

**Program & Abstracts
for the 7th Annual**

**Pacific
Undergraduate
Research &
Creativity
Conference**

PURCC-2007

Compiled and Edited by
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May 5, 2007

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Program

Oral Presentations
9:00 AM – 12:30 PM
Classroom Building, Room 170

Poster Presentations
1:00 – 3:00 PM
Pacific Geosciences Center

Engineering Design Demonstrations
2:00 – 3:30 PM
School of Engineering and Computer Science

Senior Art & Design Exhibition
1:00 – 4:00 PM
Reynolds Gallery

Oral Presentations**Moderator: Dr. Edith Sparks**

| Time | Author | Title |
|-------------|---------------------|--|
| 9:00 | Kevin Sanchez | The Dark Lord or the Messiah |
| 9:15 | Kate Walters | Seeing Red: Color and Commentary in Michael Powell's Peeping Tom |
| 9:30 | Harrison W. Inefuku | Who's Your Mammy?: Figuring Aunt Jemmima |
| 9:45 | Eliana Cetto | Cindy Sherman's Madame de Pompadour (nee Poisson) of 1990 |
| 10:00 | Lyna Nguyen | Cyborgs and Goddesses: Mariko Mori's Revision of Japanese Feminine Identity |
| 10:15 | Amy Langford | Barbara Kruger and the Fragmentation of the "Happy Housewife" |
| 10:30 | Break | |
| 11:00 | Cassandra Mitchell | "In the Child's Best Interests": Pathologized Notions of Black Parenting and the Overrepresentation of African American Youth in Foster Care |
| 11: 15 | Joshua Foster | Trade and Immigration Barriers: The Economic Border Model Applied to the U.S. and Mexico |
| 11:30 | Joyce Huh | "P" for Pathology, not Accent: The Social and Cultural Phenomenon of Accent Modification/Reduction Programs |
| 11:45 | Logan S. Ahlstrom | Replica Exchange Simulations of Folding in the YAP 1 Protein |
| 12:00 | Betty Huang | Synthesis of Polyalanine Peptides Containing a Lysine Residue via Solid-Phase Peptide |
| 12:15 | John P. Tan | Synthesis and Molecular Modeling of Cysteine-Polyalanine Peptides |

Poster Presentations**Moderator: Dr. Lisa Wrischnik**

| Poster# | Author(s) | Title |
|----------------|--|--|
| 1 | Selene Trujillo Mendoza | Futbol & Football: How Different Are They Really? |
| 2 | Lauren Moulton | How Bad Can a Mosquito Bite Really Be? |
| 3 | Adriana Ibarra | Advocating Awareness for the Women of Juarez, Through A Graphic Design Approach |
| 4 | Brittney Holmquist | Detecting Malingering on Reaction Time Tests |
| 5 | Harnoor Singh, Domenick Cava, Mandi VanDorn, Audrey Booth, Travis Styles | Cardiopulmonary Test-Retest Variability in Healthy, Physically Active Women |
| 6 | Vanessa B. Barberis | Solid Waste Inventory: Assessment of Recyclable and Compostable Material in Pacific's Waste Stream and its Environmental and Financial Impacts |
| 7 | Vanessa Barberis, Anne Fisher, Matt Gallon, Win McLaughlin, Kyle Womack | The Global Sulfur Cycle: Sources, Sinks, and Fluxes |
| 8 | Steven Giovannoni | Impact of rain events on water quality in the Lower Calaveras River Watershed |
| 9 | Richard Enriquez, Mishell Chhay, Sean Cualoping, Kyle Womack, Jessica Dudley and Eric Hartman | Salmon Survey in the Calaveras River |
| 10 | Kyle Womack, Jessica Dudley, Eric Hartman, Richard Enriquez, Mishell Chhay, and Sean Cualoping | Removal of the Invasive Species <i>Arundo donax</i> Using Non-Invasive Techniques |
| 11 | Kristen Chang | Analysis of the Correlation between Measurements of the Lengths and Widths of the Abdomen, Hairpin, Major Ampullate Glands, and Prosoma in <i>Latrodectus hesperus</i> |

| | | |
|----|--|--|
| 12 | Cu Huynh Joe King | Isolation of novel glue proteins from black widow egg case silk |
| 13 | Shannon McNary Thein Thao Ngo | The Expression of ECP-1 Truncated in Bacteria |
| 14 | Jason Quach, Ellen Cho, Quinn Le, Parin Patel | Why is it so dirty? Purification of Proteins |
| 15 | Brett Burton, Lyndsey Dean, Christine Hsieh, Mike Vu | Unraveling the Mysteries of Di-tyrosine Linkages in Spider Silk Using the Mass Spectrometer |
| 16 | Irene Chen Christina Tran | The Quest for Super-Secretor <i>Pichia pastoris</i> Strains |
| 17 | John Nguyen, Vincent Perez | Cryptic Cuts of an Escort Protein |
| 18 | Kirti Sohal Caroyln Dam | Expression of human SLP-1 protein in the yeast <i>Pichia pastoris</i> |
| 19 | Laura Ray | <i>Pichia Pastoris</i> : The Search for the Perfect Length of the 5'UTR |
| 20 | Kamaldeep Singh | Isolation of Multicopy Beta Lactamase Expression Strains of <i>Pichia pastoris</i> |
| 21 | Smita Matkar, Will Smith, Daniel Sasson, Scott Sutter | How to kill a cancer cell |
| 22 | Tam Thai, Smita Matkar | Breaking Up with DNA |
| 23 | Andrey V. Samoshin | Novel Molecular Switches Based on Hydroxypiperidines |
| 24 | Andrey V. Samoshin | Green Photochemistry: Sun-Induced Aromatic Nucleophilic Substitution of Alkoxy Groups by Alkylamines. Transformation of Benzocrown Ethers Into Aza-Analogs |

| | | |
|----|----------------|---|
| 25 | Nikmala S. Tan | Novel Inhibitors For Fungal Glycosidases |
| 26 | Yuen Shan Wong | <i>trans</i> -2-Aminocyclohexanols as pH-Triggered Molecular Switches |

Refreshments Provided by Steve Hurlbut of Fisher Scientific

Engineering Design Demonstrations
2:00 – 3:30 PM
School of Engineering and Computer Science
(partial listing)

| Author(s) | Title |
|--|--|
| Bioengineering | |
| John Yoshimura, Kanwer Hundal | Design of a Magnetic Liposome Drug Delivery System |
| Sean McNary, Bhupinder Shergill, Michael Nguyen | Z-Cell: Sample Analysis of Impedance in a Microfluidic Chamber |
| Bryan Foronda, Iyad Khourdaji, Truc Le | What's the Solution? Developing an Automated Solubility Detection Device |
| Computer Science | |
| Josef Nguyen | Comparing the Intuitive Use of Input Devices in Maneuvering through a Virtual Reality System |
| Mechanical Engineering | |
| Michael Basha, Gavin Saito | Unmanned Aerial Vehicle |
| Heather Worden, See Yang | Adult Posterior Walker |
| Robb Low | Biodiesel Generator |
| Robert Fenrich Kyle Harris | Human Powered Vehicle |
| Jonathan Ching, Nick Jordan, Jonathan Park, Donny Samporna | Mini-Baja Vehicle |
| Phath Chuon, Tara Hodgetts Shuwei Yin | Six Surface Machining Station |

Senior Art & Design Exhibition
1:00 – 4:00 PM
Reynolds Gallery
(partial listing)

| Author(s) | Title |
|---------------------|---|
| Jennifer Curtier | Seven Deadly Sins |
| Harrison W. Inefuku | A Fabric of Many Threads: Asian Americans in Stockton |
| Jessica Johnson | A Study in Primates and Portraiture |
| Geneva Smith | Reconstructing the Femme Fatale |

Oral Presentations

Oral Presentation: 9:00**The Dark Lord or the Messiah**

Kevin Sanchez

Since his first appearance in 1977, Darth Vader has been considered to be the epitome of evil. However, this is a hasty reaction we make in categorizing a very complex and interesting character. The concept that Vader is not genuinely evil can be grasped by understanding what constitutes a tragic hero. Examining his tragic flaw, his fall, and his connection to the protagonist of Shakespeare's *Othello* are vital to unveiling the true identity of this man of mystery—or machine of mystery considering Vader is half mechanical. Likewise, biblical influences, such as Jesus Christ and St. Michael the Archangel, can be seen in Vader suggesting that he is actually the savior of the *Star Wars* universe. As it turns out, Darth Vader triumphs over the Dark Side of the Force and proves that he is not the all powerful God of Evil that he is so often perceived to be.

I was inspired to write about Darth Vader because of how prominent of a character he is in our culture. There are many people who know *about* Darth Vader, but there are few people who actually *know who he is*. Thus, he is categorized as an evil villain, and often considered to be the greatest of all time. In my presentation, I hope that people will be able to sympathize with someone they always thought was pure evil and as a result, understand the injustice of judging something at face value.

Faculty Mentor: Cynthia Dobbs

Oral Presentation: 9:15**Seeing Red: Color and Commentary in Michael Powell's *Peeping Tom***

Kate Walters

Michael Powell's 1960 British horror film *Peeping Tom*, tells the story of Mark Lewis, a severely troubled young cameraman who grew up under the magnifying camera lens of his scientist father. As I will show, Mark's childhood trauma contributes to his scopophilia and voyeuristic tendencies, as well as his desire to film the reactions of sexualized females at the point of death. My paper works to emphasize the importance of psychoanalysis and formal analysis in an effective film 'reading'. By referencing psychoanalytic film theory, I will argue that in *Peeping Tom*, the color red highlights women as sex symbols, fetish objects, and murder victims

Faculty Mentor: Merrill Schleier

Oral Presentation: 9:30

Who's Your Mammy?: Figuring Aunt Jemima

Harrison W. Inefuku

In existence for over a century, the advertising icon Aunt Jemima remains a point of contention for many African Americans, despite a recent makeover that attempted to remove visual signifiers of slavery. To understand the icon's negativity, I explore its roots in slavery, the minstrel stage and *The Exhibition of the Other*. I then move to an analysis of **The Legend of Aunt Jemima,** a series of advertisements produced in the 1920s, to determine how racism was manifested in the icon's promotional materials.

Faculty Mentor: Merrill Schleier

Oral Presentation: 9:45

Cindy Sherman's Madame de Pompadour (néé Poisson) of 1990

Eliana Cetto

In her portrait of Madame de Pompadour (1990), contemporary photographer Cindy Sherman attempts to reestablish artistic conventions through a "feminine" aesthetic. The artist dismantles historical French gender constructions by appropriating the materials and designs of eighteenth-century dinner wear, and placing herself costumed as Madame de Pompadour on its face. As I plan to demonstrate, she subverts its primary use as decorative dinner ware, deflects the male gaze, and elevates women from the status of object of desire to subject of intellect.

Faculty Mentor: Merrill Schleier

Oral Presentation: 10:00

Cyborgs and Goddesses: Mariko Mori's Revision of Japanese Feminine Identity

Lyna Nguyen

Contemporary photographer and performance artist Mariko Mori investigates Japanese feminine identity by depicting herself as a number of identities, from a futuristic cyborg to a spiritual cyborg-goddess. In my paper, I will investigate this notion of hybridity and multiplicity in Mori's images, using iconographic analysis combined with aspects of gender and feminist theory by Judith Butler and Donna Haraway. Mori uses the cyborg body in a number of her works including, *Tea Ceremony III*, as a literal and metaphorical approach to explore multiplicity and hybridity found in feminine identity. Mori's cyborg-goddess image in *Miko No Inori* blends the religious traditions of the east with western modernity to further challenge society's notion of a singular identity

Faculty Mentor: Merrill Schleier

Oral Presentation: 10:15**Barbara Kruger and the Fragmentation of the “Happy Housewife”**

Amy Langford

As a result of her background in graphic design, artist Barbara Kruger is able to subvert the visual and textual techniques used by contemporary mass media advertisers who prescribe messages of social conformity. Her style is unique in that she often works within the confines of portrayals of female imagery reminiscent of 1950s advertising media. By employing images and texts that refer to feminine ideology that developed during the post-war era with current techniques in graphic design, Barbara Kruger illuminates and attempts to counteract the presence of the ideal of feminine passivity and domesticity, both of which continue to remain a prevalent tool for female confinement and objectification.

Faculty Mentor: Merrill Schleier

Oral Presentation: 11:00**“In the Child’s Best Interests”: Pathologized Notions of Black Parenting and the Overrepresentation of African American Youth in Foster Care**

Cassandra Mitchell

Studies show that African Americans are placed in foster care at a significantly higher rate than children of other backgrounds. African American children are placed in out-of-home care at six times their ratio in the general population, and are twelve times more likely than their white counterparts to be placed in such care. Contemporary scholarship on overrepresentation of African Americans in the child welfare system has been divided on how to interpret this well known and tragic phenomenon. Some scholars have claimed that higher rates of foster care placement for African American youth accurately reflect the incidence of child maltreatment in the African American community. Studies testing this claim, however, strongly suggest that race is the controlling factor in predicting foster care placement for African Americans, as opposed to parental behavior or socioeconomic factors. Analysis of foster care placement decisions over the past two decades has turned to the question of why race is such a definitive predictor of removal from the family home into the child welfare system for African American children.

The present study asks what impact notions of the African American family have on foster care placement decisions. In this survey article, I attempt to describe the sociocultural context for caseworker decisions about whether or not to remove African American youth from their biological families. Studies that have demonstrated “low interrater reliability” in caseworker judgments about which youth are at risk suggest that factors other than severity of abuse and neglect play a role in the overrepresentation of African American youth in foster care. Omni and Winant’s theories of racial formation are crucial to my analysis of the link I posit between historically negative views of the African American family and parenting, and the tendency of social workers to view removal of the African American child from his or her family as in the best interests of the child. This study promises to contribute to the literature investigating the differential treatment of various races in the child welfare system.

Faculty Mentor: Marcia Hernandez

Oral Presentation: 11:15

Trade and Immigration Barriers: The Economic Border Model Applied to the U.S. and Mexico

Joshua Foster

For over seventy years, the U.S. has protected its domestic agricultural industry with commodity subsidies. This policy has created a distortion in the international agricultural commodities market. Increased attention in the past twenty years to how international trade affects developing countries has resulted in escalating pressure from international regulatory bodies such as the World Trade Organization for the U.S. to liberalize its trade policies. This paper asks how removing domestic agricultural subsidies would impact trade with Mexico, and what the corollary impact of this policy change would be on Mexican immigration to the United States. The present study extends contemporary scholarship on the economic impacts of immigration by investigating what impact domestic policies might have on immigration. To investigate this question, this study develops a model to describe baseline conditions much like those that obtain between the U.S. (Country A) and Mexico (Country B). This economic border model accounts for a change in market conditions precipitated by removal of agricultural subsidies in Country A. In the model, Country A (a developed nation) supports its agricultural industry with subsidies, shares a common border and engages in trade with Country B (a developing nation), which provides no agricultural support to its farmers. The model suggests that with the removal of farm subsidies in Country A, agricultural production would fall in Country A and rise in B. This imbalance would impact the labor markets of both countries and reduce the unilateral immigration flow from Country B to A. Central to my analysis of the model's economic phases are Samuelson's factor price equalization theorem, human capital theory, and Bernoulli's hypothesis of economic choice. As applied to economic relations between the U.S. and Mexico, the economic border model predicts that the elimination of U.S. farm subsidies would reduce immigration pressure on the U.S.-Mexico border.

Faculty Mentor: Joy Viveros

Oral Presentation: 11:30

“P” for Pathology, not Accent: The Social and Cultural Phenomenon of Accent Modification/Reduction Programs

Joyce Huh

Jean Jacques Rousseau once said, “The accent is the soul of a language; it gives the feeling and truth to it.” According to the *Webster College Dictionary*, the speech accent is “a mode of pronunciation characteristic of or distinctive to the speech of a particular person, group, or locality.” The accent, then, is inevitable, and an integral part of all speech communities of all languages.

However, a curious phenomenon seems to suggest otherwise: accent reduction/modification programs, directed by certified speech-language pathologists (SLPs), are widely established in the United States since the 1980s. Why is it that SLPs are running these programs? The U.S. Bureau of Labor Statistics describes SLPs as “trained professionals in assessing, diagnosing, treating, and helping to prevent speech, language, cognitive-communication, voice, swallowing, fluency, and other related disorders.” Speech disorders are typically caused by a range of disabilities related to cognitive, developmental, and speech-organ anomalies. These speech disorders do not pertain to matters of speech accents. However, many people who seek service from these programs are non-native English speakers who want help with reducing, even eliminating, their accent. But if accents are representative of the individualities of the speakers, and if the utterances are colored with a personality, an identity, and are envoys to our diverse and dynamic world, why do people want to have their accents reduced or eliminated? In what ways are the phenomena of accent modification/reduction programs shaped by the sociohistorical conditions, including colonialism, racism, and globalization? These are the questions I will investigate in this paper.

Faculty Mentor: Zhou Xiaojing

Oral Presentation: 11:45

Replica Exchange Simulations of Folding in the YAP1 Protein

Logan S. Ahlstrom

Proteins, or polypeptides, consist of multiple amino acid subunits that interact with each other through specific molecular properties. The disruption of these interactions by external influences – such as heating – can lead to denaturation (loss of structure and function) of a protein. Mother Nature has the capability to refold a denatured protein and thus restore its conformation and function about a million times each second; however, the largest and most capable computer in the world will be over a thousand times less able to imitate this task due to the inefficiencies of human knowledge. In order to approach what Mother Nature is able to do, I will combine modern molecular dynamics techniques with classical computational techniques to visualize the heating and refolding of a helical polypeptide. Implicit mathematical and physical constructs are applied to the simulations in order to closely mimic the solvent properties of water. I will interpret structural and energetic analysis to determine the probability of the refolding of the helix. Since these simulations are carried-out in an aqueous environment, the results from our study could have relevance to various biotechnological and pharmaceutical endeavors, such as the battle against cancer and drug design and quality. I will examine a helical polypeptide fragment of the YAP1 protein, a gene product regulator active in defense genes in the yeast *Saccharomyces cerevisiae*, to complete this study.

Faculty Mentor: C. Michael McCallum

Oral Presentation: 12:00

Synthesis of Polyalanine Peptides Containing a Lysine Residue via Solid-Phase Peptide Synthesis

Betty Huang

The synthesis of a polyalanine peptide with a single lysine residue has been achieved using the solid-phase peptide synthesis (SPPS) method. Our SPPS method involves coupling the 9-fluorenylmethoxycarbonyl (Fmoc) protected amino acid residues sequentially to a solid support using the coupling reagents HOBt (1-hydroxybenzotriazole) and DIC (diisopropylcarbodiimide). The solid support consists of small insoluble beads with linkers that attach the C-terminus of the peptide covalently by an ester linkage. This allows for the ease of purification by eliminating impurities through washing with dichloromethane and N,N- dimethylformamide (DMF) while the peptides are immobilized by an insoluble solid support. Successive couplings are performed by removal of the base- labile Fmoc group using diethylamine and followed by addition of the next desired Fmoc protected residue. The deprotection and coupling procedures are repeated until the desired peptide length is reached. Once completed, the N-terminus is protected by an acetyl group using acetic anhydride and the peptide is cleaved from the solid support with the cleavage cocktail Reagent R, mainly composed of trifluoroacetic acid (TFA). The lysine side chain is protected by an acid labile t-butoxycarbonyl (t-Boc) protecting group and is cleaved off concurrently with the cleavage of the solid support. Purification is accomplished either by chloroform extraction or precipitation in cold diethyl ether. Analysis of the peptide and sequence determination is performed by using a triple quadruple mass spectrometer coupled with electrospray ionization. Successful synthesis was confirmed by obtaining the expected ionized fragments. Several peptides have been successfully synthesized, including the pentapeptide Ac-KAAAA.

Faculty Mentor: Jianhua Ren

Oral Presentation: 12:15

Synthesis and Molecular Modeling of Cysteine-Polyalanine Peptides

John P. Tan

In connection with the investigations of the chemical properties of Thioredoxin family of enzymes, we studied a series of Cysteine-polyalanine peptides, Cys-Ala₍₃₋₇₎-NH₂. The peptides were synthesized through Solid Phase Peptide Synthesis (SPPS) using Rink Amide Resin. Coupling each amino acid was performed through DIC (Diisopropylcarbodiimide)/HOBt (1-Hydroxybenzotriazole) chemistry and deprotected using diethylamine/DMF. Each step-wise elongation cycle required a deprotection and coupling step. The peptides are cleaved from the Rink Amide Resin using Trifluoroacetic acid and purified using cold ether precipitation. The identity of the peptides is verified using the Varian 1200L triple-quadrupole mass spectrometer via Collision Induced Dissociation (CID). The results indicate that these peptides were produced in sufficient yields and purity for further mass spectrometry studies.

Molecular Modeling was performed using the Gaussian 03 computational program. Molecular Modeling involves geometry optimization, calculation of the energetic properties, and prediction of the theoretical acidities of the peptide through isodesmic reactions. These calculations were performed using density functional theory (DFT) and AM1 semi-empirical methods. DFT was used for the single point energy calculations, and AM1 was used for optimization and enthalpy corrections. Molecular modeling results show that the helical conformations exist in both the neutral and the deprotonated peptides. Molecular Modeling also shows a trend of increasing the gas phase acidity as the peptide elongates for the Cys-Ala₍₃₋₇₎-NH₂ series. These results agree well with previous experimental gas phase acidity determinations on shorter cysteine-polyalanine peptides (Cys-Ala_(3,4)-NH₂).¹

¹John P. Tan and Jianhua Ren, "Determination of the Gas-Phase Acidities of Cysteine-Polyalanine Peptides Using the Extended Kinetic Method" *Journal of the American Society for Mass Spectrometry*, 20007, 18, 188-194.

Faculty Mentor: Jianhua Ren

Poster Presentations

Poster # 1**Futbol & Football: How Different Are They Really?**

Selene Trujillo Mendoza

This paper presents an ethnographic analysis of the social behavior of a group of individuals surrounding a Mexico vs. United States Soccer game. The study focuses on the rituals, rules, and gender roles surrounding the game. For this particular study all the individuals observed were of Mexican descent. The study also compares the behavior observed previously on Superbowl Sunday with a group of individuals of Caucasian descent. The study finds that the behavior surrounding a sporting event amongst both male and female are the same regardless of the type of sport and the ethnicity of the individual.

Faculty Mentor: Kenneth D. Day

Poster # 2**How Bad Can A Mosquito Bite Really Be?**

Lauren A. Moulton

West Nile Virus is a potentially serious illness that is widely misunderstood. There are additional varieties of illness that can accompany West Nile Virus, such as West Nile Meningitis, and West Nile Encephalitis. Utilizing graphic design to create a clear and easy to read public awareness campaign I will address this misunderstanding and lack of information by visually educating the public. This campaign would include brochures, posters, booklets among other possibilities. Each of these different pieces could lead the target audience to a website to gain more comprehensive information, and direct them to other resources. The primary audience would be adults, that can be responsible human beings to transport the information to the rest of their family or by protecting them following several key tips. A doctor's office would hold the booklet, as it would contain more information than a brochure mailer would. Posters could be made for young educational levels offering a large visual image and a short synopsis on West Nile Virus. It is important all ages to understand this illness and to protect them from this growing epidemic.

Faculty Mentor: Brett DeBoer

Poster # 3**Advocating Awareness for the Women of Juarez, Through A Graphic Design Approach**

Adriana Ibarra

Since 1993 more than 400 impoverished women and young working girls have been raped, tortured, and then murdered, and more than seventy women are still missing in Ciudad Juarez, Mexico. There has been an inadequate level of support to find the people who are responsible for these tragedies and bring them to justice. The language barrier and lack of resources have made it difficult to advocate for these women and their families. A possible graphic design solution could be creating a series of images to visually communicate the existing problem. These strong visuals could be employed to help overcome any potential language barriers by reaching audience members who speak English or Spanish. I will apply communication design with the use of typography and imagery to multimedia compositions and/or print media. By creating these design applications I will be able to raise public awareness, emotional support, and urge financial aid.

Faculty Mentor: Brett DeBoer

Poster # 4**Detecting Malingering on Reaction Time Tests**

Brittney Holmquist

Computer-based reaction time (RT) tests are used in the Pacific Fatigue Lab to determine if neurocognitive function is altered in pathological conditions. Because the results of these tests can be used in disability cases there is the possibility for intentional malingering (purposeful exaggeration of physical or psychological complaints in order to receive some kind of reward) to win scientific support for a legal case. **PURPOSE:** The purpose of this study was to find signs indicative of malingering when using the California Computerized Assessment Package (CalCap®). **METHODS:** Nine (N=9; 3 male and 6 female) subjects were asked to complete three reaction time tests using the CalCap. The first test was to familiarize subjects with the testing equipment. Then the subjects were asked to either perform to their best ability on the test (Fast), or intentionally try to demonstrate a slow reaction time (Slow). The two conditions were assigned in a counter-balanced design. Four reaction time measures were analyzed; simple reaction time (SRT), choice reaction time (CRT), and two forms of sequential reaction time (SQRT 1 and SQRT 2). The range of responses and the comparison of the responses to normative values were used to inform when the subject was feigning lethargy. **RESULTS:** Reaction time measures were significantly slower in the intentionally slow condition, so retarded that they were often found to be 3.0 SD slower than normative values. RT measures in the Slow condition also demonstrated abnormally high range scores. The range scores in the Slow condition indicate lack of accuracy in responses. **CONCLUSIONS:** There are at least two primary ways to detect if someone is cheating on the CalCap: 1) abnormally slow reaction-times, beyond what is expected even in pathological conditions and 2) high variability in the responses, this indicates a lack of precision when subjects attempt to intentionally impede their reaction times.

| Means | SRT | CRT | SQRT1 | SQRT2 |
|-------|-----------|-----------|-----------|-----------|
| Fast | 255 ±26 | 363 ±19 | 449 ±73 | 473 ±136 |
| Slow | 897 ±430* | 593 ±123* | 682 ±132* | 707 ±146* |

| Range | SRT | CRT | SQRT1 | SQRT2 |
|-------|-----------|----------|----------|-----------|
| Fast | 161 ±71 | 188 ±64 | 319 ±112 | 614 ±36 |
| Slow | 890 ±461* | 419± 87* | 317 ±71 | 412 ±138† |

*p<0.005 vs Fast (Slow condition is significantly less)

†p<0.05 vs Fast (Slow condition is significantly greater)

Faculty Mentor: J. Mark VanNess

Poster# 5**Cardiopulmonary Test-Retest Variability in Healthy, Physically Active Women**

Harnoor Singh, Domenick Cava, Mandi VanDorn, Audrey Booth, Travis Stiles

The reliability of cardiopulmonary values during serial exercise testing has been examined in healthy subjects and in pathological conditions. Three to four percent variability between tests may be attributed to biological factors and up to 8% variability is considered to be acceptable within pathological populations. In a recent study in our lab, patients with Chronic Fatigue Syndrome (CFS) showed variability scores of up to 27% on repeated exercise tests. In other studies repeated tests were done with several days in between, so that it is not known if exercise tests can be reproduced within 24 hours. **PURPOSE:** The purpose of this study was to establish the degree of variability among cardiopulmonary measures during an exercise test-retest paradigm in healthy, physically active women, with the exercise test separated by 24 hours.

METHODS: Six (n=6) physically active women performed two graded exercise tests to maximal exertion on a bicycle ergometer. The tests were separated by 24 hours. Peak values for heart rate (HRmax), oxygen consumption (VO₂ max), ventilation (V_Emax), respiratory quotient (RQ) and values at anaerobic threshold (AT); HR@AT, VO₂@AT, and V_E@AT, were compared between test 1 and test 2. Maximal effort was determined using American College of Sports Medicine guidelines. **RESULTS:** All six subjects reached criteria for maximal effort on test 1 and test 2. Percent variability for each value is shown below:

| Variable | Test 1 | Test 2 | % Variability |
|---------------------|---------------|---------------|----------------------|
| HRmax | 182±12 | 179±14 | 2.1±1.6 |
| HR@AT | 153±20 | 149±24 | 2.8±3.7 |
| VO ₂ max | 46.6±4.7 | 45.5±4.5 | 1.1±2.3 |
| VO ₂ @AT | 31.6±6.3 | 28.5±6.5 | 9.1±14.7 |
| V _E max | 111.2±15.0 | 112.4±18 | 1.6±2.5 |
| V _E @AT | 56.9±16.1 | 56.6±17.5 | 0.5±12.4 |

Variability for all factors except oxygen consumption at anaerobic threshold (VO₂@AT) were similar to reported values for pathological populations and were similar to the variability reported for sedentary populations. **CONCLUSIONS:** Within this small group of subjects, test-retest was very small, less than 3% for the majority of the measures. The large variability observed for VO₂@AT may be due to methodological error that we will address in follow-up studies.

Faculty Mentors: J. Mark VanNess

Poster # 6**Solid waste inventory: Assessment of Recyclable and Compostable Material in Pacific's Waste Stream and its Environmental and Financial Impacts**

Vanessa B. Barberis

Colleges and universities across the United States invest significant resources in developing effective and sustainable recycling programs. These programs yield financial and environmental benefits, which include reducing waste disposal costs, minimizing material diverted to landfills, and reducing the use of energy and resource needed to produce new products. While the University of the Pacific (Pacific) has made significant investments in a recycling program, the program was not being fully utilized. With the help of Pacific's Students for Environmental Action group, approximately 175 kg of solid waste was inventoried from four buildings on Pacific's Stockton campus during the spring semester of 2007. The results from this inventory suggest that only $14 \pm 6\%$ (by mass) of the material in Pacific's waste stream is true waste and the remainder of the material in the waste stream was either recyclable ($53 \pm 6\%$), green waste and compostable material ($23 \pm 6\%$), or liquid/hazardous waste ($7 \pm 6\%$). Results from a companion photographic survey of three dumpsters serving the dormitories also indicate that the majority of material in Pacific's waste stream is recyclable or compostable. Recycling uses less energy, decreases waste, reduces air and water pollution. As a result, increasing Pacific's recycling efforts will lead to greater environmental sustainability. In addition, the results of this waste audit suggest that Pacific may save a significant portion of waste removal fees by eliminating recyclable and compostable materials from the waste stream. The financial benefit should serve as an incentive for improvement of recycling on campus and could be used to offset the cost of future environmental initiatives at Pacific.

Faculty Mentors: Laura K. Rademacher and Kurtis C. Burmeister

Poster # 7**The Global Sulfur Cycle: Sources, Sinks, and Fluxes**

Vanessa Barberis, Anne Fisher, Matt Gallon, Win McLaughlin, Kyle Womack

Sulfur is the tenth most abundant element on earth, and is vital for all life and plays a crucial role in the folding of proteins and formation of amino acids. The biological processing allows life to exist in some of the most extreme conditions on earth such as deep sea thermal vents, areas of extreme pH and temperature, and in the absence of other vital elements and minerals. This research project aims to give an in depth look at the global sulfur cycle to understand the ways that sulfur travels through the major reservoirs: goesphere, ocean, atmosphere, soil, and biota. The fluxes that transport the sulfur link each of the reservoirs through chemical and physical processes such as weathering, anthropogenic sources, and biochemical processes. Scientific journals and other primary research tools were used in the compilation of the complete sulfur cycle. Major focuses of the paper included anthropogenic sources of sulfur and how they are altering the ways that sulfur is cycled in various reservoirs and consequences such as acid rain and soil toxification.

Faculty Mentor: Laura K. Rademacher

Poster # 8**Impact of rain events on water quality in the Lower Calaveras River Watershed**

Steven Giovannoni

Many waterways in California's Central Valley have water quality impairments resulting from urban and agricultural impacts. The Lower Calaveras River (LCR), which flows through the University of the Pacific's campus, is no exception. The LCR is a stretch of the Calaveras that starts at New Hogan Dam and ends at the confluence with the San Joaquin River. The LCR provides drinking and irrigation water to the city of Stockton and surrounding communities via the Stockton East Water District, as well as a habitat for numerous aquatic species. The goal of this study was to measure water quality parameters at multiple locations in the LCR to determine potential sources of impairment to the watershed. Samples were collected during three surveys – one prior to the first major storm and two immediately following major precipitation events during winter 2006-2007. In situ measurements of temperature, conductivity, and pH, along with field measurements of turbidity were collected at each site. In addition, samples were collected for E. Coli and fecal coliform analysis at the University of the Pacific. Results indicate there is a positive correlation between turbidity and bacteria levels. Cosgrove Creek, a tributary leading into the LCR immediately downstream of New Hogan Dam, is impaired with the highest levels of bacteria. In addition, two smaller un-named tributaries also contributed significant levels of bacteria to the LCR. Ongoing studies include an investigation of the relationship between nutrient levels and bacteria, as well as the relationship between land use and water quality in LCR

Faculty Mentor: Laura K. Rademacher**Poster# 9****The Record: Salmon Survey in the Calaveras River**

Richard Enriquez, Mishell Chhay, Sean Cualoping, Kyle Womack, Jessica Dudley, Eric Hartman

Chinook salmon are a species of anadromous fish that migrate up the Calaveras River every year. As settlements grew in San Joaquin County however, the migrations essential for salmon reproduction have been experiencing decreased success due to water diversions and impediments. In 1973 the Chinook Salmon were finally placed under the Endangered Species Act. The goal of this project was to aid the U.S. Fish and Wildlife Service, the California Fish and Game and the California Fisheries Foundation in their mission to monitor the number Chinook salmon in the Lower Calaveras River. The task was to observe and record Salmon sightings along the Calaveras River from the UOP campus in Stockton to the Bellota Dam about 20 miles upstream. The goal was to determine the amount of spawning salmon and to discover any injured or dead salmon along several sites on the river.

Faculty Mentor: Greg Anderson

Poster # 10**Removal of the Invasive Species *Arundo donax* Using Non-Invasive Techniques**

Kyle Womack, Jessica Dudley, Eric Hartman, Richard Enriquez, Mishell Chhay, Sean Cualoping

Our project focused on finding the least invasive and most effective technique for the removal of the invasive Giant Reed (*Arundo donax*). The giant reed is a bamboo-like grass that can rapidly grow to heights of 20 feet or more. It is native to southeastern China and was introduced to California in the 1820's for erosion control of canals in the Los Angeles Area. The impressive rate at which it grows, up to a foot in one day, means it can out-compete most native species. The stems and rhizomes secrete toxic alkaloids that further inhibit the growth of native plants. These alkaloids also deter insects and grazing animals from feeding on the plant, leaving it open for uncontrolled growth. Our techniques involved setting up three experimental plots; the first was only cut, the second was cut and treated with a mild herbicide, and the third was a composting technique where the *Arundo* was cut and that stalks laid upon the rhizomes and covered with a tarp. Because of the quick re-growth time we had to monitor the plots three times a week and cut the different plots numerous times before we were able to see any results. Our results showed that the composting technique was by far the most effective in the removal of *Arundo*. Our poster will highlight the three techniques used in the removal of *Arundo donax* and describes which technique was most effective.

Faculty Mentor: Greg Anderson

Poster # 11**Analysis of the Correlation between Measurements of the Lengths and Widths of the Abdomen, Hairpin, Major Ampullate Glands, and Prosoma in *Latrodectus hesperus***

Kristen Chang

The purpose of this project was to find out whether there was a correlation between the lengths and widths of various regions of the spider, mainly the prosoma, abdomen, and major ampullate silk glands. The experiment involved catching, caring for, dissecting, and measuring parts of several black widow spiders of a wide variety of sizes and ages. The main part of the experiment, the dissection, was done with a special microscope specific for micro-dissection. A poster presentation on this will explain methods used and the results obtained.

So far, we have not managed to gather enough data for a conclusive evidence to confirm the hypothesis that the ampullate sizes are correlated with the sizes of the spiders' abdomens and prosomas. The data we have taken so far has not been conclusive because we have been unable to gather enough samples of both males and juveniles, thus our results could easily be skewed in one direction. The data that we obtained may be significant to understanding geometry and the variations in sizes that we see.

Slope values:

L Prosoma vs. L Major Ampullate: 0.229027
L Prosoma vs. W Major Ampullate: 0.241414
L Prosoma vs. L Hairpin: 0.465052
L Abdomen vs. L Major Ampullate: 0.533068
L Abdomen vs. W Major Ampullate: 0.27168
L Abdomen vs. L Hairpin: 0.449004
W Abdomen vs. L Major Ampullate: 0.189055
W Abdomen vs. W Major Ampullate: 0.120221
W Abdomen vs. L Hairpin: 0.128976
L Major Ampullate vs. L Hairpin: 0.535583
W Major Ampullate vs. L Hairpin: 0.326095

Faculty Mentor: Anne Moore

Poster # 12**Isolation of novel glue proteins from black widow egg case silk**

Cu Huynh Joe King

The peptides obtained from a tryptic digestion of egg case silk were analyzed, and it was observed that the masses of the fragments corresponded with the masses of peptides that were posttranslationally modified with GlcNAc or GalNAc residues, which indicated the presence of glycoproteins in the silk glands from which they were taken. The partial peptide sequence...SDGGSNVGGNEYR was used to design primers for the purpose of amplifying the gene which encodes the peptides of these glycoproteins. After running PCR using one anchor primer and one gene-specific primer, several DNA bands of various sizes were discovered. These were taken as candidate cDNA fragments and they were extracted and purified from the gel, then ligated into a Topo vector for bacterial transformation. Colonies grown on LB-AMP plates were then cultured and plasmid DNA was isolated. The DNA was then sent for sequencing, and their sequences were analyzed using bioinformatics. The results will be discussed.

Faculty Mentor: Craig Vierra

Poster # 13**The Expression of ECP-1 Truncated in Bacteria**

Shannon McNary, Thein Thao Ngo

Spider silk has extraordinary tensile strength and elasticity. Little is known regarding the molecular constituents that comprise egg case silk. In previous studies Egg Case Protein-1 (ECP-1) was established to be predominantly produced in the tubuliform gland, with lower levels detected in the major and minor ampullate glands. In this study, we expressed full-length ECP-1, as well as truncated versions of ECP-1 (N-terminal and C-terminal) using the prokaryotic expression vector pBAD. This study was performed in preparation for future experiments to be conducted this summer. This summer we want to determine if ECP-1 interacts with TuSp1 and if it does, determine the location of the interaction. TuSp1 is also found in the large diameter fibers of the egg case silk. Primers were selected to clone ECP-1 through PCR. Specific restriction sites were added to the 5' termini of the primers to help determine directionality once the fragments were ligated into the plasmid. Following PCR, ECP-1 cDNA fragments were ligated into pBAD and transformed into bacteria. Restriction digests were used to determine the directionality of the fragments. Once the fragments were determined to be in the correct direction, a pilot expression was performed, followed by a western blot analysis. Through the analysis of the western blot it was determined that full length ECP-1 could be expressed, however, the expression was significantly reduced in comparison to the truncated versions. These results indicate that expression of full-length ECP-1 is likely toxic to the cells.

Faculty Mentor: Craig Vierra

Poster # 14**Why is it so dirty? Purification of Proteins**

Jason Quach, Ellen Cho, Quinn Le, Parin Patel

The underlying theme of biotechnology is the understanding of cellular functions and ways to manipulate the mechanics to produce pragmatic products. In order to study these mechanics, which are produced naturally by living cells and microbes, it is necessary to replicate or amplify the apparatuses that yield these products. In general, these apparatuses are usually proteins and enzymes. Through various amplification and purification steps, it is possible to obtain a very concentrated amount of proteins that can further the investigation of various cellular functions.

First, the organism used is typically the bacterial strain *Escherichia coli* used to carry the plasmid encoding for the gene to produce the target protein. Depending on the type of promoter located on the plasmid, expression of the plasmid can be induced by certain natural biochemicals. IPTG is generally used as the induction factor, causing the *E.coli* cells to yield the wanted protein in large quantities. Through experimentation, different laboratory techniques were utilized to purify the protein. Ideally, the protein would have been put through a Q-sepharose fast flow column, followed by dialysis, and finally purified using a BioRex 70 column in order to remove cellular debris and impurities. To ensure the protein was present, PCR and agarose gel electrophoresis was performed during the intermediate purification processes. It was discovered that the protein achieved optimal activity through dialysis and alternative methods without utilizing either the Q-sepharose fast flow column or BioRex 70 column.

Faculty Mentor: Craig Vierra

Poster # 15**Unraveling the Mysteries of Di-tyrosine Linkages in Spider Silk Using the Mass Spectrometer**

Brett Burton, Lyndsey Dean, Christine Hsieh, Mike Vu

Spider silks are known to have intriguing physical properties such as being lightweight extremely strong and elastic, which would be very valuable to the commercial industry. If the genes could be isolated and synthetically manufactured the possibilities are numerous, ranging from bullet-proof vests to stronger building materials. However, the formation of this silk is a mystery that is still being unraveled.

The hypothesis was that two tyrosine amino acids may be able to link up with either each other or with other proteins to precipitate a solid from the liquid inside the glands. These peptide chains may either link to each other (3B1-3B1) or to the other peptide (3B1-MaSp2). Our research has gone into investigating the possibilities of how the mechanism of silk formation in the black widow spider, *Latrodectus Hesperus*. The primary focus of our work has gone into exploring the existence of di-tyrosine cross link formations, particularly by that of the protein 3B1.

Under varying pH and temperature environments, it was attempted to determine under what conditions the linkages formed. Taking whole cell extracts and individual glands, the mass spectrometer was used to help identify any changes in protein weight that could represent the formation of any di-tyrosine cross-linkage.

Faculty Mentor: Craig Vierra

Poster # 16**The Quest for Super-Secretor *Pichia pastoris* Strains**

Irene Chen, Christina Tran

The goal of our project was to create a new mutant library of *Pichia pastoris*, a yeast commonly used for expressing genes from other species, in order to find new super-secreting strains. The mutagenic plasmid pREMI-Z was randomly inserted into the yeast's genomic DNA through restriction-enzyme mediated integration (REMI). BamHI was the restriction-enzyme used to mediate this random integration. In order to generate the number of transformants necessary for a complete library, varying amounts of pREMI-Z DNA and BamHI enzyme were tested. After multiple transformations, the optimal conditions for transformation efficiency were determined to be 170 ng of pREMI-Z and 2 units of BamHI.

Faculty Mentors: Geoff Lin-Cereghino and Joan Lin-Cereghino

Poster # 17**Cryptic Cuts of an Escort Protein**

John Nguyen, Vincent Perez

The yeast *Pichia pastoris* is considered to be one of the premier systems for heterologous protein expression. However, secretion and subsequent purification may be problematic. We are attempted to use *E. coli* Maltose Binding Protein (MBP) as an “escort” protein to improve secretion and purification of other recombinant proteins from *P. pastoris*. To test this, we created a fusion between human protein FKBP-12 and MBP, but found that the protein was cut between FKBP-12 and MBP. With such proteolysis preventing secretion and purification, we deleted amino acids from MBP, an IEGR region and poly-N region, which may be possible sites for proteolysis. Western blot analysis yielded results that suggest MBP proteolysis is not amino acid specific but rather depends on its three-dimensional shape.

Faculty Mentors: Geoff Lin-Cereghino and Joan Lin-Cereghino

Poster # 18**Expression of human SLP-1 protein in the yeast *Pichia pastoris***

Kirti Sohal and Caroyln Dam

♥ *Pichia pastoris* is a methylotrophic yeast that is widely used for its ability to express large quantities of heterologous proteins. *P. pastoris* has an alcohol oxidase, AOX1, an inducible promoter that allows it to express proteins in the presence of methanol, but not in the presence of glucose.

♥ Currently, we are working with *P. pastoris* to express the functional human SLP-1 protein. This protein is normally found in saliva. In addition to that this protein is believed to have anti-HIV properties.

♥ We created an expression vector with the SLP-1 gene and inserted into *P. pastoris* strain to express high levels of SLP-1 protein. The yeast was grown under conditions that would allow it to optimally produce large amounts of SLP-1.

♥ We attempted to purify the SLP-1 protein from *Pichia pastoris* extracellular medium. Under small scale conditions, the purification was successful. We then tried purifying a large quantity of the protein using two different methods. Our first method, which involved using a Nickel binding column, was a little more difficult to use. We will soon see whether our second method, using a Cobalt binding column, is a winner!

Faculty Mentors: Geoff Lin-Cereghino and Joan Lin-Cereghino

Poster # 19***Pichia Pastoris*: The Search for the Perfect Length of the 5'UTR**

Laura Ray

The yeast, *Pichia pastoris*, has the greatest protein expression system in the world. *Pichia*'s success can be attributed to the Alcohol Oxidase I Promoter (AOXI) which is fused to its 5' Untranslated region (UTR). The AOXI 5'UTR is used for expression of most proteins and is extremely long, consisting of 115 bases. Proteins are synthesized when DNA is transcribed into messenger RNA (mRNA) and mRNA is then translated into different proteins. There are three specific parts of mRNA: a 5'UTR, coding sequence, and a 3'UTR. The question is: can changing the number of bases in the 5'UTR increase or decrease the amount of protein expression from the RNA in *P. pastoris*? The goal of this project is to make deletion and insertion mutants of the AOXI 5'UTR to investigate changes in protein expression. Laboratory techniques used were mutagenesis reactions, Double Oligo Reannealing Technique (DORT) reactions, and a *Lac Z* reporter. To our surprise protein expression varied unexpectedly with the different mutants.

Faculty Mentors: Geoff Lin-Cereghino and Joan Lin-Cereghino**Poster # 20****Isolation of Multicopy Beta Lactamase Expression Strains of *Pichia pastoris***

Kamaldeep Singh

Pichia pastoris, a methylotrophic yeast, is one of the most widely used expression systems for the production of heterologous proteins expression. Much of the success of this yeast is due to its alcohol oxidase 1 gene (AOX1), which has a highly inducible promoter. Thus the gene for the desired protein is usually introduced under the control of the AOX1 promoter.

Past experiments were performed to promote transcription of the AOX1 promoter by over expressing the transcription factor gene, MXR1, for the AOX1 promoter. However over expressing MXR1 protein in cells with one copy of AOX1-Beta lactamase gene cassette resulted in cell death. Thus over expressed MXR1 is toxic to cells having only one copy AOX1-Beta lactamase cassette. Therefore I am testing a hypothesis that over expressed MXR1 in cells with many AOX1-Beta lactamases copies may be able to survive as they might be able to "soak up" MXR1.

In order to test my hypothesis I transformed *P. pastoris* with the plasmid pJPBL containing the AOX1 promoter and beta lactamase. Then colonies of *P. pastoris* considered to have been integrated with multiple copies of pJPBL were isolated. Currently I'm validating the cells considered to contain multiple copy of pJPBL. The overall goal is to use the transcription factor, MXR1 gene to induce the AOX1 promoter into over expressing any genes it regulates.

Faculty Mentors: Geoff Lin-Cereghino and Joan Lin-Cereghino

Poster # 21**How to kill a cancer cell**

Smita Matkar, Will Smith, Daniel Sasson, Scott Sutter

For much of the 20th century, treating cancer (tumors that can not be surgically removed and cancers of blood cells) meant targeting their genetic material in the hope that this would lead the cancer cells to initiate self-destruction. Cancer cells are more likely to die from DNA damage because they are multiplying rapidly and have less time for DNA repair. Drugs and radiation which cause DNA damage send many cancers into remission. This happens because the damage activates a series of cellular processes (“pathways”) which lead to an ordered form of self-destruction called “apoptosis”. However, cancers are notorious for having mutations in one or more of the proteins that execute cellular self-destruction, which is the reason why radiation or chemotherapy often fails in advanced cancers. We are studying the mechanisms for how two potential anti-cancer drugs work, because they don’t seem to require DNA damage or follow the classical pathway for inducing the self destruction of cancer cells. Our poster will show examples of our recent research results and work in progress.

Faculty Mentors: Lisa Wrishnik and Uta Hellman-Blumberg

Poster # 22**Breaking Up with DNA**

Tam Thai, Smita Matkar

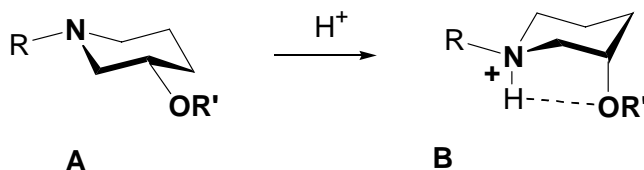
Chemotherapy can destroy many cancerous cells but it destroys some healthy cells as well. Some chemicals destroy cancer cells by alkylating DNA. Another method for killing fast growing cancer cells uses the Fenton reaction which involves hydrogen peroxide, a specific pH, and a ferrous iron catalyst. The peroxide reacts to a hydroxide ion and a hydroxyl free radical. The hydroxyl free radical is the primary oxidizing species which oxidizes and breaks apart organic molecules, such as DNA. We have set up Fenton reactions in a test tube and studied the effect on DNA strand breaks. Recently, we have begun investigating a nickel complex that had been shown to cause DNA single strand breaks. In this case, reactions that break up the DNA may be enhanced by the ability of complex to intercalate or slide between the bases of DNA. There may be different methods to cause DNA strand breaks but in any case, antioxidant should be able to prevent it. Antioxidants are molecules that slow down the production of free radicals and oxidation reactions. They can remove radical intermediates and are often called reducing agents. Small amounts of antioxidants may help prevent cancer by preventing DNA strand caused by environmental chemicals. Large amounts of antioxidants or antioxidants taking during chemotherapy may not be helpful. In order be able to study the effect of different amounts of antioxidants on the Fenton reaction and other reactions that cause DNA strand breaks we have been optimizing methods for detecting DNA strand breaks.

Faculty Mentor: Uta Hellman-Blumberg

Poster # 23**Novel Molecular Switches Based on Hydroxypiperidines**

Andrey V. Samoshin

The conformationally controlled molecular switches provide a new and promising approach to substances and materials with controllable properties. In particular, derivatives of cyclohexane and other six-membered cycles with certain configuration of substituents are able to model allosteric systems with negative cooperativity. Thus, a protonation of hydroxypiperidines leads to conformational shift: due to a strong intramolecular hydrogen bond, conformers (**B**) becomes stabilized. This 'impulse' is mechanically transmitted by the structure of the molecule to induce a conformational change of remote groups, thus altering their properties. These structures can serve as powerful conformational pH-triggers. Variation of substituents allows a tuning of the conformational equilibrium and its pH-sensitivity, as studied by ^1H NMR. The conformationally controlled molecular switches may find many applications, e.g. in a design of switchable ionophores for membrane transport, or of the triggerable lipid vesicles for drug and gene delivery.



The Dean's Undergraduate Research Award from College of the Pacific, UOP, and the Scholarly/Artistic Activity Grant, and the Eberhardt Research Fellowship from UOP are gratefully acknowledged.

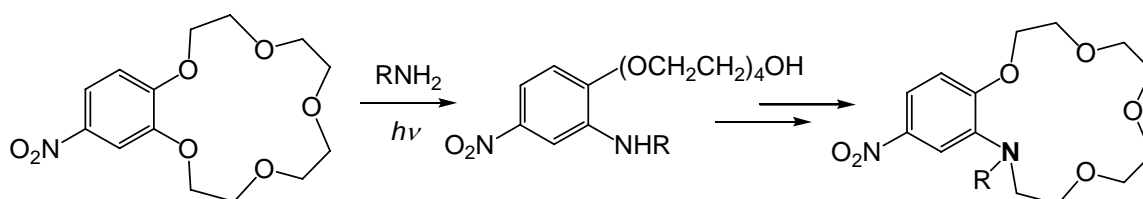
Faculty Mentors: Andreas H. Franz and Vyacheslav V. Samoshin

Poster # 24

Green Photochemistry: Sun-Induced Aromatic Nucleophilic Substitution of Alkoxy Groups by Alkylamines. Transformation of Benzocrown Ethers Into Aza-Analogs

Andrey V. Samoshin

Solar photochemistry was proved to be efficient for the nucleophilic substitution of alkoxy groups by amines in alkoxy nitrobenzenes. The results of the sun-induced photochemical substitution were comparable to the outcome of the same reaction under irradiation by a low-pressure mercury lamp. Using 4'-nitrobenzo-15-crown-5 as a starting material, we obtained polyether amino alcohols and used them as precursors for the regioselective synthesis of benzoazacrown ethers.



1. Partially published in:

A. V. Samoshin, V. V. Samoshin, *J. Undergrad. Chemistry Research*, 2006, **5** (2), 67-70.

2. Reported:

A.V. Samoshin, A. H. Franz, V. V. Samoshin.

232nd National Meeting of the American Chemical Society, San Francisco, **2006**.

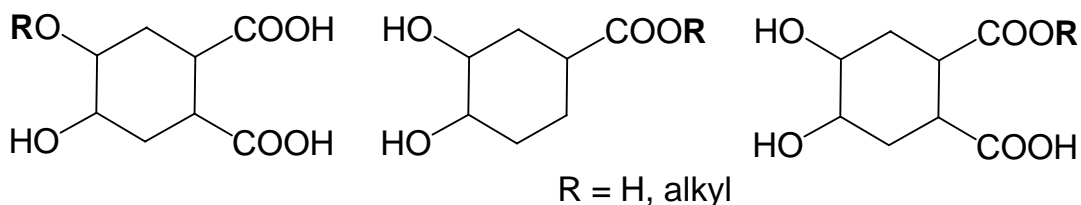
The Dean's Undergraduate Research Award from College of the Pacific, UOP, and the Scholarly/Artistic Activity Grant, and the Eberhardt Research Fellowship from UOP are gratefully acknowledged.

Faculty Mentors: Andreas H. Franz and Vyacheslav V. Samoshin

Poster # 25**Novel Inhibitors For Fungal Glycosidases**

Nikmala S. Tan

A series of carbasugars was synthesized and tested for the inhibitory activity towards fungal glycosidases from *Aspergillus* and *Penicillium sp.* in order to reveal a dependence of inhibition on the alkyl group R.



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N. S. Tan, B. Brazdova, N. M. Samoshina, V. V. Samoshin,
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B. Brazdova, N. M. Samoshina, N. S. Tan, V. V. Samoshin.
232nd National Meeting of the American Chemical Society, San Francisco, **2006**.

The Dean's Undergraduate Research Award from College of the Pacific, UOP, and the Scholarly/Artistic Activity Grant, and the Eberhardt Research Fellowship from UOP are gratefully acknowledged.

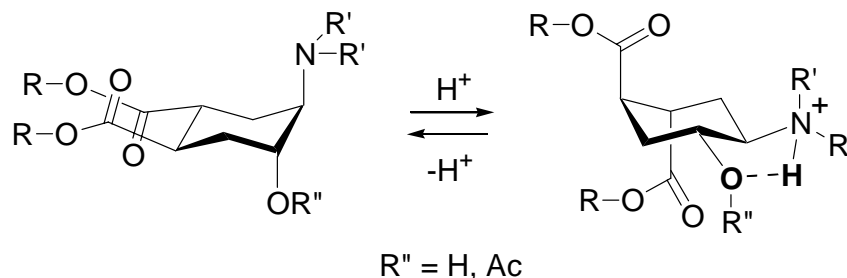
Faculty Mentors: Barbora Brazdova, Nataliya Samoshina, Vyacheslav Samoshin

Poster # 26

trans-2-Aminocyclohexanols as pH-Triggered Molecular Switches

Yuen Shan Wong

The cyclohexane-based conformationally controlled molecular switches provide a new and promising approach to allosteric systems with negative cooperativity. Protonation of *trans*-2-aminocyclohexanols leads to dramatic conformational changes: due to an intramolecular hydrogen bond, a conformer with equatorial position of ammonio- and hydroxy-groups becomes predominant. This 'impulse' is mechanically transmitted by the structure of the molecule, inducing a conformational change in the second site, thus altering its properties, e.g. decreasing its affinity to an appropriate guest, or changing a distance between groups of atoms. The variation of NR₂ groups allows a broad tuning of the conformational equilibrium. These structures can serve as powerful conformational pH-triggers, and may find many applications, such as a design of switchable ionophores for membrane transport, or of triggerable lipid vesicles for drug and gene delivery.



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B. Brazdova, Y.-S. Wong, S. Koo, A. Samoshin, A. H. Franz, V. V. Samoshin, *J. Undergrad. Chemistry Research*, **2007**, submitted for publication.

2. Reported:

B. Brazdova, S. Koo, Y.-S. Wong, A. V. Samoshin, N. Zhang, A. H. Franz, Xin Guo, V. V. Samoshin. *232nd National Meeting of the American Chemical Society*, San Francisco, **2006**;

Y.-S. Wong, B. Brazdova, A. H. Franz, V. V. Samoshin.

National Conference on Undergraduate Research, San Rafael, CA, **2007**.

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Faculty Mentors: Barbora Brazdova, Andreas H. Franz, Vyacheslav V. Samoshin

Senior
Engineering
Design
Presentations

Design of a Magnetic Liposome Drug Delivery System

John Yoshimura and Kanwer Hundal

In tumor treatments using liposomes, the biggest challenge is initiating the maximum release of the encapsulated drug at the tumor site. This anti-tumor treatment uses a novel drug delivery system which utilizes the abilities of liposomes to encapsulate various substances, in this case, magnetites, to localize the delivery of the drug. The liposome have been created using DPPC (DPPC–1,2-Dipalmitoyl-sn-Glycero-3-Phosphocholine), DSPE-PEG-2000 (1,2-Distearoyl-sn-Glycero-3-Phosphoethanolamine-N-[Methoxy (Polyethylene glycol)-2000]), and MPPC (1-Myristoyl-2-Palmitoyl-sn-Glycero-3-Phosphocholine), which lowers the phase transition temperature of the liposomes. In this project, fluorescent ANTS/DPX dye is encapsulated to determine the permeability of the liposome membrane. Encapsulated magnetites reduced the amount of microwave energy needed to disrupt the membranes. A 1000W microwave was used to irradiate the liposome batches at 100% power for 4 seconds. Testing consisted of comparing the fluorescent intensity using a spectrofluorophotometer. The data collected was used to find the amount of encapsulated dye released after each treatment. All liposome batches were given the same treatments: No microwave heating, microwave heating (4s. at 100% Power), and the addition of detergent. When compared to the negative control liposomes (DPPC + DSPE-PEG 2000), the inclusion of MPPC and magnetites increased the amount of encapsulated dye released after microwave heating.

Faculty Mentor: Xin Guo

Z-Cell: Sample Analysis of Impedance in a Microfluidic Chamber

Sean McNary, Bhupinder Shergill, Michael Nguyen

Cell counting and viability assays of biological cell cultures can be costly in terms of reagents, time and manpower required. Utilizing the electrical properties of cells, a device (Z-Cell) was designed, constructed, and tested to measure the impedance of solutions and cell suspensions inside an enclosed, microfluidic chamber. Impedance of an ionic solution is a function of solution's temperature. Thus, a temperature controller was also constructed to keep the Z-Cell within ± 0.5 °C of the set temperature. The impedance of multiple concentrations of phosphate buffered saline (PBS) was tested. Z-Cell found impedance to be inversely proportional to the ionic concentration of PBS, in accordance with accepted scientific theory. *E.coli* suspensions in lysogeny broth (LB) of optical density (OD_{600}) between 0.4 and 1.5 were tested. Initial data indicates that, at these densities, there were an insufficient number of cells to produce a detectable change in impedance.

Faculty Mentors: Douglas Modlin and Camille Troup,
and John Hefti, PhD, DvBio, Inc., Palo Alto, CA

What's the Solution? Developing an Automated Solubility Detection Device

Bryan Foronda, Iyad Khourdaji, Truc Le

The physical properties of chemical compounds include their ability to dissolve within a solution. Pharmaceutical companies and research institutions have a vital need to understand the dissolution properties of drugs under development. Knowing the solubility of a candidate drug early in the drug discovery process can validate or eliminate it from further consideration. The shake-flask technique is the current standard for drug solubility measurement. Although it is the convention, the process is tedious, time consuming and requires large amounts of reagent. Although improvements to the shake-flask technique exist, such as multi well assays, they remain very expensive and require extensive preparation. We have developed *FlowSol*, a device which decreases both the amount of compound and the time necessary to perform solubility tests. The device uses flow-thru agitation and spectrophotometric measurement of a compound. Periodic photometric absorbance readings are acquired at a rate and duration specified by the user through a computer interface. Solubility profiles developed for benzoic acid and furosemide using *FlowSol* yield similar results to those produced through conventional shake-flask methods. The process of determining a compound's solubility using *FlowSol* drastically reduces the time and labor required to perform solubility measurements without sacrificing the integrity of the data.

Faculty Mentors: Xiaoling Li

Comparing the Intuitive Use of Input Devices in Maneuvering through a Virtual Reality System

Josef Nguyen

Virtual reality has the potential to provide a useful and versatile tool to education and the general public. Through virtual reality, any user can explore an art museum or walk through a foreign city without having to physically go to these places, making these experiences more accessible to the public. However, a constant problem with virtual reality is determining an appropriate user interface to the system: the devices in which the human interacts with the computer. For the general population, a user should not be expected to be extensively trained in order to explore a virtual museum or walk the streets of a virtual city. Rather, the user should just be able to pick up (or put on) the input device and begin exploration with little instruction or practice. This study compares the effectiveness of several user input devices that are reasonably accessible with the purpose of determining which devices are suitable for general population applications of virtual reality systems and environments.

Faculty Mentor: Dan Cliburn

Unmanned Aerial Vehicle

Michael Basha and Gavin Saito

The Pacific Unmanned Aerial Vehicle Project (PUAV) is an undergraduate research and design project the ultimate goal of which is to produce an aerial vehicle which can be controlled solely by an onboard computer. The project is divided into two primary areas: Airframe and Hardware. An airframe must be designed which can meet the following performance characteristics, speeds in excess of 40 mph, altitudes greater than 500 feet and flight times of more than 20 minutes. The second category, hardware design, includes the design of all necessary sensors to completely automate the airframe and conduct land surveys through an imaging sensor. Information such as physical location and images will be transmitted to a ground station.

Faculty Mentor: Kyle Watson

Adult Posterior Walker

Heather Worden and See Yang

Widely used for pediatric patients with similar or greater impairments to Spinocerebellar Ataxia and neurological injury. Posterior walkers have shown drastic improvements in ambulation and loss of balance occurrences in children. Adult patients predominantly use anterior walkers to aid in ambulation, but the benefits are minimal. The availability of adult posterior walkers is extremely limited, with only one version being available in the United States. A posterior walker with increased functionality and decreased complexity is in great need. University of the Pacific Physical Therapy Department is currently researching the benefits to adult patients using posterior walkers and would like to see a more optimal design with light weight materials, easier maneuverability, more stability, and ease with transportation. The involvement of the Mechanical Engineering Department was to design and fabricate an adult posterior walker. In the design process a panel of pediatric posterior walkers was analyzed based on all key features and the Hoover Posterior Walker was developed based on simplicity of attributes while ensuring attention to impairment needs. Experiments have shown that the ambulation speed with posterior walkers will double in comparison to speeds with anterior walkers; results of experimentation with the Hoover Posterior Walker have confirmed these hypotheses.

Faculty Mentor: Kyle Watson

Biodiesel Generator

Robb Low

Overall, the purpose of this newly proposed research is to plan, engineer, and develop a sophisticated demonstration prototype unit for the production of biodiesel fuel from used cooking oil. In today's shortage of fossil fuels, a new generation of cleaner burning biofuels is coming up and proving to compete with current petrol and diesel fuels of today. Using an 8 gallon stainless steel drum, the unit will essentially be capable of producing upwards of 5 gallons of Methyl-Ester, more commonly known as biodiesel. Using a simple submerged immersion heater and a diaphragm pump, the main processor unit is capable of shortening the reaction time to about 12 hours, before settling in a conical tank another 12 hours. Using a two-stage process, the unit is capable of producing biodiesel using either methanol or ethanol as the alcohol. The purpose of using a two-stage process is to convert the free-fatty acids and triglycerides into alkyl-esters within the two stages of Esterification (stage 1) and Transesterification (stage 2). The research done in the laboratory has proven the process to produce quality biodiesel which has been tested to meet theoretical heating values of current biodiesel samples. This simple prototype unit will hopefully spark a new profound research into biofuels in the School of Engineering at this university.

Faculty Mentor: Kyle Watson

Human Powered Vehicle

Robert Fenrich and Kyle Harris

The scope of our project was to build a Human Powered Vehicle (HPV) to compete in the American Society of Mechanical Engineers (ASME) HPV Challenge, Utility Class. The vehicle is meant to be an everyday means of transportation. It is designed to be used on roadways, maneuver in and around traffic and be able to traverse obstacles such as speed bumps. The competition judges the vehicles in three areas: safety, design and performance. The vehicle will not be competing in the 2007 ASME HPV Challenge, due to cost issues and time constraints, however the vehicle was still built to the specifications outlined by ASME with the exception of a roll bar, front faring, and a safety harnesses. These missing components will be able to be easily incorporated into the current design, with hopes of competing with the vehicle in future competitions.

The vehicles is a Reverse Recumbent Tricycle, meaning that you sit down on the vehicle in a reclined position, and that there are two wheels in the front of the vehicle and one in the rear. Our design is unique in the fact that it has full suspension, incorporating dual A-arms and shocks in the front and a rear shock from a mountain bike. Most of the production reverse "Trikes" on the market come with at most a single rear shock and a solid front axel. We are very pleased with how our HPV turned out and plan on upgrading parts when possible and powder coating the frame.

Faculty Mentor: Kyle Watson

Mini-Baja Vehicle

Jonathan Ching, Nick Jordan, Jonathan Park and Donny Samporna

The SAE Baja competition simulates a real-world engineering design project where engineering students design and build an off-road vehicle that will endure rough terrain. The objective of the competition is to provide students with a challenging project that involves the planning and manufacturing found when introducing a new product to the consumer industrial market.

Collegiate teams compete against one another to have their design accepted for manufacture by a fictitious firm. Teams also compete in various events to test their final vehicle against the other schools. This task was undertaken by five mechanical engineering students at the University of the Pacific with the ultimate goal of competing in the MiniBaja Korea series.

The scope of this project was to design and build the frame and suspension under the criteria of the SAE Baja competition. In essence, the goal of the senior project course was to produce a rolling chassis. Thus far, the group has successfully fulfilled the project criteria and is working on additional subsystems to have an operational, competition ready vehicle. This includes an integrated motor with braking, steering, and drive-train subsystems.

Faculty Mentor: Kyle Watson

Six Surface Machining Station

Phath Chuon, Tara Hodgetts and Shuwei Yin

The machines currently on the market for rotation of a part make machining only possible on up to five surfaces. This makes machining the sixth surface a time consuming process. For industry a station that rotates a part to expose all six of its faces is ideal for speeding up the machining process. The six face machining station is used for rotating a three inch (or smaller) cube to be machined on all six of its surfaces. The cube has four holes drilled into it prior to mounting in the machining station. The cube is held in place by four pins which are inserted into the holes. The linear motion is controlled by two opposing motors fastened to two lead screws. The rotational motion is controlled by two high torque motors. All four of the motors are controlled by a basic stamp program.

Faculty Mentor: Kyle Watson

Senior Art & Design Presentations

A Fabric of Many Threads: Asian Americans in Stockton

Harrison W. Inefuku

With limited knowledge of archival repositories, the public often views archives and special collections as dim, dusty, isolated spaces for the rarified academic. To improve the public awareness of archives, I seek ways to utilize Graphic Design to stimulate visual interest in the wealth of knowledge the repositories hold. In *A Fabric of Main Threads: Asian Americans in Stockton*, I combine photographs from local archives (Holt-Atherton Department of Special Collections and the Haggin Museum) with contemporary photographs, to tell stories about San Joaquin County's Asian American community and the archives that will keep cultural memories alive.

Faculty Mentor: Merrill Schleier

Seven Deadly Sins

Jennifer Curtier

With my work, I wanted to explore the Seven Deadly Sins: lust, greed, sloth, gluttony, envy, wrath, and pride. My photographs portray a more contemporary interpretation for each sin. I chose to use digital photography for this series because it is a media that is best suited for my contemporary theme. Each image is a black and white print with a colorful advertising slogan. These slogans are meant to compliment the sin and help show how our strong moral foundation has crumbled in today's society. To aid in my artistic process, I turned to the writings of Dante Alighieri and the artwork of Barbara Kruger.

Society has become so self-absorbed that we no longer recognize what constitutes a sin. I want to raise awareness about our daily activities, thoughts, and emotions in hopes that some people will be inspired to change their style of sinful living.

Faculty Mentor: Trent Burkett

A Study in Primates and Portraiture

Jessica Johnson

I use my artwork to create change and affect overall apathy towards the primates of Africa and those of the Cameroon Wildlife Aid Fund (CWAF). I have created a series of large-scale and small-scale black and white portraits of the specific primates from this organization. The 10 small-scale portraits are wrapped with raffia, to symbolize deforestation. They are sewn together with red thread to both symbolize the blood shed because of poaching and the bond these orphaned creatures share. They are inspired by the research of Jane Goodall and Diane Fosey, and the artwork(s) of Jill Greenberg, Andy Warhol, and George Rodrigue. These portraits are not like typical wildlife art in that they convey a sympathetic human-like expression of these animals. This makes the primates become more relatable to the viewer, hence their ability to evoke a response and hopefully foster change.

Faculty Mentor: Trent Burkett

Reconstructing the Femme Fatale

Geneva Smith

My current series explores the Femme Fatale as a symbol. During the Art Nouveau period, the character was commonly used to represent evil. After examining past manifestations of the Femme Fatale, I decided to restructure her into a symbol of feminine independence. I feel today's society needs more examples of independent women. Reconstructing this symbol helps to alleviate the issue.

The red dress is a central motif in my series. I wanted to draw the viewer's attention to my pieces by using a translucent red fabric and constructing the garment directly on the canvas. The shade of red represents the Femme Fatale's passionate struggle to obtain her independence from her male followers. By portraying her as the dominant character towering over smaller figures, she becomes even more powerful.

Faculty Mentor: Trent Burkett