2016 Science Symposium
Part of SSU Symposium on Research and Creativity
May 4, 2016
Student Center Ballroom
www.sonoma.edu/scitech/symposium

Program:
• 4-5:30 pm Freshman SCI 120 Research talks
• 4-6 pm Poster Session and Reception
• 6 pm Awards Presentation

Presenter Registration:
Go to:
www.sonoma.edu/scitech/symposium
1. Pre-register by March 22
   (project title only)
2. Register by April 25 and submit an
   ABSTRACT to qualify for AWARDS and
   receive a FREE t-shirt

The Symposium is open to
all students, faculty, staff
and community members

The symposium features talks
by SCI 120 students, and a
poster session showcasing the
scholarship and achievements
of students in the School of
Science and Technology as
well as collaborations across
disciplines and with community
partners as part of the WATERS
Collaborative
## Agenda

### Science 120 - Oral Presentations

Oral presentations are from students considering a major in science as participants in the School of Science & Technology’s new Freshman Year Experience.

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<th>Alexander Valley Room, SC 2084</th>
<th>Bennet Valley Room, SC 2085</th>
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<tr>
<td>4:00</td>
<td><strong>Soil Compaction at Sonoma State University</strong>&lt;br&gt;Clarissa Alcala, Emily Beireis, Austin Poli, Sydney Tatum</td>
<td><strong>Variability of Water Quality Along Copeland Creek</strong>&lt;br&gt;Jacob Andrews, Daniel Chan, Emma Forester, Emily Humphrey</td>
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<td>4:15</td>
<td><strong>How does UV-B light affect seed germination?</strong>&lt;br&gt;Dillon Ireland, Brian Lee, Giovanni Ruggiero, Matthew VanderKlugt</td>
<td><strong>Types of Erosion along Copeland Creek</strong>&lt;br&gt;Zachary Flodquist, Elliot Olson, Christian Ramirez</td>
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<td>4:30</td>
<td><strong>Do temporary creeks support macroinvertebrates that indicate high water quality?</strong>&lt;br&gt;Andre Jenab, Mariah Mesner, Nick Vaughan, Kylen Wooley</td>
<td><strong>Effects of Heat Exposure to Plant Growth</strong>&lt;br&gt;Erik Castellanos, Leighan Harbaugh, Alec Pesavento, Chris Sanborn</td>
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<td>4:45</td>
<td><strong>Quantifying Risks of Douglas Fir Encroachment at Fairfield Osborn Preserve</strong>&lt;br&gt;Keegan Donley, Bobby Gloner, Adrian Smith</td>
<td><strong>A comparison of water runoff quality between a landfill and a wildlife preserve</strong>&lt;br&gt;Craig Ebersold, Holly Hay, Gino Nimri, Lydia Vass</td>
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<td>5:00</td>
<td><strong>Relationships Between Water Quality and Salamander Abundance</strong>&lt;br&gt;Leo Brajkovich, Shannon Lessard, Ian Pickering, Matthew Parkinson</td>
<td><strong>Do Coast Live Oak Trees Show Recovery from Sudden Oak Death at Fairfield Osborn Preserve?</strong>&lt;br&gt;Amber Carr, Ryan Emerick, Sean Luna, Josh Miranda</td>
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<td>5:15</td>
<td><strong>Evaluating Fertilizer for Plant Growth and Runoff Pollution</strong>&lt;br&gt;Maurice Becnel, Kendall Gutt, Lychelle Kime, Shayna Lorenz</td>
<td><strong>Fine sediment in Sonoma Creek</strong>&lt;br&gt;Kerry Krohn, Roma Nawy, Lexi Phan, Baelei Wiesner</td>
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### Poster Session - Student Center Ballroom

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<td>4:00 to 6:00 pm</td>
<td>Poster Session and Buffet</td>
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<td>6:00 to 6:30 pm</td>
<td>Poster Awards Presentation</td>
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<td>7:00</td>
<td>Poster Session closes</td>
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Science 120

Abstracts

Name: Clarissa Alcala, Emily Beireis, Austin Poli, Sydney Tatum
Title: Soil Compaction at Sonoma State University
Advisor: Martha Shott, Jeremy Qualls, Nathan Rank
Abstract: The purpose of this project is to identify the level of soil compaction across the Sonoma State University campus. Soil compaction can be measured by testing bulk density, soils with high bulk densities will restrict root growth as well as the porosity and permeability of water which needs to be able to pass through the surface level terrain to eventually become groundwater. We will be conducting our research across the Sonoma State University campus which has a variety of landscapes with the potential for various soil densities. In this project, we will be using a steel ring pressed into the soil to collect core samples, which we will take to our lab to analyze. We will compare our results from each location to determine which area on campus is most affected by soil compaction. To determine soil density we will weigh our samples after they have been dried and will then calculate the density in g/cm$^3$. The information that we discover through our research can be used by Sonoma State University to maintain the landscape and ensure the best possible soil porosity for groundwater recharge.

Name: Erik Castellanos, Chris Sanborn, Leighan Harbaugh, Alec Pesevento
Title: Effects of Heat Exposure to Plant Growth
Advisor: Nathan Rank
Abstract: The purpose of this research project is to observe the relationship between heat wave exposure and plant growth. It is known that climate change has been occurring rapidly and could negatively affect the growth of plants as heat waves are becoming more prevalent. Our research will be conducted in a biology laboratory at Sonoma State University on radish seedlings, an agricultural crop. The plants will be kept in a controlled environment at mild temperatures, and then exposed twice a week to high temperatures from 30 - 50 C at 10 degree increments of heat for 30 minutes. Based on experiments that have been previously done, we expect our data to show the negative effects of heat on plant growth. The information that we gather can be used to better understand what could be done to prevent significant plant growth decline. Our research will add to our general understanding of heat wave exposure to plants and the use of an agricultural plant may help those using agricultural crops.
Name: Keegan Donley, Adrian Smith, Bobby Gloner  
Title: Quantifying Risks of Douglas Fir Encroachment at Fairfield Osborn Preserve  
Advisor: Jeremy Qualls  
Abstract: The purpose of this research project is to determine the risk of Douglas fir encroachment at Fairfield Osborn Preserve. Oak woodlands are a key feature of the California landscape, both culturally and ecologically. However, these environments are at risk due to a variety of factors including sudden oak death. Fairfield Osborn Preserve has been at the heart of a huge volume of research on oak, and has sites with oak species and Douglas fir. We intend to develop a clear understanding of where at risk locations are, and what the timeline of encroachment is. This will be accomplished through an exhaustive survey of several pre-established plots looking at the current state of encroachment, as well as recording Fir stands encountered while traversing the preserve. The management of the preserve is considering taking measures to reduce Douglas fir encroachment by removing the encroaching fir trees, but they don't have a good idea of where and when treatment needs to be applied. Our data will allow the preserve managers to effectively combat Douglas fir encroachment.

Name: Holly Hay, Craig Ebersold, Gino Nimri, Lydia Vass  
Title: A Comparison of Water Runoff Quality Between a Landfill and a Wildlife Preserve  
Advisor: Martha Shott  
Abstract: The purpose of this research project is to compare the water quality of landfill runoff to runoff from Copeland Creek at Fairfield Osborn Preserve. Landfills can be detrimental to ecosystems and their runoff is often incorporated into the larger watershed. The Republic Services of Sonoma County Inc. Landfill meets the federal clean water act and the waste discharge requirement; all of their water runoff is collected within two large pools. The Fairfield Osborn Preserve is also well managed and sustains a large amount of wildlife yearly. The study will compare Copeland Creek to the two runoff pools at the landfill, and will be testing phosphate and nitrogen levels. Results between the two sites will then be compared and analyzed. The resulting analysis can be used to determine the quality of water runoff when addressing ecologically friendly landfills and natural wildlife preserves and how they may differ.

Name: Emily Humphrey, Emma Forester, Jacob Andrew, Daniel Chan  
Title: Variability of Water Quality along Copeland Creek  
Advisor: Jeremy Qualls  
Abstract: The purpose of this research project is to see how water quality varies from the headwaters at Fairfield Osborn Preserve to the Santa Rosa Laguna Treatment Plant. Nitrates and other chemical runoff have been proven to vary at certain spots along Copeland Creek in the past. We want to know if and why this is still happening, where this chemical runoff is coming from, and how the amount of runoff can be minimized. Scientists have conducted certain water quality tests on specific areas of Copeland Creek in the past; however there have not been any studies that have analyzed the change in water quality from the headwaters down to the Santa Rosa Laguna. However, after the recent El Nino Sonoma County has experienced, we want to test the possible increase of chemical runoff polluting this major Rohnert Park waterway. In this project we will be collecting
data from predetermined sites along Copeland Creek and examining the variation in water quality. We will be testing the temperature, dissolved oxygen levels, pH levels, and nitrate levels at each of our 10 sites. After analyzing our data if we observe harmful levels of nitrates coming from certain areas along Copeland Creek will then provide our community partners with the information to determine the potential source of contamination.

Name: Dillon Ireland, Matt VanderKlugt, Brian Lee, Giovanni Ruggiero
Title: *How Does UV-B Light Affect Seed Germination*
Advisor: Jeremy Qualls
Abstract: The purpose of our project is to examine how ultraviolet (UV-B) light affects local plants and agriculture. Ultraviolet radiation produced by the sun is known to hinder plant growth. Studies show that the thinning of the ozone layer is leading to an increased amount of UV-B light to enter our atmosphere. To test this exposure, we will shine exclusively UV-B light on various groups of plant seeds, and compare their germination rate to seeds exposed to exclusively natural sunlight, and a third to florescent light. During the two week period we will record the length of time it takes for the watered seeds to germinate while being directly exposed to the given light source. If our data proves UV-B light has a negative effect on plant growth, we can help raise awareness about the dangers of ozone thinning and UV-B radiation.

Name: Lychelle Kime, Kendall Gutt, Maurice Becnel, Shayna Lorenz
Title: *Comparing the Relationship Between Low Nitrogen Levels and a Healthy Growth Rate*
Advisor: Jeremy Qualls
Abstract: The purpose of our research project is to learn how different fertilizers affect not only plant growth, but also nitrogen runoff. Nitrogen is found in commercial fertilizers used by farms, but can be very harmful to the environment. When it rains, the nitrogen runoff from these fertilizers enters creeks and oceans. The nitrogen creates an algae that reduces the amount of oxygen within the water and creates a dead zone where no marine life is able to live. Our project will help to find an alternative form of fertilization that is as effective as a commercial fertilizer, without the harmful nitrogen runoff. In our project, we will plant and observe sixteen radishes in total using three different fertilizers and one control. Through this research, we hope to find a fertilizer with low nitrogen runoff that still maintains a healthy growth rate. Ultimately, our results will be used to better understand what fertilizers are most beneficial for agricultural purposes while reducing harmful pollution for local farmers within our region.

Name: Josh Miranda, Sean Luna, Amber Carr, Ryan Emerick
Title: *Do Coast Live Oak Trees Show Recovery from SOD at FOP?*
Advisor: Jeremy Qualls
Abstract: The purpose of this project is to provide Fairfield Osborn Preserve with information about their Coast Live Oak trees. Sudden Oak Death is a major contributor to Oak Mortality in Northern California and Southern Oregon. While it is prevalent in Sonoma county, there is a significant gap in current and relevant data on Sudden Oak Death, especially on the topic of recovery. FOP currently has data containing the mortality and condition of selected Coast Live Oaks. Our data will be comparing what we will find about the marked trees to what is already known about them from
Name: Matt Parkinson, Shannon Lessard, Leo Brajkovich, Ian Pickering
Title: The Reliability of Salamanders in Differing Environments
Advisor: Nathan Rank
Abstract: The purpose of this research project is to compare two separate sites and determine the ideal characteristics for a salamander to live in. Salamanders have been commonly used as an indicator species involving the conditions of the surrounding environment in addition to acting as tell-tale signs of environmental distress. The semi-permeable skin of salamanders allows for small scale environmental issues to be addressed before the problems become large scale and irreversible which we plan to test the water quality at two sites. Due to the prior knowledge about the semi-permeability of their skin, we plan on testing the ability of the water to withstand the change of pH in the water within the surrounding area between Fairfield Osborn Preserve and Sugarloaf determine the ideal living conditions for the salamanders. Variables such as Alkalinity, pH, humidity, and canopy cover will be logged to gather data about which environmental factors correlate to a higher average salamander population, therefore, indicating the health of the environment. We will split into three areas along the creek, one person upstream, two people staggered downstream from the first position and use pH strips to determine some of the water quality within the area, a canopy cover tester to determine the coverage above the environment, and a humidity tester to determine the average temperature of the surroundings and actively looking for salamanders for 25 minutes along the creek. The underlying reason for conducting this research is to compare two “identical” sites and determine the ideal habitats for salamanders to strive so their populations can be stabilized and increased due to their importance as an indicator species.

Name: Christian Ramirez, Zachary Flodquist, Elliot Olson
Title: Types of Erosion along Copeland Creek
Advisor: Jeremy Qualls
Abstract: The purpose of our project is to identify erosion along two points of Copeland Creek and to categorize what type of erosion it is. Currently to the west of SSU the creek is channelized, which is not beneficial to the ecosystem, and lessens the groundwater recharge along the creek. If the undisturbed part of the creek is observed, then that could potentially be recreated in the channelized areas to boost biodiversity and groundwater recharge. We will be comparing the two different sites based on erosion patterns. The two places we will document signs of erosion will be directly adjacent to Petaluma Hill Road, and at Fairfield Osborn Preserve. We will be taking various measurements such as turbidity and soil composition, as well as placing each site in an erosion category. With the data we take at our sites, land management can begin to think about ways to positively change the structure of the creek.

years earlier. To collect our data we will be going to FOP three separate times to assess the trees against prior data to determine if they are recovering. The data we collect will then be used to strengthen FOP’s knowledge of the trees being affected by this disease on their preserve.
**Title:** Macroinvertebrate Study with the Indication of Water Quality

**Advisor:** Martha Shott

**Abstract:** The purpose of this research project is to examine the types of macroinvertebrates and how they represent water quality at both a temporary and permanent water streams. Macroinvertebrates are one of the best indicators of water quality. They are also a critical part of the stream food web and the water quality of streams. Each macroinvertebrate has a greater or lower ability to tolerate polluted water. By identifying specific species we can understand what the quality of the water is like. Because the local water systems are pretty similar to each other we have decided to test two temporary streams and one permanent stream to compare it too. We want to see if there will be a difference in water quality between these three locations and we will use macroinvertebrates to determine these differences. Two of our streams are located at F.O.P. At this site there is both one temporary and one permanent stream. Our other location is at the Pepperwood Preserve where we will be looking at a temporary stream. To collect our data we will attempt to catch these macroinvertebrates using d-nets. Once we have captured and identified the macroinvertebrates, we then can find their pollution tolerance using species identification materials. The information we will learn gives us a better understanding of the health of temporary streams vs. permanent streams.

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**Title:** Fine Sediment in Sonoma Creek

**Advisor:** Jeremy Qualls

**Abstract:** The purpose of this project is to compare the different amounts of fine sediment in different locations at Sonoma Creek. Salmonids such as Rainbow Trout need high quality water conditions to thrive and if there is too much fine sediment in the water it can cause developmental and spawning complications. Recently in Sonoma Creek, there has been a lot of erosion that can potentially increase the amount of fine sediment. We are going to be testing four sites in Sonoma Creek, which is located in Sugarloaf State Park. In order to collect our data, we will be using a transect tape and an underwater viewer to look at the amount of fine sediment, as well as a turbidity sensor to measure the clarity of the water. Our research will be beneficial to the state park and our community partner, the Sonoma Ecology Center, to help learn more about the fine sediment in Sonoma Creek and add to their research.
Science Symposium
Poster Abstracts

Poster # 2
Name: Ariana Bates, Graham Blacksmith, Heather Hollier, Tracy Dunn
Title: *Returning to the Tap*
Advisor: John Sullins
Abstract: We look at the scare tactics used by bottled water companies that are employed to drive consumers away from the use of tap water. The social costs of this practice are traced and we look at how philosophical values can contribute to making better water use decisions.

Poster # 5
Name: Kenneth Rauen
Title: *How to Destroy a Delta*
Advisor: John Sullins
Abstract: How are we to save the Bay-Area Delta? This project traces the values that are driving projects meant to technologically divert water from the Delta to other uses in the state.

Poster # 7
Name: Russell Scarola
Title: *Copeland Creek Water Testing*
Advisor: 
Abstract: Measuring campus runoff effects on Total Dissolved Solids in Copeland Creek.

Poster # 8
Name: SeanPatrick Shadduck, James Blake, Briona Hendren, Jessica Noyes
Title: *FOP Installation*
Advisor: Mads Lynnerup
Abstract: The intermediate/advanced sculpture class of fall 2015 was awarded the Norwick Memorial Fund for an installation at the Fairfield Osborne Preserve. As a class of 20 each student was required to make a raw clay installation near the preserves building. As a class we collected clay from the site and incorporated it into a larger amount of clay that the class used. The project as a whole speaks about the ephemerality of the medium and also how the environment can alter the work.
Name: Alionzo Adame  
Title: Surface adsorption of proteins to a Non-Toxic Surface  
Advisor: Dr. Su  
Abstract: Modern studies done in vitro of proteins that are natively found on the surface of a cell membrane neglect to account for surface protein interactions. Therefore, the purpose of this study is to quantitatively characterize the effects of surface adsorption of myoglobin on a silica surface at changing pH values using Ultraviolet Visible (UV-VIS) attenuated total internal reflection (ATR) spectroscopy in order to mimic the native environment of the cell. We expect to find that the electrostatic interactions between the protein and the surface is the predominant cause in affecting the structure and orientation of adsorbed myoglobin. As well as adsorption to both a hydrophobic and hydrophilic surface to be energetically favorable. The ability for ATR to quantitatively characterize atomic level changes in a molecule under differing conditions may be utilized by protein chip technology based companies. Therefore it is important to understand and quantify what parameters govern the adsorption of proteins to a surface. Future data obtained from multi pass ATR will allow one to accurately quantify the pH at which a protein fused to a hydrophilic and hydrophobic silica surface in high concentrations denatures, degrades, and leaves the surface.

Name: Blanca Arango  
Title: Eggshell Porosity Value on Western Pond Turtle Emys marmorata  
Advisor: Dr. Nicholas Geist  
Abstract: Gas and moisture exchange across the shell membrane is limited by the diffusive properties of gases, and the porosity in an eggshell. The regulation of such gases can be measured as a porosity value, and along with nesting behavior; it could predict hatching success of the embryo. The aim of this study was to analyze eggshell porosity in western pond turtle Emys marmorata, under the Scanning Electron Microscope. Eggshells dated 2000-2015 were examined and measurements were scored. We calculated porosity value relative to egg mass by using a series of calculations, based on a previous research paper. Further comparison of porosity values can be used to predict the outcome of E. marmorata and its relation to environmental changes, since elevated temperatures and toxins might have a detrimental impact on E. marmorata embryos. Modeling ideal environmental conditions to incubate eggshells is imperative to implement conservation measurements and ensure the survival of endangered or threaten species.

Name: Henry Arbaugh  
Title: Time Dependent Observing: Variable Stars  
Advisor: Professor Scott Severson  
Abstract: This study represents an inquiry into the methods used in the observation of stellar systems with time dependent luminosities. The variable star system i Boo (GCVS catalog) was chosen for this study. This system is an eclipsing binary star system of the W Ursae Majoris (contact binary) type. These systems are characterized by stars of the spectral type F, G, or K and their common envelope of stellar material with periods less than a day. The i Boo system is composed of two G2V type stars with an apparent magnitude of 4.700 and a period of 0.267 days, allowing for a measurement of a significant portion of its luminosity variation during a single observing period. Following is a photometric analysis of the data gathered on this system over the course of one observational period, including a measurement of its total luminosity plotted as a function of time.
Name: Angelica Arguelles
Title: Minority Females in the Physics Field
Advisor: Dr. Severson
Abstract: This instructional design project introduces physics as a plausible career path for minority female students. In 2011, only 19.1% of physics bachelor's degrees nationwide were awarded to women, and out of those, only 5% were awarded to minorities. In efforts to break these gender and racial inequalities, I hosted a day of outreach for high school female students where they were introduced to the physics field. By designing two different experiments where students engaged in hands-on learning, they were able to learn fundamental physics concepts. Students' knowledge of the physics field was evaluated before and after the day's activities and the results showed a positive impact. In the pre-survey, knowledge students should have learned in elementary school was tested, and students averaged a score of 41%. After the day's activities and lessons, students took a post-survey, where the average score rose to 79%. When asked if physics would be a major they'd consider pursuing in the future, all students replied yes.

Name: Mark Ayala
Title: Visualizing the data path: What really happens in a processor?
Advisor: Dr. Suzanne Rivoire
Abstract: Understanding how a machine-code instruction moves through a processor is a key challenge for computer architecture students. In this project, I designed a web-based visualization of a single-cycle MIPS processor to graphically illustrate the flow of data.

Name: Courtney Baker, Anthony Hofmann
Title: SOD/Catalase Mimetics
Advisor: Dr. Fukuto
Abstract: The human body creates and consumes different radical species, which left uncontrolled can cause health problems. Salen-manganese complexes have been looked at in their catalytic role in converting these reactive oxygen species (ROS) as a supplement to the body’s natural enzymes. Synthesis and characterization of the salen-manganese complexes must be better understood to be utilized in the medical field. We have reported the synthesis and catalytic activity of several salen-manganese complexes (*not complete yet) as SOD and catalase mimetics. Salen ligands were analyzed with 1H NMR and verified. The catalytic activity of salen-Mn-OAc increased the % saturation of oxygen by 6%.

Name: Erin Ballantyne, Bianca Ramirez-Vilchis, Melvin Quindoy
Title: Purification and Characterization of Lactate Dehydrogenase from Bovine Heart
Advisor: Monica Lares
Abstract: Lactate Dehydrogenase (LDH) is an enzyme that catalyzes the reversible conversion of pyruvate to lactate using the coenzyme NAD+ as an oxidizing agent or NADH as a reducing agent. Pyruvate, a primary product of the glycolysis pathway, can be oxidized into acetyl-
**Poster #20**

**Name:** Erin Ballantyne, Adrian Alvarado, Christopher March  
**Title:** *Wastewater Treatment Degradation Products*  
**Advisor:** Mark Perri  
**Abstract:** We examine the effects of waste water treatment on common chemical wastes. A growing concern is the fate of various products such as antibiotics, personal care products, and fitness supplements that end up in our water supply. Waste water treatment commonly reacts products with chlorine and this can lead to hazardous chlorinated byproducts. We react common chemical waste with chlorine and UV light to simulate waste water treatment and seek to identify products to determine what degradation products are created as a function of time.

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**Poster #23**

**Name:** Terris Becker, Adrian Smith, Ruby Suarez  
**Title:** *Automated Strain Analysis: A Statistical Approach*  
**Advisor:** Dr. Matty Mookerjee  
**Abstract:** Using linear algebra and statistical techniques as well as computer programming to analyze experimental strain data. A collaborative undergraduate student effort that spans multiple fields in the school of science and technology.

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**Poster #24**

**Name:** Logan Bleeg, Leticia Calderon  
**Title:** *Viability of Raw Cells Exposed to Hydrogen Peroxide under Different Cystine and Cysteine Medium Concentrations*  
**Advisor:** Joseph Lin  
**Abstract:** Endogenously, hydrogen peroxide is produced as a byproduct of normal metabolism, as well as having important roles in cell signaling, immune function and lipid catabolism. The immune system produces hydrogen peroxide to combat infections, but this can be a problem if an autoimmune disease develops. Extracellular concentrations of hydrogen peroxide can rise to harmful levels. Our research asks how altering the cystine and cysteine environment around cells affects their viability. We have found that changing the medium around a cell to a reducing environment shows increased viability at higher hydrogen peroxide concentrations.
Poster #25

Name: Julianne Bradbury, Julie Wittman
Title: Impacts of abiotic conditions on herpetofauna abundances in the Mayacamas and Sonoma Mountains
Advisor: Derek Girman
Abstract: Local abundance of herpetofauna, a group that includes amphibians, lizards, snakes, and turtles, can be a useful indicator of ecosystem health, particularly in measuring the effects of climate change. A precise understanding of how species within this group occupy specific habitats in response to abiotic conditions can inform restoration efforts and enhance our understanding of ecosystem dynamics. Cover board surveys can be a useful method of observing herpetofauna populations. Four sets of cover board transects were established at the Fairfield Osborn and Pepperwood Preserves in grassland, forest, and canopy edge habitats. From December 2015 to April 2016, weekly surveys were conducted and the resulting data was examined in relation to local abiotic conditions. Initial examination of data from amphibian taxa revealed patterns of observed abundances of amphibian taxa in response to estimated soil moisture. Moreover, anurans and newts shared a pattern of abundance under coverboards that differed from that of plethodontid salamanders. The difference in these patterns can be associated with differences in breeding behavior among the various amphibian taxa.

Poster #26

Name: Joshua Brown-Herrera, Martina Schnitzler, Nick Hagerl, David Wentworth, Oscar Lucario
Title: Assessment of Trail Erosion Treatments at SSU’s Fairfield Osborn Preserve
Advisor: Suzanne DeCoursey
Abstract: Rainwater flowing across trails during heavy rain events causes incising of the trail, which can contribute to erosion, soil loss, and sediment pollution in nearby streams. We assessed treatments performed last year on a trail at the Fairfield Osborn Preserve, to measure how these issues were addressed. We also mapped locations of other high-risk trails and recommended treatments.

Poster #27

Name: Demitri Call
Title: Size-Mass Relations at Galaxies of Redshift $z = 4$
Advisor: Dr. Thomas Targett
Abstract: The size-mass relation for galaxies presently traces their evolution to a redshift of $z = 3$, limited by availability of rest-frame optical data beyond the 4000 angstrom break. These data indicate that galaxies exhibit an increasing trend in compactness with redshift. However, this trend must eventually “taper off”, as otherwise it would imply that galaxies were infinitely dense at early ages. In this study, recently obtained K-band (2.2um) data has allowed us to explore the galaxies size-mass relation at redshifts up to $z = 4$. Our goal was to see if this epoch of galaxy evolution is when the change in the trend of compactness begins. Data were collected by making models of our galaxy sample to determine their morphological parameters. Masses will be provided from SED fitting conducted by an external collaboration. By combing these data, we will obtain the first ever reliable estimate of the galaxy size-mass relation beyond redshift $z = 3$. Initial results are now in a phase of convergence.
testing to determine the final set of galaxies to be used in finding this size-mass relation. The initial trend reveals surprising results as the relation implies that galaxies in this epoch experienced rapid compression as they were less dense than has been shown in later epochs.

Name: Brandon Carter, Nickolas Fikrat  
Title: Vortex Laser Scanner  
Advisor: Derek Decker  
Abstract: Galvo based 2D laser scanners are unique in their ability to accurately locate lasers with high accuracy in a tiny fraction of a second. Scanned lasers have long been used to project patterns on room surfaces for artistic purposes. By combining this technology with smoke ring generators (a.k.a. vortex cannons), a new optical effect becomes possible. The laser will be scanned into cones or conical sections to intersect the rings made of a travelling mist of ethylene glycol droplets. The conical sections can rotate in a corkscrew fashion, undulate in radius, change hue and brightness, and pan across the ring in any direction. The vortex cannon will consist of a box with four circular ports (a large aperture to mount a 12 woofer, a small hole to feed fog into the box, a small port for the scanned laser to enter, and a medium sized hole for the smoke ring exit.

Name: Eric Cecil, Andrew Benson, Megan Gaitan, Andrea Leith  
Title: Cascading effects of reintroduced tule elk on ground-dwelling arthropods: variable responses across arthropod groups and habitats.  
Advisor: Dr. J. Hall Cushman  
Abstract: Conservation efforts rarely consider the ecological consequences of reintroducing a formerly extirpated animal to their native range. However, large mammalian herbivores have large effects on ecosystems and their reintroduction may alter existing communities. It is important to understand how reintroduced herbivores affect arthropods because these invertebrates play a central role in terrestrial food webs and facilitate an array of essential ecosystem services. To quantify the response of arthropods to tule elk reintroduced at Point Reyes, we used an 18-year exclosure experiment to answer the following questions: 1) Do mammalian herbivores alter the abundance and composition of ground-dwelling arthropod communities and do these effects vary across habitat types? 2) Are changes in plant architecture and thatch accumulation mechanisms by which large herbivores alter arthropod communities?

Name: ChiKai Cheng  
Title: Insulin Aggregation on Nanodiamond  
Advisor: Dr. Su  
Abstract: Insulin plays a key role in balancing blood glucose levels. It signals the body to store excess sugar in the liver when glucose level is too high in the bloodstream. Insulin aggregates itself into large clusters of polymer which is documented to be the most stable configuration in the body. In a previous study, results had shown that insulin aggregated and stabilized itself as polymer onto a nanodiamond. However, no preference on the size of polymer. It leads us
to study the interactions between the insulin molecules using computational approach. The orientations and combination of dimer, trimers and polymer are manipulated using computer modeling. This is to determine the possible conformation which gives the lowest potential energy level. Comparison of stability of a series of insulin polymer will be discussed.
measured parameters significantly differed between lactating and non-lactating females. For example, total antioxidant concentrations were lower in lactating females and such results could provide evidence for allocation trade-offs between reproduction and maternal survival or ELS. Resource-limitation may exacerbate these energetic challenges of reproduction, influencing population trends in southern sea otters.

Name: Anthony Chui, Jason Grunberger, Anthony Chui, Jonathon Agil, Zachary Sharrett, and Monica Lares
Title: Analysis and comparison of sugar levels in sodas and fruit juice using an optical two-component glucose sensing system
Advisor: Dr. Zachary Sharrett
Abstract: The detection of glucose has been a major area of interest over the past 20 years due to the recent increase in Diabetes mellitus in the United States and around the world. The monitoring of blood glucose levels needs to be maintained in individuals with the disease and studies have shown that it is also very important for patients in the ICU.

Name: Stephanie Church
Title: Monitoring Volcanism on Io
Advisor: Scott Severson
Abstract: Adaptive Optics (AO) is a system that works to eliminate the distortions that occur when looking through the atmosphere at objects in the solar system and beyond. Io is Jupiter’s innermost moon and it is the most volcanic body in our solar system. Presented in this poster is AO data of Io using a 1-meter telescope with the KAPAO adaptive optics system at the Table Mountain Observatory. The data analysis is done using PyRAF, which is a command language that combines IRAF, astronomical software, and the Python programming language. PyRAF allows us to manipulate the images and see the data in new ways. With the data, we are exploring the capabilities of KAPAO and learning more about Io. These data are in the visible range of the electromagnetic spectrum and we look forward to utilizing a different camera to obtain data in near infrared (NIR) wavelengths.

Name: Miah Crockett
Title: Displaying Real World Observations - Using Rainfall To Demonstrate The Creation of Graphical User Interfaces
Advisor: Dr. Chris Halle
Abstract: The standard obvious goal of a technical computing class is to instill in students an understanding of analysis techniques and algorithm development. More subtle – and perhaps more important goals – are to instill a desire to investigate and perform quality control on observations, perform basic/advanced analyses, and display the results in a fashion that is understandable to both specialists and non-specialists. This workflow forms the basis of the techniques that are often required of engineers in an industrial setting. Practice in this workflow can be accomplished through the development of “data exploration” graphical user interfaces (GUIs), where student teams learn to communicate complex concepts to a
Name: Patricia De La Torre  
Title: *Synthesis and Characterization of Chromium Complexes and their reaction with the metal transport protein, Transferrin*  
Advisor: Carmen Works  
Abstract: Chromium(III) has been shown to have potential therapeutic benefits for patients with type-2 diabetes (1). It is important to elucidate chromium’s mode of bio-absorption and transport into eukaryotic cells in order to understand its role in type-2 diabetes. One proposed mechanism is the iron hijack model in which chromium(III) binds to the iron transport protein, transferrin, and is then endocytosed into the cell. Previous in vitro studies at pH 7.4 have used chromium(III) chloride as a supplement for reaction with transferrin (2). The use of this compound in aqueous reactions results in exceeding buffer capacity as well as precipitate formation, both of which are unfavorable at the physiological environment where such reactions presumably take place. Preliminary results from this work indicate that increasing concentrations (40μM max) of chromium(III) chloride is toxic to jurkat cells in vivo and is not the best form of chromium to study bioavailability. Our work has focused on the use of chelated chromium(III) supplements such as chromium(III) citrate and chromium(III) acetate trimer, and will determine toxicity through cell viability assays. The binding of chromium(III) citrate to conalbumin (egg white transferrin) was successfully monitored through absorbance changes at λ= 220, and 280 nm using UV-Vis spectroscopy; equilibrium constants for the binding of chromium(III) to one and both binding sites of the protein will be determined.


Name: Elizabeth DeFrancesca, Keith Wellstone, Syd Godfrey  
Title: *Ecosystem dynamics during the breeding season of a federally-listed threatened species, the California red-legged frog (Rana aurora draytonii)*  
Advisor: Fran Keller  
Abstract: The California Red-Legged Frog (Rana aurora draytonii) is among particular interest of threatened amphibians as it has been extirpated from 70% of its former range, and was federally listed as a threatened species in 1996 (U.S. Fish and Wildlife Service, 1996). R. draytonii have a complex life history and are known to migrate from a non-breeding habitat...
to a breeding site for 1-2 weeks between November and February. Variability of potential breeding sites, whether imposed by competing conspecifics, interspecific interactions, or water quality, can have significant effects on successful laying, hatching and development of larval frogs (Cummins, 1989; Storm, 1960). The goal of this study was to assess and compare aquatic invertebrate biodiversity and water quality as drivers of breeding site selection between three ponds located on Sonoma Mountain Ranch Preservation Foundation property. Assessing R. draytonii populations may help determine how fragmentation of habitat can affect population viability and provide important insight to mitigation and restoration efforts of R. draytonii habitat.

Name: Katherine Desmond, Summer Clay, Nicole Curtin
Title: Does the opportunity for medical aid in dying for adult patients that are terminally ill or near the end of life, less than 6 month prognosis, provide palliative care in terms of giving of a sense of control and relief?
Advisor: Katharine Ratliff
Abstract: Through research we are inquiring if the opportunity for medical aid in dying for adult patients that are terminally ill or near the end of life, less than 6 month prognosis, provide palliative care in terms of giving of a sense of control and relief. In a survey of Oregonians requesting medical aid in dying (MAD), the main reason was to feel a sense of control. This is felt differently from UK physicians and many are opposed to MAD. A survey was conducted revealing that the opposition was related to religious purposes. In another survey, many nurses expressed that caring for a patient who has requested MAD brought conflict and moral distress. Besides the personal feelings of the healthcare workers, the focus should be on providing the best palliative care to end of life patients that have to suffer immensely, despite receiving state of the art care. Physicians and other healthcare workers should explore the least harmful and most respective way to respond to intolerable end of life suffering with requested assisted death. We are recommending that the option of assisted suicide be included in the plan of care and that nurses are trained and coached on therapeutic communication and techniques when working with end of life patients. We are also recommending a continuum of research to support and validate current ethical, religious, personal and societal concerns regarding medical aid in dying. Are collection of data and research concluded that providing the option for MAD gave the patient a sense of control and relief.

Name: Jared Deyarmin
Title: Mitochondrial Variation Along a Thermal Gradient in a Montane Ectotherm
Advisor: Nathan Rank
Abstract: Many organisms in montane environments live in isolated populations along environmental gradients. If gene flow among populations is restricted, small populations may become adapted to local environmental conditions. Chrysomela aeneicollis leaf beetles occur at high elevation (2400-3600 m) in the Eastern Sierra Nevada mountains of California and experience large diurnal temperature fluctuations during the summer growing season. Allele frequency variation is unusually high for three genes associated with central metabolism in these populations: phosphoglucose isomerase (PGI), succinate dehydrogenase (SDH), and
As technology progresses we are moving more and more towards living an entirely autonomous life. We have autonomous temperature control, automated manufacturing, and soon fully autonomous vehicles. Autonomous vehicle technology is the future of transportation because they will allow the movement of people and goods without the need for human drivers, which can lead to an increase in the speed and transportation of people and goods. Currently all autonomous vehicles require the use of an expensive array of sensors and powerful computers to navigate autonomously. The AutoCart will be a low-cost semi-autonomous vehicle that navigates specific pre-defined routes on campus. It will use GPS along with various low cost object detection sensors to safely navigate to its destination. The cart will also serve as a platform for other student projects and the system will be designed to be easily modified to fit the future project's needs.

Name: Richard Duong, Chanbora Uch and Jorge Inocencio
Title: Project Auto Cart
Advisor: Farid Farahmand
Abstract: As technology progresses we are moving more and more towards living an entirely autonomous life. We have autonomous temperature control, automated manufacturing, and soon fully autonomous vehicles. Autonomous vehicle technology is the future of transportation because they will allow the movement of people and goods without the need for human drivers, which can lead to an increase in the speed and transportation of people and goods. Currently all autonomous vehicles require the use of an expensive array of sensors and powerful computers to navigate autonomously. The AutoCart will be a low-cost semi-autonomous vehicle that navigates specific pre-defined routes on campus. It will use GPS along with various low cost object detection sensors to safely navigate to its destination. The cart will also serve as a platform for other student projects and the system will be designed to be easily modified to fit the future project's needs.

Name: Bryan Duoto, Andrea Guido
Title: Cytokine-mediated enhancement of unopsonized zymosan phagocytosis by RAW 264.7 macrophages
Advisor: Dr. Joseph Lin
Abstract: Macrophages have been demonstrated to phagocytose zymosan, a cell wall preparation of Saccharomyces cerevisiae, in the absence of serum opsonins [3]. Additionally, it has also been shown that exposure to the endotoxin lipopolysaccharide (LPS) causes enhanced proinflammatory mediator excretion as well as enhanced phagocytosis via macrophages [3]. However, few studies have tested the effects of supernatant transfer from zymosan treated cells to naïve cells and how cell-derived cytokines from zymosan-primed macrophages can augment the phagocytosis of naïve macrophages. This experiment helped to uncover the underlying mechanisms of this phenomenon through a gradient of incubation times for zymosan-induced macrophage stimulation and the contrast of conditions of either normal or alternative LPS-enhanced phagocytosis. We found that the introduction of isolated RAW 264.7-derived cytokines to naïve RAW 264.7 macrophages caused enhanced phagocytosis of unopsonized zymosan in a time-dependent manner.
Name: Eugene DeRango  
Title: Evaluation of adrenal function and immune response during capture procedures in California sea lions (Zalophus californianus) and Guadalupe fur seals (Arctocephalus townsendi)  
Advisor: Daniel E Crocker  
Abstract: Physiological response to stress is a fundamental process for all animals and is associated with a internal or external disturbance to homeostasis (Sapolsky et al. 1986). In vertebrates, stressful disturbances activate the hypothalamic-pituitary-adrenal (HPA) axis, which ultimately releases glucocorticoid hormones that immediately regulate or increase metabolic processes at the cost of increased energy expenditure (Ensminger et al. 2014). Measuring corticosteroids within the blood of free ranging animals can used to evaluate acute consequences of a stress response and long-term animal fitness (Romero 2004). Physiological studies with marine mammals are rapidly expanding in recent years as oceanographic and climatic patterns are dynamic and have the potential to be environmental stressors (Kovacs et al. 2012). Marine mammal taxa have evolved physiological adaptations to cope with stressors that differentiate them from terrestrial animals (Atkinson et al. 2014). Recent studies have attempted to use ecological adaptability and estimates of fitness to predict which otariid species will be vulnerable in a changing climate or geographic location with increased anthropogenic pressures (Gallagher et al. 2015). One of the estimates of fitness used was adaptability to a stress response. This study will analyze a suite of corticosteroid hormones elicited during a stress response at various times throughout a capture event in both California sea lions (Zalophus californianus) and Guadalupe fur seals (Arctocephalus townsendi). I will also examine the impact of different handling procedures and time to sampling on each hormone in the integrated stress response of each species with respect to age, sex and life history stage. This will help define the characteristics of the adrenal stress response in each otariid species during a major El Niño event for future comparison studies to subsequent non-El Niño years.

Name: Amanda Elderkin, SN, Chris Zimmerman, SN; Shasta Myers, SN  
Title: Effect of Advance End of Life Planning on Patient and Family Anxiety  
Advisor: Katherine Ratliff  
Abstract: The purpose of the evidence brief was to explore the question: In adult patients diagnosed with a terminal illness, does completing an Advance Directive/POLST/MOLST decrease the patient’s, and family’s anxiety related to end of life care? Research databases included: Pub Med, Google Scholar, CINAHL and EBSCO. We have found substantial evidence to support that completing an advanced directive improves outcomes in end of life care. Furthermore, patients and family members benefited from honest discussions regarding the patient’s wishes. The fundamental aspects of ACD included patients understanding of their medical condition, identifying realistic treatment options, and establishing goals. Overall, patients with ACD and their families experienced less stress, anxiety and depression. Outcomes were primarily measured using end of life care questionnaires, and anxiety and depression scales. In conclusion, advance care planning should concentrate on enhancing communication, improving inclusiveness among patients and members of the health care team and successful implementation of advance care planning policies.
Name: Cody Ender
Title: Native herbivores and habitat as mediators of an exotic grass invasion.
Advisor: Hall Cushman
Abstract: Given the large economic and ecological effects of many exotic plant species, it is vital to understand the factors that control the success of these invaders. Here, we use a 17-year-old exclosure experiment at Point Reyes National Seashore to address the relative importance of a reintroduced mammalian herbivore, tule elk (Cervus canadensis nannodes), and environmental heterogeneity in mediating the growth, abundance, and recruitment of a dominant grass invader, Holcus lanatus. We found that Holcus populations were negatively affected by elk and also varied significantly by habitat type. Despite the negative effects of elk, they had no significant effect on change in Holcus biomass or abundance over time and did not prevent the spread of Holcus in the system. These results demonstrate the combined importance of herbivores and habitat characteristics in driving plant invasions over time.

Name: Jesse Ford, Omar Alvarez
Title: Remote Monitoring System for MFC
Advisor: Ali Kujoory
Abstract: In an ever changing world there is always a need for improvement. In the 21st century, the need for technology has exponentially increased due to consumer needs. The only thing that has stayed the same throughout history is the need for fuel. A very interesting way that biologists and engineers have developed is the use of bacteria to generate energy. The process is called Microbial Fuel Cells (MFC). MFC is the use of bacteria to convert organic waste material into electrical energy. As these MFCs systems continue to grow over the years, the need to monitor them will become a demand. With our project, wineries will be able to continuously monitor the MFC process and view the operation status. We will closely monitor voltages, status, and collaboration of the MFC. The data will be stored locally then sent to a web page to be displayed. Our project will be the size of an internet modem, and will operate on an external power supply. The system will operate with the MFC system that already exists and take in desired information from the MFC. The data will be stored in a SD card locally first. The data needs to be saved locally first to avoid data lost during the transmission to the server.

Name: Danny Galvez, Juan Magana
Title: Water Monitoring System
Advisor: Don Estreich
Abstract: The water monitoring system is a new solution to monitoring your water tank. For years people could only measure what is inside the tank by using a long stick, which was dangerous and inconvenient. This new innovation makes monitoring your tank easy by wirelessly
transmitting data back to a main hub. The customer will input the height and the distance around the tank to decide the parameters. The ultrasonic sensor will use the data to compare the height of the water. The flow sensors will be calculating the flow of water entering and exiting. Putting all these sensors together will determine the time till the tank is empty and provide warning signs when problems occur such as a bad pump or a leaking pipe. The self-sustaining warning system will have two shutoff valves that will stop flow if the tank has exceeded a high limit or if the water is below a low limit.

Aersima Gebrihiwit, Sonoma State University Post- License BSN Students: Cassie Buttke RN, Melanie Croll RN, Aersima Gebrihiwit RN, Sarah Hoex RN, Stephanie Holmes RN and Megan Monte RN.

**Title:** Implementing Self Care Interventions in Low Income People With Chronic Disease

**Advisor:** Professor Michelle D. Kelly DNP, FNP-BC, PHN

**Abstract:** The burden of chronic disease rests disproportionately on the shoulders of those living in poverty. The relationship between poverty and chronic disease is interwoven; the lowest income tier of the population has the highest rates of chronic disease. This group also has significantly higher rates of preventable complications and hospital admissions. Literature suggests empowering clients to adopt and maintain a personal health record (PHR) will improve health outcomes and decrease preventable complications of chronic disease, however the effectiveness of using PHR’s in low income populations has not been documented.

SSU Department of Nursing and the Jewish Community Free Clinic have a collaborative partnership to implement an evidenced based program to reduce the effects of chronic diseases in a high-risk group of low-income patients.

Student nurse researchers coached and empowered patients to improve their self-care abilities with the use of a personal health record. Students measured and explored the impact of their coaching through pre and post testing of the client’s self care abilities.

**Name:** Kathleen Grady

**Title:** Evaluation and Guidance for Riparian Restoration in Coastal California Using Birds as Indicators of Restoration Success

**Advisor:** Derek Girman

**Abstract:** Marin and Sonoma counties are both places where wildlife and people come into close contact and often have seemingly opposing demands on the landscape. As the population of the San Francisco Bay Area expands, managed landscapes become more important for birds and other wildlife, and for the human population. The Students and Teachers Restoring a Watershed program has been working to address erosion and water quality issues by conducting riparian restorations—often on private ranchland—for over 20 years. We examined these restored areas using birds as indicators of habitat quality and restoration success. We compared historic (2001-2009) avian use at 25 sites using the area search protocol to evaluate the bird community response to riparian restoration on private lands. We found a diverse community of birds using the restored areas during the breeding season suggesting that these projects have been successful beyond the intended goals of improving water quality. Our results suggest that riparian restoration helps people by improving water
quality and reducing erosion, and can simultaneously create suitable habitat for wildlife. Additionally, our future plans involve including data from the 2015 and 2016 seasons to further examine bird response over time. Further, by understanding site and landscape level components that contribute to avian response, we can make recommendations about future restoration projects to help ensure success.

Name: Justine Gray
Title: Cloning and Characterization of Hemicellulose-Degrading Enzymes from Cellulomonas sp. Strain FA1
Advisor: Michael Cohen
Abstract: The polysaccharides cellulose and hemicellulose in the cell walls of terrestrial plant cells are the most abundant carbon source on Earth. Currently, hemicellulose is discarded as a waste byproduct by paper mills and in the production of cellulosic bioethanol. However, with advances in processing hemicellulose could be repurposed as a cheap and abundant feedstock for bioethanol production. Production of plant based biofuels is hindered by the presence of lignin, which must be degraded by means such as alkaline pretreatment in order for enzymes to gain access to cell-wall polysaccharides. We are seeking to develop ways to utilize hemicellulose as a biofuel feedstock by applying organisms and enzymes capable of degrading plant biomass under alkaline conditions. Cellulomonas sp. strain FA1 is an alkaline tolerant bacterium that, unlike yeast, is capable of degrading hemicellulose and fermenting its component sugars. From the genomic sequence of strain FA1 we identified putative genes encoding β-mannosidase and xylanase, which cleave mannose and xylose, respectively, from hemicellulose. Both genes were PCR-amplified from genomic DNA, cloned into IPTG-inducible vectors and transformed into E. coli DH5α for expression and characterization. A polyhistidine tag incorporated into the PCR primers will allow for Ni-NTA affinity purification of recombinant proteins following induction. Enzyme activity assays carried out using locust bean gum as a hemicellulose substrate will be conducted to investigate hydrolytic activity over a range of pH, temperature, and substrate concentration conditions in order to determine optimal activity and kinetic parameters. Applications of alkaline-stable hemicellulose degrading enzymes may allow for the efficient extraction of energy from an inexpensive, abundant, and renewable material that would otherwise go to waste.

Name: Anthony Hargrove, Juan Soto
Title: Sense-It
Advisor: Dr. Don Estreich
Abstract: Sense-It is a Bluetooth based device that will assist persons with visual disabilities to navigate new areas. The system is comprised of a handheld device, an iPhone application and wall mounted beacons. By carrying a pocket sized device, a person will receive notifications when they have reached predetermined locations of import. At each location, our wall mounted device will be installed with a unique ID. When the traveler receives notification of arrival at a location, they will have the option to receive further information by downloading messages left by the facility administrator via our iPhone application. Messages can be as simple as 'Men's Bathroom on left’ or a more complex description of when and where a professor might be on what days.
Name: Travis Hayes
Title: Maximum Cut Problem
Advisor: Martha Shott
Abstract: Given a weighted and undirected graph, what is the maximum cut that partitions the graph into two disjoint subsets, S and S'? My poster will explore both the exhaustive method for calculating the maximum cut and my own personal algorithm I came up with in Thailand over the summer of 2015.

Name: Victoria Hernandez
Title: Connecting K-12 to Sonoma State around Sustainable Water and One Planet Living
Advisor: Professor Robert Girling
Abstract: On April 2nd, 2016, Sustainable North Bay will be hosting the first annual Youth Summit, which aims to showcase grades 7-12 teacher-student projects around sustainability and One Planet Living. Sustainable Water, a principle of One Planet Living, is founded upon the practice of efficient water usage. It is fundamental that we bring this issue to the attention of schools and universities to ensure these practices are addressed on a systemic level. The Youth Summit is an ideal opportunity to survey a sample of schools to learn about their approaches to Sustainable Water. We will identify schools that are addressing water issues and ask them more detailed questions about water conservation at schools, future goals regarding sustainable water, and how the SSU community could assist them.

Name: Anthony Hofmann
Title: The Structural Characterization of Nanodiamonds
Advisor: Dr. Su
Abstract: Nanodiamonds (NDs) have become an integral component in scientific and industrial applications and until recently, the unique properties and variable size of NDs were unrealized. Nanodiamond, an allotrope of carbon with a lattice identical to large diamond, has gained much attention in microbiology, pharmacology, and photonics. The cubic nature of NDs produce characteristic spectra of x-ray diffraction, the most powerful tool for analyzing structure. Specific defects in the crystallites give rise to phenomena like fluorescence, a product of pre-existing ND core modification. In this research, the structural characterization of four types of NDs was conducted for use in upcoming experiments. The data collected from x-ray diffraction was fit with the Lorentzian function to determine certain values needed to calculate the average size. To verify that the fluorescent NDs were of a specific type, a sample was run in a spectrofluorometer to obtain emission data. SEM was deployed to get a visual look at the nanometer sized particles at over 30,000X magnification.
**Name:** Justin Hoijer  
**Title:** *Water Harvesting*  
**Advisor:** Jeremy Qualls  
**Abstract:** Global conditions are making clean water an increasingly precious substance. Current methods of generating clean water tend to be expensive, impractical, or environmentally unfriendly. The purpose of this research is to explore cheap and environmentally conscious methods of water harvesting through modeling and experimentation. Specifically, we are targeting to harvest moisture from the over three thousand cubic miles of water stored in the atmosphere. Our research has specifically prototyped a hybrid three part passive water collection system. The system uses desiccants and cold surface collection to enable water harvesting at all times. Our results show that passive water collection is feasible and promising.

**Name:** Daniel Hudson, Robert Valenti, Michelle Nozari  
**Title:** *Mate Selection in Pacific Newt Species Due to Chemical Cues in the Water*  
**Advisor:** Derek Girman  
**Abstract:** Mate sex and species recognition proves to be an important mechanism for sympatric Taricha species maintaining reproductive isolation. The mechanism of species mate selection is observed by males and females of rough skin newt (Taricha granulosa) and California newt (Taricha torosa) populations both of which inhabit the same ponds. In addition to pond dwelling populations we observed individuals inhabiting close by streams; rough skin newt and red belly newt (Taricha rivularis) in Sonoma and Mendocino county areas. We observed these mate selections by running a y-maze in the field using sampled individuals. The data collected was then quantified by structuring a linear graph comparing efficiencies between males and females of these populations. Our data supports the hypothesis that females are more efficient at choosing the correct species to mate with, and that certain species are better at sensing cues of mate selection. Changes in water flow can also effect chemical production and sensory efficiency adaptations between populations dwelling in ponds verses streams. This research gives us the understand of why possible hybridization in nature is not occurring on a noticeable scale.

**Name:** Megan Humphrey  
**Title:** *The Role of Thioredoxin in Regulation of Oxidation and Reduction*  
**Advisor:** Dr. Joseph Lin  
**Abstract:** Research has supported the idea that cellular oxidative damage is linked to multiple disease states. Reducing enzymes are crucial in the maintenance of redox environments and have been shown to protect cells against oxidative damage and in some cases reverse the damage. Thioredoxin is one of these anti-oxidant enzymes which utilizes a disulfide bond that acts as a redox switch. Thioredoxin contains an active site with a CXXC motif that is essential for disulfide bond reduction in cytoplasmic proteins. By replacing the cysteine with a serine the reducing capability of thioredoxin can be determined. Recombinant wildtype, single mutant, and double mutant thioredoxin was purified from bacteria containing the gene encoding human thioredoxin and the respective mutants. Enzymatic activities were assessed using 5,5'-Dithio-bis-(2-nitrobenzoic acid) solution.
Poster #62

Name: Chelsea Irmer
Title: Synthesis of Pyrazole Containing Aromatic Heterocycles
Advisor: Dr. Steven Farmer
Abstract: It was discovered long ago that 2-methylaniline formed indazole in very low yield when diazotized in acetic acid. The unexpected conversion of isoquinoline into pyrazoloisoquinoline suggests that this method could be more versatile than previously thought. The present project explores the scope of this reaction. As part of this project we will be synthesizing a wide variety of aromatic compounds which contain the pyrazole ring structure. In addition, a computation chemistry study will be preformed to better understand this reaction. This will allow future researchers to determine if this reaction will work in their system of interest.

Poster #63

Name: Wayde Jaskela
Title: Infrared Detection in Biological Tissue
Advisor: Dr. Jeremy Qualls
Abstract: Current methods used to monitor and guide the Insertion of cathe ters under the skin are very expensive. The purpose of this project is to create an inexpensive device to accurately resolve the location of a foreign object within close proximity of the surface of the skin. Based on the optical transparency properties of human tissue, an array of near-infrared light emitters at select wavelengths has been constructed. This array coupled with a detector creates the basis for a cheap detector. Results show that the device can detect intrusions and has potential for multiple applications.

Poster #64

Name: Bethany Johnson, Amy Hammer, Alexandria Williams
Title: Math in the Bath
Advisor: Dr. Martha Shott
Abstract: Consider a person who fills a bathtub with water of a certain temperature. After a time, the bath water cools and is no longer comfortable for bathing. To remedy this, one might turn on the faucet to begin replenishing the hot water, allowing for more time to relax and cleanse. Our team has developed a mathematical model that demonstrates this process of bathing. In essence, we propose two methods to recover the initial temperature after the bath has cooled. For those who enjoy a short bath, we suggest using very hot water at a high rate for a short time before reducing the flow and setting the temperature to the desired degree. If a longer bath is more suitable, then it is sufficient to run the water at its highest temperature at a low flow for a bath that is longer in duration. Our analysis measures the efficiency of these methods by comparing the volume of water lost, and also considers any change affected by adding bubble bath.
Name: Nicole Karres
Title: The diet and foraging behaviors of an assemblage of Western Pond Turtles (Actinemys marmorata) living in two Northern California urban streams
Advisor: Nick Geist
Abstract: For three-years, we studied the diet of an assemblage of Western Pond Turtle (Actinemys marmorata) that foraged in two urban streams in Santa Rosa, California. The primary prey of these turtles was a non-native crayfish, Procambarus clarkii (Red Swamp crayfish) that was 70.91% of their diet. Furthermore, there was no statistical significance between the diet of these turtles based on gender, size, or age classification. They did supplement their diet with Anisoptera (dragonfly) naiads and a native fish Gasterosteus aculeatus (3-spined Stickleback), and Cecidomyiidae larvae. The turtles found the larvae of Cecidomyiidae in galls that they sought out and ate hanging from grasses found on the nearby marshy terrestrial landscape. In addition, our observations indicate the turtles of this assemblage of A. marmorata are primarily carnivores that incidentally ingest the habitat of prey such as sediment, vegetation, and filamentous algae. In addition, we found that conventional stream maintenance modifications removed prey habitat forcing them to abandon one stream in order to find food. Furthermore, they are likely to abandon the remaining stream they are in and become locally extinct. Nevertheless, this does not need to happen elsewhere should the agency make a choice to use adaptive practices.

Name: Kristine Kohlmann, Lee Reinertson Jamie Lawson, Kristine Kohlmann
Title: Factors influencing a parent’s decision to withhold life-sustaining treatment for their terminally ill child
Advisor: Katharine Ratliff
Abstract: When children are diagnosed with a terminal illness, it is up to the parents to choose a full code status, or to make the difficult decision of withholding life-sustaining treatment. The parent’s choose what they think is best for their child. Though each choice varies based on unique circumstances, there are significant trends in what parents consider to be the most important factors in making this decision. Our research showed that the most important factors that influenced a parent’s decision to withhold life sustaining treatment was the child’s quality of life. We researched the factors that influence a parent’s decision, and came up with some recommendations to use as a guide for parents in the future.

Name: Molly Kommer, Carly Gill, Katrina Buhagiar
Title: The Effects of Caffeine Intake on Free Throw Accuracy Before and After Exhaustive Intermittent Exercise
Advisor: Bulent Sokmen
Abstract: Caffeine is becoming a widely used performance-enhancing drug in the world of amateur and professional athletics. This study investigated the effects of three differing dosages of caffeine on free throw shooting percentages in basketball, before and after exercise. A psychological stress, a recording of loud game-like noises, was added during the free throw attempts to mimic a game-like situation. Twelve female collegiate basketball players, ages 20 years old to 22 years old, ingested 0 mg/kg/BW, 1.5 mg/kg/BW, and 3 mg/kg/BW of
B-cell activating factor, BAFF, is a member of the TNF ligand superfamily. TNF, tumor necrosis factor is a multifunctional cytokine with a wide range of functions, one being inducing necrosis, death, of tumor cells. It has been shown that upon binding to BAFF-R, transmembrane activator and calcium modulator and cyclophilin ligand interactor (TACI), the ligand-receptor interaction plays a role in the maturation of B and T-cells. The interaction also increases cell proliferation of normal, along with malignant B-cells. This results in an increase of cancer cells over normal cells. Overexpression of BAFF bound to BAFF-R has been identified in Non Hodkin’s Lymphoma, NHL. NHL stems from the lymphocytes, white blood cells or B and T-cells, and spreads throughout tissues. This cancer can be either aggressive, fast growing, or non-aggressive, slow. RNA interference among the BAFF - BAFF-R interaction lowers the expression of these genes. This idea leads to the hypothesis that aptamers have therapeutic capabilities. An aptamer is a single stranded DNA or RNA that can bind to select target areas with high specificity. Binding of the BAFF-R aptamer to the BAFF-R protein blocks and limits the binding of the BAFF protein to the receptor. This hinders and slows the productions of the malignant cells. Since the malignant cell growth is usually much faster than normal B-cells, this approach allows normal B-cells to catch up and aide in preventing these malignant cells from taking over.

By synthesizing, and purifying the RNA aptamer, DMS modifications can be performed. These chemical modifications will lead to determination of the specific nucleotides interacting on the RNA with the BAFF-receptor protein. Further structural analysis and determination via protein mutation, etc. can ensure.
acting as tell-tale signs of environmental distress. The semi-permeable skin of salamanders allows for small scale environmental issues to be addressed before the problems become large scale and irreversible which we plan to test the water quality at two sites. Due to the prior knowledge about the semi-permeability of their skin, we plan on testing the ability of the water to withstand the change of pH in the water within the surrounding area between Fairfield Osborn Preserve and Sugarloaf determine the ideal living conditions for the salamanders. Variables such as Alkalinity, Ph, humidity, and canopy cover will be logged to gather data about which environmental factors correlate to a higher average salamander population, therefore, indicating the health of the environment. We will split into three areas along the creek, one person upstream, two people staggered downstream from the first position and use Ph strips to determine some of the water quality within the area, a canopy cover tester to determine the coverage above the environment, and a humidity tester to determine the average temperature of the surroundings and actively looking for salamanders for 25 minutes along the creek. The underlying reason for conducting this research is to compare two “identical” sites and determine the ideal habitats for salamanders to strive so their populations can be stabilized and increased due to their importance as an indicator species.

**Poster #72**

**Name:** Liridona Leti  
**Title:** Quantification of Volatile Organic Compounds (VOCs) in grass  
**Advisor:** Dr. Mark Perri  
**Abstract:** VOCs contribute to ground-level ozone production, a pollutant that can cause respiratory ailments such as lung inflammation in addition to contributing to global warming. Solid phase microextraction (SPME) coupled with gas chromatography-mass spectrometry (GC-MS) will be used to extract and analyze the VOCs ((E) 2-hexenyl acetate, (Z) 2-hexen-1-ol, (Z) 3-hexenyl acetate and (Z) 3-hexen-1-ol) emitted from grass. We seek to quantitate these compounds’ release by cut and uncut grass in order to better understand their human health and environmental impacts.

**Poster #73**

**Name:** Chantelle Leveille, Marylynn Lewiston  
**Title:** Purification and Characterization of Tyrosinase from Agaricus bisporus  
**Advisor:** Dr. Monica Lares  
**Abstract:** The copper-containing oxidase tyrosinase was isolated and purified from the common Bella mushroom, Agaricus Bisporus. Tyrosinase catalyzes the hydroxylation of tyrosine to L-DOPA as well as the oxidation of L-DOPA to dopaquinone. Both reactions are necessary steps in the melanin synthetic pathway. Melanin is the molecule responsible for pigmentation in the human skin and browning in plants. Isolation and purification was achieved by phosphate buffer extraction, ammonium sulfate precipitation, and dialysis followed by DEAE-column chromatography. Dopachrome formation, a cyclized red product of tyrosinase, was analyzed spectrophotometrically at 475 nm to assess enzyme activity. Protein concentration was calculated through the use of a bovine serum albumin standard to preform a Bradford Assay and enzyme purification was verified with an SDS-PAGE gel.
Name: Kaysie Lewis, Nichole Berry, Penelope Wilson
Title: *Lemur Enrichment at the Oakland Zoo*
Advisor: Karin Jaffe
Abstract: Enrichment promotes natural behavior and greater activity levels in captive animals. It allows them to interact with the environment like they would if they were in their natural habitat. Enrichment devices are also hypothesized to increase the amount of time zoo guests observe animals because of their increased activity levels. The purpose of this project was to examine whether environmental enrichment encourages ring-tailed lemurs (Lemur catta) to be more active and whether changes in lemur activity affects the length of time zoo visitors observed them. Enrichment devices were specifically designed and built to dispense food without human intervention. To examine changes in lemur activity, we recorded their behavior every thirty minutes, in what we called “lemur scans”. We examined zoo visitor interest by recording “visitor stay time” at the exhibit in number of seconds. Our poster will compare lemur activity and visitor stay times in the presence and absence of the enrichment devices to examine the effects of enrichment on the lemurs and zoo visitors.

Name: Casey Lewiston
Title: *S4*
Advisor: Dr. Lynn Cominsky
Abstract: Small Satellites for Secondary Students (S4) was a program designed to teach high school students about engineering, electronics and scientific experiments through the use of rocket delivered payloads. Work consisted of logistically supporting this program, especially during the flight competition last summer.

Name: Melissa Makita, Chikai Cheng, Melissa Makita
Title: *Synthesis and Characterization of Chelating Properties of a Macroyclic Trishydroxamate Ligand*
Advisor: Dr. John Fukuto, Dr. Steve Farmer
Abstract: Iron is an essential component of cell growth due to its involvement in DNA synthesis and cell proliferation. Siderophores, iron specific chelating agents, are an important component of biological systems due to their ability to uptake iron (III) from the environment into microbial cells. In order to replicate the chelating properties of a naturally occurring siderophore, ferrichrome, a synthetic trishydroxamate ligand is synthesized to examine its binding affinity with iron. The synthesis of this trishydroxamate ligand can be summarized in three steps: 1) the preparation of N-methyl-O-benzylhydroxylamine by the methylation of O-benzyl hydroxyl amine 2) the preparation of an O-protected hydroxamic acid by N-acylation of the corresponding hydroxylamine, and 3) coupling the nitrogen atoms from [12]ane with the acetyl α carbon of the O-protected hydroxamic acid. This is followed by O-deprotection, resulting in the ligand H3L. The methylation process has successfully been completed, as indicated by 1H-NMR characterization. Currently, efforts to fully synthesize the trishydroxamate ligand are still in process. Future work to examine the synthetic siderophore’s binding affinity with iron includes potentiometric titration, 1H-NMR, and UV-vis analysis.
Name: Melissa Makita, Adrian Alvarado
Title: Measurements and Modeling of Sonoma County Air Quality
Advisor: Mark Perri
Abstract: We examine the influences of events around us on our local air quality. We are working on combining measurements of ozone and aerosol optical thickness, laboratory analysis of natural volatile organic compound emissions, and computer simulations to construct an overall view of the county’s air quality. This poster will present recent results to show how Sonoma County’s air quality has been influenced in the past by forest fires, and how it may be influenced in the future by the SMART train.

Name: Daniel Martin, Paige Paquette
Title: Constructing A Geological Squeezebox to Model Fault Asperity Kinematics
Advisor: Matty Mookergee
Abstract: Constructing A Geological Squeezebox to Model Fault Asperity Kinematics

PAQUETTE, Paige, MARTIN, Daniel, and MOOKERGEE, Matty, Geology Department, Sonoma State University, 1801 East Cotati Avenue, Rohnert Park, California, 94928 madaniel@sonoma.edu

A squeeze box is simply an apparatus that applies compression to material along one end of the container. The problem with the more traditional squeeze box experiments is that they neglect to quantify the small-scale, three-dimensional flow of the material. Using a modified squeezebox, and a viscoplastic analog material composed of fused wax beads, we are attempt to yield quantifiable data with respect to the flow of material as it encounters a deep fault asperity. The squeeze box has been modified to utilize a stepper motor, programmable driver unit, heating elements and an aluminum asperity attached to the bottom of the box. At the end of an experiment, the cooled wax is sectioned in order to perform strain analysis on the deformed wax beads.

Name: Meghan McCurry, Christine Yang
Title: Purification of Superoxide Dismutase (SOD) from Garlic
Advisor: Dr. Lares
Abstract: Superoxide dismutase (SOD) catalyzes the dismutation of the superoxide anion (O2-) into hydrogen peroxide and molecular oxygen. It is one of the most important metalloenzymes in the first line of defense against oxidative stress. Several studies have indicated that SOD plays a central role in protection from radiation damage, cancer, cardiovascular diseases, autoimmune disorders, and inflammatory diseases. SOD was isolated and purified from garlic (Allium sativum). The stepwise isolation and purification procedure consisted of a phosphate buffer extraction, acetone precipitation, and ion exchange chromatography using a DEAE column. Each purification step resulted in a loss of total protein but an overall increase in specific enzymatic activity.
Poster # 81

Name: Sarah Memmer, Kyle Goshia
Title: *Smart Table*
Advisor: Dr. Saeid Rahimi
Abstract: The Smart Table is an outdoor solar powered charging station featuring a sensor network. This Smart Table has been designed and built to meet the specific needs of the Sonoma State University community. It provides a place for four to six people to gather and charge their devices. The solar panel provides comforting shade and the table is wide enough to allow students to sit with their laptops and school supplies. This project provides the client with a sensor network that shows how the environment can affect power production of an off-grid system. The environmental parameters being monitored are ambient temperature, light intensity and barometric pressure. The sensor network monitors and pushes data to a website. While this specific charge station has been built for the needs of Sonoma State University, the sensor network can be placed on other off-grid power systems in varying environmental conditions. The design of this prototype can also be tailored and sized to fit the needs of other organizations such as National Parks, Universities, corporations, public use areas and even for the use in developing countries. This initial prototype solves the issue of limited battery life for portable devices such as cell phones, tablets and laptops. Smart Table serves as a picnic table, a charge station, a power production monitoring system and a weather station. It is user friendly, educational and promotes renewable energy.

Poster # 82

Name: Lauren Meneghetti
Title: *Transcriptional changes in elephant seal adipose tissue in response to stress*
Advisor: Dr. Daniel Crocker
Abstract: Stress activates the hypothalamic-pituitary-adrenal (HPA) axis, inducing a hormone cascade with many physiological effects. In response to stress, the anterior pituitary releases adrenocorticotropic hormone (ACTH), stimulating cortisol release from the adrenal cortex, which in turn influences gene expression in target tissues. As an alternative to measuring baseline cortisol levels, downstream effectors of the stress response can be identified using an ACTH challenge. We used ACTH injection to induce an acute stress response in northern elephant seals (Mirounga angustirostris) and measured subsequent changes in the blubber transcriptome to identify molecular markers of acute stress in free-ranging marine mammals. ACTH challenge induced significant increase in endogenous cortisol and changes in adipose tissue gene expression as measured by RNAseq and confirmed by qPCR, with high correlation between the two approaches. Genes upregulated during acute response to ACTH included those involved in adipose differentiation and catabolism, while genes associated with cell growth were downregulated. The transcriptional response to ACTH was specific and rapidly terminated by negative feedback. The markers that we developed can be used as molecular tools in further studies of stress and fasting metabolism in marine mammals.
Name: Emily Murakami  
Title: *Getting to Know Native Fauna: Head-Starting the Western Pond Turtle, Emys marmorata, for Success*  
Advisor: Dr. Nicholas Geist  
Abstract: The Western Pond Turtle (WPT), Emys marmorata, is the only freshwater turtle native to California and is the focus of an on-going conservation effort that includes a captive rearing (head-starting) program to help bolster declining wild population numbers. These conservation and head-starting efforts provide an opportunity to investigate poorly understood aspects of WPT physiology and behavioral ecology that can help improve current head-starting practices and, since WPT are an indicator species in freshwater ecosystems, the potential effects of global climate change on the environments they live in. Through my research, I will be comparing the environmental effects on Temperature Dependent Sex Determination (TSD) and Personality in two populations of WPT that evolved under different microclimatic regimes. I anticipate being able to both elucidate the question of changing environments on the long-term success of WPT populations, as well as begin to understand the role personality plays in WPT development, population ecology, and success.

Name: Emily Nazareno, Mahala Kuehne  
Title: *Mussel Performance Under Immersion Thermal Stress*  
Advisor: Mackenzie Zippay PhD  
Abstract: Thermal stress is a dominant physical stressor in the intertidal and is often considered one of the main factors that can lead to vertical distribution patterns among marine species. To understand the physiological response of marine organisms to abiotic stress, cardiac activity was measured with an invasive subtidal mussel, *Mytilus galloprovincialis*. The heart rate of the submerged mussels was measured by gluing infrared sensors to the mussels’ shell above the heart and recording beats per minute every hour. There was an overall positive trend in heart rate, such that cardiac output increased with increasing seawater temperature.

Name: Anne Nelson  
Title: *Photo-activation of an [FeFe] Hydrodgenase Model Complex*  
Advisor: Carmen Works  
Abstract: The [FeFe]-hydrogenase enzyme catalyzes the reversible oxidation of molecular hydrogen: H₂<->2H⁺ + 2e⁻. Structural and functional models are showing great promise as iron-based catalysts. These models offer an attractive replacement for platinum analogs, which are the basis of current hydrogen fuel cells. Our research investigates the wavelength dependent role of light which is required to drive the hydrogen evolution reaction in [FeFe]-hydrogenase models. Additionally, solvent effects are examined. It is hypothesized that wavelength dependent photolysis of (μ-pdt)[Fe(CO)₂(PMe₃)]₂ in the presence of H₂ will remove a CO ligand. The aforementioned complex is photolyzed and the resulting photo-chemical and thermal changes are monitored spectroscopically. Exploring properties of the possible photoproducts will help us elucidate a mechanism of hydrogen activation in these enzyme mimetic systems.
Name: Jennifer Nunn, Jarrett Baglietto, Blake Sacks
Title: SOMO solar.mobile
Advisor: Saeid Rahimi
Abstract: The purpose of this project is to create a Smart Mobile Solar Generator. The SOMO mobile solar generator is intended to replace noisy, fossil fuel based gas generators with a high output, quiet, renewable energy generator. Under normal operating condition one device such as this could save 360 gallons of gas annually and remove the necessity to constantly refill fuel tanks further saving fuel from transportation costs of delivering fuel. With our Solar Generator Control System we use sensor input data from; a rain sensor, a temperature sensor, a light sensor, a voltage measurement and current measurement. This allows the device to self deploy and retract depending on the weather conditions or time of day. The control system also uploads the recorded data to an on-board HTTP server made accessible via wireless connection on a LAN.

Name: Rosita Ordoñez
Title: Fabrication and Characterization of Highly Ordered Titanium Dioxide Nanotubes
Advisor: Dr. Hongtao Shi
Abstract: Titanium dioxide (titania) nanotubes have drawn much attention in the past decade due to the fact that titania is an extremely versatile material with many technological applications in photo catalysis, photovoltaics, gas sensing, and optical coatings. Electrochemical anodization of titanium (Ti) metal in different electrolytes has proved to be a successful and straightforward approach to fabricating these nanotubes, however, their degree of order can still be improved. In this research, a two-step anodization method was used to create highly ordered titania nanotube arrays. A Ti substrate was anodized in an electrolytic solution of HF and NaH2PO4 at 20 V for two hours to grow the initial disordered layer of titania nanotubes. This initial layer was then removed by etching with hot, concentrated sulfuric acid. A second anodization with the same electrochemical parameters as the first was then done to fabricate the highly ordered titania nanotube arrays. The morphology of the anodized titanium sample was measured using a scanning electron microscope (SEM) in the Keck lab, and the elemental presence of a titania film was determined using the energy-dispersive X-ray spectrometer (EDX).

Name: Nicola Peyko
Title: Fabrication and Characterization of Mg and In doped thin films
Advisor: Dr. Hongtao Shi
Abstract: The purpose of this project is to study how the bandgap and electrical conductivity of zinc oxide (ZnO) change as magnesium (Mg) and indium (In) are doped into ZnO thin films as impurities. We used a spin coating method to fabricate samples on pure glass substrates with the basic solution containing diluted zinc acetate and diethanolamine in 2-methoxyethanol (MEA). Samples were then annealed in furnace before we used the facilities in the Keck Microanalysis laboratory to analyze them, such as the scanning electron microscopy (SEM) with energy dispersive x-ray spectroscopy (EDX), UV-Vis spectrometer, and atomic force microscopy (AFM). We found that Mg-doped samples have a blueshifted
bandgap compared to that of pure ZnO, while In-doped samples have a small redshift, depending on the concentration of Mg or In in the samples. We are currently in the process of trying to make transparent conductive oxides for possible solar applications.

**Name:** Kenneth Rauen, Jonah Baumgartner, Jorge Casanova, and Niklas Rowen  
**Title:** Nature Preserve Robot  
**Advisor:** John Sullins  
**Abstract:** Embedded Ethical Design practices have been used to develop a small robot that can be used to monitor the micro environment found high in the tree canopies at SSU’s Fairfield Osborn Preserve. There are many possible remote sensing devices but our design is sensitive to philosophical values such as leaving a small footprint in the preserve, stewarding nature without overt control, and making something that can capture the imagination of visitors to the preserve, especially the many school children that interact with the preserve each year. This project has developed a prototype machine but future work will refine this design and make it more robust with the idea of deploying more in various locations in the preserve. This project was funded by a WATERS and Norwick grant administered by the SSU Preserves.

**Name:** Richard Regello  
**Title:** Growth of Three Creeks: Effects of Environmental Temperature on Life Stage Progression in a Montane Insect  
**Advisor:** Nathan Rank  
**Abstract:** Species living in high elevation environments are especially threatened by climate change, due to the loss of snow cover and a limited range of elevations with appropriate environmental conditions. Montane species may lose their battle against extinction as summer and winter temperatures continue to change. We hope to gain insights into the effects of temperature, elevation, and latitude on the development and summer life cycle of the willow leaf beetle, Chrysomela aeneicollis. We also measured their ability to survive in a variety of habitat types over several years to gain insight on the potential of their populations to persist in nature. Our study organism occurs at high elevations ranges of the Eastern Sierra Nevada mountains were we established fourteen study localities across three major drainages and five sub-drainages. This project extends range observations made since the late 1980s and consistently supplemented to include more of this organisms’ life. Measurements are made using data loggers and population surveys along replicate altitudinal gradients. From this study we found that elevated mean temperature was typically associated with increased beetle developmental rate. Yet surprisingly for part of the temperature range beetle development decreased with increasing minimum temperature. Development rate and population size vary among study localities. These results suggest that this beetle will continue to be affected as climate changes because they will not go extinct but will contract their ranges in certain regions.
Name: Bianca Rose, Anjelica Shubbie

Title: Morphometry & Behavioral Assessment of Head-started Western Pond Turtles

Advisor: Nick Geist

Abstract: Bianca Rose will collect regular (every other week) morphometric measurements on cohorts of hatchling western pond turtles (WPT) at the Oakland and San Francisco zoos. Data will be used to generate growth curves for each individual. In addition, BR will collaborate with Anjelica Shubbie to perform flip tests on each hatchling to assess phenotypic performance. Flip tests will be performed alternate weeks under 2 conditions: 1) no prior handling, and 2) after morphometric data has been obtained to assess the effect of handling on performance.

Name: Gabriel Sacher

Title: Pilot testing of a microbial fuel cell-based system for treating winery wastewater

Advisor: Dr. Cohen

Abstract: Wastewater treatment can be a major cost for wineries. The most energy-intensive portion of the treatment process is aerating the wastewater to facilitate microbial oxidation of organic compounds. However, some bacteria, instead of consuming oxygen, are able to oxidize organics by delivering electrons to conductive surfaces. Microbial fuel cells (MFCs) harness this flow of electrons to an external cathode, generating an electric current. We are investigating applications of MFC technology as an energy-saving substitute for wastewater aeration. After a period of laboratory tests with small-scale MFCs, in October 2015 we initiated operation of a pilot-scale MFC-based system to treat winery wastewater at Vintners Square, Santa Rosa. The entire system consists of a 150-L anaerobic digestion/pH stabilization tank, a novel 50-L tubular MFC, and a 200-L vertical-upflow wetland for removing residual nitrogen and phosphate from the MFC effluent. Outflow from the system is used to drip-irrigate on-site landscaping. Use of a Results gathered from the testing and optimization of this pilot system will inform the development of full-scale MFC-based systems to treat winery wastewater to a level suitable for irrigation.

Name: Heidi Schindler, Megan Stock, Anthony Tercero, Andrew Winston, Jessica Torres, Ellen Gallanty, August Stadtfield, Teija Isotalo

Title: Mountain Lake—a Progress Report: Invertebrate Diversity in a Restored Urban Lake

Advisor: Nick Geist

Abstract: We collected and analyzed benthic macroinvertebrates (BMI) from 2 aquatic ecosystems, the recently restored Mountain Lake (MTL) in the Presidio of San Francisco, and Turtle Pond (TP) in the Fairfield Osborn Preserve (FOP). These surveys will provide valuable data of the abundance and diversity of BMI in the lake post-restoration, as well as a basis for comparison with a set of earlier samples from 2014 and 2015. Samples are likely to reflect the condition of the ecosystem, as well as provide data on the relative abundance and quality of prey items for several of the reintroduced vertebrate species in the lake (e.g., 3-spined sticklebacks, western pond turtles). Samples from the relatively pristine TP will be used to compare diversity and relative abundance.
**Name:** Kathryn Schwan, Christina Collins  
**Title:** *Do Mussels Like it Hot?: Examining Heart Rate in a Changing Climate*  
**Advisor:** Mackenzie Zippay  
**Abstract:**  
Do Mussels like it Hot?: Examining Heart Rate in a Changing Climate  
Christina L. Collins, Kathryn D. Schwan and Mackenzie L. Zippay  

Increase in global temperature can cause an organism to physiological respond differently that may compromise their ability to tolerate temperature variation. Further, a marine organism may be forced to adapt to a new thermal maximum based on the rise in temperature. Measuring cardiac output of these organisms is crucial to understanding the way they cope with the consequences of a changing environment. Using the invasive, subtidal blue mussel, *Mytilus galloprovincialis*, cardiac performance was measured to find their response to an increase in aerial temperature at a rate of 4°C per hour. Infrared sensors were attached to mussels and heart rate was recorded every hour. Results indicated that heart rate was highest when exposed to ecologically relevant temperatures (12-16°C), and lowest when temperatures were suboptimal.

**Name:** Garrett Shipway, Kerry Wininger  
**Title:** *Sudden Oak Death Lesion Culturing*  
**Advisor:** Nathan Rank  
**Abstract:**  
Phytophthora ramorum is a plant pathogen that kills ecologically critical forest tree species, especially Coast Live Oak (*Quercus agrifolia*), a keystone species in California oak woodlands. California bay laurel (*Umbellularia californica*) is a foliar host for *P. ramorum*, which is not killed by the pathogen but acts as a vector transferring it to oaks. We identify *P. ramorum* symptoms on bay laurel based on observable lesions on leaves. We noticed that small scale insects (*Aspidiotus nerii*) often occur clumped directly on the underside of bay laurel leaves. In preliminary findings, we found that trees that harbor more symptoms of *P. ramorum* tend to show lower abundance of scale insects in nature. Yet insects may also carry the disease from one bay laurel host tree to another and play a role in establishment of new *P. ramorum* infections. We will test this hypothesis by collecting leaves with scale insect lesions from trees that had many *P. ramorum* symptoms and comparing them to leaves with scales from trees that had few *P. ramorum* symptoms. We will culture these leaves in a selective medium to see if *P. ramorum* was present. If we can culture the pathogen from lesions with insects, then this suggests that insects facilitate transmission of the pathogen. If culture success does not depend on insect presence, we will conclude that insects do not play a major role in transmission. It is possible that maintaining healthy natural populations of insects reduces prevalence of the disease because trees mobilize their natural defense response; conversely insects may promote spread of the pathogen if *P. ramorum* uses insects to disperse to new hosts. Our research should help us distinguish between these possibilities.
**Poster #98**

**Name:** Nicholas Shively  
**Title:** Processing EEG Signals: Understanding Brainwaves with Machine Learning  
**Advisor:** Dr. Ravikumar, Dr. Gill  
**Abstract:** This project will use machine learning techniques in order to understand and use EEG (electroencephalography) data. However, there is still much uncertainty on whether or not EEG data can be used alone meaningfully. Generally features of EEG are paired with other data, such as muscle movement, in order to produce meaningful results. This project will use machine learning techniques in conjunction with EEG data to control a robotic hand in real time.

**Poster #99**

**Name:** Adrian Smith  
**Title:** Computational Classification Techniques for Neuroimaging  
**Advisor:** Gurman Gill  
**Abstract:** The field of functional neuroimaging is rapidly growing, and has far reaching implications on the futures of a wide variety of scientific fields. In our research we develop strategies that apply computational techniques to draw conclusions from data produced using functional magnetic resonance imaging (fMRI). The goal is to create a generalizable methodology based on machine learning techniques with which to analyze these complex data sets.

**Poster #100**

**Name:** Betsy Smith, Kaitlyn Fleming, Owen Anfinson  
**Title:** Refining the Paleozoic Geologic History of the Yreka Terrane, Eastern Klamath Mountains, CA  
**Advisor:** Owen Anfinson  
**Abstract:** The geologic history of the Yreka Terrane of eastern Klamath Mountains of northern California is poorly constrained. Based on what is understood about the geology of the Eastern Klamaths, we are certain that this large fragment of land (~2500 sq. mi.) is not from North America. The region is what is known as an exotic terrane. The geologic evidence suggests that this continental fragment was once part of either Australia or Baltica (Europe). Although we have some understanding of when the terrane was accreted (attached) to North America, we have very little understand of how it got there. The region was heavily investigated in the late 1900’s due to its potential for gold and mineral resources, however recently it has received less attention. Mapping and petrographic analysis of rocks from the Yreka Terrane of the Eastern Klamath mountains provide constraints on its geologic history. These analyses provide a framework for future geochronologic (age dating of geological material) studies that will allow us to investigate this terrane is more detail than ever before.
Poster # 101

Name: Betsy Smith, Julie Freeman, Phil Mooney
Title: Topographic Interactive Model: Augmented Reality Sandbox
Advisor: Phil Mooney
Abstract: The augmented reality sandbox is a hands on, interactive model of earth processes. "TIM" demonstrates topography and how it shapes our landforms. This is a learning tool to teach students of all ages, rules of topographic maps, hydrologic cycles, volcanic and glacial activity and many more natural earth processes. Using a Microsoft Kinect and a basic projector, topography line, snow, water, and lava can be projected onto a 3D surface and manipulated in real time.

Poster # 102

Name: Betsy Smith
Title: Spatial & Temporal Variability of Winter Accumulation on Taku Glacier, Southeast Alaska between 2012 & 2015
Advisor: Matt James
Abstract: Glacier mass balance is an integral part of understanding a glacier’s health and dynamics. A key component of determining mass balance is winter accumulation which is traditionally estimated by digging and measuring snow densities from within snow pits. However, this method represents a labor-intensive point measurement which may not fully capture spatial variability of accumulation. To more efficiently estimate spatial variability of winter accumulation across Taku Glacier and its main tributaries in southeastern Alaska in 2015, we used 400 MHz Ground Penetrating Radar (GPR) Common Offset (CO) surveys along center-line transects which were also collected during a 2012 study. We used common midpoint (CMP) surveys, migration, snow pits, and probing to improve depth estimates and provide ground truth of winter accumulation depth measurements from CO surveys. We determined that the winter accumulation was significantly lower in 2015 than in 2012. However, gradients in accumulation versus elevation were consistent from year to year along center-line transects. We suggest that this low accumulation may be influencing the recent two year stall of Taku Glacier which has exhibited an advancing terminus for nearly a century. We recommend that further studies be conducted to extend the reach of this dataset beyond 2 years. This data would be invaluable to future models and mass balance studies on the Icefield and may capture key components that suggest a tipping point from advance to retreat of Taku Glacier.

Poster # 103

Name: Matt Smith
Title: Efficient Implementation of Machine Code Interpreters for Software Emulation
Advisor: Suzanne Rivoire
Abstract: The purpose of this project is to compare various programming techniques for efficient implementation of an interpreted virtual MIPS processor in C++11. It uses low-level compiler tricks, such as GCC’s Labels as Values extension and aggressive code inlining, to reduce the ratio of native instructions to virtual instructions and achieve high performance. The project may be useful in the future for computer architecture instruction and for testing embedded software for MIPS-compliant hardware.
**Poster #104**

**Name:** Carly Smith, Paige Abrams, Shauna Fassino, Megan Hofer  
**Title:** *Pain Management in Pediatric Palliative Care*  
**Advisor:** Katharine Ratliff  
**Abstract:** The purpose of this evidence-based practice brief is to investigate how pediatric palliative care influences pain management in children with terminal illnesses. The research question for this brief was: In children with terminal illnesses, how does the implementation of pediatric palliative care affect pain management from the perspective of the patient and the family compared to a non-palliative approach? In order to conduct this research we acquired our articles through searching the CINAHL and PubMed databases. We gathered articles from peer reviewed medical journals such as The New England Journal of Medicine, the Journal of Pain and Symptom Management, and the American Journal of Hospice & Palliative Medicine. Our research found that pediatric palliative care focuses on providing relief from the symptoms, pain, and stress of a serious illness. Combined with Haley’s Integrative Harmony Model, palliative care is the link between balancing extreme stress and personal strengths. By using the integrated model of palliative care and curative care, pediatric patients will receive better overall treatment, as well as improved pain management when dealing with symptoms of chronic or terminal illnesses. To conclude this research, we found that pediatric palliative care improves the lives of pediatric patients’ their families, and should be better implemented among all aspects of health care. Some recommendations for this are: better education of parents about medications and end-of-life processes, implementation of Haley’s Transcultural Assessment Guide for Parent Caregivers, use the integrating palliative and curative care together, and offering pediatric palliative care during the initial diagnosis of a serious illness.

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**Poster #105**

**Name:** Michelle Soule, Kimberly Descalso, Bailey Cullimore  
**Title:** *Toxic Effects of a Polycyclic Aromatic Hydrocarbon on Zebrafish Development*  
**Advisor:** Murali Pillai  
**Abstract:** Polycyclic aromatic hydrocarbons (PAH) are a group of ubiquitous environmental toxins released from a variety of natural and anthropogenic sources such as tobacco products, oil spills, and incomplete burning of fossil fuels. Phenanthrene, a three-ringed PAH, has been reported to cause numerous teratogenic effects in a number of developing organisms, including zebrafish (Danio rerio). Prior research suggests that phenanthrene leads to abnormal development via disruption of the wnt/β-catenin signaling pathway. This evolutionarily conserved pathway regulates developmental processes, including somitogenesis in vertebrate systems. Zebrafish, a model organism for developmental toxicology, develop 30 somite pairs in a chevron pattern, flanking the notochord. In the present study, we examined the dose-dependent and stage-specific effects of phenanthrene on zebrafish somitogenesis by describing the severity of scoliosis and total number of somite pairs formed.
Name: Alex Staidle
Title: *Isolation of a Novel Chromate Reductase from Pseudomonas Veronii*
Advisor: Dr. Works
Abstract: According to the WHO, Cr(VI) found in the environment is almost entirely due to human activity, largely from industrial chrome plating. Chromium-VI is a mutagen and has a broad toxicity affecting much of the organ system. A Cr(VI) is highly soluble in water, and can be absorbed through the intestinal mucosa, efforts to remove this contaminant from ground water have received a great deal of attention. However, it has proved difficult to remove from the environment. There is hope that bioremediation could be the answer to convert Cr(VI) to the less soluble and less toxic Cr(III). Chromate reductases (ChrR) enzymatically reduce Cr(VI) or Cr(V) species to Cr(III). Enzymes with chromate reducing activity have been found in several species of bacteria within the Escherichia, Pseudomonas, and Shigella genus, just to name a few. Bacteria found growing in the chromium waste in the lab displayed chrR activity and was suitable for growth in suspension and media. This bacteria was previously determined to be Pseudomonas veronii, a species in which no chrR was previously reported. I propose to isolate this novel enzyme responsible for the chromate reductase activity for characterization and comparison to other ChrR isozymes.

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Name: Caitlin Thornton, Maritza Perez, Judy Barcelon
Title: *The effects of dietary habits, exercise habits, and body composition on antioxidant measures of healthy high school male and female students*
Advisor: Dr. Bulent Sokmen
Abstract: This research study investigated the relationship between gender, body composition, diet and physical activity on antioxidant levels of Piner High School students.

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Name: Heather Timmons, Michael Huang, Brian Lavin
Title: *Examining Nuclear DNA in the California Giant Salamander (Dicamptodon ensatus)*
Advisor: Dr. Girman
Abstract: We examined nineteen specimens of the California Giant Salamander (Dicamptodon ensatus) with EC16C7 (Williams et al, 2013), a anonymous nuclear marker, from three different mitochondrial DNA populations in order to determine if previous work done with mtDNA is supported with the nuclear DNA locus that we examined. We found that the nuclear marker did in fact support the three mitochondrial DNA populations from the three regions: Mount Tamalpais in Marin County, Sonoma County, as well as a region in the South Bay.
Name: Shaanti Trikha
Title: Competitive Protein Attachment onto Nanodiamonds
Advisor: Dr. Su
Abstract: Nanodiamonds (ND) are small diamonds that range anywhere from 4-30nm, with all the same characteristics as visible natural diamonds. They have strong covalent bonds, and with impurities in the lattices can create fluorescence (ref 1). Their dense structure makes it ideal for packing and distributing cargo. I am interested in characterizing the protein-protein and protein-surface interactions between BSA (Bovine Serum Albumin) and (Equus caballus) Myoglobin’s’ static attachment onto charged Nanodiamonds in altering pH environments. By using ultraviolet-visible spectrophotometry and MALDI-TOF. First, I would like to recreate previous work by attaching one protein onto a charged nanodiamond surface in an altering pH. Measuring the surface adsorption constant in pH’s ranging from 5.5-7.5, by creating an isotherm graph. My goal is to characterize the adsorption of multiple proteins attachment onto Nanodiamonds at varying ranges of concentration.

Name: Dipali Vasadia
Title: Cold Fish in Hot Water: MicroRNA Regulation of the Heat Shock Response in Trematomus bernacchii
Advisor: Sean Place
Abstract: The Notothenioids are a diverse suborder of Antarctic fish that possess a unique array of evolutionary adaptations to subzero sea waters. These fish provide a valuable opportunity to study genetic mechanisms that contribute to loss of function or gain of function phenotypes that arise from extreme stenothermy. One such phenotypic adaptation is found in the Antarctic notothenoid, Trematomus bernacchii that lack the ability to mount a heat shock response to temperature or other cellular stress. The heat shock response is an important and ubiquitous cellular process that involves transient expression of molecular chaperones called heat shock proteins (HSPs). HSPs are normally upregulated to restore the functions of damaged proteins denatured by cellular stressors. This study will examine the mechanistic role of microRNAs in the HSR of T. bernacchii. MicroRNAs (miRNAs) are short (~22 nucleotides), conserved, non-coding, RNA molecules that control gene expression in a sequence specific manner. Canonically, miRNAs silence gene expression by binding to their target mRNAs and suppress translation or initiate transcript degradation. Thus, these tiny molecules are intricately involved in regulating many cellular processes that involve animal development and growth, signal transduction, and disease. Ultimately, this study will provide insight on the possible disruption of the HSR in these fish and generate a clearer picture of the susceptibility of these fish to cope with warmer oceans given their physiological adaptations to sub-zero seawater temperatures.
**Poster #113**

**Name:** Jacqueline Vickerman, Rebecca Hildebrant, Jamie Hanks  
**Title:** *The Effect of Animal-Assisted Therapy on Pain in Pediatric Patients*  
**Advisor:** Katherine Ratliff  
**Abstract:** The purpose of the evidence brief is to answer the question: In pediatric patients, does animal facilitated therapy, or AFT, decrease pain levels, compared to not using AFT? In order to conduct this research, we acquired our articles through CINAHL, PubMed, SAGE, Elsevier databases. Animal facilitated therapy, or AFT, is used in several different ways to help people relax and de-stress. All of the evidence collected suggests that AFT is helpful in reducing pain in pediatric patients. It offers a distraction from the hospitalization and provides the patient with therapeutic touch and comfort in a way other humans cannot. Most of our research findings have shown a decrease in verbalized pain, as well as a decrease in blood pressure, heart rate, and respiratory rate in the patients, all signs of a physiological decrease in pain. The few risks associated with AFT such as allergic reactions and use in immunocompromised patients warrant further research.

**Poster #114**

**Name:** Chad Vink, Zach Thurston  
**Title:** *Visualizing the Flow of Students Through an Academic Program*  
**Advisor:** Dr. Ali Kooshesh  
**Abstract:** Utilizing data visualization from past class registration to enable data mining in order to predict trends in future class registrations.

**Poster #115**

**Name:** Scott Walker  
**Title:** *Towards Fine Grained Power and Performance Signatures of High Performance Computing Workloads*  
**Advisor:** Suzanne Rivoire  
**Abstract:** This poster will cover the use of three recently developed computer science research utilities for gathering power and performance data on Intel based systems. Libmsr provides a simplified interface for collecting the data, while MSR-SAFE and CSR-SAFE expand the operating system to support the rapid collection of model specific register and PCI configuration register data in a secure way respectively. Previous experiments in application power signatures have used node level power meters at 1Hz, but by using these new utilities data can be collected directly from the processor and DRAM at 1KHz or faster. The poster concludes with the results and analysis of power and performance data collected with the three utilities for select NAS parallel benchmarks.

**Poster #116**

**Name:** Tyler Weiss, Tyler Spott  
**Title:** *Mobile Data-Logger*  
**Advisor:** Chris Halle  
**Abstract:** A simpler way to gather and store data wirelessly from a data gathering sensor.
**Poster #117**

**Name:** Emily White  
**Title:** *Heavy mineral analysis of Eocene sediments deposited on the high elevation North American Cordilleran Plateau*  
**Advisor:** Dr. Owen Anfinson  
**Abstract:** The North American Cordilleran hinterland is the product of extensive crustal shortening and rock uplift followed by extension and orogen collapse. During the Paleogene, a high elevation plateau approximately 3-3.5 km was situated between the Sevier thrust front and the magmatic arc. In northeastern Nevada, hinterland rivers draining the eastern side of the Eocene paleodrainage divide fed a large, deep lake basin on this plateau for ~10 million years. To the west of this drainage divide, rivers created deeply incised paleovalleys that extended to the Paleogene continental margin. Sediments derived from these rivers provide records of drainage system evolution, rollback-driven volcanism, and exhumation patterns of sediment source terranes.

The primary goal of this study is to use heavy mineral analysis to reconstruct the fluvial drainage network and differentiate between Eocene sediment sources, as well as provide new information on the exhumation and drainage evolution of the North American Cordilleran. This study clarifies uncertainties in existing provenance data from U-Pb geochronology, (U-Th)/He thermochronology, and field counts of clast lithologies.

Heavy minerals were extracted from all nonmagnetic separates denser than 2.8 g/cm³, identified, and counted to compare populations of major and trace minerals. Heavy mineral separation was achieved through acid washing, petrographic and stereomicroscopic identification and grain picking. Unidentifiable grains from each sample were mounted for Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS), and cathodoluminescence (CL). Following grain identification, separates were mounted on glass slides and counted using the ribbon counting method. Point counting has shown changes in fluvial drainage patterns and distinct erosional trends through comparison of igneous and metamorphic minerals eroded from Eocene highlands in the Cordilleran hinterland. Heavy mineral analysis of detrital grain separates differentiates between source regions that have indistinguishable detrital zircon U/Pb age populations and/or thermal histories.

**Poster #118**

**Name:** Kerry Wininger, Tanner Jacobson  
**Title:** *This tree's not big enough for the both of us: Symptoms of Sudden Oak Death on California Bay Laurel are lower when insect herbivores are abundant*  
**Advisor:** Nathan Rank  
**Abstract:** Leaves of California bay laurel (Umbellularia californica) are considered the primary natural source of inoculum for the devastating forest disease sudden oak death (Phytophthora ramorum), and yet this plant & insects associated with its leaves remain understudied. This is unfortunate due to the role herbivorous insects may play in disease transmission and alterations to plant disease susceptibility. There is also a deficit of knowledge on how landscape level variability or the effect of microclimate may influence insect presence, and about systems involving both a plant’s pathogen and insect herbivores. 200 woodland plots within a 275 km² region of Sonoma county have been assessed since 2003 for disease progression. Insect diversity and abundance on leaves of bay have been monitored since April 2014, with species appearing most often from the suborder Sternorrhyncha, which includes aphids,
Name: Emily Wirdzek, Victoria Dwyer, Melinda Takano, Devin Graves, Stephen Simpson
Title: *The Effects of Vibration Exercise on Motor Unit Recruitment, Force, and Rate of Force Development*
Advisor: Bulent Sokmen
Abstract: The purpose of this study is to examine the effects of acute bouts of vibration exercise on participant’s motor recruitment, force, and rate of force development. In particular we will investigate how an explosive plyometric exercise of loaded bilateral squats with or without vibration effect one’s motor unit recruitment, force, and their rate of force development during the loaded counter-movement. We will also take into account the fatigue level of our participants. We will observe the participants performing five repetitions of the loaded counter-movements every five minutes for a total of twenty minutes.

Name: Julie Wittmann
Title: *The Evaluation of Citizen Science Smartphone Technology in Herpetofauna Monitoring*
Advisor: Dr Derek Girman
Abstract: With increasing interest in the impacts of climate change among members of the general public, non-scientists using recent advances in technology can potentially improve the way in which biological observations can readily be documented. New and advancing technologies, especially those involving the use of smartphones by volunteers are tools that could assist with climate change indicator species research and monitoring which are yet to be explored by research scientists and resource managers. The results of the volunteer and citizen science contributions in this research will provide feedback to resource managers to improve knowledge about how to effectively use participants and related technology for amphibian and reptile monitoring. In addition, the results may be useful to determine which herpetofauna species are useful to monitor by citizen scientists using smartphone citizen science technology. iNaturalist, an online nature documentation platform, has been the technology of choice for citizen science efforts documenting biodiversity within the United States. With these tools, data generated by these volunteers can be aggregated such that online photos and written exchanges between researchers, naturalists, and students are shared. This technology functions akin to a “Facebook of Biology” in that these photos, identifications, and comments are shared in a global community of citizen scientists.
Name:  Ryan Yoast  
Title: *Complement Hemolysis Assay Development and Application In Northern Elephant Seals*  
Advisor: Dr. Daniel Crocker  
Abstract: Sexually dimorphic animals alter their physiology and morphology to favor traits that will increase their likelihood of reproductive success. It is known that species who are dimorphic in morphology make physiological trade-offs in order to accommodate their radical morphological changes. Northern elephant seals are an example of a sexually dimorphic species who also live a non-traditional life cycle when compared to other mammals. During stages of this life cycle males will be exposed to combat that can lead to, at times, large open wounds. These wounds must then heal in a high population density beach environment without leading to infection. The complement system is vital to the clearing of infection, and the reason why we chose to evaluate its killing activity in individuals of both differing life stages as well as breed rank. Two questions were posed pertaining to variability in complement killing activity: (i) Does complement killing vary between different breed ranking males, and (ii) Does CH50 vary between life history stages? Our objective was to develop an assay adapted from a human protocol then utilize this assay to obtain CH50 values for 42 serum samples. Upon creation of the assay, the samples were successfully ran, CH50 values were assigned, and the results were statistically analyzed leading to the following conclusions. CH50 did vary between alpha ranked males and peripheral males, but did not vary between alpha and beta ranked males. While no statistical difference in CH50 was observed between life history stages. These results show that one trait of a dominant male may be modulation of their immune system. But the variable CH50 could also be a response to density dependent living conditions as the alpha males generally remain in the middle of a harem while lower ranking males would be more peripherally located. The procedure followed in our research could be applied to other species that undergo combat or live in variable density populations, giving further insight into how mammals modulate their immune systems in response to varying social interactions and living conditions.

Name:  Bo Zhang  
Title: *Microbial influence on the stress response in a leaf beetle*  
Advisor: Nathan Rank  
Abstract: Multicellular organisms are hosts to a wide variety of endosymbiont microorganisms that influence survival and reproduction. These endosymbionts may strongly influence metabolic processes and responses to heat or cold stress. Few studies have examined endosymbiont communities of insects that live in thermally variable environments across a landscape. The leaf beetle *Chrysomela aeneicollis* lives at high elevation (2400-3600 m) in the eastern Sierra Nevada mountains of California. Like other insects, it is presumed to host a variety of endosymbionts, including species in the genus Wolbachia that infect many insects and manipulate host reproductive systems and sex ratios. We analyzed the species composition of endosymbionts of *C. aeneicollis* to determine whether they are influenced by environmental factors such as temperature and elevation. We found that Wolbachia microbes predominate in the microbiome, but that the prevalence of this endosymbiont varies among latitudes and elevations. Other endosymbionts were identified that have been previously
In biomimetic chemistry, being able to design a compound that can mimic the structural aspects and chemical reactivity of biological compounds can lead to a further understanding and perhaps improvement on that biological compound. The focus of this project is the ligand 2,5-Bis[hydroxybis(2-pyridyl)methyl]thiophene (bhpmt), designed to mimic the coordination sphere and catalytic ability of cytochrome P450 enzymes. Bhpmt was synthesized through the lithiation of thiophene which is then followed by the addition of bis(2-pyridyl)ketone. 1H-NMR and UV-Vis spectroscopy confirmed that the desired product had been synthesized. Due to time constraints, we were unable to synthesize the corresponding iron perchlorate complex and therefore could not test its catalytic ability to perform epoxidation of simple olefins.

The Geography 370 Weather and Climate of Fall 2015 mapped out several locations to place a weather station in order to compare microclimate variations along Copeland Creek in Sonoma County, CA. Using climate data already being collected at the Fairfield Osborn Preserve, the Geography Department is working to install an additional weather station on the Sonoma State University campus, to explore the temporal and seasonal variations in local and regional climate and weather at these two locations. This study focuses on temporal and seasonal changes, microclimate variations, and ability to predict meteorological events.

The water quality of the Laguna de Santa Rosa has unhealthy level of sediment, temperature, dissolved oxygen, nitrogen, phosphorus, and mercury. Copeland Creek is a tributary of the Laguna de Santa Rosa that flows through the Sonoma State University campus. This research project evaluates the levels of nitrogen and phosphorus in fine grain sediments deposited along Copeland Creek and the Laguna de Santa Rosa. We sampled sediment deposits starting upstream at the Fairfield Osborn Preserve and as the creek passed vineyards and urban drainage areas. Downstream sampling sites included in the Laguna de Santa Rosa and at a drainage ditch on a dairy farm. We found that as sediment flows from Sonoma...
Mountain down through agricultural, and then urban areas, that the nitrogen and phosphorus levels increased. These results indicate that the creation of sediment settlement basins upstream could limit the amount of nitrogen and phosphorus reaching the Laguna de Santa Rosa.

Name: Lindsay Tally
Title: Politics of C.O.A.A.S.T and Community Involvement
Advisor: John Isom
Abstract: Californians Organized to Acquire Access to State Tidelands, or C.O.A.A.S.T was an organization formed in 1968 that aimed to preserve coastal lands in Northern California. They asked for citizen support and worked to educate others on the dangers of certain developments near coastal areas. C.O.A.A.S.T got citizens involved in the political process, and helped put coastal tidelands access initiatives on the ballot. This included Proposition 20 in 1972, which got huge citizen approval, passed, and allowed California to regulate development in parts of the coastal zone. Projects like dredging in Jenner, the Bodega Head nuclear power plant, and others were declined. If it weren't for C.O.A.A.S.T, many coastal lands we see today would be devastated. The group disbanded in 1993, but their legacy still remains today.

Name: Andrew Hunt, Sheridan Cark
Title: Photochemical Characterization of Thiolate-Bridged Binuclear Ruthenium(I) Hexacarbonyl Complexes
Advisor: Dr. Carmen Works, Dr. Jon Fukuto
Abstract: The dithiolate-bridged complex, ($\mu$-pdt)[Ru2(CO)6], was prepared from refluxing the corresponding metal carbonyl and 1,3 propanedithiol. Photochemical studies were conducted using a handheld mercury lamp at 254nm and 365nm to probe the photochemical reactivity of the compound. Coordinating and non-coordinating solvents, hexane and acetonitrile respectively, were used during the 254nm and 365nm photochemical studies to examine the solvent effects on the photochemistry of the hexacarbonyl species. Infrared and UV-Vis spectroscopy was used to monitor the reactivity of the photolyzed species over time. The UV-Vis and IR data does not indicate that photochemical changes are occurring during photolysis with either 254nm or 365nm light, but we cannot rule out the possibility that if photochemical changes are occurring during photolysis then they must be occurring on a faster timescale than that measurable with our instrumentation.

Name: Michael Romero
Title: Assessing LiDAR Efficiency for Estimating Aboveground Biomass in an Open-Canopy Mixed-Species Forest.
Advisor: Dr. Matthew L. Clark
Abstract: Forests are a globally significant sink for biospheric carbon, given that half of biomass in forests is sequestered carbon. Reliable and cost-effective methods for quantifying carbon storage in forests is becoming increasingly necessary. Our study evaluates the remote sensing application of light detection and ranging (LiDAR) to estimate biomass in open-canopy natural forests of mixed conifer and broadleaf tree species. The study site is Sonoma State University's Fairfield Osborn Preserve. Our study provides a three-tiered evaluation, analyzing both live and dead trees, using varying point densities of LiDAR, and comparing accuracy of two modeling approaches.
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