the flow as different components and phases (e.g., air-water, hydrogen-water, etc.). Such a flow can commonly be found in the nuclear, petroleum, and process industries. This proposed study can also be applied to the irrigation issues in California by reducing the pressure drop of water through pipes with injecting air bubbles into the water.

In the present work, numerical values of pressure drop for a vertical two-phase flow, consisting of water and air, are computed and compared with published experimental data from Tang et al., 2013 paper. Utilizing ANSYS FLUENT 14.5 and ICEM CFD 14.5, pipe flow simulations are performed to match the experimental conditions of Tang et al., 2013 paper assuming a two-phase Eulerian-Eulerian and ensemble-averaged flow in a two-dimensional (2D) flow domain. The effects of air volume fraction on pressure drop in an upward vertical two-phase flow are conducted numerically. The inlet air velocity for this study ranges from 0.2 m/s to 11 m/s while the inlet water velocity ranges from 0.31 m/s to 1.17 m/s for a 220.1 cm long pipe of 1.27 cm diameter.

The numerical values are in agreement with the experimental values for inlet water velocities greater than 2 m/s. However, the numerical model is not able to capture the experimental pressure drops for inlet water velocities less than 2 m/s due to the turbulence model.

Alan Suarez, Dr. The Nguyen

Alan Suarez, Dr. The Nguyen

alan2s@mail.fresnostate.edu

California State University, Fresno

Department of Mechanical Engineering

Poster Session II

Poster Board No. 18

**Design and Experimental Analysis of a Biomedical Prosthetic Knee with
Magnetorheological Fluid**

Current prosthetic legs rely on technology that is inefficient. Prosthetics utilizing smart materials, including Magnetorheological (MR) fluid, require less power to operate effectively. During the current state of research, the first version of a MR fluid knee was designed for above the knee amputees. The proposed design is modeled resembling a drum brake because it provides the simplest design with the greatest the uniformity of MR fluid. The MR fluid knee features a novel non-circular rotor. Three fourths of the rotor has the same radius and the remaining quarter has a varying radius to provide a variable gap size between the rotor and stator. This feature allows the MR fluid to experience a stronger magnetic field as the knee rotates, resulting in a variable braking torque. At this stage of the research, a prototype has been built and tested to determine the braking torque profile. The MR fluid knee performed as expected. Both theoretical and experimental results exhibited a significant improvement over conventional MR fluid knees. An improved design is planned for weight reduction and optimization to allow the commercialization of the MR fluid knee.

Andrew de la Pena, Dr. Carmen Caprau

Andrew de la Pena, Sarah McGahan, Carmen Caprau

delapena_0595080@mail.fresnostate.edu

California State University, Fresno

Department of Mathematics

Poster Session II

Poster Board No. 19

A Reduced Presentation of the Virtual Singular Braid Monoid

A braid is a set of n strings passing between two horizontal bars. These strings may interact with one another but must always travel in the downward direction. If the two horizontal bars are brought together and each pair of string ends are glued together in order, the resulting structure will be a knot or a link, called the closure of the braid. The focus of our research has been to study the set of braids whose closure is a virtual singular knot or link. We define the set of virtual singular braids on n strands as a monoid via generators and relations. The defining set of relations mimic the isotopies of virtual singular links. Further we prove that the virtual singular braid monoid has another presentation using fewer generators and relations.

Marisela Torres, Stephanie Ruiz, Dr. Suzanne Sindi

Suzanne Sindi, Marisela Torres, Stephanie Ruiz
mtorres34@ucmerced.edu; sruiz6@ucmerced.edu

University of California, Merced
Department of Applied Mathematics

Poster Session II

Poster Board No. 20

Using Next Generation Sequencing Data for Simultaneous Structural Variant Discovery in Related Species

The genomes of related individuals may differ in many ways from single nucleotide substitutions (SNPs) to larger structural variants such as inversions, duplications and deletions. Up until recently, structural variants (SVs) were thought to be rare, but today we understand they represent a substantial amount of the genetic variation between humans, plants, and other organisms. Typically, structural variants are identified by a process where short fragments of DNA from a test (unknown) genome are mapped to a reference genome. Such methods are effective at determining variants when a very closely related reference is available. However, for many species of interest the closest reference may be too distantly related for traditional SV detection methods to work. Our goal is to develop an SV discovery method capable of detecting variants only a distantly related genome is present but we have sequencing data from multiple closely related individuals.

Our approach for SV detection builds upon a previously published method called the Geometric Analysis of Structural Variants (GASV). The GASV method relies on using information about the distribution of fragments in the DNA sequencing experiment as well as the depth of coverage in mapping of reads to the reference. In our approach, we want to distinguish true variants, those which are polymorphic in the test population from those which represent differences shared by all the test genomes. To do so, we consider the frequency with which variants are observed in the individual genomes and employ a hypothesis test to distinguish which variants are true.

In this study, we present the results of analyzing simulated populations where the true variants are known. We find that, as expected, the closer the test population is to the known reference the better the ability to resolve true variants. In addition, the higher the sequencing coverage the stronger the ability to determine true variants.

Our work indicates that even without a close reference, it is possible to gain substantial information about which variants are present in a population. In addition, by coupling our method with other *de novo* SV detection methods we will likely be able to further improve our results.

Jennifer Garner, Dr. Jin H. Park

Jennifer Garner

jennifergarner@mail.fresnostate.edu

California State University, Fresno

Department of Computer Science

Poster Session II

Poster Board No. 21

**Efficient Measurement of Not-Uniquely-Mappable Regions
for RNA-Seq Data Analysis**

The field of bioinformatics is increasingly important and thus faster and more efficient algorithms need to be developed for use by researchers. In the area of RNA-Seq data analysis, unique read mapping is commonly needed to measure gene/exon expression levels, and normalized measurement method like RPKM, which is bound to the gene/exon length and the total number of mapped reads, has been developed. However, such normalized measurement methods should also consider the length of the region in which no reads are uniquely mapped in nature – we name this region deadzone in our research. There are two possible ways of reflecting those not uniquely mappable regions when computing the normalized expression level, one is practically measuring the mappability of each gene/exon and the other is finding deadzone regions using an algorithm, which saves processing time greatly. Our goal of the research is in two fold, measuring the correlation between the practical mappability result and the result from the algorithmic approach and developing high-performance versions of the algorithmic approach.

In our practice, we measured the mappability of each exon in HG19 chromosome 1 by mapping synthesized reads generated from all exons found in the genome to the whole genome. For checking the effect of the read length, we used three different read lengths. We compared this result with effective exon lengths, which excludes the deadzone regions found from the algorithmic approach. In our practice with HG19 chr1 exons and read length 100 case, the algorithmic approach of finding the deadzone regions takes 18 minutes on a PC computer with Intel Core i7 processor, and the correlation between the results of the practical way and the algorithmic way is found as 92.21%. Other read lengths, i.e., 50 and 70, also showed similar correlation values, 88.7% and 90.57%, respectively. To build a high-performance version of deadzone finding software, we used a task parallel approach with PThread and also tested with using an optimized string matching algorithm in the software. Speedup of using optimized string matching algorithm (Boyer-Moore) achieved 1.32x over the original version; PThread version (without Boyer-Moore) achieved 1.54x; and the version with both Boyer-Moore and PThread achieved the best performance (1.90x) on PC machine with Core i7 processor.

Harbhinder Kaur, Dr Jin Park

Harbhinder Kaur and Jin Park

harbhinder_kaur20@mail.fresnostate.edu

California State University, Fresno

Department of Computer science

Poster Session II

Poster Board No. 22

Exploiting Higher Security and Quality on Image Steganography

As a method of hiding critical information during transferring data through internet, steganography has been in use in many cases. With its increasing use, researchers have been addressed the issues of increasing the security level of hidden information, the quality of stego media, i.e., image or video, and the capacity of information to hide.

In this research, we address the issue of enhancing the security level of hidden information as well as enhancing the quality of stego media within the scope of LSB (Least Significant Bit of RGB true color image) based image steganography. In our practice, we implemented the binary representation of the hidden information and the LSB of each byte within the stego image. A secret key is used to protect the hidden information and it is converted into an array of bit streams to interact with RGB matrixes, i.e., bit-wise XOR operations, to enhance the quality of the image including the hidden information.

As compared to NA-I Wu's method (2010) found in the literature, where almost all pixels are modified in an image and Four Neighbor method (2010), where 3 or more pixels are modified, our proposed scheme modifies only one bit of each pixel and thus results in higher quality of image measured by PSNR (Peak Signal-to-Noise Ratio). The measured PSNR values of NA-I Wu method, Four Neighbor method and our proposed method are 41.1893, 41.7174 and 76.6359, respectively. In conclusion, our experimental results show that the proposed method is an effective way to integrate hidden information and a stego image without significant distortion. Also for unauthorized users it is very difficult to detect the changes made in the stego image.

Sarah Hasan, Dr. Samendra Sherchan

Sarah Hasan, Samendra Sherchan
sarahhasan54@mail.fresnostate.edu
California State University, Fresno
Department of Public Health

Poster Session III

Poster Board No. 1

**Risk Perception of Drinking Water Source and Quality in Low-Income Hispanic
Community in the Central Valley**

Over 42 million people in the US are dependent on individual wells for their drinking water. In most states, these private wells are not regulated by local health environmental agencies. For this reason, only few studies have been conducted on water quality of this water. The objectives of this project are 1) to determine if there is a difference in water quality between public supplied tap water and the actual drinking water used by these communities in the Central Valley 2) to understand the risk perception these families have about their drinking water source. The survey was conducted with approximately 150 randomly-selected Central Valley residents in low-income communities and the results illustrate significant difference in drinking water source and risk perception among low-income Hispanic communities. The results from this study helped us to understand health disparities and combat community concerns regarding water usage.

Anissa Robinson, Dr. Donna Bee-Gates

Anissa Robinson

robinson.anissa22@gmail.com

California State University, San Jose

Department of Psychology

Poster Session III

Poster Board No. 2

How Authority Figures Influence High School Seniors Academic Achievement

The purpose of this research article is to determine the influence of parental expectations, sibling(s) comparison, and teacher expectations on high school senior academic achievement in an economically disadvantaged area in East Palo Alto, California. The participants (N=5) were asked to complete a questionnaire about how these factors influenced their academic career. The results indicated that parents had the highest influence on the participants' academic achievement; moderately high influence was placed upon teacher expectations and low to moderate influence was placed upon sibling(s) achievement. Keywords: Parental expectations, Sibling comparison, Teacher comparison, Academic achievement, Motivation, School setting.

Danielle Baker, Dr. Spee Kosloff

Danielle Baker, Spee Kosloff

danielleysebaker@gmail.com

California State University, Fresno

Department of Psychology

Poster Session III

Poster Board No. 3

Predicting Successful Outcomes among Substance Abusers in Residential Treatment

Prior research has struggled to identify the factors that contribute to resistance and resiliency among substance abusers. There is a general consensus that a combination of dispositional and situational factors contribute to whether or not an individual will be successful in residential substance abuse treatment. The present study (N=50) focuses on the assessment of five constructs--self-regulation, distress tolerance, attachment-related anxiety, beliefs about emotion and regulation, and interpersonal support--among a population of clients at a residential drug treatment facility. Data collection is still in progress, and results are expected to show that participants with higher levels of assessed self-regulation, distress tolerance, and interpersonal support, lower levels of attachment-related anxiety, and a variety of positive beliefs regarding emotion regulation will remain in treatment longer, and be more likely to successfully complete their treatment episodes. Five scales are being used to assess participants' levels of the previously mentioned constructs. Participants are first assessed within three days of initial intake at the residential treatment facility. The five scales will be administered again within three days of termination of the clients' treatment episode, or at the end of the 4-month data collection window. Clients that do not successfully complete treatment will be assessed upon discharge. Dependent measures include successful completion of the treatment program and length of stay. Obtaining expected results would not only demonstrate the ability to predict which individuals will be successful or unsuccessful in treatment, but will provide a framework for the application of treatment strategies that prove compatible with client needs, subsequently improving residential treatment outcomes.

Cirenia Huerta, Dr. Mark Van Selst

Cirenia Huerta

cireniahuerta99@gmail.com

California State University, San Jose

Department of Psychology

Poster Session III

Poster Board No. 4

High Impact Practices Associated with Higher GPAs of Psychology Transfer Students

Kuh (2008) reported on specific educational practices that correlate with higher levels of academic challenge, student engagement, and achievement. These “High Impact Practices” (HIPs) have been associated with improvements in retention and graduation rates, or, more broadly, with “student success.” In the current study, students who had been accepted for admission in the BA or BS programs in Psychology at San Jose State University were asked to participate at the conclusion of their onsite transfer orientation. Of the approximately 250 students approached, 133 completed the questionnaire. Results indicated support for the relationship between participating in HIPs (yes/no on one or more of the ten HIPs identified by the Association of American Colleges and Universities (AAC&U) and academic success (GPA in the prior semester at the pre-transfer institution): $t(109) = 2.18$, $p = .029$. These results are surprising given the ceiling effects imposed by the transfer selection criteria and potential misunderstanding of the HIP categories. The prior semester GPA of the No HIP group was 3.06 ($SD = .85$); the prior semester GPA of the 1+ HIP group was 3.40 ($SD = .53$). We intend to follow up with consenting participants on their performance throughout their time at SJSU to collect additional data on the relationship between participation in HIPs and academic success and to determine the extent of definitional confusion. Caution should be taken in considering these (and other) HIP-related results because causal links have not been adequately demonstrated.

Rebecca Sandoval, Dr. Camille Johnson

Dr. Camille Johnson and Rebecca Sandoval

rebeccasandoval10@yahoo.com

California State University, San Jose

Department of Psychology

Poster Session III

Poster Board No. 5

Attitudes towards E-cigarettes as a Function of Use and Appearance

E-cigarettes have been increasing in popularity, possibly because people e-cigarettes are safer than cigarettes. Given concerns about the health risks associated with the devices, it is important to understand people's perceptions of these products. To explore this, a diverse sample of college students completed a series of surveys. The surveys revealed some negative attitude towards e-cigarette use in public, even among smokers, and regardless of beliefs about the risks of e-cigarettes. In addition, mechanical-looking e-cigarettes (non-conventional) were viewed more positively than e-cigarettes resembling a tobacco cigarette (conventional).

Brionna Mendoza, Dr. William Skuban

Brionna Mendoza

sokrgirl309@mail.fresnostate.edu

California State University, Fresno

Department of History

Poster Session III

Poster Board No. 6

A Threat to National Security: The Cold War on Drugs

With the beginning of the Cold War, national security became the nation's top priority. Washington pursued a strategy of containing Communism by intervening in regions deemed to be especially susceptible to leftist revolution. When Fidel Castro rose to power in Cuba, it seemed that the Communist threat had moved directly into the United States' own backyard. Meanwhile, in the domestic sphere, citizens were increasingly worried about drug abuse, which signaled for many as a breakdown in traditional American values. Richard Nixon initiated the battle against drugs, but it was Ronald Reagan who connected it directly to the elusive Communist threat lurking in Latin America. The perceived collaboration between narcotics manufacturers and leftist guerrilla groups prompted the Reagan Administration to implement a militarized strategy that aimed to eliminate the very sources of the supply of narcotics. However, because he largely ignored both internal American demand for drugs and the long-established cultural traditions within Latin America surrounding the cultivation of coca, the War on Drugs made little progress towards its goals. This research relies on government documents (speeches, congressional hearings, pieces of legislation, propaganda pieces, etc.), newspaper articles, academic monographs, and scholarly journal articles.

Phonemany Ounkham, Dr. John Constable

Phonemany L. Ounkham and John V.H. Constable

pounkham@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 7

Structural and Physiological Responses of *Helianthus annuus* and *Helianthus winteri* to Field and Common Garden Environments

As part of a larger study focusing on seed production by 15 North American sunflower species; this study investigated leaf and photosynthetic differences between the closely related common sunflower (*Helianthus annuus*, Ha) and a recently described California native sunflower (*Helianthus winteri*, Hw). Measurements were performed in a natural setting east of Orange Cove, CA and a cultivated row crop setting in Parlier CA at the USDA San Joaquin Valley Agricultural Experiment Station. At both locations (i) leaves were collected to determine mean leaf area and mean specific leaf area (SLA); and (ii) attached leaves were measured for photosynthesis, stomatal conductance, transpiration, and water use efficiency using a LiCor Li-6400 gas exchange unit. All leaf and gas exchange values are presented as mean \pm SE (n=12-23). In the field, the mean leaf area of Hw was similar to that of Ha (72.1 ± 6.2 and 83.3 ± 7.5 cm², respectively). The SLA of Hw (56.2 ± 1.8 cm²/gDW) was less (P<0.001) than Ha (67.9 ± 1.7 cm²/gDW) suggestive of greater water use efficiency. The two species did not differ in any of the field measured photosynthetic characteristics. At Parlier, irrigation reduced (P<0.001) the mean leaf area of Ha by >60% (31.4 ± 2.2 cm²), while the mean leaf area of Hw was unchanged (92.2 ± 4.2 cm²). In both species SLA increased ~2.5X under irrigated conditions, but Hw SLA (136.5 ± 7.3 cm²/gDW) remained less (P<0.01) than Ha (169.2 ± 6.2 cm²/gDW). Interestingly, at Parlier, gas exchange characteristics of Ha were unaltered, whereas photosynthesis of Hw declined 30% (P<0.05) resulting in an increase (56%) in WUE. The mixed results suggest that the responses to different environments vary between the species. Between the field and Parlier, Hw varies principally in leaf structure, whereas Ha varies in leaf physiology. These differences may contribute to variation in the species' geographic distributions.

Julio Perez, Dr. Steve Blumenshine

Julio Perez, Karen Boortz, Steve Blumenshine

jcesar559@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 8

Riverbed Substrate Effects on San Joaquin River Lower Trophic Levels

Since the construction of Friant Dam in 1942, the dam has diverted 95 percent of the river water for agricultural purposes, leaving behind long stretches of dry and barren river bed. The San Joaquin River Restoration Program was established through a legal settlement to restore Chinook salmon to the river. However, juvenile salmon will have to overcome predation, food supply, and limited habitat due to drought. Their diets consists of macroinvertebrates, which thrive under riffle environments consisting of fast moving water as well as large riverbed substrates such as large gravel and rocks. This provides the favorable conditions necessary for sustainable macroinvertebrate colonization and growth, and in turn, supplies prey for juvenile salmon. A ten week experiment introduced varied substrate sizes (sand, gravel, rock) at upstream and downstream locations to test if macroinvertebrate assemblages were affected by substrate size. Sand substrates possessed significantly higher abundance numbers of macroinvertebrates as opposed to coarser substrates, rock and gravel. In addition, abundance numbers were also higher in areas downriver (Skagg's bridge) than those upriver (Owl Hollow). Low numbers of macroinvertebrates in upstream gravel and rock substrates should be considered in future restoration efforts.

Alejandro Hernandez, Dr. Alejandro Calderón-Urrea

Alejandro Hernandez, and Alejandro Calderón-Urrea

alexhv@mail.fresnostate.edu

Californina State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 9

Wastewater purification through the use of *Scenedesmus dimorphus*, *Chlorella vulgaris*, and *Dunalielia primolecta*

California is facing a water crisis due to the lack of rain in the last couple years. If the state continues without rain, it will eventually run out of fresh water. Since California is an agricultural based state demand for water is extremely high. It is because of this that many businesses in the central valley are looking for ways to recycle water. In this context, it is questioned if algae can be used as a supplement in wastewater cleanup; we are collaborating with Biofiltro USA Inc. developers of the Biofilter Dynamic Aerobic (BIDA) System, which clean up wastewater. The system employs combination layers of red worms and their castings (humus), wood shavings, and gravel to treat liquid streams contaminated with organic nutrients. This study compares the algae growth in 100%, 80%, and 50% dairy industry generated wastewater before and after treatment with the Biofiltro system. As a measure of the algae effects on clean up we compared the values of the Chemical Oxygen Demand (COD) before and after algae growth. *Scenedesmus dimorphus*, *Chlorella vulgaris*, and *Dunalielia primolecta* were inoculated into 5ml of media. After inoculation the algae species were allowed to grow for 10 straight days with counts done every other day to keep track of their growth rate; we conducted three independent trials with each species of algae. Our results indicate that *D. primolecta* grows well in the wastewater that has been treated with Biofiltro, while *S. dimorphus* and *C. vulgaris* growth declined. Our results also indicate that *D. primolecta* reduced more COD in the wastewater that was not treated with Biofiltro, than the other two species. It also appears that the three algae species contribute to increase the COD when grown in wastewater treated with the Biofiltro. When considering all our results it seems like the best-suited algae for removal COD and growth is *D. primolecta*.

Karen Boortz, Dr. Steve Blumenshine

Karen A. Boortz, Julio Perez, Steve Blumenshine

kaboortz@gmail.com

California State University, Fresno

Department Biology

Poster Session III

Poster Board No. 10

Field Experiment to Determine if San Joaquin River Organic Matter Production is Limited by Riverbed Material

Historically the San Joaquin River was California's second largest river, nourished one of the state's richest ecosystems and provided breeding grounds and nurseries to the southernmost run of Chinook Salmon on the Pacific Coast. When the Friant Dam was built in the 1940's it diverted nearly 95 percent of the river's waters for farmland irrigation causing over 60 miles of the river to go dry and nearly eliminating the salmon population. The San Joaquin River Restoration Program began in 2007 in an attempt to restore the historic salmon runs. One of the likely limiting factors for the reintroduction of salmon is the ability of the juveniles to survive and grow in the heavily altered river bed environment. Juvenile salmon survive on a diet of macroinvertebrates who in turn consume organic material in the streambed substrate. Macroinvertebrates typically thrive in fast moving water with large streambed substrates such as large gravel. Much of the San Joaquin River restoration area is bedded with sandy substrates in areas known as glides that are thought to not support the growth of algae and other organic material needed for a thriving macroinvertebrate population. A ten week sediment size manipulation experiment demonstrated that there is an effect of substrate type and river location on periphyton and FPOM accumulation. Substrate enhancement should be considered as an important part of the river restoration.

Emerald, Kelsey, Dilraj Bibler, Haack, Kaur, Dr. Ulrike Muller

Bibler E, Haack K, Han S, Hwang S, Kaur D, Parisis K, Smart A, Tran A, Villalobos J, Zoghi S

ebibler@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 11

**Exploring Mechanical Advantages through the Analysis of Mandible
Morphologies in Mammals**

The jaws of carnivores are adapted to tearing and cutting tough flesh whereas the jaws of herbivores are designed for chewing and grinding plants. Teeth reflect these different diets through differences in tooth placement, shapes, and numbers. Researchers commonly focus on these factors to gain insight in animal diet, feeding, and hunting styles. This project aims to complement this approach by focusing on the functional morphology of mandibles. The mandible contains the attachment points for the two main chewing muscles: the masseter and the temporalis. The distances between the jaw hinge and where these muscles attach are a measure of bite force and can be expressed through mechanical advantage. Through the examination of the hinge and attachment processes of mandibles in the Fresno State Vertebrate Skeleton Collection, this study presents a methodology of identifying animal diet through skeletal analysis. It aims to establish a quantified classification system for carnivores, herbivores, and omnivores based on the morphology of their mandibles. The species explored in this project cover an unprecedented range of sizes from shrew to elephant and give us an opportunity to see if the relationships between the distances of prominent points on the mandible scale with animal body size. To accomplish this, the distances between the jaw hinge and the bony attachments of the masseter and temporalis muscles were measured in over sixty species. We found that in carnivores the temporalis has a larger mechanical advantage than the masseter. In contrast, herbivores show that the masseter has a larger mechanical advantage than the temporalis. These differences reflect differences in diet as the temporalis is the main muscle for ripping while the masseter is the main muscle for crushing. When looking at size effect, we find that the mechanical advantages do not change drastically with size in carnivores whereas they do change in size in herbivores. Analyses of these kind accurately reflect the animal's hunting lifestyle and provide reliable, quantitative methods to determine the feeding styles of mammals based on their skeletons. Such an approach can also prove to be especially useful in the study and characterization of extinct species.

Ben Person, Dr. David D. Lent

Ben Person, David D. Lent

ben@personfamily.org

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 12

Determining Visual Preference in Tethered Walking Flies

Flies demonstrate a strong attraction towards decaying plant and animal material on which they feed upon. What sensory cues are important for identifying these behaviorally relevant stimuli? Attraction can be for the odor emanating from these sources of food, but they can also use the visual characteristics. It has been previously shown that flies are attracted to light, specifically high contrast edges, but most of this work has been done in flying flies. The attraction towards light and the preference for wavelength of light has not been well studied in walking flies. The question that we are exploring here is: Do flies have any preference between a blue short wavelength light versus a green medium wavelength light when searching in their environment for food? This question allows us to explore and develop a tethered walking system to ask more sophisticated questions regarding insect visual behavior in the future. An air-supported trackball was designed and built that supports semi-immobilized flies. The fly can freely move its legs on the trackball, which will rotate with each step, but the fly cannot produce any back, forward or lateral movements. The fly can turn the trackball and this movement is tracked using a USB camera. There is a large red LED panel that functions as a backlight for the small, HD, USB camera. Red long wavelength is used because this is outside of the visual spectrum of the fly and allows for the flies to be recorded in "dark conditions." The videos were stored for later analysis to determine a light preference. The visual display used two colored LED panels: one green and one blue. These panels serve the purpose of attracting the fly or giving the fly something to direct its walking during exploration. The panels position was randomized each trial to control for directional preferences. The data collected demonstrates that the air trackball system can be used to study visual guided behaviors in tethered walking flies. Flies freely walked and made clear turns during their exploration. This can likely be used to study walking in any type of insect, as the system we built is scalable. Individual flies demonstrated a preference for one wavelength over the other, but all individuals did not prefer the same wavelength. When comparing the preference between the lights and how they behaved it was observed that motivation to walk was quite variable. What determines the drive to walk on the trackball is not known at this time. Future studies will look to explore more complex stimuli and compare the preferences between species and relate that to their ecology.

Kevin Muthima Jennifer Leyva, Dr. Ulrike Muller

Fatima Hidalgo, Jennifer Leyva, Victoria Lieu, Kevin Muthima, Ahmad Nassef, Samantha Smith, Nicholas Tubutol

muthima@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 13

**Do Quadrupeds and Bipeds Scale Differently
When Looking at Their Arm and Leg Bones?**

Size matters: The bones of small animals support less weight than those of large animals. Scientists have argued that larger animals should have thicker bones to support their larger mass. If their bones had the same shape as those of smaller animals, their bones would be more likely to break. When larger and smaller animals differ only in size, but have the same shape, their size is said to scale geometrically. To keep the load on the bones the same across sizes, animals need to scale elastically: larger animals need to have relatively thicker and shorter bones. Scientists found that bovines scale elastically. But when looking across a wider range of species (from shrews to elephants), quadrupeds scale geometrically. Data for bipeds so far are lacking. The objective of this study is to compare the scaling of the bones in the upper arm and leg of quadrupeds and bipeds.

To determine how length and diameter scale with mass, we measured the humeri and femurs of fifteen quadrupeds and fifteen bipeds, including a marsupial (wallaby), mammals (humans), and birds. We expected that the back legs of the quadrupeds and legs of the bipeds would scale geometrically since they serve the same purpose. For the arm, we expected the quadrupeds to scale geometrically and the bipeds to scale elastically due to the different purpose of each limb.

Our data of quadrupeds agree with past research. We compared the data of fifteen mammal quadrupeds with data from fifteen vertebrae bipeds, which included marsupials (wallaby), mammals (human), and birds. We found that they scaled geometrically. However, the scaling factor of the biped humerus and the birds-only humerus was larger than is consistent with geometric scaling. We conclude that bipeds and quadrupeds follow the same scaling laws for limbs with the same function, but not for limbs with different functions (walking vs. flying).

Chayce Hartung, Dr. John V.H. Constable

Chayce Hartung, John V.H. Constable, Mamta Rawat

chartung@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session III

Poster Board No. 14

Identification of Endophytes of the Sunflower *Helianthus winteri*

The physiological and regulatory processes of organisms are exceptionally complex; however, the increased importance of the microbiome illustrates that many organisms do not exist autonomously. The potential implications of the microbiome have not been well-studied in plants. Many plants have symbiotic relationships with either bacteria and/or fungi that participate in a range of key metabolic processes (e.g. nitrogen fixation, phosphate acquisition, drought tolerance). The newly described perennial sunflower, *Helianthus winterii*, is found in dry, nutrient poor sites on south-facing slopes of the Sierra Nevada foothills, where the microbiome may participate in environmental tolerance to harsh conditions.

This study investigates the endophytic microbiome in above ground tissue of *H. winterii*, including leaves and flowers. Tissues of *H. winterii* were collected east of Orange Cove, CA. Tissues were surface sterilized by submersion in ethanol, and subsequently in 30% hydrogen peroxide, followed by three rinses with sterile deionized water. Sterility of tissue was confirmed by plating washes on Trypticase Soy Agar, a rich bacterial growth medium. The sterile tissue was ground in liquid nitrogen and genomic DNA was extracted. The bacterial DNA was PCR amplified with primers to the 16S ribosomal DNA and the amplified bands were separated by gel electrophoresis. A band of 1 kb representing the amplified plant mitochondria and a band of 0.75 kb representing the bacterial DNA were observed. The bacterial DNA will be pyrosequenced to identify the specific endophytic bacteria in the tissues. The composition of the endophytic microbiome of this perennial sunflower may aid in understanding how this species endures the poor growth conditions in its habitat.

Shoji Hishida, Dr. Pei-Chun Ho

1. Shoji Hishida, Taylor McCullough-Hunter, Pei Chun Ho 2. Brian Maple 3. Tatsuya Yanagisawa

sdhishida@mail.fresnostate.edu

1. California State University, Fresno

2. University of California, San Diego

3. Hokkaido University

Department of Physics

Poster Session III

Poster Board No. 15

Specific Heat Measurements of the Filled Skutterudite $\text{Pr}(x)\text{Nd}(1-x)\text{Os}_4\text{Sb}_12$ Using Relaxation Calorimetry

The Filled Skutterudite Compounds $\text{NdOs}_4\text{Sb}_12$ and $\text{PrOs}_4\text{Sb}_12$ exhibit many exotic properties at low temperatures, such as Ferromagnetism in the Neodymium compound and heavy fermion behavior and unconventional superconductivity in the Praseodymium compound. There is interest in studying $\text{Pr}_{1-x}\text{Nd}_x\text{Os}_4\text{Sb}_12$ in order to understand the interplay between the magnetism and the unconventional superconductivity. Our objective is to measure the normal-state specific heat of these compounds over the temperature range of approximately 11 K to 300 K. Understanding the normal-state is important to understanding the overall behavior. The experimental setup utilizes finite pulse relaxation calorimetry to obtain the specific heat. This has been used to measure the specific heat of $\text{Pr}_{1-x}\text{Nd}_x\text{Os}_4\text{Sb}_12$ for Nd concentrations of $x=0.25, 0.5, 0.75, 0.8, 1$. In this method, a heat pulse is applied to a sample for a set period of time, and the temperature response of the sample is measured using a Cernox resistance thermometer. The heat pulse is applied for a finite period of time that is less than the time needed for the calorimeter to reach full thermal equilibrium. The data can then be analyzed to determine the expected equilibrium temperature and information about the heat capacity can be extracted. Once the heat capacity data is obtained, a curve fit is performed to estimate the values of parameters that contribute to the specific heat of the crystal. The contributions to specific heat that we consider are from the conduction electrons, the lattice vibrations, and the Crystalline Electric Field Effect. The parameters that the curve fit estimates include the Debye temperature, Einstein temperatures, and the electronic specific heat coefficient. The data shows an average value for the electronic specific heat coefficient of approximately $37 \text{ mJ/K}^2\text{mol}$. The lower Einstein temperature remained fixed with temperature, while the higher Einstein temperature increased with increasing Nd-concentration. Also, as Nd-concentration increased, the estimated values for the Debye temperature decreased.

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Daniel Hairabedian, Dr. The Nguyen

Daniel Hairabedian, JoeAngel Miramontes, Cameron Khalili and Johnny Vang

daniel.hairabedian@gmail.com

California State University, Fresno

Department of Mechanical Engineering

Poster Session III

Poster Board No. 16

Parkinson's Tremor Reduction

Parkinson's disease (PD) is a disorder that affects the central nervous system. Those affected with the disease experience gradual loss of muscle control including trembling of the limbs and face, muscle stiffness, imbalance and slowness of movement. These tremors can range from mild to severe causing difficulty in completing daily tasks. The objective of this project is to develop a wearable tremor suppression device for the upper limb.

Wearable devices to reduce tremors have been proposed by the research and academic community. Current tremor reduction devices are exoskeletons which are bulky and not practical for everyday use. The device developed in this project is a wearable vibration absorber designed to be worn in place of a wristwatch.

The vibration absorber in this project is tunable to different tremor frequencies by means of an electromagnet. The device consists of two permanent magnets attached to the end of a shaft. In between the two permanent magnets is a mass, in our case a controllable electromagnet. Attached to each end of the electromagnet is another permanent magnet which is repelled by the stationary magnets. As the vibration absorber oscillates between the two permanent magnets, a microcontroller provides current to the electromagnet to alter its vibrating frequency to match that of the tremor. As a result, the device can adapt and reduce the differing tremors caused by Parkinson's disease.

This ongoing project is currently in the testing phase. The designs of the system were modeled in SolidWorks 2014 while the simulations and analysis were conducted utilizing FEMM, MATLAB and Simulink. An initial prototype was made based on the design parameters. Several experiments have been performed to experimentally verify key system characteristics. The device is now being tested and optimized before the final prototype is made.

Shervin Zoghi, Dr. Maziar Ghazinejad

Shervin Zoghi

shervin.zoghi@mail.fresnostate.edu

California State University, Fresno

Department of Mechanical Engineering

Poster Session III

Poster Board No. 17

A Review on the Applicability of Graphene

Graphene is a novel, carbon-based nanomaterial that has a wide variety of applications in modern electronics, filtration, structures, supercapacitors, and more. The research discussed herein characterizes graphene in terms of its mechanical properties, possibilities of synthesis, associated nanocomposites, and applications. Graphene has, empirically and experientially, been shown to have incredibly strong results, including an Elastic Modulus of around 1 TPa - the highest ever reported for any known material. Furthermore, using various fabrication techniques (i.e. chemical vapor deposition, CVD), one can somewhat easily create small-scale graphene oxides and composites. As a result of these findings (among many others), graphene has the ability to revolutionize modern technology. Currently, graphene is being used as a nanofilter for desalination projects. Furthermore, due to its high conductivity and low resistance, graphene has been proposed as a replacement for the supercapacitors - which has positive benefits for various industries. One such industry includes electric vehicles, which has issues with energy storage inside of capacitors. Overall, our research review has proven to be fruitful for understanding the various properties and uses of graphene in modern society. As a result of the aforementioned observations, it is clear that graphene will play an increasingly important role in modern technologies and propel them forward.

Johnny Vang, Dr. The Nguyen

Johnny Vang, The Nguyen

jv4ko@mail.fresnostate.edu

California State University, Fresno

Department of Mechanical Engineering

Poster Session III

Poster Board No. 18

**Designing a Robot with Shape Metal Alloy (SMA) as Actuator and
Controlling it with Arduino**

Shape memory alloy (SMA) is a smart material that remembers its original shape. Once SMA has been deformed via force or other means, it will return to its pre-deformed shape when heated to its specific transformation temperature. This heat can be done by fire, electricity, or any heat source. The purpose of using SMA wire as actuator is to utilize its quiet, cheap, and high weight to strength ratio characteristics to replace linear actuators like electric motors. The objectives of this research are to prove that SMA wire can be used effectively for actuation through proof of concept, design, and experimental procedures. A mini-robot conceiving of four legs was designed having SMA wire to actuate each leg. Heat conducted by electricity was used for this experiment due to safety and efficiency. The weight of the legs and torsion springs were used to deform the SMA in order to produce the needed actuation after being heated. To control the level of input electricity to each SMA wire, the microcontroller Arduino was used. The levels of input electricity directly determine the temperature of the SMA and actuation speed. Standard equations of motion for SMA were used to model the relationship between movement versus electricity in MATLAB/Simulink (Simulation and Model-Based Design). Having Simulink running off Arduino, the robot can be controlled via a Bluetooth controller or from a computer. The results from the experimental setup show that SMA wire can effectively actuate a weighted object, but also reveals that it's inefficient when returning to its original stretched length due to slow cooling. Further optimization for the mathematical model are needed to be done to ensure for a more robust and reliable program. Additional improvements to the physical design are also necessary to increase the robots mobility.

Yvette Valadez-Carranza, Dr. Akthem Al-Manaseer

Dr. Akthem Al-Manaseer, Yvette Valadez-Carranza

yvette.valadez-carranza@sjtu.edu

California State University, San Jose

Department of Civil and Environmental Engineering

Poster Session III

Poster Board No. 19

**New Approach to Measure Early-Age Shrinkage of Cement Paste
Grout with Admixtures**

The objective of this presentation is to investigate early-age shrinkage strain of cement-based grout with mineral admixtures using a new shrinkage-testing device. The device determines strain-reading measurements immediately after mixing. Fresh grout paste was placed into a steel frustum cone mold and a laser sensor was utilized on the top surface of the specimen to record displacement changes. The displacement data was recorded during the first 36 hours after placement. Tests were performed on sealed and unsealed specimens. Shrinkage strain measurements were calculated from the vertical displacement readings. A cement paste mix with w/cm ratio of 0.40 was investigated. Three mineral admixtures were utilized including class F fly ash (FA), silica fume (SF), and metakaolin (MK). The admixtures were replaced by weight of cementitious materials at 10%.

The new device was found reliable in measuring early age shrinkage of repeated tests. Mixes containing metakaolin exhibited the lowest early age shrinkage followed by silica fume and then fly ash. Final setting time was correlated to the change of slope of the unsealed shrinkage versus time curves of the grout specimens. The device offers a new method to determine early age shrinkage.

Bethany Smith, Dr. Scott Sailor

Smith, B., Wright, M., Sailor, S., Jackson, C., & Smith, C.

renalvet2be@mail.fresnostate.edu

California State University, Fresno

Department of Kinesiology

Poster Session III

Poster Board No. 20

The Utility of a Brief, Open Source Test of Working Memory to Enhance Concussion Assessments and Management

Objective: The current study was conducted to evaluate the relationship between the Standard Concussion Assessment Tool Deficit Approach (SCAT3), an open source screening measure of the common signs and symptoms of concussion; Auditory Consonant Trigram (ACT), an open source test of working memory, and Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT), a brief computerized test battery that collects an athlete's cognitive performances at baseline and post-concussion.

Participants and Methods: College athletes with a history of past-concussions (n=59) and without a history of past concussions (n=196) were administered the Standard Concussion Assessment Tool (SCAT3), Auditory Consonant Trigram (ACT), and Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT), in addition to a demographic questionnaire that included their concussion history.

Results: The threshold for significance was set at $p < .05$. The groups differed in age, education, sex, and history of past-concussions. For males, ACT 18 seconds, correlated with average duration of PTA (Posttraumatic Amnesia), SCAT symptoms correlated with past concussion frequency, PTA frequency, and RA (Retrograde Amnesia) frequency, and SCAT severity correlated with past concussion frequency. For females, ACT 18 seconds and SCAT severity correlated with concussion frequency and BESS (Balance Error Scoring System) correlated with PTA frequency and RA frequency.

Conclusions: Overall, ACT is predictive of concussion and may be beneficial to include in the sports concussion assessment. While ACT does not add a lot of predictive power, it did correlate with concussion history, unlike the cognitive scores from the SCAT. These findings suggest that new instruments that are more sensitive to sports concussion need to be researched and developed. A new instrument should account for potential gender differences in concussive experiences and outcomes.

Deborah Omolayo, Dr. Mary Ann McCarthy

Deborah Omolayo

doo01@mail.fresnostate.edu

California State University, Fresno

School of Nursing

Poster Session III

Poster Board No. 21

Another School's In-Service Program Evaluation

The Student Success Program (SSP) is an in-service opportunity through at the School of Nursing at California State University, Fresno (Fresno State) that benefit the nursing students and the communities around the university. The SSP consists of nursing students going into the underserved and underinsured communities to improve awareness about hypertension through taking blood pressure and educating the people about the disease. This is a qualitative study which assessed how the students perceive the program to have benefited them academically, clinically, and professionally. Each nursing student who has participated in SSP voluntarily filled out a questionnaire designed by the researcher. The outcomes of the study demonstrate positive feedback from the nursing students on how the program has benefited them academically, clinically, and improved their performance and experience as future nurses. The future implications are of the study: expand the program to create more in-service opportunities for nursing students, and promote the program to other medical institutions similar the Fresno State nursing program.

Keywords: in-service, hypertension, blood pressure

Christina Thabit, Dr. Mallory Novak

Christina Thabit, Cynthia Cortez, Machelle Wilson PhD, Mallory Novak DO, Brian Morgan MD PhD

cthabit@gmail.com

California State University, Fresno

Poster Session III

Poster Board No. 22

**Pesticide Exposure and the Development of Spina Bifida in the San Joaquin Valley:
A Case-Control Study in one Perinatology Practice**

Pesticides and herbicide sprays used in the San Joaquin Valley's agricultural industry are frequently used near residential areas and serve as a potential source of adverse environmental exposure to pregnant women. Prior studies have shown associations between agricultural sprays within proximity to a mother's address and development of spina bifida, but none with statistical significance. Our perinatology clinic serves women in Fresno and surrounding counties who develop fetal anomalies, including spina bifida, at rates higher than the national average. We hypothesize that our mothers will have babies with an increased risk of spina bifida because of their close residential proximity to pesticide sprays. 27 cases and 257 controls were prospectively identified and spray frequency was recorded using the CALPIP database where sprays are recorded by year. Using this database we were able to locate a spray within one square mile of the mother's home during her date of conception.

Odds ratios showed an increased risk of spina bifida for mothers with private insurance (OR=4.29, 95% CI 1.50 - 12.21). There was no increased risk of spina bifida observed if the mother's address was within one mile of a recorded pesticide spray (OR=0.71, 95% CI 0.27-1.82) (table 5). There was no difference in the spray frequency observed between exposed infants with spina bifida and exposed controls (Fisher's exact test $P \leq p$ was 0.86) (table 6).

We were not able to show an increase in risk of spina bifida for mothers living in the San Joaquin Valley. Increased risk to mothers with private insurance likely represents selection bias. However, our results do suggest that mothers living in the counties studied are exposed to pesticides and herbicides within one mile of their homes. Future areas of interest include developing ways to test a mother's serum levels of commonly used pesticides to objectively quantify their exposure.

Keith Edmonds, Dr. Paul C. Price

Keith A. Edmonds, Paul C. Price, Ph.D.

kthedmonds@mail.fresnostate.edu

California State University, Fresno

Department of Psychology

Poster Session IV

Poster Board No. 1

Is There a Cross-Modal Magnitude Priming Effect on Numerical Estimation?

The present study is an attempt to conceptually replicate the findings of a previously published study on the topic of cross-modal magnitude priming. Oppenheimer et al. (2008) found that drawing a long or short line influenced subsequent estimations of unrelated quantities such as the length of the Mississippi River and the average high temperature in Honolulu in July. These researchers argue that drawing the long or short line primes concepts related to larger or smaller magnitudes and these primed concepts have a direct effect on people's estimates. To our knowledge, however, there have been no follow-up studies published on this phenomenon. For this reason, we wanted to try to replicate the effect, using a modified procedure.

Participants in our study (N=132) were asked to complete a task in which they quickly drew five lines, each of which connected two points on a single oversized piece of paper. In one condition, the drawn lines were approximately 24 inches long and in the other condition they were approximately three inches long. Immediately after completing the line-drawing task, participants were shown a jar of jelly beans and asked to estimate quickly how many jelly beans were in the jar. In this procedure, the difference between the length of the long and short lines was much greater than in the study by Oppenheimer et al., which one would think should enhance the effect. Furthermore, the estimate was more perceptual than conceptual, which should reduce variability in the estimates due to large differences in participants' knowledge about quantities like the length of the Mississippi River.

Results from this conceptual replication indicate no significant difference in estimates between people that were asked to draw long lines or short lines, $t(127)=-.69$, $p>.05$, $d=.69$. Furthermore, our past attempt at a direct replication with a reasonable large sample (N=160) also failed. This leads us to believe that if indeed there was a cross-modal magnitude priming effect to be found—it would likely have been found here. Since it was not found in either replication we conducted, this casts further doubt on the existence of this phenomenon.

Diana Le, Dr. Merle Canfield

Diana Le & Merle Canfield, PhD

Dle@alliant.edu

Alliant International University

California School of Professional Psychology, Fresno

Department of Clinical Psychology

Poster Session IV

Poster Board No. 2

Confirmatory Factor Analysis on Five Taxonomies of Rated Human Utterances

The present study uses a coding system to view human interaction on five different taxonomies. The five taxonomies were made up of positive and negative aspects of: emotion, cognition, contracts, performance and reward. An exploratory factor analysis was performed on half of the utterances (n=1100) and confirmed using the other half for a total of 2200 utterances. Four of the negative taxonomies made up factor one. Factor two included four of the positive taxonomies. Factors one and two are intuitive in the fact the positive and negative taxonomies stayed together. However, when looking at factor three, it included positive contract and negative cognition. The reason for being so is because people tend to give information about negative contracts but at the same time they ask questions about positive contracts. For example, when a person asks a question, it would be rated as negative cognition (i.e. without knowledge). In particular, a question pertaining to interpersonal relationship or values. This factor structure is a step in understanding the relationship between utterances and human interaction.

Shauna Dauderman, Dr. Christine Edmondson

Faculty: Christine Edmondson, PhD.

shaunadauderman@mail.fresnostate.edu

California State University, Fresno

Department of Psychology

Poster Session IV

Poster Board No. 3

College Student Belongingness, Stress, and Academic Engagement

A. Universities are funding programs to focus on understanding academic deficits. One approach is to examine the roles of campus belongingness and traumatic stress in academic engagement. University mental health professionals are aware of how lack of social connectedness and stress are risk factors for depression. Their knowledge makes them qualified for discussing with administrators about the role of trauma and mental health issues in academic success.

The learning objectives of our poster are as follows: Understand the relationship between traumatic stress and belongingness and how it affects academic performance in college students. Discuss ways university mental health professionals can participate in efforts to increase student persistence and success. Discuss ways university mental health professionals can initiate a dialogue with academic administrators about the role of trauma and mental health in student persistence and success

B. In the poster, we will present the results of a study that tested the hypothesis that a sense of campus belongingness and traumatic stressors affect students' ability to academically engage. The participants were recruited from the Introductory Psychology Human Subjects Pool to complete an on-line survey containing the following questionnaires: General Belongingness Scale (Malone, Pillow, and Osman, 2012), Sense of Belongingness to Campus Scale (Bollen & Hoyle, 1990), Traumatic Life Events Scale (Kubany, Haynes, Leisen, et al., 2000), and the Potentially Traumatic Life Events Scale (Anders, Frazier, & Shallcross, 2012).

C. Results indicate that campus belongingness and traumatic events predicted the most recent GPA, campus belongingness also predicted the expected grade in the class, and traumatic events predicted the number of hours studying outside of class. In the poster, we will present the results of a multiple regression analysis that delves deeper into the relationships among these variables.

D. This poster is a research study intended for university mental health professionals and university administrators.

Taylor Clayton, Dr. Christine Edmondson

Taylor Clayton, Shauna Dauderman, Alex Gonzalez, Christine Edmondson, and Trisha Kivisalu

tclayton@mail.fresnostate.edu

Alliant International University

California State University, Fresno

Department of Psychology

Poster Session IV

Poster Board No. 4

The Role of Complicated Life Situations on College Student Academic Performance

Student retention and graduation rates have become important indicators of university effectiveness and administrations are being held accountable for student success. Common strategies used to increase student success include working with local high schools to improve academic preparation, providing enhanced academic support for students at risk for academic failure, and course redesign. These strategies are working to increase student success; however, there is room for improvement. One way to improve student retention and graduation rates is to identify and explore barriers to student success that are not directly related to academic skills. The present study explores the role of student relationships and resources in academic performance.

One hundred seventy Introductory Psychology students completed an on-line survey with questions about campus belongingness, traumatic life events, complicated relationships, resources for focusing on academics, and everyday stressors and hassles. Multiple linear regression analyses were conducted to explore how these variables affect three academic performance variables: number of hours spent studying outside of class, the number of missed classes, and the expected grade in the class. In this poster, we describe how complicated relationships such as having a family member with a mental illness affect the academic performance variables. In addition, we describe how complications with access to resources such as computers, internet, and shelter affect academic performance variables.

Our results indicate that students are very resilient despite complicating life situations. While belongingness and history of traumatic life events are strong predictors of academic performance, complicated life situations do contribute to the prediction of the number of missed classes, the number of hours studied, and the expected grade in the class. Implications for future research and campus student success initiatives are discussed.

Shivalee Gujarathi, Dr. Karine Gousset

Shivalee Gujarathi and Karine Gousset

sgujarathi@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 5

HIV-1 Nef induced TNTs are Myo10 Dependent

HIV-1 infects various cell types of the immune system including macrophages, which are essential in the loss of T lymphocytes and formation of viral reservoirs. The accessory HIV-1 viral protein Nef (Negative Regulation Factor) is critical for the maintenance of high viral loads and the development of AIDS. Many long-term HIV survivors commonly show deletion or defective Nef alleles. Moreover, without Nef expression, direct cell-to-cell transmission of HIV-1 is impaired.

Nef expression also induces numerous changes within infected cells including the modulation of protein cell surface expression, signal transduction, and cytoskeletal remodeling. For example, HIV-1 infected lymphocytes display “long, thin filopodium-like protrusion,” and reduced membrane ruffling. Interestingly, Nef deleted HIV-1 infected cells display a normal phenotype, while Nef expression alone induces the “filopodium-like” phenotype of WT-HIV-1 infected cells. Recent studies have demonstrated that Nef uses protrusions (which we, and others, term tunneling nanotubes or TNTs) to transfer itself to uninfected cells.

Exactly how Nef induces these protrusions remains unclear. We have recently shown that Myosin X (Myo10), an unconventional actin molecular motor, stimulates TNT formation in neuronal cells. In this study, our goals were to investigate the effects of Nef on TNT formation in macrophages and determine its mechanism of TNT formation. Here we show: 1) an inducible Nef system using a murine macrophage (RAW 264.7-N5) cell line that is stably transfected with pSC Nef 51 to produce low levels of Nef is an ideal model system to study the role of Nef in TNT formation in macrophages; 2) increase in Nef expression correlates with an increase in Myo10 expression; 3) high levels of Nef expression increase the number of functional TNTs. Overall, our data suggests that Nef expression induces TNT formation via a Myo10-dependent mechanism.

Amina Lodhi, Dr. Steve Blumenshine

Steve Blumenshine and Amina Lodhi
alodhi@mail.fresnostate.edu
California State University, Fresno
Department of Biology
Poster Session IV
Poster Board No. 6

Conserving Endangered Ecosystems: River Biodiversity

Rivers encompass some of the most endangered ecosystems in world. American Rivers listed the San Joaquin River (SJR) in 2014 as the number 1 most endangered river in America. The SJR is undergoing restoration and management efforts that can be augmented by a deeper understanding of the biodiversity patterns within the system. Conserving biodiversity is hinged upon enumerating and interpreting species presence, absence and abundance in an area. This process often requires the area of interest to be scaled down into hierarchical components (localities and region). The difference between localities and the relationship between local and regional levels of species can elucidate the processes that underlie biodiversity patterns. Since biodiversity patterns are not well understood for the SJR, the objective of this study is to quantify and analyze the diversity measures for this restoration region.

Reach 1A, 2, 3 and 4 have species richness indices between 22-25 with between 16-21 of them being non-native and 3-9 species being native. Reach 1B had the lowest species richness (14) with 12 being non-native and 2 being native. And reach 5 had the highest level of species richness (32) with 27 non-native and 5 native species. The threatened Chinook salmon was present in reach 1A and reach 5. A total of 43 individual species were present in the entire restoration region.

Quantifying and analyzing diversity measures for the SJR restoration region can direct conservation efforts to particular localities that may contribute to regional levels of biodiversity. Focus can be put on localities with for example higher levels of native species or localities where threatened species are present. Levels of species diversity can also provide a deeper understanding of distribution and abundance patterns across the river. Other restoration and management efforts for river ecosystems can also benefit from the insight provided by this study.

Maxwell Hall, Dr. Ulrike Muller

Maxwell Hall, Co-Author Dr. Otto Berg

maxwellhall@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 7

Prey Capture Efficiency of *Utricularia vulgaris*

Several lineages of plants have adapted to low-nutrient and acidic environments by carnivory, which makes up for the lack of phosphorus and nitrogen. Reliance on carnivory is expected to exert evolutionary pressure for increased prey capture efficiency: the more specialized and active the trapping mechanism, the higher the success rate must be in order to offset the cost of developing and setting such traps. The bladderwort *Utricularia vulgaris*, for example, is a free-floating aquatic plant which forms small (~1- 4 mm) bladders to suction capture zooplankton. The suction traps are structurally intricate and energy-intensive, hence the expectation that their capture efficiency (captures per feeding strike) is high. By combining imagery of captured prey and acoustic recording of feeding strikes, we are able to measure the capture efficiency of bladderwort for the first time. Our results show that the success rate is indeed high—comparable to the most efficient predatory animals—and exceeds efficiency estimates for terrestrial carnivorous plants. The data further documents the role of prey size and trap age in the life history of *U. vulgaris*. Our measurements of the capture mechanism complement published studies of its genetic basis, making this species an excellent case study of rapid adaptation to a specialized niche.

Rachel Tamayo, Dr. Alejandro Calderón-Urrea

Rachel Tamayo-Elizondo, Shoghig Stanboulian, Sosse Kendoyan, and Alejandro Calderón-Urrea

rtamayo82011@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 8

Elucidating the Mechanism of Chalcone Action as Nematicidal Agents

Plant Parasitic Nematodes (PPNs) are an enemy to agriculturalists because they create an annual monetary loss of \$157 billion worldwide. To control this monetary loss, understanding how nematicides work is important to synthesize the most effective cocktail of nematicidal agents to control (kill) nematodes. Previous work in Dr. Calderón-Urrea's lab identified two organic chalcones (chalcones 17 and 25; Saeed, et al. 2012 and Calderón-Urrea, personal communication) as effective nematicidals on *Caenorhabditis elegans*, although their mechanism of action is not known. I address this lack of knowledge by identifying the pathways that enable *C. elegans* to overcome (live in the presence of) organic chalcones. I hypothesize that "the susceptibility to chalcones is due to the action of the chalcone on a protein product, perhaps an enzyme, and therefore mutations on the gene (or genes) encoding for that protein will render the chalcone action ineffective". Identifying the responsible genes for this pathway will be accomplished by screening approximately 20,000 mutagenized *C. elegans* genomes (during the F2 of the mutagenized worms) and testing the survivor worms for the presence of transmissible mutations alleles. This will be accomplished by crossing each putative mutant (a survivor worm) with a wild-type worm and looking at the F2 progeny. If the putative mutant is transmissible as a dominant allele a 3:1 ratio of chalcone resistant to susceptible will be observed. Conversely, if the putative mutant is transmissible as a recessive allele a 3:1 ratio of susceptible to chalcone resistant will be observed. Allelism of the putative mutants along with mapping and identification of the implicated DNA sequences will be conducted in a single step by whole-genome-sequencing (WGS) and single nucleotide polymorphism (SNP) mapping strategy. Here we will present our strategy and preliminary results on the best way to expose the nematodes to the chalcones.

Shravan Kannan, Dr. Karine Gousset

Stacy Han, Shravan Kannan, and Karine Gousset

shralkumr@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 9

Interaction of the FERM Domain of Myo10 with the Tumor Suppressor p53

Myosin X (Myo10), an integrin binding MyTH4-FERM myosin, essential in the formation of filopodia and TNTs in various cell types, localizes in nuclear punctuates. However, this nuclear localization and its function there has been left largely unresolved. Here, we decided to explore its nuclear function.

Recently Myo10 was shown to play a role in mutant p53-driven cancer invasion. Moreover, FAK (Focal Adhesion Kinase) another integrin binding FERM domain protein, signals the nucleus during cellular stress. In fact, disruption of its integrin/ECM connection triggers cell-cycle arrest or apoptosis by way of p53. It does this by translocating to the nucleus and enzymatically enhancing Mdm2 dependent poly-ubiquitination of p53. The connection between FAK and p53 is dependent upon the FERM F1 lobe of FAK.

We first performed in silico modeling of a p53 peptide known to interact with the FERM domain of FAK, and used docking software to predict its binding with the 3D structure of the FERM domain of Myo10. Our results show a targeted interaction with the Myo10 FERM F1 lobe. Next, we explored this interaction through immunoprecipitation experiments. Wild-type GFP-Myo10 was over-expressed in neuronal CAD cells and co-immunoprecipitation experiments were performed to identify possible protein binding partners. Visualization of co-immunoprecipitated proteins by gel electrophoresis revealed the presence of multiple bands, suggesting multiple binding partners that may form a complex with Myo10. Western blotting analysis identified p53 as one of these proteins.

Next we used a newly described cell fractionation method to separate the cytosolic, perinuclear and core nuclear fractions. Interestingly, Myo10, p53 and Mdm2 were all enriched in the perinuclear fraction, identifying the PNF as the potential site for Myo10/p53 interaction.

Alexander Shiglik, Dr. Ulrike Muller

Alexander Shiglik, Otto Berg

ashiglik@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 10

The Asynchronous Flapping Oscillator in House Flies: Mapping the Parameter Space through Application of Weight to Wings

Beetles, flies, wasps and bees flap their wings by an asynchronous mechanism: Wing strokes are not individually triggered by nerve impulses; rather, delayed stretch-activation allows the flight muscle to oscillate spontaneously when coupled to a resonant load. This type of 'distributed' control mechanism has advantages, such as neurological economy and robustness against perturbation, but the implications have not been fully explored. Previous studies found that asynchronous flappers are constrained to a narrow frequency range. We have constructed mathematical and mechanical models of delayed feedback oscillators that display additional complex dynamics which have not been observed in insects. We use high-speed video recordings of house flies to investigate how manipulating wing mass affects wing movements. To increase wing mass, we spray-paint the entire wing with a thin layer of spray-on make-up. We attach the fly to a wire and then record the wing movements of the tethered fly at 6200 frames per second. We then determine wing beat frequency and amplitude from the recordings. By mapping the dynamical parameter space displayed by a real insect we can determine whether the delayed feedback oscillator mechanism is sufficient, or whether additional control mechanisms are employed. We found that flies with increased wing mass are still able to fly and flap their wings. However, adding weight to the wings decreases the frequency of the flapping as well as increasing the amplitude of wing movement during each flap. This observation is consistent with our prediction that the wings behave like a harmonic oscillator and carries implications for the evolution of flight and robotics; a different result would have indicated that the dynamics are more complex or the control mechanism is neurologically rather than mechanically mediated.

William Whalen, Dr. Jason Bush

William A. Whalen, B.S., Jason Bush, PhD.

williamwhalen@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 11

Novel Methods for 3-Dimensional Spheroid Cultures Using Three MDA-MB-231 Breast Cancer Isogenic Variants

Traditional cell culture techniques grow cells in a 2-dimensional (2D) format on compatible surfaces, but cells do not grow like this *in vivo*. A fast emerging alternative is 3-dimensional (3D) cell culture, which encourages cells to work together while suspended in a matrix rather than relying on adhesion to a treated surface. Most studies utilize a commercially available, industry standard recombinant basement membrane substitute---Matrigel®; however, this is proprietary and expensive. For these studies, our goal was to refine an alternative to Matrigel® for use as a suspension media. Our efforts focused on economical Methocel (methylcellulose dissolved into basal growth media) in combination with rat-tail collagen (Type I). Methocel promoted the formation of spheroids among several cell lines including all three isogenic variants of a triple-negative metastatic breast cancer cell line, MDA-MB-231, notoriously difficult to get into spheroid culture.

While not required for all cell lines, the addition of collagen (Type I) greatly increased the efficacy of spheroid formation among all cell lines. Once harvested, spheroids were suspended within a Methocel-collagen gel. Cultures were treated with various drugs which included: bisphosphonates (Ibandronate and Zoledronic acid) and a second line chemotherapeutic drug (Docetaxol). The effectiveness of these drugs to inhibit metastasis of the MDA breast cancer variants through a surrogate extracellular matrix was determined by the degree, or lack there of, of invasion, as measured by distance migrated from the spheroid periphery. All treatments had some degree of invasion inhibition, however, Docetaxol proved to be the most effective during these preliminary experiments. Ultimately, this cost effective model system allows for an *in vivo*-like microenvironment in which to study tumor development and metastasis with the simplicity and replicability of *in vitro* methods.

Further investigation into side-by-side comparison showed that identical cell-line are producing different amounts of certain proteins when grown under different conditions, 2D vs. 3D. Lastly, current experimentation is looking at varying degrees of gene transcription via Reverse Transcriptase- Polymerase Chain Reaction, RT-PCR, between MDA-MB-231 isogenic variants grown in the presence of different bisphosphonate and chemotherapeutic drugs over a determined time course. The genes of interest, due to their role in cell metastasis are: Integrin β-1 (ITGB1), Integrin β-4 (ITGB4), N-Cadherin (CDH2), and E-Cadherin (CDH1).

Chinka Pruthi, Dr. Alejandro Calderón-Urrea

Chinka Pruthi and Alejandro Calderón-Urrea

Chinka1@mail.fresnostate.edu

California State University, Fresno

Department of Biology

Poster Session IV

Poster Board No. 12

Increasing the Shelf Life of Pomegranate Arils using an Edible Coating

In recent years there has been a renewed interest in the pomegranate (*Punica granatum*). Despite a great deal of benefits offered by this fruit, it still lacks worldwide acceptance because of short lifespan. Preliminary observations in Dr. Calderon-Urrea's lab suggest the presence of endophytic bacteria associated with the arils which might play role in preventing browning of arils. Before we identify these bacteria, we wanted to study the effects of edible coating on extending arils shelf-life and prevent spoilage. The arils were extracted, some were bleached and some non-bleached. The juice extracted from both types of arils was cultured on TSA media and TSA containing 20% and 50% pomegranate juice. Any bacteria growing in plates containing media were cultured on media supplemented pomegranate juice and vis-e-versa. To confirm that presence of juice effects the growth of bacteria, the colonies obtained were cultured on media having different juice concentrations. On other hand the arils were also coated with different edible coatings to standardize a concentration of a suitable coating to prevent browning of arils. Gelatin and chitosan were tested to analyze certain qualitative traits like pH, taste, color and fullness, over a period of time. The results suggested that chitosan works best at 0.5% and 1% (w/v) concentration at 4°C. Then chitosan were analyzed for qualitative traits' like weight change, change in pH, anthocyanin content and refractometer analysis, for period of 28 days. ANOVA analysis was performed on these results and it showed that chitosan helps prevent browning of arils. The next step will be repeating the chitosan procedure on a larger scale and to perform more improved statistical analysis to standardize a concentration of chitosan for a commercial scale.

Key words: Pomegranate arils, Browning, Endophytic bacteria, Chitosan

Matthew Ogbuehi, Dr. Delwar Hussain, and Dr. Jason Bush

Matthew Ogbuehi, Delwar Hussain and Jason Bush

mogbuehi@mail.fresnostate.edu

California State University, Fresno

Department of Biotechnology

Poster Session IV

Poster Board No. 13

Nanoscale Co-delivery of Curcumin and Chemotherapeutics to Treat Drug Resistant Pancreatic Cancer

Pancreatic cancers, as is true with most cancers, are difficult to treat in a safe and effective manner. These diseases are especially problematic when they acquire drug resistance. Nano-scale drug delivery of highly water insoluble anti-cancer compounds holds the promise of not only sensitizing drug-resistant cancers to chemotherapy, but are also capable of solubilizing the drugs, increasing their bioavailability, decreasing the necessary effective dose, and lowering the risk of side effects on patients. Curcumin, a natural compound found in turmeric spice, displays the ability to not only to kill cancer cells but also re-sensitize drug-resistant cancer cells to treatment with chemotherapeutics. Unfortunately, curcumin is highly insoluble and displays low bioavailability. Here we develop nanoparticles that can deliver both curcumin and the chemotherapeutic docetaxel to pancreatic cancer cells. This formulation is more effective than either compound alone while also reducing the necessary dosage, thus reducing the potential side effects associated with high doses of chemotherapy drugs. We validate this nanoformulation by characterizing its size and electrical charge and use high performance liquid chromatography (HPLC) to analyze its chemical composition. We then treat pancreatic cancer cells (sensitive and drug-resistant) with the formulation and use cell viability assays to evaluate the efficacy of the novel drug in comparison to treatment with curcumin and/or docetaxel. The long term implication of these results is to develop more effective drugs for treating drug resistant cancers in patients.

Ernesto Torres, Dr. Krish Krishnan

Cheenou Her, Aaron P. Alonzo, Justin Y. Vang, Ernesto Torres and V.V. Krishnan
ernestotorr89@yahoo.com.

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 14

Real Time Enzyme Kinetics by Quantitative NMR (qNMR) Spectroscopy and Determination of Michaelis–Menten Constant using Lambert-W Function: An Experiment for Undergraduate Physical Chemistry Laboratory

Enzyme kinetics is an essential part of a chemistry curriculum, especially for students interested in biomedical research or in health care fields. Though the concept is routinely performed in undergraduate chemistry/biochemistry classrooms using other spectroscopic methods, we provide an optimized approach that uses a real-time monitoring of the kinetics by quantitative NMR (qNMR) spectroscopy and a direct analysis of the time course data using Lambert-W function. The century old Michaelis-Menten equation, one of the fundamental concepts in biochemistry relates the time derivative of the substrate to two kinetic parameters (the Michaelis constant KM and the maximum rate Vmax) and to the concentration of the substrate. The exact solution to the Michaelis-Menten equation, in terms of the Lambert-W function is not available in standard curve-fitting tools. The high-quality of the real time qNMR data on the enzyme kinetics enables to revisit the concept of applying the progress curve analysis. This is particularly made feasible with the advent of analytical approximations of the Lambert-W function. Thus the combination of NMR experimental time-course data with progress curve analysis is demonstrated in the case of enzyme (invertase) catalyzed hydrolysis reaction (conversion of sucrose to fructose and glucose) to provide students with direct and simple estimations of kinetic parameters of Michaelis-Menten. Complete details on how to implement the experiment and perform data analysis are provided in the Supporting Information.

Cheenou Her, Dr. Krish Krishnan

Cheenou Her, Salvador C. Vazquez, Santanu Maitra and Krish Krishnan

cheenouher09@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 15

**Isotope Labeling via Chemical Modification of Antifreeze Glycoproteins (AFGPs) for
Structural Study using High-Resolution Nuclear Magnetic Resonance (NMR)
Spectroscopy**

Intrinsically disordered protein (IDP) resembles the denatured states of ordered proteins, best described as an ensemble of rapidly inter-converting alternative structures, which, nevertheless, is their native, functional state. Their function is realized via molecular recognition in which structural disorder confers specific advantages, such as increased speed of interaction and specificity without excessive binding strength. Antifreeze glycoproteins (AFGPs) are intrinsically disordered proteins. The ice-crystal growth inhibition property of AFGPs is crucial for the survival of certain Arctic and Antarctic fishes in subzero temperature. The primary structure of AFGPs consist of a number of repeating tri-peptide sequence of (Ala-Ala-Thr*)_n in which the Thr* is glycosolated with the disaccharide beta-D-galactopyranosyl-(1-3)-2-acetamido-2-deoxy- α -D-galactopyranose. We hypothesize that the inherent flexibility of AFGP to be disordered is closely coupled to its function.

Nuclear magnetic resonance (NMR) spectroscopy provides a powerful option to investigate the dynamics of proteins in the solution state. As the AFGPs behave as IDPs in the solution state, there is a significant overlap of resonance peaks even at high magnetic fields. One of the solutions to this problem is to isotopically modify the N-terminus of AFGPs with NMR active carbon-13 (13C) labeled methyl groups to increase the sensitivity of the carbon spectrum (natural abundance of 13C is ~1%). The efficiency of our current scheme for chemical modification ranges between 50-60% as determined by NMR methods. The experimental results related to optimization and validation of the chemical modification process in several model systems including single amino acids, di-peptides, tri-peptide, and large proteins such as lysozyme are presented. NMR based dynamic measurements of the chemically modified AFGPs using modern NMR methods are expected to provide a comprehensive view of role of AFGPs as they function to keep the water 'cool' even at ice forming temperatures.

Aaron Alonzo, Dr. Krish Krishnan

Aaron Alonzo, Joy J. Goto and Krish Krishnan

apalonzo@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 16

Conformational Equilibrium Dynamics of beta-methyl-amino-L-alanine (BMAA) and Its Carbamate Adducts using NMR Spectroscopy

The modified amino acid, beta-methyl-amino-L-alanine (BMAA), is associated with the elevated incidence of the amyotrophic lateral sclerosis/Parkinsonism dementia complex (ALS/PDC). BMAA exhibited activity only in the presence of bicarbonate ions (HCO_3^-) at physiological concentrations and therefore the interaction is to play a critical role in the modality of BMAA's role in excitotoxicity. The interaction of BMAA and HCO_3^- leads to the formation of BMAA in its carbamylated forms (primary and secondary carbamate adducts). Furthermore, our recent research discovered that at physiological conditions, the BMAA and its primary and secondary adducts coexist in solution and undergo conformational exchange, which could be essential in order to address questions related their neuroactive potency.

Following the hypothesis that altering the nature of the cation in the solution may alter the equilibrium process, a comprehensive structure-mechanism study using high-resolution nuclear magnetic resonance (NMR) spectroscopy at equilibrium conditions is presented. The equilibrium dynamics of BMAA with different bicarbonate solutions are investigated: sodium bicarbonate, potassium bicarbonate, cesium hydrogen carbonate, and ammonium bicarbonate. In addition to following the chemical equilibrium process as a function of time, NMR chemical shifts and intensities are used to determine the structure and population of each species. Conformational exchange process is measured using NMR based two-dimensional exchange spectroscopy (EXSY) and exchange constants were measured for all the experimental conditions. Our results suggest the ionic contributions to the adduct formation may follow Hoff Meister series of ions that based on the 'salting' interaction occurs between the water molecules and the BMAA. As our results suggest, BMAA may exert multiple modes of neurotoxic activity via formation of multiple adducts that coexist at physiological conditions, which we will be able to more accurately evaluate and assess the human health risks posed by exposure to this cyanotoxin.

Divine Yang, Dr. Alam Hasson

Divine Yang, Justin Vang, Robyn Verhalen, Erik Rangel, and Dr. Alam Hasson

mvyang@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 17

The Chemical Composition of Third-Hand Smoke

Second-Hand tobacco smoke (SHS) consists of hundreds of toxins and many of these such as 1,3-Butadiene, and Ethylene oxide are known to cause cancer. The health effects of SHS are well known, however, the effects of environmentally-aged side stream smoke or remnants of SHS, which is termed third-hand smoke (THS) is an emerging area of interest that has yet to be fully evaluated. The organic compounds in third-hand smoke can react with ozone and related atmospheric oxidants to form additional carcinogenic compounds. These hazardous carcinogens build up overtime and can be inhaled, therefore potentially, posing a greater risk than second-hand smoke alone. The aim of this study is to understand the chemical composition of third hand tobacco smoke. Samples of THS are generated by using the Teague-Enterprise 2 smoking machine. Samples of smoke particles and vapor are collected on Teflon filters, and in Teflon bags, respectively. Selected samples were exposed to ozone/oxygen mixtures generated by a commercial ozone generator. Changes in chemical composition were evaluated using nuclear magnetic resonance spectroscopy, gas chromatography-mass spectrometry and proton transfer-reaction mass spectrometry. Preliminary data show that exposure to ozone transforms unsaturated hydrocarbons into carbonyls, alcohols, and other oxygen-containing compounds. The implications of these results will be discussed.

Moeko Toride, Dr. Cory Brooks

Moeko Toride, Samariah Bautch, Brandy White, Cory Brooks

toridem@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 18

**Humanization of Single-Domain Antibodies that Blocks Invasion of
*Listeria monocytogenes***

Listeria monocytogenes (Listeria) is a human pathogen that causes the severe food-born infection, listeriosis. A major virulence Listeria factor is Internalin B (InlB), which binds a surface receptor on epithelial cells and mediates internalization of the bacteria. Listeria is one of the few bacteria that can cross the placental and blood-brain barriers. This makes pregnant women one of the most vulnerable groups for listeriosis.

Single-domain antibodies (VHHs) are derived from the immune system of Camalidae and are the smallest known antibodies. VHHs are known for their high antigen-binding affinity, high stability, and natural solubility. Previously, we have identified five VHHs (R303, R326, R330, R357, and R419) that bind to InlB with high affinity. These VHH are capable of inhibiting Listeria invasion of epithelial cells in vitro, and thus represent a novel therapeutic venue for the prevention of Listeriosis during pregnancy. As the VHH are derived from Camel species, they may elicit an immune response when administered to humans. Furthermore it is not known if they can survive the hostile environment of the human digestive system. Thus, the objective of my research was to screen the VHHs for their stability against temperature and different concentrations of human proteases, and ultimately to design humanized, stable versions of the VHH for therapeutic administration.

The first part of the experiment was to analyze the thermostability of VHHs using differential scanning calorimetry (DSC) to measure and compare the melting point of each VHH. The second part of experiment was to perform in-situ proteolysis on five different forms of VHHs. Each VHH was treated with different concentrations of pepsin, chymotrypsin, and trypsin and the effect was analyzed after one hour of incubation.

It was found that R357 and R303 had a highest thermostability among the five VHHs and their melting point was 76.5 °C and 75.5 °C respectively. R303 and R330 were most stable against chymotrypsin and trypsin; however, they were less stable against pepsin. In conclusion, R303 is the most stable VHH against temperature and human proteases, and represents the most promising candidate for further therapeutic development. We will explore how to approach on humanizing R303 for our next experiment so it can be used as human therapeutics in the future.

Chengsheng Chen, Dr. Qiao-Hong Chen

Chengsheng Chen, Rubing Wang, Xiaojie Zhang, and Qiao-Hong Chen

chenggraduate@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 19

1,5-Diheteroaryl-1,4-Pentadien-3-ones with Bulky Terminals: Synthesis, Cytotoxicity, and Anti-Proliferative Activity of towards Prostate and Cervical Cancer Cells

Curcumin is isolated from rhizome of turmeric that has been used for long as a food additive and a traditional Indian medicine. Its potential to treat prostate cancer has been demonstrated by in vitro and in vivo data. Curcumin processes a high safety profile in human. However, its mild cytotoxic potency and poor bioavailability prompted us to search for curcumin-inspired anti-cancer agents with enhanced potency and bioavailability. Our group has previously identified 1,5-Diheteroaryl-1,4-pentadien-3-ones as an optimal scaffold for the in-depth development of curcumin-inspired anti-cancer agents.

This study aims to explore the effect of the terminal aromatic rings on the cytotoxicity of 1,5-diheteroaryl-1,4-pentadien-3-ones. Seventeen new target compounds have been successfully synthesized through the Horner-Wadsworth-Emmons reaction of 1,3 bis(diethylphosphonato)acetone with appropriate aromatic aldehydes. The structures of the synthesized compounds have been determined by interpreting their ¹H and ¹³C NMR spectra, as well as IR and HRMS data. Their cytotoxicity and anti-proliferative effects towards three prostate cancer cell lines (PC-3, Du145, and LNCaP) and an aggressive cervical cancer cell line (HeLa) have been evaluated by trypan blue exclusion method and WST-1 cell proliferation assay. All target compounds are more potent than curcumin. The optimal compounds are up to 121-fold more potent than curcumin. The synthesis and biological data of this class of compounds, as well as the effect of bulky aromatics on the cytotoxic and anti-proliferative potency, will be presented.

Jean-Baptiste Urtecho, Dr. Laurent Dejean

J.B. Urtecho, Ashley Peton

jurtecho@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 20

Quantification of a Pro-Apoptotic Protein Using a Conformation-Specific ELISA

Apoptosis is the cell's primary response to stress; it is one of the body's most important lines of defense against cancer, and dysregulation of it has been implicated in a wide variety of other diseases. This wide-ranging significance means that establishing mechanisms for these regulatory processes would offer insight valuable to a large variety of research fields. The process originates with a stress signal from either inside or outside of the cell, which is received by a family of regulatory proteins known as Bcl-2 family proteins. Reception of this signal results in Bax, a pro-apoptotic member of this family, being transformed from a cytosolic monomer to an activated oligomer within the mitochondrial membrane. These oligomers form mitochondrial channels through which cytochrome c and other effectors leak into the cytoplasm and initiate the mechanisms to induce cell death. These activated Bax oligomers are early markers of apoptosis, and their levels may therefore be used as a diagnostic tool for cancers, neurodegenerative disorders and autoimmune disorders, among other diseases. However, current methods only provide a qualitative or, at best, semi-quantitative detection of activated Bax. Practical diagnostic application necessitates that fully quantitative measures be developed.

To this end we are developing an enzyme-linked immunosorbant assay (ELISA) protocol in order to quantitatively assess activated Bax levels. In addition to its quantitative nature, ELISA is highly specific and sensitive to the activated form of Bax. This ELISA establishes a basis of comparison using both total Bax antibodies and antibodies specific to the n-terminus exposed in the activated form of Bax, allowing us to assess amount of activated Bax and, by extension, how prone to apoptose the sample cells are. Our goal was to demonstrate that apoptotic cells will show more positivity to the ELISA, due to their elevated levels of apoptotic Bax. Our methods have proven functional, and have shown the ability to readily distinguish between the activated and non-activated forms of Bax, in both standards and biological samples.

Justin Vang, Dr. Krish Krishnan

Justin Vang, Divine Yang, Kathryn Patterson, Jason Bush, Alam Hasson, Krish Krishnan
yasxayas@mail.fresnostate.edu

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 21

NMR based Chemometrics of Third Hand Smoke

On average, 14.1 cigarettes are smoked by smokers each day and a generic cigarette may contain as much as 4000 different chemicals. Smoke produced from the cigarette contains potentially harmful chemicals and is classified by first-hand, second-hand, or third-hand smoke. A developing hypothesis suggests that third-hand smoke is as dangerous as first-hand or second-hand smoke. Third-hand smoking occurs when second-hand smoke attaches to the environment, but once released the compound will react with ozone or other airborne contaminants creating gaseous volatile organic compounds (VOCs) and unknown harmful chemicals.

The long-term goal of this collaborative research is to investigate and evaluate the potential for atmospheric oxidation of second hand smoke by oxidants such as hydroxyl radicals, ozone and other nitrate radicals. In this research we present a chemometrics approach (extracting information from chemical systems by data-driven means) to determine the molecular profiles of third hand smoke effects under controlled experimental conditions. Nuclear magnetic resonance (NMR) spectroscopy, a unique and versatile spectroscopic method capable of identifying mixtures of chemical in the solution phase is used to collect the experimental data required for chemical analysis.

Chemicals are extracted using the samples collected Teague Enterprise 2 (TE-2) Flux instrument (laboratory built environmental chamber where tobacco smoke is exposed to common atmospheric oxidants). Upon completion of the standardization experiments to produce consistent data sets (number of cigarettes, flow-rate and other experimental variables), replicate measurements are performed to determine the role of ozone on the chemical composition of the molecules generated in the environmental chamber. One dimensional NMR experiments in a 400 MHz NMR spectrometer are collected at 30oC with deuterated chloroform as the solvent. Relative changes in the levels of the various chemicals altered due to the exposure to ozone are estimated via statistical methods on the average values of the peak intensities and standard deviations derived from the replicates. Individual molecules responsible for these changes are identified by using two-dimensional NMR experiments (TOCSY and J-resolved). The chemometric results from these measurements would determine if the atmospheric chemistry of second hand smoke leads to measureable changes in chemical composition in a controlled environmental chamber. Upon completion of the chemometric analysis, the effect of the chemicals identified on the growth and efficacy model cellular systems will be determined using biological assays.

Maggie Abercrombie, Dr. Taha Rezaia

Maggie Abercrombie, Susan Her, Cheenou Her, Aaron Alonzo, Justin Vang, Jaideep Singh, John Breen, Laurent Dejean, Taha Rezai and Krish Krishnan

maggie.abercrombie@actagro.com

California State University, Fresno

Department of Chemistry

Poster Session IV

Poster Board No. 22

Understanding the Molecular Nature of Actagro® Agricultural Products: Overview of an Academic-Industry Research Partnership in Fresno

Actagro®, LLC is a global leader in plant nutrient technology. The organic acid-based products are highly effective when used with plant nutrients. Through research and in-field studies, Actagro®'s line of fertilizers, micronutrients and soil amendments have proven to provide growers with consistently higher yields, healthier crops, and stronger soil profiles. The agricultural products of Actagro® are molecular complexes of with primary, secondary, and micro-nutrients formulated as special blends for specific agricultural needs. An overview of the on-going research to understanding the molecular level characterization of these products using modern chemical, biochemical and chemometric methods will be presented. A true academic-industry collaboration within the Fresno area allows cross training of students in biotechnology while providing access to cutting-edge research instrumentation to applications that are vital to the central valley's agricultural research. A sustained collaboration provides a true synergy that will enable Actagro® to design and develop products to compliment conventional plant nutrition, and meet the needs of progressive and profitable growers and dealers throughout the California's Central Valley and rest of United States.
