2015 ABSTRACTS – PALOS VERDES PENINSULA USD SCIENCE & ENGINEERING FAIR

MISSING ABSTRACTS IN RED FONT – WILL BE ADDED AS RECEIVED

BEHAVIORAL & SOCIAL SCIENCES

1.

CHANG, Angela
BEHAVIORAL AND SOCIAL SCIENCES
2015

2.

COOPER, Mary Kate
BEHAVIORAL AND SOCIAL SCIENCES
2015

THE EFFICIENCY OF PROSTHETIC SUSPENSION SYSTEMS

Comparing modern prosthetic devices to beginning prosthetics, below knee (BK) and above knee (AK) amputees today have many options when it comes to choosing a suspension system to hold on their prosthetic legs. I conducted research, in the form of a survey, to see which suspension system; the shuttle lock, vacuum or suction system is the most efficient from both a medical and personal point of view. Survey responses were collected online from December 12, 2014 till February 11, 2015, allowing me to reach out to amputees from all around the United States. While each system has its pros and cons, I learned that medically a suction system is the most popular with prosthetics due to its simplistic nature, ease for fittings and adjustments. Responses form data collection show amputees enjoy the advantage of the vacuum system to provide a consistent and even pressure on the residual limb to best hold the prothetic device on.

3.

EKANAYAKE, Ruwanthi
BEHAVIORAL AND SOCIAL SCIENCES
2015

Effects of Avatar-Based Virtual Reality on Veracity Perception and Kinetosis

The purpose of the current study was to investigate correlations between presence, immersion, perceptual modality, stress and kinetosis in vision-dominated virtual reality (VR) compared to limited-submersion virtual reality.

Subjects were divided arbitrarily into 2 groups: vision-dominated VR and limited-submersion VR. These 2 groups were further divided into 2 groups each: low-stress and high stress. In each VR setting, participants were allowed time to explore and gain familiarity with the controls. They then completed a coin-collecting task where they were instructed to move around the VR setting and use the controls to obtain VR coins. The low-stress subjects were told they would not be timed for this task, while the high-stress subjects were informed that they would be timed. Two post-procedural surveys were given. The first determined immersion, presence, and kinetosis. The second determined perceptual modality.

The subjects displayed a high correlation between immersion and presence in both the vision-dominated and limited-submersion VR settings, with correlations of 0.42689 and 0.4564, respectively. The vision-dominated subjects displayed a negligible negative correlation between immersion and kinetosis (-0.1539) and a negligible positive correlation between presence and kinetosis (0.03623). The limited-submersion subjects displayed a moderate negative correlation between immersion and kinetosis (-0.38563)and a negligible correlation between presence and kinetosis (0.051568). There was an increase in kinetosis with visual and kinesthetic VR participants, as well as with high-stress participants.

Contrary to the hypothesis, this study suggested that presence and immersion have less to do with experienced kinetosis; rather familiarity of sensory input and stress levels contribute more in a virtual reality settting. This provides important information for the use of virtual reality as an educational tool, as well as one used in military and cooperative circumstances.

4.

GRAGG,Sophie
BEHAVIOURAL SOCIAL SCIENCE
2015

THE AFFECT OF COLOR SHADES ON MEMORY

The purpose of this experiment was to determine if different shades of color could help recall items in an image better. The hypothesis is that there is a correlation between color and memory. Furthermore, between sepia tone and regular color, regular color will play a greater affect in recalling images because our brain is used to seeing images in regular color.

For this experiment, 12 students from Palos Verdes Peninsula High School were gathered in a classroom. The participants filled out their participant info sheet which included their initials (to keep track of data), age, and if they had any color blindness. The students were then given 30 seconds to look at image that had 14 items in it. In Trial #1, this image was in color. After 30 seconds, the participants were asked to read a short passage to temporarily distract their mind.

After this passage was read, the participants were asked to write down all of the items from the image they remembered. 2 weeks later, Trial #2 occurred. Trial #2 was the same process, except the image was in Sepia color (still the same image however), and the participants were given another passage to read. After each trial the results were recorded and compared.

The average number of items remembered in the sepia toned image was nine, and only eight for the image in regular color. Seven of the twelve participants remembered more items when the image was sepia toned, while only four remembered more items when the image was in regular color(one participant had no preference).
The data lead to the conclusion that sepia tone has a larger affect on memory than regular color does. A possible explanation for this could be that our mind and brain are not used to seeing things in sepia tone, so we pay closer attention to that in sepia tone. If this experiment were to be conducted again, a larger sample size would be beneficial because it would provide more data and possibly more accurate results.

5.

MURTY, Maansi
BEHAVIORAL AND SOCIAL SCIENCES
2015

THE PREVALENCE OF THE RANSCHBURG EFFECT ON PEOPLE OF DIFFERENT AGES

The Ranschburg effect was tested for amongst people of both gender, and different ages, to see in which was it most prevalent. The purpose as to why is to incorporate the findings into everyday activities, such as improving our education system or simply helping elongate memory. Since repetition of words seems to help recall, then these same techniques can be subsumed into assisting students when studying and learning new material in schools.

A verbal test was administered to each test subject, with 10 boys and girls within the ages of 6-13, then to 10 young adults ages 14-20, and finally to 10 men and women ages 40-60. Each subject was asked to write down a list of words which was read to them before they began reading. Participants were asked to refrain from writing their names on the paper, to maintain and protect confidentiality within the experiment. The results were then compared amongst each other and all together to see which age group was affected most by the Ranschburg effect.

The data showed that the average amount of answer correct out of 20 for Group A (ages 6-13) was 4.5, or 22.5%. Group B (ages 14-20) had an average of 6.6 correct, meaning 33% correct. Group C (ages 40-60) had an average of 2.5 correct, earning a 12.5%.

Altogether, it showed that Group C was most affected by the Ranschburg effect. Adults struggled the most, and had an inability for serial recall. The young adults were least affected, which possibly could show that young adults have already acclimated to rapid memorization, due to education.

6.

RIAZ, Isra
BEHAVIORAL AND SOCIAL SCIENCES
2015

HOW STYLE AFFECTS THE DEVELOPMENT OF FIRST IMPRESSIONS

The objective of this project was to determine the relevancy of past styles that have induced positive first-impression reactions compared to contemporary audiences.

First-time, casual encounters were generated with adult and adolescent audiences to observe the variation in response to different styles of dress. The only materials used were articles of clothing applicable to each testing variable. Female models with similar physical appearances—but dressed in opposing styles, requested the time from participants and observed their initial reactions. This process was repeated until fifty responses were collected from each audience per factor.

Although presence of color and modesty remains favorable in modern vogue, the clear distinction in emotional response between opposing styles that still exists with adult audiences was not prevalent in adolescent audiences. Interestingly, positive response to formality in casual settings declined intensely with both adult and adolescent audiences.

After collecting and analyzing the data, my hypothesis proved partially true; due to human nature, familiarity would produce comfort, therefore producing a generally positive response. This is exhibited in the adult-targeted responses; they remain comfortable with what has been proven appealing to their generation. On the other hand, adolescents responded comfortably and positively to most factors on an equal scale—a reflection of lack of familiarity or conformity to specific styles. Furthermore, this project also proved that formality no longer induces feelings of respect and admiration but rather intimidation and abjection."

7.

SALVAY, Jenna
BEHAVIORAL AND SOCIAL SCIENCES
2015

THE EFFECT OF FAMILY V. SOCIETY ON THE PERCEPTION OF RACE IN TEENAGERS

Throughout society, race, whether with a negative or positive connotation, is a prevalent topic. From discrimination and racial profiling to the seemingly harmless stereotypes, ideas of race are omnipresent. This experiment will determine if teenagers believe their ideas of race stem from their parents or from the society around them (i.e. friends or school). If one factor can be identified as being a stronger influence, changes can be made in the hopes of reducing racism.

Teenagers aging from sixteen to eighteen were asked to complete an anonymous online survey. Each student was then asked to complete three parts, inquiring about how each of their parents view race, as well as how the participant views the topic himself. Answers were then analyzed.

Participant responses indicated that parents affect students' ideas of race more than their environment. Students also answered that they believe race is a topic of nurture, demonstrating that teenagers believe that the way a child is raised affects how they view race.

This project concludes that parents have a greater influence than society on the race perception in teenagers. With this information, it is important that parents know that how they view race will affect their children.

BIOCHEMISTRY

8.

BENEDICT, Braeden
BIOCHEMISTRY
2015

PATHOLOGY AND CHEMISTRY OF THE BRAIN IN SANFILIPPO SYNDROME TYPE B

The effects of Sanfilippo Syndrome Type B, a rare genetic lysosomal storage disease, on the mouse brain were studied in this project. It was initially hypothesized that affected mice would have lowered volume and/or neuronal density in the amygdala, a region of the brain previously observed to have been affected in humans. Also, it was hypothesized that the activities of choline acetyltransferase (ChAT) and acetylcholinesterase (AChE), enzymes involved with the acetylcholine neurotransmitter pathway, would be lower in diseased mice.

Using stereology software, volume and cell count measurements of the amygdala region were made using snap-frozen brain tissue samples of both carrier (healthy) and diseased mice treated with both a Nissl stain and an AChE activity stain. The activity of both AChE and ChAT throughout the brain was quantified by performing enzyme activity assays using brain tissue homogenate from both carrier and diseased mice. ChAT immunohistochemistry staining was also performed to locate specific affected regions of the brain.

While there was no significant difference in volume or cell counts, it was observed that the intensity of AChE staining was lower in the diseased brains. It was then measured that the activity of AChE was lower by about 20% in the region of the brain containing the amygdala and by 10% throughout the brain. Likewise, the ChAT activity was lower by 10% throughout the brain.

Although the initial hypothesis regarding amygdala volume and cell density was disproved, observations made during that study led to discovering significant differences in the activities of AChE and ChAT enzymes between carrier and diseased mice. Changes to this enzyme activity in the acetylcholine pathway can provide an indicator of the progression of the disease and could provide an indicator of the success of attempted therapy. This knowledge will aid in the development of enzyme replacement therapies to treat the disease first in animal models, then in human patients.

9.

KIM, Anthony
BIOCHEMISTRY
2015

PURIFICATION AND BIOCHEMICAL CHARACTERIZATION OF THE FORMIN DELPHILIN

This project aimed to purify the C-terminus of Delphilin in order to determine its biochemical function—in this case, whether or not Delphilin functions like other Formins by polymerizing actin filaments.

To purify the N-terminal hexahistidine tagged Delphilin CT, affinity chromatography was first used. Because histidine tags have an affinity for nickel ions, this process was used to separate a majority of other proteins from the Delphilin gene. For elution, imidazole was then used to displace the tagged protein from the bound nickel ions. Then, ion exchange chromatography was then run to further purify Delphilin CT. To further separate it from other proteins, anion exchange chromatography was used to attract Delphilin CT to positively charged MonoQ columns based on its isoelectric point. An increasing salt concentration with a high salt buffer of 60.0% was also used to separate the protein from its column. Mass spectrometry was then used to find Delphilin's mass and compare it to its predicted mass in order to clear any ambiguities. Finally, pyrene polymerization assays were run in order to collect data to determine if the hexahistidine tagged Delphilin CT polymerized actin.

Based on the data collected, Delphilin indeed operates on a dose-dependent manner in regards to the polymerization of actin. Adding increased concentrations of Delphilin CT with actin yielded in faster polymerization rates during the pyrene assay before they plateaued at a certain time interval.

These results provide empirical data that Delphilin consistently polymerizes actin filaments and therefore functions like other members of the Formin super-family; as a result, these new findings can provide insight in Delphlin's functioning as a scaffolding protein within cerebellar Purkinje cells.

10.

KIM, EMILY
Biochemistry
2015

ELECTROPHYSIOLOGY-BASED SCREEN FOR GENES INVOLVED IN SYNAPTIC HOMEOSTASIS

There are many different psychiatric and mental disorders which affect many people in the world such as schizophrenia, autism, and epilepsy. Although there has been much research done on this subject there is still much to be discovered about these diseases in how certain genes and/or processes which result in them. Therefore, this project was designed to determine if certain genes are involved in homeostatic plasticity which is suspected in having a role in many neurodegenerative diseases.

Drosophila containing seven different genes were crossed against a T15 cross which knocked down the targeted genes and a C15 cross, the control. The resulting 3rd instar larvas of the crosses were dissected to reveal the neuromuscular junction. Electrophysiology was then performed to gather mEJP (miniature excitatory junction potentials) and EJP (excitatory junction potentials) values for the different crosses. If a gene appeared to have a role in homeostatic plasticity, imaging was also conducted to see if the knockdown of that gene caused any morphological changes in structure. The NMJ was dissected for again. Then the larvas were fixed in fixative, PFA, and then stained with primary and secondary antibodies. A confocal microscope was used to take pictures of the synapses of the larvas.

After experimentation was completed, results showed that one of the seven tested genes, unc104, may potentially be involved in homeostatic plasticity as the average size of the mEJP and EJP values in the larva where unc104 is knocked down were significantly smaller than in the larva expressing the gene. When imaging was conducted, it was revealed that when unc104 was knocked down, there were no significant changes in size of the presynaptic densities; however, the postsynaptic densities showed defects in morphology.

Thus this experiment supported my hypotheses that if there is a change in size of the mEJP and EJP levels or a change in the morphology of the larva, then the target gene may potentially be involved with homoeostatic plasticity. In the future, more tests would be required to confirm the results of this experiment. Additionally, a future potential experiment could be overexpressing the genes and then observing the effects on homeostatic plasticity.

11.

YE, ZHIREN (GEORGE)
BIOCHEMISTRY
2015

BIOLUMINESCENCE UNDER DIFFERENT CONDITIONS

The main objective of this project was to analyze the amount of bioluminescence produced by Pyrocystis lunula under different conditions. The main purpose of this experimentation was to determine if Pyrocystis lunula could produce more bioluminescence after the exposure to light or kept in a higher temperature.

In order to observe the bioluminescence produced, six tubes of Pyrocystis lunula were placed into three boxes, two tubes each box, that were label as light, dark, and light/dark. Then, they were observed and given a number that indicated the amount of bioluminescence produced on a scale from one to six four times a day. This cycle lasted for four days. The second part of this experiment was relatively similar to the first part, though a factor of temperature was added. The tubes were placed into six cups that contains water with different temperatures. This was recorded in the same way as the first part.

The data collected showed that Pyrocystis lunula produced less bioluminescence after the exposure to light and produced more bioluminescence under a higher temperature.

After reviewing the data, my hypothesis, which states more bioluminescence is produced by Pyrocystis lunula if more lights are exposed or kept in a higher temperature, is inexact. The amount of light exposed has a negative correlation to
the bioluminescence produced while temperature of the surroundings has a positive
correlation to the bioluminescence produced.

BOTANY

12.

BADDOUR, Talia &
WOODWARD, Emily
BOTANY
2015

NUTRIENT UPTAKE OF Ocimum basilicum IN HYDROPONICS VERSUS SOIL

The object of this experiment is to compare the nutrient uptake in basil plants in a hydroponics system and in a traditional soil system based on plant biomass and nitrogen content.

Twelve basil plants were grown from seeds. Once they had sprouted, six plants were implemented into a soil system, and six plants were implemented into a hydroponics system. The nitrogen content of each system was tested 4 times throughout a five week growing period. After the growing period was complete, the basil plants were dried and the biomass was recorded.

Nitrogen content and biomass of hydroponically grown basil plants and soil grown basil plants were compared. The total biomass of the six plants from the hydroponics system was 41.053 grams, while the total biomass of the six plants from the soil system was only 19.398 grams. The average nitrogen content of the hydroponics system was 13.75 ppm, and the average nitrogen content of the soil system was 11.25 ppm.

Due to greater solubility of nutrients in the water reservoir of the hydroponics system, these basil plants absorbed more nutrients than the plants in the soil system. Consequently, they reached a greater biomass and achieved higher levels of nitrogen content.

13.

HOOD, Rachel
BOTANY
2015

WATERING AMOUNTS IN COASTAL LOS ANGELES GRASSES

The current drought in Southern California has led many to question the type of grass in front lawns and how much water grass uses. I tested three different types of grass called, Bermuda Grass, *Cynodon dactylon;* Ryegrass, *Lolium Rigidum;* and Buffalo grass, *Buchloe dactyloides.* I wanted to see which grass flourished best with the least amount of water and how the most water-conserving grass compares to the water amounts used by the succulent, *Sedum brevifolium.* I predicted in my hypothesis that the Bermuda Grass would flourish the best with the least amount of water between the grasses and that overall the *Sedum* succulent would flourish best with the least amount of water. After two months of experimentation, from December 6, 2014 to February 12, 2015, I learned that both statements were correct. In order for citizens of Southern California to make a dent on water amounts, grasses should be switched to Bermuda grass, *Cynodon dactylon,* or to the succulent, *Sedum brevifolium*.

14.

KIM, Irene
BOTANY
2015

THE DIFFERENT LEVELS OF PHOSPHORUS, NITRATE, AND POTASSIUM

The intention of this project was to find the different levels of phosphorus, nitrate, and potassium in the composted soil before and after the marigolds were planted. Hypothesis was that the levels of the three soils will can change after the growth of marigold.

This experiment consisted of of two parts: Measuring the levels of compost soil before before growing the marigold and measuring the level again after the marigolds grew. To measure the different levels, compost soil had to be made. In order to make a compost, leaves and kitchen scraps were composted for twenty days. Rose & Flower Fertilizer was added for better growth. The samples' levels of phosphorus, nitrate, and potassium were measured afterwards. After that, marigold seeds were planted into three pots. It took about three to four weeks until it was fully grown. Then the homemade composted soils were measure again to see if there were any difference in the levels.

The first data showed low, medium, and high for the levels and after the growth of marigold, it did not change. The low level stayed at its level, the medium level also stayed at its level, and the high level stayed at its level according to the color chart but the colors that determine the levels were slightly lighter than the one before. This showed that nothing was changed by the growth of marigold in the soil.

Results proved that the levels of potassium, nitrate, and phosphorus did not change after a flower was planted into the soil. Even though the colors that determines that level did change slightly for nitrate, it wasn't a big difference enough to count that as a "change". In conclusion, hypothesis was wrong.

15.

LANDSBERGER, Huws
BOTANY
2015

THE EFFECT OF TEMPERATURE ON SALT MARSH PLANT GROWTH

The objective of this study was to analyze the effects of temperature on salt marsh plant growth and cover. It was hypothesized that an increase in temperature would cause a decrease in cover. This prediction was based off of the historical and current geographical locations of salt marshes in the United States; thriving salt marshes are more commonly found in Eastern coast areas, where colder temperatures are predominant.

In order to obtain quantifiable data, testing of the salt marsh was usually carried out every other week. For the purpose of obtaining unskewed data, measurements were documented only during low tide and from two set areas. A transect, quadrat, and thermometer were used: a transect was set up along the preset area, a quadrat was used to measure cover, and a thermometer was used to take the temperature of the soil every meter.

To analyze data, linear regression tests were used in determining significance of findings. Pickleweed, a nesting plant for a protected bird and several other species, presented a strong negative correlation to temperature, confirming the hypothesis that increased temperatures would lower plant growth. On the other hand, other plants such as cordgrass yielded insignificant results, and affirmed the alternative hypothesis of temperature having no effect on plant cover.

With this study, it can be predicted that as temperatures rise, important plants such as pickleweed will die off, resulting in endangerment or extinction of species. With the threat of large scale warming, it is paramount to focus on the impacts on and to know what to expect for the health of the important salt marsh environment.

16.

LIU, Michael
BOTANY
2015

GREYWATER IRRIGATION

Greywater is known as the relatively clean wastewater from utilities and appliances. My investigation focused on how relatively clean greywater actually is and could it or should it be used for agricultural purposes instead of using fresh water on crops. This experiment was conducted to examine if greywater would produce the same results as fresh water when growing tomatoes. The control group was the tomato plants watered with fresh water and the experimental group was the tomato plants watered with greywater. The greywater was created by mixing 1/8 of home sense automatic dishwasher gel in a cup of fresh water. I measured and compared the height of the main stem, color of the tomatoes, size of the tomatoes, and the juiciness of the tomatoes. This experiment was conducted in my backyard. From January 4, 2015 to February 18, 2015. After data collection and analysis, the tomato plants watered with fresh water produced the tallest plants, reddest, biggest, and juiciest tomatoes. Therefore, greywater can not be used as an alternative to fresh water in growing tomatoes because it could not produce the same results as fresh water.

17.

NADBEREZHNA, Mariya
BOTANY
2015

EFFECTS OF MIRACLE-GRO AND ORGANIC FERTILIZER ON MARIGOLDS AND THE ENVIRONMENT

This project was designed to demonstrate the effects of Miracle-Gro versus organic brands on marigold growth, soil pH, and phosphate levels in runoff.

Simulations of small environments were constructed in 6 paint trays, with one marigold in each tray. Water used to water the plants was tested for pH and phosphate prior to watering. Miracle-Gro was applied to three of the trays, while fish and kelp based fertilizer was applied to the remaining three. The samples were then watered, and runoff was tested for pH and phosphate.

After about three weeks, it was found that the marigolds grew faster with Miracle-Gro, but the pH and phosphate levels were lower with fish and kelp based fertilizer. With the pH of water used being 7.5, the pH of the fish and kelp fertilizer runoff water was 7.0, while the pH level of the Miracle-Gro runoff water was 6.0. Phosphate levels, measured in parts per million (ppm), were also slightly higher in the Miracle-Gro runoff.

My hypothesis that commercial fertilizer helps plants grow faster, yet causes more impacts on the environment, was supported by the results. It would be interesting to next test with alternative fertilizers and naturally faster-growing plants.

18.

REVECHE, Hope
BOTANY
2015

THE EFFECT OF RHIZOBIUM BACTERIA ON CLOVER PLANTS

The objective of this project was to view how the bacteria Rhizobium affected legume plants, specifically clover. The purpose of the experiment was to determine if these legume plants would grow faster with or without the bacteria. This would display how it positively or negatively impacts legume plants, which would allow the usage of this particular bacterium to become more active to assist in battling our current global food crisis.

To test the bacteria's effect on clover, the Rhizobium and white clover plants were needed. The plants were allowed time to grow for 12 weeks, watered every 3-5 days to ensure that they were not flooded or deprived of water. The data was collected every time the plants were watered and recorded in centimeters. The results of the plants with bacteria were compared to the results of the plants without the bacteria.

The data documented showed that the plants with the bacteria did grow much faster than the plants without. The average measurement of the plants with bacteria was about 6.3 cm and the average measurement of the plants without bacteria was about 2.6 cm. Therefore, the plants with bacteria grew faster with a 3.7 cm difference.

The results displayed that the bacteria Rhizobium has a positive effect on legume plants. The plants, whether mixed with bacteria or not, both are able to grow to an acceptable height, however the plants with Rhizobium do in fact grow faster that those without.

19.

Stark, Jeremy
Botany
2015

THE EFFECT OF ACIDIC CONDITIONS ON BAMBOO SPROUTS

The objective of this project is to analyze the effect that distilled vinegar has on the growth and development of a common specie of bamboo. The project is a way of simulating what would happen to bamboo if acid rain became more prevalent.

The materials that were used included six separate plots to hold the six bamboo plants that would be grown. Also used, was about a pint and a half pint of distilled vinegar which is 5% acetic acid, and strip ph testers that showed that the amount of vinegar that was put made the ph of the soil 3.5 or 5. The bamboo were split between two that were given a soil ph of 5, two that were given a soil ph of 3.5, and a control that wasn't given any distilled

vinegar..The project was carried out over the course of six weeks and the normal time that it takes for bamboo sprouts to appear is around four weeks.

What was found was that the bamboo that received the higher acidity did not do well. They did not grow as fast and look as healthy as the control bamboo. At the end of the six weeks the sprouts from the acidic soil bamboo were less healthy or did not appear yet.

It was concluded that my hypothesis was correct, the bamboo which had higher acidic conditions would not develop as well and the sprouts would be stunted compared to bamboo under more normal conditions.

20.

TSAI, Anson
BOTANY
2015

THE EFFECT OF FLOATING ISLANDS ON THE PHYTOREMEDIATION OF MADRONA MARSH WATER

This experiment tested the effectiveness of artificial floating islands at reducing phosphate levels of polluted water. An artificial floating island is a man-made raft which carries plants that absorb phosphates from the water underneath them. The goal of this experiment was to determine which species of plant is the best to use on a floating island to achieve the most effective build.

To find the most efficient build, three tanks with the same polluted water but different contents were used. Tank zero (control) contained no floating island, while tank one had a floating island carrying Schoenoplectus acutus(Califonia Tule) and tank two had a floating island carrying Chrysopogon zizanioides(Vetiver Grass). Both water and tissue samples were sent to Associated Laboratories for precise testing only for the initial and final tests, while La Motte's colorimetric phosphate testing kit was used to determine a rough phosphate reading of the water every week.

At the conclusion of the experiment, there was a significant difference of phosphate concentrations in the tissues of the two species of plants, but there was barely any differences between the phosphate levels of the water in the tanks. The Tule had ~200PPM more phosphate in its tissues but only a ~0.6PPM difference of phosphate in the water than the Vetiver.

Upon further analysis of the data, both floating islands successfully reduced the phosphate levels in the water with the California Tule more effective at absorbing phosphates since it had a higher final concentration of phosphates in its tissues. Also, it has been discovered that the plants were not placed in an environment with high enough phosphate to stimulate rapid phosphate absorption, which explains why the water had similar concentrations at the end of the experiment.

21.

YONG, Stephanie
EARTH SCIENCE
2015

THE EFFECTS OF TERRA SORB ON *Astragalus Trichopodus* Year II

This project presents the idea of using Terra Sorb as a substance to decrease the amount of water used to irrigate our plants. Terra Sorb is a potassium based co-polymer gel which has the ability to hold water up to 200 times its weight. If this substance were to be successful, results can conclude that Terra Sorb does in fact help store the water needed for the plant's use.

40 species of *Astragalus trichopodus* were planted in Abalone Cove, and were designated random assignments by the statistician. The groups Water and Terra Sorb, Water and No Terra Sorb, No Water and Terra Sorb, No Water and No Terra Sorb were utilized to display the potential effects of Terra Sorb. Li-Cor and water potential data were collected as well to further analyze plant health. When calculating data, the biomass was calculated by weighing parts of the species on a scale, and the averages of the biomasses and the standard deviation were calculated.

Water and Terra Sorb had the greatest CO_2 uptake values and lowest water potential values when compared to the other treatments. As for the Water Tension results, the No Water group had the highest water stress.

Overall, results indicated that the Water and Terra Sorb and Water and No Terra Sorb had the greatest average biomass. When comparing the no water treatments, the No Water and Terra Sorb had the greater average biomass compared to the No Water and No Terra Sorb; therefore, conclusions can be made that Terra Sorb is effective, but is most effective when water is present.

CHEMISTRY

22.

CHANG, Julia Na
CHEMISTRY
2015

THE EFFECTS OF SALINITY AND pH LEVELS DURING FERMENTATION IN VARYING ENVIRONMENTS YEAR 2:

Fermentation is an essential chemical process that aids in alcohol production, preservation of food, and enrichment of diet. The objective of this project was to determine which temperature condition will increase the rate of fermentation to the greatest degree. Two different food samples were tested under varying temperature conditions to ferment and measure the salinity and pH levels.

The ingredients to make Rice Wine Makgeoli, and Dwaenjang Soybean Paste were gathered and made. An important ingredient that was essential to the production of Rice Wine Makgeoli was nuruk, an enzymatic microbiological culture. Each of the three samples were placed in a room temperature of 20.5C, hot temperature of 43.3C, and cold temperature environment of 1.2C with the help of an electronic heater, an enclosed room, and a refrigerator respectively. This set a total of nine samples, three in each environment. The samples were left to ferment for 1-2 months. The salinity, pH levels, and temperature were measured with a salinity and pH meter before and after the experiment.

The levels of salinity and pH produced varied significantly among the tested results. In average, the hot temperature samples produced the highest average amount of salinity levels of 1.65% and lowest average pH level of 2.82 pH. The room temperature samples had an average salinity levels of 1.3% and an average pH levels of 3.32 pH. The cold temperature samples produced the lowest average amount of salinity levels of .45% and the highest average pH level of 3.47 pH. In the samples that measured the salinity and pH levels under a changing temperature of hot to cold, the average amount of salinity levels was .3% and the average pH level of 2.83 pH. In the samples that measured the salinity and pH levels under a changing temperature of cold to hot, the average amount of salinity levels was 1.3% and the average pH level of 2.63 pH.

My hypothesis that the rate of fermentation will be fastest in hotter temperatures was supported. Thus, it can also be concluded that the lactic acid bacteria in fermentation thrives best in hot temperatures. Measuring the amount of salinity and pH levels produced by each of the two food products under varying temperature conditions will produce useful information to find the best possible route to a successful fermentation.

23.

CRUEL, Audrey & GRANT, Stephanie
Chemistry
2015

CONVERTING SWITCHGRASS INTO BIOFUEL

The intent of the experiment was to find the optimum way of degrading the cellulose in Panicum virgatum, otherwise known as switchgrass. This inspired the question, if cellulase can break down switchgrass, what are the best conditions to extract the most cellulose. The significance of this experiment is to find a better and more efficient way to produce ethanol other than from the commonly used corn.

For the experiment, the enzyme cellulase from *Trichoderma reesei* was mainly used. The switchgrass was cut and put into beakers of 10 mL of water. After each experiment was conducted, the switchgrass and the liquid would be filtered out and the mass of the switchgrass and the volume of the liquid would be recorded.

The results from this experiment were in some way surprising. It showed that the cellulase from the *Trichoderma reesei* degraded the most amount of cellulose in the switchgrass. Also, the optimum temperature for the enzyme to work is 150 F (65.56 C), for it had a weight decrease percent of 36.48%. The test showed the higher concentration of enzyme, the lower the weight of the switchgrass became. In addition, the most successful amount of time of incubation was 2 hours, with a weight decrease of 30.22%.

The results of this experiment will ultimately benefit the production of ethanol. The most important finding was that the cellulase *Trichoderma reesei* degraded the most amount of cellulose in the switchgrass. In addition to the enzyme, the process of degradation was improved with optimum conditions such as working in 150 F (65.56 C), and having incubation time of 2 hours.

24.

KIM, Jean Won
CHEMISTRY
2015

25.

LEE, Regina
CHEMISTRY
2015

THE CONVERSION OF LIPIDS FROM COFFEE GROUNDS TO BIODIESEL: YEAR 2

Our society is dependent on fossil fuels, a source of energy that is depleting quickly. There are alternatives to these fossil fuels, such as using ethanol. However, some of these alternatives may not able to compete with the efficiency of fossil fuels because of their high energy density.

This experiment's goal was to extract oils from used coffee grounds and convert it into usable biodiesel. Biodiesels are made when triglycerides react with methoxide to create methyl ester (biodiesel) and glycerol through a transesterification process. In order to do this, used coffee grounds were collected and dried using an oven to get as much water out as possible. After that, a soxhlet extraction method was used to extract as much oils as possible from the coffee grounds. Hexane was used as a catalyst and crushed activated carbon was used to lighten the oil's color. After extracting, the hexane was evaporated and the oil was put through a transesterification process. Sodium methoxide was created and then added to the oil. They were then mixed together. The solution created a layer of glycerol and a layer of biodiesel. The glycerol was filtered out and the biodiesel was sent in for analysis as well as the coffee oil.

The coffee oil and coffee biodiesel were analyzed using an FTIR and then were compared. They both showed peaks at 1745 cm^{-1}, and a methyl ester group was present at 1453 cm^{-1} for the biodiesel. This shows that biodiesel was present in the sample. Another indicator was the change from the ester group in the coffee oil to the methyl ester group in the biodiesel. Methyl hydrocarbon found in biodiesels was also present. The analysis showed 21.8% of the biodiesel sample to have fatty acid methyl esters and 29.2% of the coffee oil was triglycerides.

In conclusion, the experiment was successful in that the coffee oils were able to be extracted and converted into biodiesel.

26.

RAMAYYA, Shreya
CHEMISTRY
2015

SYNTHESIZING AND UTILIZING DIFLUOROMETHYL- & TRIFLUOROMETHYL- ARTEMISININS TO INTERRUPT THE LIFE CYCLE OF MALARIA PARASITES

Fluorine has allowed common therapies to become even more effective in treating many diseases because of the small size, low polarizability, and high electronegativity of the fluorine atom. Malaria could benefit from such an approach as drug resistance has drastically reduced the effectiveness of artemisinin, a common malaria drug. This study focused on developing the methodology to utilize both nucleophilic and electrophilic fluorination methods to incorporate fluorine into antimalarials.

The first step involved mastering the fluoroalkylation of simple aldehydes, esters, and ketones. The next step in the study involved nucleophilic trifluoromethylation of artemisinin using the Ruppert- Prakash Reagent (TMS-CF3). Successful trifluoromethylation led to difluoromethylation of artemisinin, a process that has not been studied in great detail before. The difluoromethyl (-CF2H) group is isosteric and isopolar to the hydroxyl (-OH) group, so the difluoromethylation of artemisinin may yield extremely desirable results. The methodology developed under the study produced high yields of a pure product

The final step in evaluating the effectiveness of difluoromethyl- and trifluoromethyl- artemisinins to interrupt the production and transmission of gametocytes is underway. *In vitro* parasitemia and IC50 analysis is being used to monitor the effectiveness in halting the growth of malaria parasites in their highly virulent gametocyte phase.

In conclusion, high yields of a very pure fluorinated artemisinins were synthesized, as confirmed by nuclear magnetic resonance (NMR) spectrometry and high-resolution mass spectrometry (HRMS). Highly positive results

have come from in vitro studies of parasitemia indicating effect of fluorinated artemisinin is longer-lasting than that of traditional artemisinin

COMPUTER SCIENCE & MATHEMATICS

27.

ISOZAKI, Christopher
COMPUTER SCIENCE
2015

REDUCING THE AMOUNT OF ELECTRICITY USED BY COMPUTERS UTILIZING GREEN TECHNOLOGIES

My project has been a continuation of my effort to reduce the amount of energy used by computers using green technologies. Last year I was able to create a cooling system that did not use any electricity from the computer's power supply and used a combination of aluminum, water, heat sinks and fins, and thermoelectric devices. It was successful but not practical because of the size and form factor, risk of water damage from the water in the tank and risk of water damage due to condensation from the thermoelectric devices. This year I tried to improve the design by addressing several of the issues.
I used heat pipe technology to efficiently move the heat into a separate chamber I designed by rearranging the computer components. I created an insulated housing over the CPU/heat sink area to minimize the heat from moving into the main chamber. The separate chamber allowed me to have more options to dissipate the heat because I wouldn't have to worry about RF waves escaping, to optimize the heat differential for the thermoelectric devices and to reduce the risk from condensation. With the thermoelectric devices, I was able generate a working voltage and current that could be transformed / stepped up to a voltage and current that could be used either by a fan or a thermoelectric cooler. The only electricity used by the cooling system was the electricity generated by the thermoelectric devices using the waste heat.

28.

JIANG, Zirui
COMPUTER SCIENCE
2015

DANDELIN SPHERES: THE RELATIONSHIP BETWEEN THEIR RADIUS AND THEIR TANGENT PLANES

This project in its present form is the result of the derivation of the Dandelin Spheres, which is consisted of a cone, two spheres tangent to the interior surface of the cone, and a plane tangent to both spheres. The initial idea was to determine the relationship between the tangent plane and the position of two spheres. This project will help developing the theories behind Dandelin Sphere, and the movement of spheres may be employed as models in engineering.

The Dandelin spheres were constructed by using computer software GeoGebra. After the construction of the 3D graph, the movement of spheres relates to the tangent plane is observed. By applying special geometry and basic 2D geometry, the relationship between the tangent plane and the position of spheres is derived. 2D geometry reduces the calculations.

The relationship between the position of two spheres and the tangent plant was expressed in an equation. However, this finding only describes the relationship when tangent plane is perpendicular to yz-plane.

The result of this project contributes to the development of Dandelin spheres. The center of the upper Sphere is (0, 0, $\frac{\mathrm{cb}'\left(m^2+\frac{mc}{a}\right)+b\prime(am+ac)}{(\mathrm{am+ac})(m^2+\frac{mc}{a})}$), and the center for lower sphere is (0, 0, $\frac{-\mathrm{cb}'\left(m^2-\frac{mc}{a}\right)+b\prime(am-ac)}{(\mathrm{am-ac})(m^2-\frac{mc}{a})}$). These equations are under the conditions of tangent plane remaining perpendicular to yz-plane, equation of the cone is x^2/a^2 + y^2/b^2 = z^2/c^2. Variables m and b' all relate to the tangent plane.

29.

KIM, Kijung
COMPUTER SCIENCE
2015

JAVA CLASS COMBINER

This project's purpose was to see if combining classes beforehand and using one class variable instead of two would decrease runtime and overall make the java program more efficient. It came from the idea to reduce runtime by combining functions or using faster compiling techniques. Combining functions was not a feasible idea, for one can simply just copy and paste functions into other functions, and other compiling techniques have already been done with limited, if any, success. This experiment would have shed new light into program optimization.

To begin this experiment, an edition of java [Java SE 7] was needed. A laptop with at least 2 RAM was needed to compile, and information of other class types in java was also required. To begin, samples of the data were first created. Each sample had two class names to combine. Then, the combining class was created using Class variable. Then, the programs were tested with the control (no class combiner), and their runtimes were compared. The timer class was added to get the runtime to the exact millisecond.

When the results were compared, it was found that the new class combiner has not helped in reducing runtimes at all. On the contrary, it was found that some actually took longer than the control group, of some milliseconds. This was completely against the hypothesis, which was that the class combiner would decrease runtime considerably.

The knowledge gained from this project not only helped clear the fact that adding a function to combine classes does not reduce runtime but also helped add on to the knowledge that adding onto a program does not help in any way. One error would be that the timer might not be accurate by some milliseconds.

30.

KOUL, Kastur
COMPUTER SCIENCE
2015

MATHEMATICAL PATTERNS IN THE PRELUDES OF J.S. BACH

As any student of music will attest, the piano compositions of J.S. Bach sound different from those of other composers. Bach's piano compositions appear to have mathematical patterns. The purpose of this research project was to examine the preludes of J.S. Bach to see if there were any mathematical patterns that emerged.

A total of fifteen of J.S. Bach's preludes were examined. Individual notes were converted into their corresponding frequencies. On separate Excel sheets, each piece was separated into its right hand notes and left hand notes. The frequencies of individual notes were plotted measure by measure. The measures were then represented using stacked line charts.

The graphical representation of the music revealed that each prelude contained patterns for measures for the left hand as well as the measures for the right hand. In some preludes, the patterns were starkly visible.

The results of this research support the hypothesis that there are mathematical patterns in the preludes of J.S. Bach. This research could be furthered by comparing these patterns to other composers of the Baroque era in music. Also, more advanced analysis could be done using fractals to understand whether there are any simple underlying patterns in the music of J. S. Bach.

31.

LEE, Seung Joon
COMPUTER SCIENCE
2015

PREDICTING THE FUTURE POSITIONS OF MISSILES

This study explored how to create the most efficient position predicting program possible. The goal was to make the program so time-efficient and accurate that it becomes a practical program to use in many areas of life.

The program uses the positions of the friendly missile and enemy missile and vectors, predetermined by the user, to calculate the future positions of the enemy missile and shoot it down with a friendly missile. The algorithm used by the program was to, for every increment of time set by the user, predict the path of the enemy missile and

find the shortest distance possible for the friendly missile to hit the enemy missile. The increment of time is important as updating the data as frequently as possible helps to ensure the accuracy of the program.

The accuracy of the program was demonstrated by a record of all the coordinates in text form. The current algorithm works efficiently and relatively quickly.

The program was made to track and predict the future position of an enemy missile, even if it is taking an unorthodox path. Since many believe that missiles only travel in parabola shapes, the unorthodox paths would be in a shape of a graph with three or more zeros on the y axis on an x and y coordinate axis. The program was created to be versatile, as needed for security, and accounts for these paths.

32.

MARMARELIS, Myrl
COMPUTER SCIENCE
2015

Dynamic Multi Trend Analysis Using Polylinear Regression

The purpose of this study was to formulate a new kind of algorithm to extract important features from a signal, while making no assumptions about it. The new approach aimed to identify the most significant points of activity (turning points) at a given resolution. As a demonstration of the algorithm's effectiveness, time series data sets of blood flow velocity and pressure measurements from the human left cerebral artery were examined.

The turning points were identified by finding the best fit for a fixed number of connected trend line segments on the time series. The connecting points would represent the turning points, since they indicate the point at which the local trend changes the most significantly. The y-values of the turning points were iteratively optimized for given x-values, which were in turn optimized with a random search method based on simulated annealing.

In order to demonstrate the proposed method, the data sets were each fitted with a fixed number of trend lines. A statistically significant result showed that the turning points of the blood pressure followed those of the blood flow velocity with a specific lag.

The algorithm proved to be an effective and promising generic tool for deconstructing signals at any resolution. Unlike wave extraction and other popular methods, it did not assume periodicity or any other property in the signal. The results produced from the test case led to significant findings about the data. The algorithm has uses in countless types of applications including biomedical, engineering, and financial systems.

33.

MARMARELIS, Zissis
COMPUTER SCIENCE
2015

OPTIMIZATION OF THE HEALTH CARE SYSTEM UTILIZING COMMUNITY-BASED TELEMEDICINE

The objective of this project was to simulate a health care system utilizing community-based telemedicine to determine the optimum number of health care professionals working in a community clinic in relation to the patient wait time. From five trials examined, it was hypothesized that the most efficient system would be the middle trial that treated 3 patients per 15 minutes and 6 on busy hours, which would achieve the goal of minimizing the wait time and number of workers.

A java program was written which simulated a day for four different telemedicine communities. The number of patients was generated from a random range of the population. Patients were put into a queue upon arrival at the clinic, which progressed according to the capacity of service of a clinic. The different capacities were 1, 2, 3, 4, and 5 patients per 15 minutes, and double that amount during busy hours. The wait times for each patient treated were calculated, and the average was taken after 150 trials for each different capacity of service (COS), or number of workers.

Results showed that the clinic with COS of 3 was the optimum, with an average wait time of 0.45 hours. As the capacity increased the wait time decreased, but after a COS of 3 the marginal benefit began to decrease.

The optimum COS was determined in support of the project's hypothesis, and was compared to the counterpart for traditional medicine demonstrating the significant benefit of community-based medicine. Community-based telemedicine can greatly benefit our society by improving the wait times of patients, which is a critical issue in today's society.

34.

SHARMA, Hemakshi
COMPUTER SCIENCE
2015

CRIME RATE GRAPHED STATISTICS IN THE UNITED SATES

When people are looking for areas to buy houses and live in in the future, safety is one of the most important aspects of a good area. However, sites such a truvia do not display detailed data of crime rates in the area therefore giving buyers a very vague explanation of the crime that occurs in those areas. The object of this project was to use BlueJ in order to display helpful and realistic bar graphs to aid the user depending on which state they want to look in and what types of crimes.

The internet was used to look for crime data of the United States. Then used Excel to input the data into MySQL. Once data was inputted, BlueJ was used to begin writing the program. Java programming was used to connect MySQL data to the program. Program was finished. Then, the program was tested to check for any glitches or errors in the program.

BlueJ was successfully used to create a program that connected to MySQL to create bar graphs in which crime rates of different types of crimes were created.

My hypothesis that BlueJ can be used to create a program that would display crime rates of the United States using bar graphs was proved by the results. Initially MySQL was not being used but it was learned that without it a huge amount of data could not be connected to the program without it.

35.

SHERPA, Norbu
COMPUTER SCIENCE
2014/2015

THE EFFECTS OF USE OF IPHONE APPLICATION ON WEIGHT LOSS

The objective of this project was to analyze the impact of the use an IPhone application on a directed behavior. Specifically, the main purpose was to analyze the effects of the use of IPhone application on weight loss. Codes for an IPhone application directed toward weight loss were written by using various sources such as coding books and tutorial videos.

For the experiment, an existing IPhone application that resembled the function of the Iphone application that was coded for in this project was used for data collection. In the experiment,a person was subjected to follow a food diet from my Fit foods, a store catering nutritious and healthy foods. For five days, the diet was followed without the use of the reminder application. Each morning of the days, weight was recorded.For another five days, diet was followed with the use of the reminder application which helped regulate food schedule by using alerts and notification.

As a result, the data for the weights when not using the Iphone application fluctuated and wasn't consistent. The weights didn't consistently decrease, but fluctuated by going from lower weight to higher weight or from higher weight to lower weight day to day. Meanwhile, the data for weights when using the Iphone application consistently decreased.

The results show that the use of an IPhone application that can monitor a behavior may affect the behavior positively. In this project, diet of an individual was monitored which resulted in consistent weight loss.

36.

STEINBERG, David
COMPUTER SCIENCE
2015

COMPUTER IDENTIFICATION OF ANONYMOUS *NEW YORK TIMES CROSSWORD PUZZLES*

This project involved writing a program to analyze pre-1993 *New York Times* crosswords whose constructors were known in hopes of identifying anonymous puzzles' constructors. The hypotheses were that the more factors the program used, the more accurately it would predict constructors, and that the use of machine learning to determine the factors' weights would improve results.

The program was tested on years of crosswords whose constructors were known. The training set consisted of 1986–87 and 1991–92 puzzles; the testing set, 1988 and 1990; and the final set, 1989. The program analyzed the puzzles on seven factors. Tests were conducted with and without machine learning, with the program taking all seven factors into account, the top four factors, and the top factor alone.

Within the machine learning tests, the seven-factor test led to significantly more accurate results than did either of the others, though the four-factor test was significantly less accurate than the one-factor test. Further, with all seven factors, machine learning significantly increased the program's accuracy relative to tests without machine learning; with four factors, the same effect was observed; with one factor, there was no significant difference.

The hypothesis that the use of additional factors would improve accuracy was not supported. However, the hypothesis that machine learning would increase the program's accuracy was supported; further, the disparity between the program's accuracy with and without machine learning increased as more factors were added. The study suggests that computers can help determine authorship in a previously unexplored artistic field.

37.

TAMBE, Arjun
COMPUTER SCIENCE
2015

IMPROVING ALGORITHMS FOR THE OPTIMAL ALLOCATION OF SECURITY RESOURCES, YEAR 3

Security is a ubiquitous concern, vital for counterterrorism, wildlife reserve protection, crime prevention, and a whole host of other critical applications. Strategic resource allocation is crucial since limits on security resources prevent full protection of all targets at all times. Since adversaries can exploit predictable security strategies, protection schedules must be efficient and random. Algorithms based on game theory offer a mathematically sound approach for creating weighted random strategies that account for predicted adversary reactions and different values of different targets, and they are currently being used to allocate security resources at several vulnerable locations around the world. While many of these algorithms have assumed perfect rationality among adversaries, a recent algorithm uses the Quantal Response model of humans' imperfect decision-making, and has offered improved protection over other algorithms. However, if this model or its parameters do not accurately predict human behavior, the algorithm may recommend a flawed security strategy, resulting in losses for the defender. To that end, a new "ensemble model" of human behavior is proposed that takes a weighted average of the predictions of several models of human behavior, including Quantal Response. It is found that this model predicts adversaries' decisions significantly more accurately than competing models in tests against human adversaries. The new model thus offers the potential for improvements in security.

38.

TAMBE, Raam
COMPUTER SCIENCE
2015

THE EFFECTS OF NEUTRAL AGENTS ON THE EXPANSION OF IDEOLOGY IN A HYPOTHETICAL SOCIAL SPACE

A majority of research in the field of evolutionary game theory uses computer models to predict the effects of certain traits being introduced in to a certain population group. This experiment attempts to replicate the frequently documented "bystander effect" that commonly results from the expansion of ideological bias across a social space, such as in genocide.

Using Netlogo, a 50 by 50 grid is created to model a hypothetical social space, wherein each cell is an agent that that can choose among a neutral, passive, or aggressive strategy. Each cell is awarded points based on a set of predetermined values and their neighbor's strategies, then adopts the strategy of the highest performing neighbor. An "Evolutionary Stable Strategy" is determined when it is no longer possible for cells, whether passive aggressive or neutral, can no longer outnumber the cells of the currently dominant trait.

This model is contrasted with a more common model that exclusively allows for aggressive and passive strategies. Across three tests, with thirty trials each, the average distance in from the average rate of convergence is 1.40 ticks for the model including neutral agents, compared to an average distance of 2.86 ticks for the model not including neutral agents. The model including neutral agents had a distance from the average cell count of 22.48, resulting in an average difference of 0.002 percent.

These results indicate that modeling a social space to include neutral agents is feasible and can increase the statistical significance of data by reducing the variance per individual trial.

EARTH & SPACE SCIENCE

39.

INOUYE, Amanda
EARTH SCIENCE
2015

SPECTRAL SIGNATURES OF LIGHT POLLUTION AND SKYGLOW IN SOUTHERN CALIFORNIA

Light pollution is the unnatural glow of manmade lights in the night sky due to the overuse of lights by humans. This light affects all kinds of nocturnal organisms and ecosystems throughout the biosphere, most disrupting the behavioral and reproductive cycles of these organisms. Utilizing the technology we have available, a digital camera can be used to take pictures of the night sky, then analyzed using various computer programs. Average gray pixel values indicate how much light there is in a photo, which shows how much skyglow there is present in the photo as well.

The experiment was based off of taking photographs of the night sky using a Konica Minolta on completely manual settings. Photograph locations were Santa Monica and Desert Center, specifically the Mountains Recreational Center and Joshua Tree National Park. The photos with visible celestial bodies were analyzed for their gray, red, green, and blue pixel values.

Results indicate that the amount of RGB pixels correlate with the levels of skyglow versus the levels of light pollution in these two areas. Joshua Tree had lower levels of light skyglow overall, but the highest levels of blue and green pixels for their pictures. Santa Monica's spectral signatures, containing more light pollution, had the highest levels of red pixels.

This research signifies that natural skyglow and light pollution can be differentiated with just the quantitative data from a digital camera and an image-analyzing program. Further research can entail exactly which national parks, nature reserves, and habitats are at most risk for light pollution and which are just under the influence of natural skyglow.

40.

KURUPPU, Praveen
EARTH SCIENCE
2015

MEASURING THE GERMINATION TIME OF EHRHARTA ERECTA IN THE SUN AND SHADE AT THE MADRONA MARSH

An initial attempt to do this year's project had to be terminated due to city concerns about the use of fire. A reconstituted project was figured out and was conducted instead. By late November, a substitute project was in place in which a comparative study using two plots, one in the shade and one in the sun, was established. The main purpose of this revised study was to compare the results of shading and exposure to the sun.

This study was conducted over a six week period between late December and early February. An equal amount of Ehrharta seeds was distributed into each of the plots. There was no watering in any of the plots because of the rains that had been forecasted at the beginning of the project.

While it was expected that seedling would appear a lot faster, it took nearly 30 days for seedlings to come up. As expected, the hypothesis at the beginning of the experiment was correct. Seedling germinated faster in the sun than in the shade. One of the other questions that was trying to be answered was the relative biomass of the Ehrharta grass. At the end of the project, there were 29 seedlings in the sun as compared to 18 seedlings in the shade. One of the reasons why the Ehrharta seeds in the shade plot didn't germinate like in the sun plot was because small twigs fell from the tree overhead inhibiting the seeds from germinating.

Overall, this project was a success as it gives the manager of the marsh a better timetable of how to better control the Ehrharta grass. With this project, the manager can now save money that can be used for other projects around the marsh.

41.

LIU, Sarina
WESTERGAARD, Madison
EARTH & SPACE SCIENCE
2015

POTENTIAL ENVIRONMENTAL IMPACTS ON PORTUGUESE BEND RESERVE TRAILS DURING HOLIDAYS VS. NON-HOLIDAYS

The inappropriate use of trails at the Portuguese Bend Reserve is an important issue is concerning the Palos Verdes Land Conservancy. Our hypothesis is that if it is a holiday weekend, then there will be more potential environmental harm on the trails. During our experiment, we were working to determine how different patterns of visitors result in different potential impacts on the trails.

There were 4 surveys conducted at the Burma, Ishibashi, and Toyon trail intersection that focused on comparing 2 holiday and 2 non-holiday weekends. Visitors were categorized by number of persons in each group, mode of transport, visit frequency, zip code, and age range.

The data showed that 71% of visitors on non-holiday weekends lived in a local area, within a 5-mile radius of the Portuguese Bend Reserve, compared to 53% of visitors on holiday weekends. An average of 29% of visitors on holiday weekends reported that they visit yearly, higher than the average of 12% on non-holiday weekends. In addition, we also found that there are a greater percentage of bikers on holiday weekends, 10%, compared to non-holiday weekends, 6%.

Non-locals that don't visit regularly may not know how to properly use the trails because they are not informed on proper trail use or the conditions of the trails. With a greater percentage of bikers on the holiday weekends, there are more potential trail impacts because mountain biking can lead to growing erosion and vegetation loss. Having volunteer on holiday weekends supervising popular trails and developing biker-only trails to limit damage can help limit the potential damage to the trails during holiday weekends.

42.

UETRECHT, Ethan
EARTH & SPACE SCIENCE
2015

ASSESSING THE PRACTICALITY OF ASTEROID DEFLECTION STRATEGIES USING SIMULATION

In the absence of human intervention, an asteroid impact with Earth is inevitable. In an attempt to predict and prevent possible impacts, scientists are currently detecting and monitoring near-Earth objects (NEOs) and have proposed numerous strategies for deflecting NEOs should they become a real threat. The purpose of this project is to determine the practicality of three selected deflection methods by simulating their overall effectiveness.

The Apophis asteroid was chosen for this project because it is a good example of a potential threat to Earth. The three selected deflection methods were the kinetic impact of a space vehicle with the asteroid, solar ablation, and standoff nuclear blast. The trajectory of Apophis was modified to collide with Earth, and each of the three selected deflection methods was mathematically modeled and its effect on the asteroid was simulated.

The kinetic impact method, which has a technology readiness level (TRL) of nine, was found to be successful when the impact occurred head-on or from behind with at least 5.7 orbits (five years) prior to impact. The ablation method was found to be more effective than kinetic impact but has a TRL of two. The standoff nuclear blast method was found to be most effective at deflecting the asteroid, but will likely cause fragmentation of the asteroid.

While each of these three methods can be successful depending on the situation, no single method seems to be the best choice for all possible situations. This analysis contributes to understanding which method is appropriate in a given situation.

43.

WANG, JONATHAN
EARTH & SPACE SCIENCE
2015

ENGINEERING

44.

BARNES, Ryan
ENGINEERING
2015

USE OF MESH TO STRENGTHEN 3D PRINTED MATERIALS

The experiment aimed to create a simple, inexpensive 3D printed material stronger in tensile strength with the addition of meshes (fiberglass, stainless steel, and aluminum) so that 3D printed items could be used in more areas than they are used today. The tensile strength of the 3D printed ABS (Acrylonitrile Butadiene Styrene) was expected to improve with the addition of the stronger meshes.

The 3D printed testable Specimens were created using a Deezmaker Bukobot Duo. On some of the specimens different layers of meshes were incorporated by laying them on top of the printed material. The specimens were tested at California State University, Long Beach (CSULB). The specimens were tested for tensile strength with an Instron machine.

The results showed that the tensile strength did not improve with the addition of the meshes. The data shows that all the specimens had a very similar tensile strength. The ABS did not bond as well as hoped through the gaps in the meshes. This divided the specimens into layers, which allowed for the meshes to stretch and slide inside of the specimen when being tested. Because of this the specimens could not hold a larger load.

45.

CHEN, Shannon
ENGINEERING
2015

DESIGN AND CONSTRUCTION OF A MINIATURE HELIUM AIRSHIP

Mini-airships of volumes in the order of one cubic meter were rarely constructed for practical applications due to their limited lift capacities. This project aimed at developing a concept for the design of mini-airships that were minimal in size and capable of carrying useful payloads.

Unlike the conventional airships, the mini-airship of this project had a non-rigid hull and a gas cell. The hull was not required to be air tight and the gas cell was not required to be mechanically strong. Lightweight materials thus could be used for size minimization. The hull envelope was expanded by light weight carbon rods for advanced hull shaping and for mounting the propeller assembly and payloads. Two propellers were installed to generate differential thrust. To select the best propeller, a setup was constructed to measure the propeller rotation, thrust, and power consumption.

A mini-airship with a length of 2.5 meters, a maximum diameter of 1.0 meter, a volume of 1.1 cubic meters, and a weight of 0.895 kg was constructed to validate the concept. The hull had a streamline shape scaled from Model 111 in the NACA report TN-614. Outdoor flight demonstrated maneuverability and a flight speed of >3.3 m/s. It also had a payload lift capacity of about 0.25kg. A dependence of the propeller thrust on the third power of the propeller diameter was observed and an equation was derived to explain the observation.

In summary, a new mini-airship architecture was developed and a mini-airship was fabricated which demonstrated the highest lift capacity and the fastest outdoor flight speed for its size. These results represented a significant progress in the development of mini-airship for practical applications.

46.

EL-MAGHARBEL, Yousef
ENGINEERING
2015

CREATING THE STURDIEST DEVICE DESIGN

Touch screen mobile devices are ubiquitous, and the ease with which the glass screens can crack and shatter is a common tale. Though industry focuses on how to make the devices thinner and lighter, most people would not consider carrying their device without a protective case, which paradoxically adds weight and bulk to the device. The objective of this project was to study the force of impact of differently shaped devices from different angles and to see if a vibrating device would fall with less initial force. The hypothesis was that a more 'ovular' device that has a convex back would roll over the curve on impact, spreading the force over a larger surface area and thus be less amenable to cracking.

Four different device designs were created using computer software by using the standard dimensions of an iPhone 6 and then varying the shape and curve. They were then 3D printed in hard plastic. The impact upon hitting a mechanical scale after being dropped from three feet was filmed at high frame rate, and the initial scale deflection recorded. Two other objects (a toy and a toothbrush) were similarly studied, comparing impact with vibration and without.

The data was analyzed to assess for the sturdiest side design by finding which face of each device had the lowest impact force.

Design 2 had the sturdiest back (10.7 N); Design 4 had the sturdiest side face (9.7 N); Design 3 had the sturdiest bottom face (8.7 N).

Analysis of the effect of vibration showed that a faster vibration (the toothbrush) increased the impact force, whereas the slower vibration (lighter wind up toy) decreased the impact force.

We concluded that initial force of impact can be studied using a mechanical scale, and that design shape does affect how a device falls and its initial force of impact. We also concluded that vibrating while falling can also affect the force, but that this depends on frequency of vibration.

Based on our findings, future research is needed to redesign a mobile device that combines the best features/sides of each design, to consider weighting the phone in order to make it more likely to fall on a specific side and to further study the effects of different vibration frequencies on force of impact.

47.

HATHAWAY, Erika
ENGINEERING
2015

P.A.W.S., PERSONALIZED ANIMAL WELCOMING SYSTEM

The object of this experiment was to create a pet door system entitled P.A.W.S., which stands for Personalized Animal Welcoming System. P.A.W.S. has the ability to voice recognize animal sounds, and utilize these sounds to control access through a modified pet door. Seeing that consumers are unhappy with the unauthorized entering of wild or unwanted animals, the P.A.W.S. door system would allow for only a certain pet to enter, creating a more secure and personalized pet door.

In constructing the complex device, several recorded sounds of various common animals including the *Felis catus* (cat), *Procyon lotor* (raccoon), *Didelphis virginiana* (opossum), and *Spilogale gracilis* (skunk) were compared and analyzed using an oscilloscope program called Pratt. An electronic voice recognition module was constructed, and ten cat voices were entered into the voice recognition chip, marking these voices the sounds that should be recognized by the system. Once completed, the voice recognition module was connected to a relay driver module. This module was used to energize a solenoid to unlock the pet door, effectively allowing only the animal with pre-inputted voice to be recognized and allowed inside the door.

Through this experiment, it was found that varying cats, or animals of the same species, have similar voices. Furthermore, by utilizing the results of the Pratt program, it was shown that cats have completely different voices then the sounds of a raccoon, possum, skunk, etc. Although it was a challenge for the subject cat to be trained to go through the door, it was found that the pet door system could work.

Thus, the P.A.W.S. system was successfully able to recognize the voice of a certain animal versus other animals. This design shows good potential to be a product that could be sold in stores around the world, so that consumers may live peacefully with security for themselves and their pets.

48.

HIGAKI, Akira & SCHATZ, Stephen
ENGINEERING
2015

COMBINING THE ADVANTAGES OF A QUADCOPTER AND AN OMNIWHEEL CAR

This project's objective was to create the most mobility in a vehicle so that the driver can choose between the fuel efficiency of an omniwheel car and the maneuverability quadcopter. By allowing the operator to choose maneuverability or fuel efficiency as the situation demands, a more useful vehicle has been created.

A vehicle was constructed, called a Carcopter, which was composed of a four-wheel omniwheel car, sliders to push out the quadcopter propellers, and quadcopter motors with propellers. The Carcopter was then tested to see the mobility range and the flight efficiency.

In car mode, the Carcopter was able to go straight forward, backward, left, right, diagonally, and rotate. During flight mode, the Carcopter was able to fly with stability and mobility. The vehicle's microcontroller was able to successfully interpret the signals from an RC Transmitter and give the commands to the Carcopter's components.

The hypothesis was correct in which the Carcopter was able to do combine the full capabilities of an omniwheel car and a quadcopter. In the future, this vehicle could replace emergency vehicle, helping to save lives when time is important, but also to save on fuel costs if there no urgent need to move quickly.

49.

IM, Cheolmin
ENGINEERING
2015

BEZIER CURVE BASED 3D WING DESIGN TOOL (BEZFOIL) DEVELOPMENT

The main objective of this project is the development of a JAVA Language based 3D GUI(Graphic User Interface) tool (BezFoil) for airplane wing designs using high order Bezier functions. The BezFoil has two main platforms, which are 2D airfoil section design and 3D wing shape design, that are linked to run simultaneously during the design process.

In 2D, the lower and the upper profile are generated using a high order (up to 8th) Bezier curve without discontinuity at the leading edge (LE) by implementation of tangent Bezier control point method. The functions to

compute useful airfoil design properties, which include airfoil centroid, radius of curvature, wing section area, camber line, imposition of trailing edge (TE) thickness, and rotation of the 2D profile by a target AOA (angle of attack), are available in the 2D design system. A special function was also developed to read coordinates of airfoils, such as the NACA series database, and to scan images of arbitrary airfoil sections, like the wing profiles of birds. After the master profile is developed through 2D design, it is directly exported to 3D system.

In 3D, the initial 3D wing shape is formed as a series of multiple wing sections (up to 11) with use of a 2D master profile in the wing span direction and by the function of wing aspect ratio, which is defined as the ratio of wing root chord and wing span. The primary features for 3D wing design tool include the function of a wing section rotation by a target AOA, the function of a wing section re-scaling as a fraction of the wing root chord, the function of a section profile translation in x-, y-, z-direction, the function of wing tip rotation in the wing span direction, and the function of the smooth wing surface generation with use of Hermite cubic splines. This tool especially focuses on the objective of giving a designer a high degree of freedom by providing 3D staking techniques, i.e. wing leaning and sweeping. A 3D wing that is highly twisted, swept, and leaned can be realized by changing the stacking axis (LE line or centroid) in 3D space with use of wing section rotation and translation modules. 3D wing section modification is another useful function in the tool that allows a designer to redesign or modify the current wing section profile during the design process using the direct link to 2D Bezier system. Aerodynamic performance of the 3D wing can be significantly improved using this option by adjusting a local wing profile favorable to the air flow.

In this research, a 2D/3D Bezier curved based GUI tool (BezFoil) for advanced 3D airplane wing design was developed. As design best practices, the Northrop Grumman B-2 Spirit bomber using a flying wing concept and the 3D wing of Boing 787 Dreamliner were also re-designed. The design examples conducted in this research show the powerful ability of this tool in the design of a highly aerodynamic and three dimensional shape of wing structure. The present work is a regarded as a cornerstone to develop a complete package for advanced airplane design system, which remains the next research topic.

50.

LANDSBERGER, Rei
ENGINEERING
2015

EFFECTS OF A FLUID-BASED SOLAR TRACKING DESIGN ON A SOLAR PANEL'S EFFICIENCY

The objective of the study was to determine if a fluid–based solar tracking mechanism could provide an increase in energy efficiency for a solar panel.

A basic frame for the solar tracking design was built out of thin foam board. With a tilted slope of 30˚ where the solar panel would be placed, higher density foam pieces were placed onto the tilted frame to anchor bearings that support the pivoting platform. The solar panel was secured onto the pivoting platform. The fluid apparatus, two one-inch outer diameter glass tubes filled with liquid methanol and connected by ¼ inch polyethylene tubing, was then installed on the pivoting platform. The electrical wires from the panel were connected to a small 12 volt, 5 watt water pump in series with a watt meter to measure power output. The water pump served as a load, drawing energy from the solar panel. The data were collected by recording the instantaneous watts produced by the tracking panel during a 30 minute time period, starting from 9:00AM to 4:00PM. Then, the tilt was set to that of a non-tracking solar panel, and the power produced in that position was collected.

The fluid-based solar tracker helped to boost the efficiency of the solar panel by 29% over the period of a whole day. The tracking design was fully automated, requiring no electricity, and tracked the sun reliably as it moved across the sky.

Through observations and from the data obtained, it was concluded that the fluid-based solar tracker helped to increase the efficiency of the solar panel and was a reliable design in tracking the sun.

ENVIRONMENTAL SCIENCE

51.

BABROS, Madeline
ENVIRONMENTAL SCIENCE
2015

OCEAN ACIDIFICATION IN SOUTH BAY WATERS

Ocean acidification is a huge issue today that affects the entire world because when carbon dioxide gas reacts with sea water it causes a more acidic environment because the pH level drops. Ocean acidification is a big issue because it causes crustaceans such as clams, oysters, coral, and muscles to lose the ability to create and maintain their shells. In this experiment, I tested which beach in the South Bay is most affected by ocean acidification. I wanted to learn how this major issue could be affecting my life. So I tested three beaches: RAT Beach in Redondo, Torrance Beach and the Bay in Palos Verdes. I collected seawater from each beach and observed the conditions of shells that I put in the water for 21 days; from January 20-February 11, 2015. After my experiment was concluded, I analyzed the material and saw that Redondo Beach was the most effected because of shell deterioration after being in ocean water.

52.

BAIK, Matthew
ENVIRONMENTAL SCIENCE
2015

DEGRADING POLYETHYLENE MICROBEADS WITH *Pseudomonas putida* IN WATER

The purpose of this experiment was to assess the degrading capabilities of the gram-negative bacteria *Pseudomonas putida* on polyethylene microbeads in water.

In order to conduct the experiment, five piles of polyethylene microbeads were measured, each weighing two grams. The piles were then placed into glass containers and two were assigned as controls, while the other three were the experimental groups. Each container was given water and minimal media mix, and the three control groups also received *P.putida* bacteria. After the two month period, the microbeads were filtered from the mixture, and were then rinsed with distilled water and isopropyl alcohol. The remaining piles were then dried, and weighed again.

The results showed that all of the microbead piles gained weight, though very little. The control groups gained an average of 0.018 grams, or about 0.900% of the original weight, while the experimental groups gained an average of 0.0035 grams, or about 0.175 % of the original weight. Overall, the experimental groups gained less weight than the controls.

The results of this experiment were unexpected due to the increase in weight, which did not support the hypothesis. However, the weight gain of the experimental groups was consistently less than that of the control groups, suggesting possible degradation by the bacteria. Future repeat experiments of similar kind with emphasis on maximal precision will be needed to clarify the results.

53.

KAUFMAN Delaney
ENVIRONMENTAL SCIENCE
2015

EVALUATING THE CORRELATION OF THE ORIGIN OF PACIFIC STORM TRACK WITH THEIR $\Delta^{18}O$ LEVELS

Precipitation in South West North America (SWNA) has fluctuated with interannual and multidecadal patterns, often tied to Pacific sea surface temperatures. A significant amount of research has been done to try to reconstruct past precipitation patterns with a goal of understanding future weather conditions. Global warming and the current drought in California have intensified the need for accurate means of predicting and modeling present and future precipitation. In 2013 McCabe-Glynn, et al published a paper in which they compared the $\delta^{18}O$ of speleothem samples with their respective storm track trajectories. They concluded that high $\delta^{18}O$ storms clustered from the tropical pacific and low $\delta^{18}O$ from the North Pacific, and that speleothem isotopic concentrations could be used to

model past storm track trajectories. The purpose of this research was to reproduce McCabe-Glynn et al's data and evaluate the reliability of their conclusion.
The trajectories of storms reaching Crystal Cave in Sequoia National Park were reconstructed using the NOAA HYSPLIT website. The trajectories were then paired with the $\delta^{18}O$ speleothem data from the cave. The trajectories were then plotted on three separate graphs based on whether they had a high, medium or low $\delta^{18}O$ value.
The data evaluated did not show any significant correlation between the $\delta^{18}O$ values and the origin of the storm tracks.
The results of this project raise serious doubt as to the reliability of $\delta^{18}O$ levels being used to model past storm precipitation patterns.

54.

KIM, Caroline
ENVIRONMENTAL SCIENCE
2015

ACCOUNTING FOR AND REDUCING SOIL ACIDITY AT MADRONA MARSH PRESERVE

Madrona Marsh supports a variety of organisms and ecosystems, so its soil must not be too acidic or alkaline. Therefore, its acidity raised concern for effects on the Marsh. The objective was to find and prevent the cause of the acidity. It was thought that the soil was acid sulfate soil and that calcium carbonate could mitigate the acidity. Acid sulfate soils release hydronium ions because of sulfur compounds that react with oxygen.

After initial colorimetric tests to confirm acidity, 50 soil samples had their pH measured while suspended in potassium chloride solution. Then, 11 samples were chosen. Their sulfur content was measured using chromium to cause unoxidized sulfur to oxidize. Titrations with iodine quantified the amount of sulfur present. Then, the amount of calcium carbonate to add to 5 grams of each of the 11 samples was calculated and added accordingly. Finally, the pH of those samples was measured in potassium chloride solution.

The mean initial pH was 5.64, but a pH of 6.5 indicates non-acid sulfate soil. After the calcium carbonate was added to the selected samples, each of those samples reached a pH of above 6.5 with a percent increase greater than 40%.

My hypothesis that the soil would be acid sulfate soil, and calcium carbonate would mitigate the acidity was not fully supported. It was not possible to determine whether the soil was acid sulfate soil due to unaccounted for variability. However, it was concluded that calcium carbonate can mitigate the soil acidity at Madrona Marsh.

55.

KIM, YOON
ENVIRONMENTAL SCIENCE
2015

THE FILTRATION OF WASTEWATER BY EPP BIOFILTRATION MEDIA.

The objective of this experiment is to test the efficiency of the EPP Media in biofiltration of wastewater. The wastewater contained suspended solids (dirt, food remains) as well as nitrate ions that had been broken down from ammonia. Two filters were created with 3 ft. PVC pipe at 2 inch diameter in order to test the efficiency of this media. One filter was filled three quarters with the EPP media while the other one was filled three quarters with sand. By hooking the both up to peristaltic pumps, the water was moved from the bottom up in the EPP media filter and top to bottom in the sand filter. When 6 samples were run through with constant nitrogen content at 10.6 mg/L and constant turbidity at approx. 4.6 NTU, the EPP media was able to filter the nitrogen content much more efficiently than the sand filter while the sand filter was able to filter the suspended solids proficiently. The EPP media is able to filter the nitrogen well because they contain microscopic holes that bacteria can grow. These bacteria are able to convert the nitrate ions into nitrogen gas and lower the nitrogen concentration to 2.5 mg/L. The sand, however, does not have the space that would allow for nitrogen converting bacteria to grow. This disables them to filter the nitrates. However, because the sand particles are smaller than the EPP media, the turbidity, or the opaqueness, came out much lower at around 0.98 NTU.

56.

LEE, Eudora
ENVIRONMENTAL SCIENCE
2015

EFFECT OF FERTILIZER ON OF PHYTOREMEDIATION OF IRON USING UMBRELLA-SEDGE, NARROWLEAF CATTAIL, AND SMARTWEED

The purpose of this project was to determine the effect kelp and fish fertilizer would have on the uptake of iron using phytoremediation with umbrella-sedge, narrowleaf cattail, and smartweed. Phytoremediation is the process of plants absorbing contaminants in the soil in a cost-efficient and non-disruptive way, therefore providing numerous benefits to the sensitive biodiversity and alleviating environmental harm caused by human activity. Due to its slow rate, phytoremediation is still a relatively nascent concept and not widely practiced. Using the fertilizer as a catalyst for root growth, it was hypothesized that the extract would encourage the uptake of iron.

Five jars were filled with marsh water and one of each type of plant; both were tested for initial iron concentration. Then each jar was dosed with 17.857 g of iron nitrate (8928.57 mg/L), in for a total of 5000 ppm iron+3/L. After 4 weeks, the plants were tested for final iron concentration to determine the amount absorbed.

The results indicated a general depression of iron uptake for smartweed and an erratic pattern for umbrella-sedge and narrowleaf cattail consisting of a decrease, then a spike, and finally reduction again. Due to the inconsistent results, this experiment indicates each plant's unique response to the fertilization.

My hypothesis was not supported by my results. It is concluded that the addition of fertilizer would not be beneficial to the acceleration of phytoremediation. This research has provided a basis for future research into the factors that affect the process of phytoremediation. Future investigation would be helpful in determining the specific cause of the fluctuating iron levels caused by the fertilizer. Understanding the concept of phytoremediation will build a foundation of understanding in reducing the human footprint left on the environment.

57.

MAJMUDAR, Jay
ENVIRONMENTAL SCIENCE
2015

THE EFFECTS OF ABIOTIC FACTORS ON PERCENT COVER OF RED ALGAE.

This project was designed to allocate the different abiotic factors that affect the growth and percent cover of red coralline algae. Currently, there is a great concern for the diminishing population of marine life due to global warming. This disturbance is widely affecting the red algae. If coralline red algae were to die off near the coast, habitats and food for animals would cease to exist disrupting the community.

In order to gather quantifiable data for abiotic factors, a half-meter by half-meter quadrat was placed at a random location. For each, the temperature, pH, and dissolved oxygen with the respective probes were collected, and a vial of water so it could be later tested for phosphates was collected. These abiotic factors were then compared to find relationship to percent cover of red algae within the quadrat.

Combining the Data from the 48 trials it was found that the average pH was 7.96, the average Dissolved Oxygen was 23.18%, the average amount of phosphates was 0.53 mg/L, and the average temperature was 19.75 degrees Celsius. After analyzing the data, the R-Squared was minute and the P-values were not under 0.05.

After reviewing my results, there was no consistent pattern with the data. The hypothesis that pH, dissolved oxygen, phosphates, and temperature would have an effect, separately, was not supported. It can be concluded that the null hypothesis is correct and there is no relationship between abiotic factors and Percent cover. Further research would include studying biotic factors.

58.

MCFARLAND, Michael
ENVIRONMENTAL SCIENCE
2015

THE POTENTIAL IMPACT OF HYPERION TREATMENT PLANT'S CHLORINATED EFFLUENT AND WEST BASIN BRINE ON MARINE ORGANISMS

In the fall of 2015, Hyperion Treatment Plant (HTP) will divert its effluent from the 5-Mile Outfall to the 1-Mile Outfall, leading to an increase in bacterial levels at local beaches. In order to control the bacterial levels on local beaches, HTP will be discharging its effluent dosed with 3 ppm Cl_2. In addition to this, West Basin Municipal Water District will be discharging excess brine leftover from its water reclamation processes at the plant.

This study tests whether the increase in concentration of HTP effluent, chlorine, and West Basin brine in various combinations will have an adverse effect on the marine organisms in the area near the terminus of the 1-Mile Outfall.

Two different tests were conducted in order to determine the potential impact that the diversion will have. Seawater collected from the from the NRG power plant in Redondo Beach, California, a 24 hour-flow-weighted composite sample of HTP effluent, and a sample of West Basin brine were used in the chronic toxicity tests. Four treatments were then prepared; effluent, effluent + chlorine, effluent + brine, and effluent + brine + chlorine. The bladelike sporophylls of the giant kelp *Macrocystis pyrifera* were induced to sporulate. Spores were then collected and placed into the four experimental treatments. The spores were allowed to develop and the number of nongerminated and germinated spores along with germination tube length was observed and analyzed. In the second set of experiments, red abalone were spawned and the resulting fertilized eggs were allowed to develop in each of the four treatments. The number of normal and abnormally developed eggs was then observed and recorded.

I hypothesized that the HTP effluent alone and in various combinations with chlorine, and West Basin brine will have a significant adverse effect on the giant kelp's % germination and germ tube length and the larval development of the red abalone. The results indicated that kelp spores showed no observable effect when exposed to any of the four treatments. However, the red abalone showed a significant effect when developed in the 7.14% HTP effluent concentration, chlorine, and West Basin brine with the HTP effluent concentration having the greatest single effect.

59.

NOE, Sarah
ENVIRONMENTAL SCIENCE
2015

THE EFFECTS OF WATER TOXICITY ON *Daphnia Magna*

The objective of this project was to determine the effects of exposing *Daphnia Magna* to increasing sediment concentrations. *Daphnia Magna* are a type of freshwater water flea and are frequently used as a bioassay to test for the prevalence of toxins in water, due to its sensitivity towards pollutants.

Due to the sensitivity of *Daphnia Magna,* toxicity concentrations were only raised by increments of 3 ppm. Locally found sediment was collected promptly after rainfall, and concentrations of 3 ppm, 6 ppm, and 9 ppm were converted to grams per 4 liters, or 1 gallon. 4 gallons of spring water were used in total, each consisting of 30 *Daphnia Magna*, with 1 control group of spring water only, and 3 gallons including sediment amounts according to each concentration. The gallons were checked after 8,16, 24, then 48 hours over the course of 2.5 days, and the number of survivors was counted each time.

With an average of 22 survivors in all 4 containers, 25 survivors in the pure gallon was due to the lack of food; the effects of sediment were minor in the 3 ppm gallon of 25 survivors, and the 6 ppm gallon of 21 survivors. The only significantly affected gallon was 9 ppm with 16 survivors.

These results do support my hypothesis, and they elucidate that the mortality rate of *Daphnia Magna* is only significantly affected by toxic water when pollution concentrations reach 9 ppm.

60.

WILLIAMS, Holly
ENVIRONMENTAL SCIENCE
2015

Designing a Self- Sustaining Aquaponics System

This project was designed to determine whether or not a self- sustained aquaponics system is a viable method of growing plants and raising fish. This project is a continuation of a project from last year, where the goal was to research, design and build the structure of a system that utilizes solar energy as well as the symbiotic relationship between fish and plants. Making alterations and improvements on the design from last year, the overall efficiency of such a system will be evaluated.

After the initial alterations to the system were made, water from the fish tank was tested to determine the overall health of the system in the form of Nitrite, Nitrate, Ammonia, and pH samples. Along with the water tests, observations were made regarding the heath of the plants. Results from these tests and observations resulted in additional changes made to the overall design of the system.

The system's design proved to be an effective method to distribute the fish waste to the plants, which act as a filter. The overall health of the plants, however, suggested that there were not enough nutrients readily available in the fish waste to result in adequate plant growth. The plants were only able to maintain their health, but did not seem to flourish in the system.

The system is able to support plants and keep fish healthy, but there was too much variation in terms of water test levels and plant health to conclude that this system is a successful agricultural technique. This aquaponics system represents a good starting point as it contains successful aspects, but in order for it to be more reliable it should be run on a larger scale to reduce the margin of error and increase the available nutrients in the system.

61.

WON, Insun (Lori)
ENVIRONMENTAL SCIENCE
2015

EFFECTS OF THE RESULTS OF CLIMATE CHANGE ON THE NUMBER OF PHYTOPLANKTON

The objective of this experiment was to see if a result of climate change affected the number of phytoplankton. The experiment covered two main results of climate change: temperature and pH in the ocean. The investigation also covered phosphates and nitrate levels because those are two known reasons for the increase of phytoplankton number.

To do this experiment, the temperature, the pH and the nutrient levels were measured for each trial. Also, each trial involved counting phytoplankton in three drops of water to find the average. I made a correlation between the variables (temp, pH, nutrients) with the number of phytoplankton.

Among the four independent variables, only one showed significance, and that was only for the outer beach (between the inner and outer beach). The significance was calculated using p-values and R-squared values. The one that showed significance was the pH from the outer beach.

Before the experiment, I hypothesized that the temperature would affect the phytoplankton number the most. After analyzing the data, there was no pattern that was consistent through both beaches. Next time, it would be better to run for a longer time to have greater temperature and pH fluctuations.

62.

WONG, Kriya
Environmental Science
2015

THE EFFECTS OF SORTING REFUSE ON METHANE GENERATION IN LANDFILLS

As awareness of the dwindling amounts of fossil fuels on earth spreads, we are forced to search for alternative sources of energy to support our society. Methane, generated by the anaerobic decomposition of refuse and separated from other emitted gases, was originally viewed as a negative product of landfills but has since been transformed into a form of energy through compression, boiling and drying. The EPA reports that by volume, landfill gas is about 50% methane and 50% carbon dioxide and water vapor; it also contains small amounts of nitrogen, oxygen, and hydrogen. With over one hundred landfill gas-to-energy plants functioning under the command of Waste Management, Inc., in the United States alone, this energy powers nearly 1.1 million homes.

My previous experiment was based on the assumption that because methane makes up approximately 50% of all landfill gas, quantifying these emissions would be indicative of the methane produced. With newly-available technology, this theory will also be tested through gas chromatography. With the small addition of Drywall to the assorted mix to include the construction debris present in landfills, the same four categories of waste will be allowed to decompose and generate potentially usable gas to be collected in Tedlar gas collection bags. The amount of landfill gas generated by each category of refuse was determined over a three-month period at an approximate temperature of 90 degrees Fahrenheit. Based on negligible amounts of gas generated, this study showed that the paper waste mix did not produce a large enough quantity of usable methane. Although few analyses of gas samples were successfully, the results remained constant. Carbon dioxide comprised the majority of biogas generated by each category of waste, except for the plastic mix which was constituted mainly of nitrogen gas. These results could either be caused by a leak in the sealed lid, or by the partially decomposed refuse used in the bioreactors which did not produce a large quantity of methane in the late stages of decomposition. Based on this study, segregated landfills do not yield a higher level of methane than assorted landfills.

Future experiments include pursuing other ways to enhance the decomposition of refuse within landfills in the interest of speeding up the process. Another worthwhile project would include a cost-benefit analysis to determine the benefits of sorted landfills. Since paper waste is technically not supposed to be in landfills but recycled and reused, combining it with organic waste to generate more power would have adverse effects on efforts to cut back on deforestation.

63.

ZHU, Andrew
ENVIRONMENTAL SCIENCE
2015

AN ANALYSIS OF THE LATE-STAGE DRYING CYCLE OF EIGHT WETLAND POOLS AT THE MADRONA MARSH PRESERVE

The Madrona Marsh Preserve, one of the last remaining natural habitats in Los Angeles, is extremely dynamic, having drastic changes every year and season. Therefore, because of the unpredictability of the Preserve, it is particularly important to frequently observe and analyze the Marsh in detail to protect and prolong the health of the preserve and its inhabitants. The purpose of this investigation is to create a detailed account of the annual late-stage drying cycle of eight selected wetland sites within the Madrona Marsh Preserve.

Eight pool sites on the Preserve were selected for study during the week of June 23. Field observations began on June 27, when the documentation of the amount of water and plant life began. Water and soil samples were collected from each site and were analyzed for their chemical and biological content. Plant species were also collected for identification. The period of field study lasted 47 days.

Findings from this field study included that each individual site had varying soil types, air temperature, and plants present. Also noted were differences in pH of soil and water, which are all slightly to moderately acidic. A total of 33 higher plant species were recorded, 9 of which were present at 4 or more sites. Microscopic life was present in all the water samples and the amount and species present varied widely in every site. None of the life forms were abundant, and all were transitioning to seeds and drought-resistant cysts.

After analyzing the data and comparing it to previous years, it was determined that each site has a unique plant and animal composition although the pH of the eight surveyed sites was significantly lower than before. Also, abundance of microscopic life was concluded to be lower than past observations. Since water samples were only

collected once, it was skewed sampling, a snapshot of transitioning life forms. Whether the uniqueness discovered in this study is true regarding the habitats of the entire Preserve is a matter worth investigating, perhaps in future research.

MEDICINE & HEALTH

64.

CHATURVEDI, Deeksha and SHERFA, Sogige
MEDICINE AND HEALTH
2015

USING RESISTANCE TRAINGING TO EXAMINE THE EFFECT OF A CHANGING MUSCLE MASS ON GLYCEMIC CONTROL AND OTHER CARDIOVASCULAR RISK FACTORS.

This investigation caused a change in muscle mass in order to observe its effect on glycemic control, resting heart rate, and systolic/diastolic blood pressure. It was hypothesized that if muscle mass has an effect on glycemic control and other cardiovascular risk factors, then increasing the muscle mass through resistance training will decrease the resting heart rate and the systolic/diastolic blood pressure over time while improving glycemic control.

Eleven individuals aged 40-60 years participated in the experiment. Five subjects participated a series of resistance training exercises for 6 weeks. The remaining 6 subjects did not perform the exercises. Skeletal muscle mass, fasting blood glucose, systolic/diastolic blood pressure, and resting heart rate data were recorded each week during the 6 week testing period. The changes found in risk factors for both the experimental and control groups were compared.

No significant trend, decreasing or otherwise, was determined. Any decrease in the risk factors was not significant enough to be considered relevant when the average change in muscle mass was plotted against the average change in each respective risk factor.

In conclusion, the results did not support the hypothesis. No significant correlation was determined between a change in muscle mass and the cardiovascular risk factors. Based on the collected results, it can be concluded that a change in muscle mass alone does not determine glycemic control and other cardiovascular risk factors. Thus, it can be extrapolated that other factors determine a person's cardiovascular risk. At the very most, muscle mass in conjunction with other elements can determine cardiovascular risk. However, this study should be repeated on a broader scale to clarify the aforementioned results.

65.

CHEN, Dennis
MEDICINE AND HEALTH
2014-2015

TESTING THE SIMULATION OF AChE INHIBITORS ON BChE TO IMPROVE UPON THE DESIGN OF EXISTING DRUGS AND PROCEDURES

This research project tests existing and developing drugs against the acetylcholinesterase (AChE) and butrylcholinesterase (BChE) in a series computer simulations. In this process, it is hoped that the viability of newly designed solutions will be shown through decreased drug analysis time.

Existing software has already solidified the basis of protein-ligand and protein-protein docking, and one with rigid docking protein-ligand simulations under water was selected. Using a predefined macro for docking simulations, 500 trials of each selected inhibitor molecule were applied to both enzymes. Trials with the best docking scores were saved and analyzed through molecular visualization software.

Through inspection of the active sites of each enzyme, it was discovered, among many other observations, that molecules that formed pairs of carbon branches were more thermodynamically favorable than those that did not for AChE, while the effect was less obvious for BChE, most likely due to it's larger gorge. Furthermore, the project

succeeded in showing speed increases of a single order of magnitude compared to existing software solutions, and three orders when compared to similar wet-lab experimentation.

The results from this project show simulated dockings' capability of dramatically reducing the time required to produce competitive drugs for markets. With a greater understanding of the algorithms used to produce these results, computer simulation will show to become a viable alternative to existing wet-lab experimentation.

66.

CHOI, Hailey
MEDICINE AND HEALTH
2015

SOLUBILITY RATES : BRAND NAMES V.S GENERICS.

The objective of this project was to analyze whether if the so called "brand name" drugs have a faster solubility than the generic brands. The main purpose was to see if the higher priced drugs actually do have a faster rate of solubility than the cheaper generic medicine. This would determine if the more expensive medicine do work faster, as their brand presents them to be. The hypothesis is that if the solubility rates between the over the counter brand medicine and generics were dissolved in both water and orange juice (pH), the brand named drugs will have a faster rate of helping the person taking the medicine.

To test this, the following materials were needed: tylenol traditional pills, tylenol gel-capsules, advil traditional pills, advil gel-capsules, Tylenol generic traditional pills, Advil generic traditional pills, Tylenol generic gel capsules, and Advil generic gel capsules. All these drugs were put in separate cups, first trial was timed the solubility in water. Secondly, it was tried again with orange juice, taking stomach acid's pH into account. For both experiments, they were all timed and stirred every 30 seconds. As each medicine dissolved completely into the respected water or orange juice, the time was recorded in seconds. Both experiments were repeated with 3 trials for each one. After, the seconds for the 3 trials were averaged, with separation from the generics and traditional pills.

The data was compared. The data collected showed that both the gel-capsulated pills and the traditional pills were all about 1+ minute more faster than the generic brands. Therefore, proving the hypothesis that the "brand names" actually do react faster, therefore having faster relief / effects.

This simple experiment has helped determined if paying the extra buck for a brand named drug pill is worth it or not. If looking for a faster relief to the pain, the generics might not be the best choice, because both the gel-capsules and the traditional pills were late to react and dissolve, than the brand named drug store medicine.

67.

DIBBO, Amelia and ROBINSON, Heather
Medicine & Health
2015

EFFECTS OF TEMPERATURE MANIPULATION ON VITAMIN C LEVELS

Every day people manipulate their fruits and vegetables in their diets. Fruits and vegetables are either eaten fresh, frozen for later use, or heated in the cooking process. The vitamins and nutrients that these foods supply make them a staple in most people's diets. This experiment was designed to find out whether extreme temperatures, after being either heated or frozen, affect the amount of vitamin C in fruits and vegetables. The investigation was conducted from January 10th, 2015 to February 14th, 2015 using a vitamin C titration technique to measure the amount of vitamin C in tomatoes, kiwis, sweet potatoes, and red bell peppers. The vitamin C levels of the fruit and vegetables were tested at room temperature, after heating, and after freezing. Data interpretation showed little to no difference in vitamin C levels after manipulation. However, reliability issues with the technique used could have compromised results. Overall the project was able to show the flaws of the vitamin C titration technique. With the information gained it has allowed us to begin thinking of a new way to test for vitamin C in foods.

68.

HU, Celeen
MEDICINE & HEALTH
2015

THE EFFECT OF LESS MARCAINE DURING REGIONAL NERVE BLOCKS IN ESRD PATIENTS

The goal of this project was to determine if a smaller dose of marcaine for a the AV fistula nerve block would be a viable option for anesthesiologists. The hypothesis was that if a smaller dose and percentage of marcaine was used, the result would be the same; the difference in success rates would be negligible.

The experiment was a retrospective study using data gathered from a hospital. The AV fistula procedure requires that the area of the arm in which the procedure is to be performed be numbed. A total nerve block was performed—a mixture of lidocaine and marcaine was injected into the brachial plexus nerve bundle using an ultrasound machine to pinpoint the nerve bundle. The patients were End Stage Renal Disease (ESRD) patients.

Data was collected from a hospital, and the weights, heights, dose of marcaine, and percentage of marcaine were recorded and charted. 1.5% marcaine in a 20 mL dose was used. The success rate for the procedure was determined by the pain level that patients felt. If the pain level was zero, the nerve block was a success.

The success rate for this experiment was found to be 91.7%. Five out of the 61 patients recorded reported feeling pain.

In conclusion, the data gathered proved that the experiment was a success. This supports my hypothesis. This project was meant to show that it is safe and effective to use a smaller dose of marcaine in order to decrease the toxicity of marcaine, a cardiotoxin that can affect the central nervous system and the cardiovascular system.

69.

HUANG, Christina
MEDICINE & HEALTH
2014/2015

THE INCORPORATION OF GROWTH FACTORS WITHIN A 3D SCAFFOLD FOR PROLIFERATION OF NEURAL STEM CELLS

New advances in stem cell therapies have promising implications for victims of many diseases, especially stroke patients who suffer from motor impairments due to death of brain tissue during stroke. Transplanting neural stem cells into scar tissue can facilitate neurogenesis following injury. Improvements may be achieved with the aid of 3D matrices that deliver cells to the injury site and protect them during the transplant. A novel combination hyaluronic acid, fibrin and laminin gel was proposed as a 3D scaffold for use in transplantation therapies and showed significant benefits for stem cell proliferation and survival. Improvements to this gel were made by crosslinking various growth factors that generally promote neural stem cell proliferation, survival, and differentiation. Brain-derived neurotrophic factor (BDNF), ciliary neurotrophic factor (CNTF), basic fibroblast growth factor (bFGF), Neurotrophin-3 (NT-3), and platelet-derived growth factor (PDGF) at 25 ng/ml, 10 ng/ml, and 2 ng/ml were tested.

The proliferation of the cells was observed with a Ki67 antibody stain. The results of the combination gels were contrasted with those of a hyaluronic acid-fibrin-laminin gel without growth factors. NSCs cultured on gels crosslinked with NT-3 showed to have the highest proliferation rates and the most number of surviving cells.

These results suggest that 3D scaffolds could be improved by incorporating growth factors, which are released to cells in a controlled fashion due to the structure of the gel. These gels may be beneficial in recovering motor skills lost during stroke by serving as a replacement extra-cellular matrix. The success of this formulation is a promising precursor to future cell therapies to restore normalcy to disabled stroke patients.

70.

KHAN, Leena
MEDICINE & HEALTH
2015

CLINICAL UTILITY OF CARDIAC MONITORING AND TRANSTHOACIC ECHOCARDIOGRAM IN ACUTE STROKE PATIENTS

Cardiac monitoring is essential in medical science because after a patient has a stroke, it is possible for them to have another stroke due to an irregular heartbeat. Cardiac monitoring helps recognize the irregular activity that is possible to occur after a patient has gone through a stroke. I conducted statistical analysis using medical records of 128 patients from ages of 26 to 98 years old who had suffered from a stroke within the time span of one year. Research was conducted at Harbor-UCLA Biomed from November 25th, 2014 to January 20th, 2015. The investigation started with finding correlation between people who have diabetes, hypertension, or have abused substances and patients who are thought to have a stroke. After narrowing down to the 128 patients who actually had a stroke, I was finding the correlation between stroke and cardiac monitoring. Further investigation showed that after tracking which patients had a transthoracic echocardiogram or atrial fibrillation before they had a stroke, it became clear that cardiac monitoring is useful. Final results show that 18 of the 128 patients transthoracic echocardiogram were positive and previously unknown atrial fibrillation was shown in 9 of the 128 patients. I also discovered that 7 patients who had a stroke as had a how in their heart, which had a slight effect on the data. As a result, it is evident that cardiac monitoring after a stroke is crucial in order to diagnose the possibility of future strokes and prevent them.

71.

KIM, Ji Eun (Lauren)
MEDICINE & HEALTH
2015

CATAMENIAL EPILEPSY IN NEUROCYCSTICEROCOSIS

Neurocysticercosis (NCC) is primarily found in countries with poor santitation and hygiene and improper slaughterhouse services. NCC is an infection of the brain with the flatworm *Taenia solium*, which is normally transmitted between human and pigs. NCC is caused when human's larva of the parasites go into the brain. There was never a specific review of what clinical signs are among the people with NCC. Some symptoms are epilepsy, severe headaches, and increased intracranial pressure. Seizures are episodes of disturbed brain activity that cause changes in attention or behavior. There were 583 patients who were evaluated during the study period. Of these, 393 had to be excluded because they were seen for neurologic conditions other than epilepsy and 30 more were excluded due to the lack of neuroimaging results. This leaves 160 patients who were included in the study that I conducted statistical analysis for at LA Biomed from November 2014 to February 2015. The 160 patients were evenly distributed between the 3 groups, with 63 having neuroimaging finding consistent neurocysticercosis, 42 other structural lesions, and 55 with no abnormalities who serve as a comparison group. The groups didn't differ significantly in use of tobacco, alcohol or illicit substances, which could potentially affect the seizure threshold. I split each 3 groups into women and men younger than and older than 50 then measured the number, frequency, and average number of seizures in each group. I used the SPSS showed a significant p-value of 0.007I and concluded that the only group with actual evidence of catamenial compenent is the group with the tapeworm.

72.

LEE, Nicole
MEDICINE & HEALTH
2015

GENDER DIFFERENCE IN CONE CELL RECOVERY RATES OF HUMAN EYES

The main purpose of this project was to find if there is a gender difference in recovery rates of cone cells in human eyes by assessing how long it takes for participants' cone cells to recover after being fatigued.

30 non-colorblind 9th graders attending Palos Verdes Peninsula High School were presented a slideshow containing three slides to view. The first slide displayed a white screen to give all the cone cells the same initial conditioning. The next slide presented a three-color pie graph equally split into red, green, and blue, for 30 seconds, stimulating all three types of cone cells at the same time. The last slide showed a white image to trigger an

afterimage. The persistence, measured in seconds, of this ephemeral image perceived by the participants was an indication of the recovery rates of the different cone cells.

Males averaged 26.6 seconds, 21.8 seconds, and 20.9 seconds in recovery time for red, green, and blue cone cells respectively. Females averaged 13.3 seconds, 12.3 seconds, and 9.9 seconds for red, green, and blue cone cells respectively.

The data collected indicated significant differences in recovery rates between male and female participants in that males are slower in recovery of all three types of cone cells – red, green, and blue. A previous study found superior visual persistence of male cone cells, and this could indicate an ability to endure fatigue longer, which would require a longer time for male cone cells to recover as discovered in this study.

73.

MURTY, Nikhil
MEDICINE AND HEALTH SCIENCES
2015

THE EFFECT OF NEBULIZED VITAMIN D ON NEONATAL LUNG DEVELOPMENT

Vitamin D (1α,25(OH)2D3) is an effector of fetal lung maturation. It also is what allows the body to absorb calcium. It stimulates key alveolar epithelial-mesenchymal interactions, causing growth of the lung. However, systemic administration of vitamin D can lead to blood toxicity and increased chances of hypercalcemia.

Using a nebulized agent instead of a systemic one, this study tested for increases in prenatal lung development after administration of vitamin D. Western blot analyses were conducted on Sprauge-Dawley rat lungs for mesenchymal (PPARγ) and epithelial (surfactant protein B) markers. These proteins indicated if there was any change in the maturation of the lungs.

The results showed that the protein levels of both the lungs administered with 25D and 1,25D increased with 1,25D having a having higher levels than 25D. The serum calcium levels also stayed the same, showing no increase above the normal levels. Thus, the administration of nebulized vitamin D could enhance lung maturation without the complications caused by systemic administration of vitamin D. These results would mainly be useful to prenatal children who are many times born with underdeveloped lungs and therefore have trouble breathing.

74.

ONYEADOR, Onyinyechi
Medicine & Health
2015

ASSOCIATION BETWEEN BONE MINERAL DENSITY AND CORONARY CALCIUM SCORE

Bone mineral density (BMD) is a measurement pertaining to the density of trabecular bone in the body, and coronary calcium score is a measurement that describes how much calcium is found in plaque located along the insides of the coronary arteries. The two are measured using cardiac Computed Tomography, a test that generates thin slices of cross sections of the chest by taking multi-angle scans of the chest region. I experimented to find the association between BMD and coronary calcium score in two separate asymptomatic male and female groups, with subjects ranging from 45-90 in age, from October 31, 2014 to February 2, 2014 at Los Angeles Biomedical Research Institute in Torrance, CA. My experimentation results include finding a significant correlation between these two measurements in the female data group, but an insignificant correlation between the two measurements in the male data group, plus a gradual downward trend in both data sets when graphed on a scatterplot, showing that as the BMD went up, the coronary calcium score went down.

75.

WONG, Janeline
MEDICINE & HEALTH
2015

USING NANOMATERIALS TO 3D PRINT PROSTHETIC BONE

This project was to design a viable, structurally accurate model of the human bone using 3D printing techniques. 3D printing is a viable technique for making accurate models of objects due to its versatility and precision. If said model were to be successful, it would have many medical implications. For example, in the world of prosthetics 3D printing would be able to help makers create limbs more specific to each amputee, increasing comfort.

To create such a model, the original design was first programmed using Autodesk program to sketch out the shape. Then the model was sent through a 3D printer, which printed it first with normal plastic to make a scaled model. Then the design was fixed and additional revisions were made before it was printed using a special 3D printer specifically made to print the material hydroxyapatite. The resultant model was hollow to mimic the hard outside layer of the human bone. Then a foam gel form of hydroxyapatite was inserted into the model and evenly distributed to mimic the spongy layer of the bone. The middle was left hollow as well for structural accuracy and lightweight.

This model resulted in an accurate representation of the human bone in theory. Based on basic strength tests, the model is able to bear weight and is quite durable. The hydroxyapatite material is biocompatible, thus ensuring that the model bone fits the biological part of this experiment too.

Overall, this experiment accomplished building and designing of a compatible model of human bone. However, this is a scale model of human bone only and will require further engineering as well as testing for strength along its 2 dimensional plane as well as torsional strain. Ultimately, my hypothesis that building an accurate model of bone was proven correct as I was able to do it.

MICROBIOLOGY

76.

BAI, Ruipeng
MICROBIOLOGY
2015

CAN HEAT KILLED CLINICALLY ISOLATED WHOLE CELL BE USED AS A NOVEL VACCINATION AGAINST HIGHLY DRUG RESISTANT Acinetobacter baumannii?

This project is to detect the amount of antibodies against Acinetobacter *baumannii* by the use of ELISA (Enzyme-Linked ImmunoSorbent Assay: test that uses antibodies and color change to identify a substance). Antibiotic resistance is one of the greatest threats to human health. In the last decade, extreme drug resistant-Acinetobacter *baumannii* has become a bigger and bigger problem to our soldiers in Iraq but now in hospitals. Infections caused by "Iraqibacter" can be found in the lungs, blood, and brain. It may also be found on skin or in food, water, or soil. Getting infected is not that hard. Common infection in a hospital is due to the infection by the environment. The ability of *baumannii* to persist on artificial surfaces for extended periods caused a lot of medical problems when injured soldiers are being transported from one room to another. Open food, poor hygiene, weak immune system, and exposure from surgery can cause an infection.

In this experiment, a novel vaccine method to treat these extreme drug resistant bacteria is to see if heat killed isolated clinical whole cells can kill Acinetobacter *baumannii.* This experiment is to see if this novel vaccination can induce high titer antibody in host from running ELISA tests. The control group will be the group that does not get vaccinated and the constants are plat coating protein concentration and Isotype control dilution factor for ELISA.

As the result, we have found that heat killed whole used cells could in fact be used as a novel vaccine against this bacteria.

77.

CASTILLO, Samantha
MICROBIOLOGY
2015

DETERMINING THE CHANGES OF BACTERIA GROWING ON HIGH SCHOOL SURFACES WITHIN A WEEK

The objective of this project was to analyze the bacteria growing on different high school surfaces during an extended period of time. The main purpose of this experimentation was to determine if the bacteria on high school surfaces change, grow, or disappear during the week without someone disinfecting the area.

In order to start this experimentation, bacteria samples from Palos Verdes Peninsula High School were collected onto agar Petri dishes. After culturing these samples in an incubator, the next step is to gram staining them onto microscope slides. Taking the gram stain kit with all the necessary chemical solutions and microscope slides, the bacteria were transferred to the slides then identified by its color, shape, and how it was grouped through a microscope.

The data collected showed that every surface swabbed has several different bacteria and fungi that had cultured. The bacteria discovered included *Escherichia Coli, Staphylococcus,* and *Streptococcus.*

Because there were many types of bacteria, each time they were analyzed, different bacteria would be shown, some harmful and others not. The conclusion is that bacteria are always moving, changing, and being spread to different areas around school and new bacteria is always growing.

78.

FILLER, Elan Eng
Microbiology
2015

TRANSCRIPTIONAL REGULATORS AS DRUG TARGETS FOR TREATMENT OF *C. glabrata* Infection

The fungus *Candida glabrata* enters the bloodstream from the GI tract, causing an often fatal infection. White blood cells and cells lining the GI tract contain antimicrobial peptides that kill *C. glabrata*. Patients with *C. glabrata* infection are treated with the drug caspofungin, but some strains are resistant. This year, I hypothesized that specific transcription factors that govern resistance to antimicrobial peptides and caspofungin are also necessary for *C. glabrata*'s virulence. Screening a library of 216 *C. glabrata* transcription factor deletion mutants, I found that 9 were sensitive to both antimicrobial peptides and caspofungin. Remarkably, 6 of these transcription factors were predicted by bioinformatics to part of 3 complexes, each of which governs gene expression by modifying histones. These complexes were the SAGA histone acetyltransferase complex, the RPD3L histone deacetylase complex, and the COMPASS histone methyltransferase complex. Adapting the *Galleria mellonella* model of disseminated *C. glabrata* infection to test the virulence of 5 of the 6 transcription factor mutants, I found that only Ada2, a member of the SAGA complex, was required for virulence. Computer-assisted protein modelling, docking, and screening identified potential antifungal drugs that inhibit Ada2. These included sulfonamides, a class of compounds that is already used to treat bacterial and parasitic infections. Thus, Ada2 is a highly promising antifungal drug target.

79.

HWANG, Saehui
MICROBIOLOGY
2015

EVALUATION OF THE EFFECTS OF EFFECTIVE MICROORGANISM ON MARSH WATER

Effective Microorganism, abbreviated as EM, consists of a wide variety of effective, beneficial and nonpathogenic microorganisms commonly found in all ecosystems. Teuro Higa introduced the idea of Effective Microorganism as a combination of microorganisms that are able to purify and revive nature. However, Higa himself said "the main limitation is the problem of reproducibility and lack of consistent results." No research has been conducted regarding marsh water, nor the different concentrations. This project was designed to test the effects of EM on marsh water, and to test the different results according to different concentrations.

Six water buckets were filled with 15L of marsh water. Each tank was tested for pH, dissolved oxygen, nitrate nitrogen, and ammonia nitrogen. After each test, different amounts of EM were added to the experimental tanks. This process was repeated every 5 days.

After 30days, dissolved oxygen increased in buckets with low concentration, and decreased in buckets with high concentration. The pH increased very slightly in all tanks. Nitrate nitrogen and ammonia nitrogen did not show significant results.

Microorganisms release OH ions and O ions, which release Oxygen into the water. This is why the dissolved oxygen rates went higher in lower concentration buckets. This project showed that buckets with higher concentration had more and more microorganisms demanding oxygen. The oxygen taken in by the microorganisms outweighed the released oxygen. The results show that adding EM to a water source creates a more suitable habitat for organisms by increasing oxygen availability.

80.

KAHSAI, Yasmine
MICROBIOLOGY
2015

THE RESISTANCE OF *ESCHERICHIA COLI* TO CONCENTRATED GREEN TEA

The purpose of this research was to determine if green tea could continuously hinder the growth of *Escherichia coli* without the bacteria becoming resistant. It is based on previous studies that had proven green tea's antibacterial properties on intestinal bacteria. This project attempts to answer whether tea is effective in the long run, after several uses on a bacterial colony. Antibiotics used today do not always function well because microorganisms evolve to escape influence; green tea may serve as a replacement.

Four separate samples were brewed for 6 minutes, with different concentrations. 1, 2, 3, and 4 teaspoons of Ito En loose leaf tea were used for this process. After the teas had completely cooled, a sterile swab stroked the entire surface of a soy agar plate with *E. coli*. 4 sterile paper disks were soaked in each sample of tea, then placed on the agar using sterilized forceps. The plate was set aside in an incubator. If zones of inhibition were present, the diameters were measured and the bacteria growing closest to the zones were swabbed and placed onto new plates. A paper disk with the corresponding tea concentration was placed in the middle of the swabbed area. If no zones of inhibition were present, the initial trial was repeated with higher concentrations.

No zones of inhibition were ever present on the plates. In some cases, the *E. coli* grew the most around the tea-saturated paper disks. The concentrations were increased several times, with similar results.

These results did not support the hypothesis that green tea would hinder the growth of *E. coli* and prevent resistance based on the concentration. Instead, the outcome indicated that traditional green tea was not strong enough to affect bacteria. The concentration must be much higher in future research to determine the actual influence. However, it is still possible that a different form of tea can replace typical antibiotic medicine.

81.

KANG, Hannah
MICROBIOLOGY
2015

THE EFFICACY OF PALLADIUM VS. SILVER NANOPARTICLES ON THE NEUTRALIZATION OF *E. coli* BACTERIA

The objective of this study was to determine the optimum metal nanoparticle, silver or palladium, for the neutralization of *E. coli* bacteria. Finding the concentration that neutralized the most efficiently was also tested.

This experiment consisted of two parts: the first part was comparing 10ppm colloidal silver and 10ppm colloidal palladium. In 10 baby food jars, labeled #1-5 Ag, and #1-5 Pd, different concentrations of colloidal silver and palladium were obtained. The concentrations were 10,00 μ/L, 1,000 μ/L, 100 μ/L, 10 μ/L, and 1 μ/L. 3 small paper circles were placed in each jar. *E. coli* bacteria was grown on nutrient-agar plates. The circles were placed on each of the nutrient-agar plates. The second part of the experiment was like the first, but instead of using a concentration of 10ppm, 500ppm was used. In this experiment, only silver was used because a high palladium concentration could not be found.

The 10ppm concentrated treated *E. coli* did not have any effects. However, the 500ppm treated bacteria did form zones of inhibition after 2 days. The highest concentration, 500,000 μ/L, formed an average width of 0.223cm. The next two highest concentrations formed averages of 0.260cm and 0.030cm.

It is not known which metal neutralizes bacteria the best, but it is proven that only high concentrations can treat bacteria. This discovery shows that if nanoparticles were to be used, a low priced metal would be ideal.

82.

KONG, Christopher
MICROBIOLOGY
2015

83.

KWAK, Chulhun
MICROBIOLOGY
2015

THE DEVELOPMENT OF THE RESISTANCE FORCE OF BACTERIA(FOUND IN CARS) AGAINST ANTIBIOTICS

This project was conducted to find out if there was a presence of antibiotic resistance bacteria in car handles and car gears and also to see susceptibility to commonly used antibiotics.

Ten cars were swabbed and then the bacteria were swabbed onto LB agar plates. Then five colonies were chosen from each plate and cultured. The cultures were then put onto agar plates and antibiotic disks from six different antibiotics were placed onto the plates.

After 24 hours, the inhibition zones from the antibiotic disks were measured and classified as resistant, intermediate, and susceptible according to the inhibition zone radii. The conclusion showed that a lot more colonies of bacteria were resistant to penicillin, and as well as ampicillin.

Ultimately, the hypothesis was supported and the penicillin and its similar antibiotic ampicillin is found to be the most resistant. More research could lead to the antibiotics that are not as resistant as the ones that have been used for a long time.

84.

LEE, Amanda
MICROBIOLOGY
2015

OIL DIGESTING MICROBES – THEIR USE IN POLLUTION CONTROL

Petroleum oil has been depositing on the bottoms of oceans for thousands of years. The reason our oceans have no significant oil pollution is because of oil-eating microbes. Certain bacteria such as a widely abundant *Pseudomonas* specialize in oil digestion. At the Madrona Marsh Preserve in Torrance, California, there are natural seeps that leak oil into the water and the surrounding soil. The purpose of this project was to determine if the native microbes of Madrona Marsh would participate in oil digestion by measuring the amount of total organic carbon (TOC) degraded within a 35-day time period.

The experiment was set up in capped test tubes at the Madrona Marsh lab: one tube containing commercial (Valvoline 10W-40) oil and marsh water. Madrona's native oil was not viscous enough for the experiment. Commercial oil was chosen as an alternative. The observations contained changes in the turbidity of the water and oil color change and volume. A La Brea Tar Pits sample was used for a reference.

The commercial oil test tube was sent to an environmental laboratory, Weck Industries for a TOC count and BioScreen Testing for a bacterial count and identification. The results for the commercial oil test tube showed a significant decrease of oil between the initial and final test tube. The TOC decreased by from 788000 mg/kg dry wt to 765000 mg/kg dry wt. The bacterial count increased tenfold from >2.0E+0.3 cfu/mL to >5.7E+0.4 cfu/mL. The predominant bacteria was identified as *Pseudomonas fluorescens*. The lab results provided evidence that *Pseudomonas fluorescens* digests oil without any feeding boosters or enzymes.

This knowledge helps to understand bioremediation, a natural process that uses microbes to digest pollutants. What was observed in this experiment can be inferred that the process can occur in similar environments with bioremediation. This project proved the global significance of bioremediation on a microscopic scale.

85.

MARQUEZ, Francesca
MICROBIOLOGY
2015

EFFECTS OF DILUTIONS OF LISTERINE ANTISEPTIC ON BACTERIAL RESISTANCE

The main purpose of this research project was to determine how different strength dilutions of Listerine antiseptic affects bacterial resistance. The hypothesis stated that if the bacterium *Escherichia coli* were exposed to solutions of 25%, 50%, and 100% of Listerine antiseptic, then the 25% solution would cause the most bacterial resistance to develop because it is the least amount of concentration of antiseptic.

Three beakers were made, each consisting of 25%, 50%, or 100% of Listerine antiseptic. The bottoms of each of the four agar plates were then divided into four quadrants. After the *Escherichia coli* was placed in all the agar plates, a sterilized paper disk was dipped into one of the beakers and placed in one quadrant of one agar plate. This was repeated for each agar plates' four quadrants, with the fourth agar plate being the control and consisting of water-soaked paper disks. A week was waited for each of the four generations until bacterial growth could be seen and recorded.

The zones of inhibition varied for each generation. The results of the 100% and 50% solutions were mostly inconsistent, with the 25% solutions, the weakest dilution, having the most consistent results.

Repeated exposure to different dilutions of Listerine antiseptic did cause some bacterial resistance to develop in the 25% solution. This supports the hypothesis, but the results for the 25% solution did not have much resistance, creating reasonable doubt of this experiment's validity. It would be wiser to use a disinfectant in the future.

86.

MCCLOUD, Kaelyn
MICROBIOLOGY
2015

CHEMOTAXIS: PHYSARUM POLYCEPHALUM IN THE PRESENCE OF VARIOUS AMOUNTS OF GLUCOSE

The purpose of this experiment was to measure chemotaxis in slime molds in the presence of various amounts of glucose. Since slime molds help in decomposition, seeing their reactions to certain glucose levels can aid to the environment; by seeing how environments can improve for their better.

In doing the experiment a number of procedures had to be done before the actual testing. First, healthy stocks of slime molds were grown. Afterwards various solutions with different concentrations of glucose were made. There were five paper cups labeled 100MM, 10MM, 1.0MM,and 0.10MM and Blank. One glucose tablet was used in which it was dissolved in the cup labeled 100MM. 10ml of the 100MM solution was poured into the cup labeled 10MM and 10 ml of that solution was poured into the cup labeled 1.0MM, the process continued to the 0.10MM cup. The Blank cup was pure water, no glucose was added. After making the solutions, paper strips were made and labeled with one of the MM and one labeled Blank. One cup of only water soaked six paper strips as well; this would lay beside the glucose paper strip to test what side the slime mold prefers. The paper strips with the corresponding label were placed into the cup for 15 minutes. The paper strips were then placed in a clean petri dish and four squares of agar with the slime molds were cut out and placed face down in between the water only and glucose paper strips. The Physarum grew for a week and the results were recorded.

Based on the results it can be concluded that Physarum Polycephalum prefer glucose, in most of the petri dishes the Physarum grew towards the glucose side.

The results agree with my hypothesis that Physarum Polycephalum prefer an environment with glucose. With this information many environments can be examined to see if slime molds are a good fit, and if not they can be improved for the slime molds better.

87.

SUNG, Eleanor Mina
MICROBIOLOGY
2015

INCREASING PHOTOSYNTHETIC EFFICIENCY OF ALGAE BIOFUEL BY FORMING NANOPLASMONIC MICROCAVITIES

This project was designed to test different concentrations of a gold ion solution in an environment to find the concentration in which microalgae can produce biofuel most efficiently. Though microalgae produces biofuel naturally, the rate at which it is produced is very low. As a result, by creating a nanoplasmonic microcavity, or an environment that is coated with metal ions like a mirror, the light that would normally pass right through the microalgae will be reflected back, therefore enhancing growth of the microalgae and production of biofuel. Different concentrations show different efficiencies of biofuel and cell growth.

PDMS, a polymer, was used to create the microcavities. While it was in gel form, the different concentrations of gold ion solutions were pipetted into the PDMS. Then, the PDMS was baked so that it would harden and the ion solutions would form into microcavities. After the wells were cleared of residual liquids, the microalgae that is at 0.1 optical density is pipetted into each separate well. Each day the growth of the microalgae was monitored by use of a hemocytometer.

Out of the five concentrations: 0mM, 0.5mM, 1.0mM, 2.0mM, and 4.0mM, the highest concentration (4.0mM) proved to be the most efficient environment because the number of microalgae cells was consistently greater compared to the other concentrations.

At the start of the project, I believed that a higher concentration would lead to a more efficient microalgae growth because it would have higher reflection, but I also thought that if there is a too high concentration, instead of enhancing the growth, it could prohibit growth. Though the second part of my hypothesis was not supported, further tests may prove to show whether it is correct or not.

PHYSICS

88.

CHAN, Matthew
PHYSICS
2015

THE DISTANCE GAINED IN A MAGNETIC ACCELERATOR

A gauss rifle is an electromagnetic device that consists of steel ball bearings and magnets. The purpose of this device is to increase kinetic energy within the system by taking advantage of the magnets' pull on the steel ball bearings. This experiment was performed to determine the distance gain for a varying amount of magnets. Currently, weak magnets are being used to model different mechanisms that could be based off of this.

A magnetic stage in a gauss rifle is composed of a magnet with a few steel ball bearings attached to one end of it. These magnetic stages were placed close together, magnet first. Another steel ball bearing would then be rolled towards the first magnetic stage, triggering the rapid transfer of kinetic energy within each magnetic stage, similar to the Newton's Cradle.

The results showed that an increase of magnetic stages lead to a steady, but not linear, rise to the distance traveled of the final ball bearing. With each trial, the amount increased to distance traveled would falter just a tad, losing a few tenths of a centimeter each time.

Although the results were as expected, the way the experiment was run yielded a considerable amount of energy lost due to the nature of the track used. Research for a practical use of this device would require a stronger magnets and a smoother track to run the experiment.

89.

HATHAWAY, Alisa
PHYSICS
2015

CAN YOU HEAR ME NOW: AN ENHANCED DEVICE TO IMPROVE CELL PHONE SIGNAL STRENGTH

This experiment was conducted to investigate the feasibility of utilizing a parabolic reflector to optimize service for cell phones. In this way, people that are in an emergency situation may be able to contact the authorities, and perhaps will be able to save people's lives.

A 5' parabolic umbrella was obtained online, and 10 aluminum foil triangles were used to cover the whole interior of the umbrella. A holder for the umbrella was also created, along with an alignment fixture, which consisted of two screw rods and 3 pieces of wood, which allowed the scientist to adjust and experiment with the angle and direction of the parabolic reflector without disrupting the radio waves. To test the parabolic reflector, it was aimed at the cell tower emitting the strongest signal, (which was found using a helical antenna constructed by the scientist) and the signal strength was measured using a power analyzing machine.

The results showed a definite increase in the strength of the signal, measured in dBm, when using the parabolic reflector. On average, the signal power was increased by around 10dBm, which is a significant increase in signal strength (around 30 times). During one of the trials, the scientist was able to increase the signal strength from -75dBm to -51dBm.

The hypothesis "If the scientist is able to create a parabolic reflector using common household materials, then there will be an increase in signal strength for a cell phone." was accepted. It would be interesting to try this experiment again, except this time using a normal low cost umbrella instead of a parabolic umbrella, to see how much, if any, the signal strength would increase.

90.

JOHNSON, Christopher
PHYSICS
2015

THE GEOMETRIC ANALYSIS OF BANKING SHOTS

The objective of this experiment was to analyze which positions on the basketball court are the easiest or hardest to shoot from and at which angles.

In order to test this, a shooter was placed four meters away from the center of the basketball hoop. The balls were shot from different angles, 30, 45, 60 degrees, 90 degrees being the baseline measurement. The distances were measured from where the middle of the hoop is perpendicular to the shooter. Distances were also measured for, when the balls went in, the spot on the backboard where the ball hit. The two distances were subtracted to get the total area on the backboard where the ball is able to go in, otherwise known as X1. X1 distances for all angles were divided by X1 for the 90 degree angle to get probability.

At the 30 degree angle, the ball is 419% more likely to go in compared to the 90 degree angle. At the 45 degree angle, the ball is 316% more likely to go in than compared to the 90 degree angle. At the 60 degree angle, the ball is 116% more likely to go in compared to the 90 degree angle.

The results show that it is easiest to bank a shot in from the 30 degree angle and it's hardest from the baseline position.

91.

SHAH, Sher
PHYSICS
2015

LOOPING A DC CURRENT BETWEEN TWO GENERATORS AND AA BATTERIES

Today's demand for energy has created a great dependance on natural gas and oil. Alternative energy has, to some success, reduced this dependancy. Recently, however, the invention of the QMoGen has claimed to be able to generate an infinite amount of energy by looping energy. However, none of these claims have any data to back them up, leading others to distrust the claims. This experiment aims to test the eligibility of QMoGens in a practical purpose.

QMoGens loop energy between a motor and a generator, creating additional energy in the process. This project is different from other QMoGens built, because in this experiment the QMoGen is tasked to power a car. Using a car will show the looped energy in the QMoGen as distance traveled. The finished car, in addition to the QMoGen setup, included a battery holder, and two rotatable wheels. The tests require the car to be released from the top of a ramp both with and without dead batteries, and for the distance the car traveled after it leaves the ramp to be measured.

The results of the data show that with a ramp height of twelve inches, the car with dead batteries was able to travel twenty-four percent farther than the car without batteries. Other height showed similar, but much lower result.

This experiment disproved claims made by QMoGens, but did show that energy could be looped. The experiment also demonstrates a successful practical use for QMoGens. However, harnessing energy in this way is extremely inefficient and needs to be worked upon.

92.

WOODLAND, William
PHYSICS
2015

PIEZOELECTRIC ELECTRICITY GENERATION ON CAMPUS

The objective of this project was to determine if it was plausible to provide power to a school by utilizing piezoelectricity. Piezoelectric materials are capable of converting pressure exerted onto them into electricity; so, human footsteps on a floor mat containing piezoelectric crystals could create electricity. Once the experiment was completed, the wattage created was determined.

A circuit board containing nine piezoelectric disks in a parallel circuit was constructed and placed in between two plywood boards the size of a standard stair. The board was placed at the bottom of a busy school staircase. Between each period, hundreds of students stepped on the mat, resulting in voltage generated. Then, the voltage the capacitor held was recorded. The data collected was used to find the average voltage generated each passing period.

The amount of electricity that could potentially be created was extrapolated from the average voltage. If each mat contained 20 circuit boards, and each was placed on every stair of the staircase, it would be possible to create 17.26 watts per day. Although using piezoelectricity to power a high school campus proved not plausible, these mats could create enough electricity to light up LED's, which could be used for safety purposes on a busy crosswalk.

The data revealed that piezoelectricity is not yet a viable alternative energy source, but does have the potential to be in the future. The data was significant in determining how much electricity could be created using "human powered" piezoelectric mats.

93.

WU, Juliana
ENGINEERING
2015

IMPROVED APPLICATIONS OF THERMOELECTRICITY AT A HOUSEHOLD LEVEL: YEAR THREE

For the past few decades, people have strived to utilize renewable resources as the source for electricity and power to run their homes. Thermoelectricity, which uses a temperature gradient to generate electric power via semiconductor technology, provides an alternative method to collect thermal energy, which is ultimately derived from solar power. Ideally, thermoelectric generators should be designed to be used with a hot water tank in a household set up.

The purpose of this project was to discover the most optimum combination of external supplements to the thermoelectric chip to maximize the power yield it can produce, as well as minimize the drawbacks of the potential heat transfer from the "hot" surface to the "cool" surface that ultimately occurs with a thermoelectric module. Comparisons were made between the using tin and copper metal on the chip, as well as connecting the numerous chips by a parallel loop or a serial loop. Observations with a combination of a magnify glass and a glass Pyrex cover were also made.

The setup using the heat sink, the copper sheet metal laid on top of the thermoelectric chips, and covered by a glass Pyrex bowl yielded the greatest voltages, which indicates that power would be high as well. The most optimum combinations were chose based on choosing the one with the greatest voltage, but also has a feasible increase in water temperature.

Based on this research data, it seems that including thermoelectricity technology in the hot water system is feasible. The data showed that the magnifying glass did not necessarily improve the thermoelectric module's performance the most, but if the glass Pyrex bowl cover can be molten to be shaped into a different shape, an optimum angle of the cover can be looked into in the future.

94.

XIANG, Colin and STOUT, Ben
PHYSICS
2015

IMPROVING THE COST EFFICIENCY OF FUEL CELLS BY CHANGING THE CATALYST

The objective of this experiment is to build a basic fuel cell and determine its efficiency and to attempt to improve cost efficiency of the fuel cell by changing the catalyst. We hypothesized that there is a cheaper metal catalyst that doesn't reduce the efficiency of the fuel cell.

First, a fuel cell was built. To produce hydrogen gas and oxygen gas, a battery was used to perform electrolysis. When the gas tanks were filled to an appropriate level, the fuel cell chemical process began to generate electricity and power the motor. The currents were measured and the efficiencies were calculated. Different metals were tried however none of them are in shape to be used as a catalyst.

One of the principal finding of this experiment is that this type of fuel cell with platinum catalyst has an efficiency of 10%, meaning 10% of energy used to produce the hydrogen was effectively able to power the motor. Another principle finding is that pure nickel and aluminum cannot catalyze fuel cell reactions.

Through this experiment, we concluded that further research is required to discover a cheaper metal catalyst that does not reduce the efficiency of the fuel cell to replace platinum. Although we didn't find a solution the high cost of fuel cells, researchers in MIT and other intuitions are working to find a solution so that we can generate the electricity for the future.

ZOOLOGY

95.

BOUSHEHRI, Shannon
ZOOLOGY
2015

ABUNDANCE OF ANOTHOPLEURA ELEGANTISSIMA IN THE POINT FERMIN TIDE POOL ECOSYSTEM

The objective of this project was to determine at what point in the interidal zone the *Anothopleura Elegantissima* are more abundant within the Point Fermin tide pool ecosystem. *Anthopleura elegantissima* are present in the intertidal area in aggregating groups, when produced asexually, or solitary forms, when produced sexually. Information regarding the abundance of these aggregating anemones at different tidal levels within the Pt. Fermin tide pools can lead to insight on the effects of location on the reproduction and type of reproduction of the aggregating anemones.

The experiment was conducted by selecting six random points, with a random number generator, for every 25 meters along the coast of the Point Fermin tide pools. This went on for 175 meters. At these random points a random number generator was again used to select how far out from shore a quadrate would be placed. Photos were taken of the quadrates and ImageJ was used to calculate the amount of sea anemones within each. All data was collected when the tides were at or below zero feet.

From the data collected, it was concluded that the *Anothopleura Elegantissima* are more evident within the high intertidal. There were many found in the middle intertidal also but not as many.

The conclusions from this experiment did not support the hypothesis that there would be more in the lower intertidal zone. If repeated, data should also be collected of the predators of the sea anemone in the area.

96.

HADIDJAJA, Karen
ZOOLOGY
2015

SURVEY OF MUSSELS IN THE INTERTIDAL ZONE FOR THE PURPOSE OF THE EFFECTS OF THE SEA STAR WASTING SYNDROME ON THE POINT FERMIN TIDE POOL ECOSYSTEM

The project was designed to discover how the Sea Star Wasting Syndrome has affected the population of California Mussels (*Mytilus californianus*) along the Point Fermin Tide Pool Ecosystem. Mussels are one of the main preys of sea stars (*Asteroidea*), and with the disappearance of their predators, the numbers of mussels will presumably increase.

Data was collected through the method of random sampling in three locations along the Point Fermin tide pools. Transect tapes were positioned at 8 meters of length at each landmark to form a grid for quadrate placements that were selected through a random number generator; there were five quadrate placements for each location. Then, the number of mussels were recorded in a lab notebook. This was done for each of the three locations selected along the Point Fermin Tide Pools.

The data collected has depicted an unstable slope with neither an increasing or decreasing pattern over a three month time period.

More data will be necessary over a longer period of time in order to come to a conclusion for the affects of the sea star wasting syndrome on the population of mussels. This experiment has initiated a long term project that has an open ended question, and can fill in the blanks for the enigma of the sea star wasting syndrome.

97.

HARTUV, Dustin
ZOOLOGY
2015

CORRELATION BETWEEN HABITAT QUALITY AND ABUNDANCE/DIVERSITY OF CALIFORNIA BIRDS

Past studies have been contradictory in whether the abundance and diversity of a species is positively correlated with habitat quality. One study showed that of the 80 species of birds counted before and after a fire in a Coastal sage scrub habitat (CSS), almost 100% of the species had higher numbers in the developed habitat (Stanton 1986). Another study on land snails found that there were species that did not correlate the same way (Vergeer, Rengelink, Copal and Ouborg, 2003). As such, in an eight week period between November 30,2014 to January 25, 2015, I observed ten different species of common birds native to the CSS habitat in three different qualities of habitats, highly degraded, restoration in progress and existing native habitat, all found along the Palos Verdes Peninsula. After the eight weeks, I averaged the amount of birds counted and found that with the exception of the house finch and the spotted towhee, all of the species of birds had the highest numbers in the restoration in progress habitat. These results prove that not all species have the highest numbers in a native habitat. These results can be used in several ways, including increasing the numbers of an endangered species if it is known whether the species prefers a native habitat or restoration in progress habitat. In addition, nature preserves can determine what habitat quality to insert specific species into in order to have that species thrive satisfactorily.

98.

KIM, Anthony
ZOOLOGY
2015

THE RELATIONSHIP BETWEEN SALINITY AND PULSATION RATES OF *AURELIA AURITA*

Aurelia aurita, the common moon jelly, is found near coasts in warm tropical habitats and is also abundant in inshore and ocean habitats. They are able to withstand wide ranges of temperatures and salinities, which would explain their versatility. This project studied the relationship between salinity and pulsation rates of these organisms to explore how one abiotic environmental factor affects the behavior of the moon jellies over time. The hypothesis was that as salinity increased, the rate of pulsation should also increase.

25 ephyrae, the offspring of asexual reproduction of polyps, were separated into five different beakers with 500 mL reverse osmosis water and Instant Ocean salt. After changing the salinities of the water in which the moon jelly ephyrae were placed to 20, 25, 32, 35, and 40 ppt, and 32 ppt was set as the control. The number of pulses was

then measured for 5 consecutive 1-minute intervals immediately after placement from the original culture, one hour after placement, and 24 hours after placement.

After the conclusion of the experiment, the data revealed that the relationship between salinity and pulsation rates was directly linear, supporting the hypothesis. One-way ANOVA data analysis tests were used to compare the pulses per min for each salinity after 1-min, 1-hr, and 24-hr after transfer, and there was a p value less than 0.02 for "after 1-min" and "after 1-hr" but a p value less than 0.05 for "after 24-hr". The direct relationship between salinity and pulsation rates inverses after 24 hours, but the data did not completely reflect that.

Even though jellyfish do not have an osmoregulation system, there must be a mechanism in which they respond to the various degrees of salinity. It is likely like that through increased pulsation, the jellyfish quickly adapt to the hypersaline conditions, and it is likely that after 24 hours, pulsation behavior returns to normal rates.

99.

LEE, Lauren
ZOOLOGY
2015

INVESTIGATING AQUACULTURE CONDITIONS OF HALIOTRIS RUFESCENS LARVAE

100.

LU, Sarah
ZOOLOGY
2015

EFFECTS OF ALGAL ENRICHMENT ON THE GROWTH OF MOON JELLY EPHYRAE (*Aurelia aurita*)

The significance of the indirect consumption of microalgae by sea jellies is unknown. This project was designed to determine the effects of algal enrichment on the growth of Moon Jelly (*Aurelia aurita*) ephyrae by measuring growth. Algal enrichments were fed indirectly to the ephyrae through a main food source for ephyrae, *Artemia sp.*. If indirect algal consumption impacts ephyrae growth, then ephyrae that are fed enriched *Artemia sp.* will grow at a faster rate than ephyrae that are fed non-enriched *Artemia sp.*.

In the five trials conducted, ten ephyrae in each experimental group were fed 10mL of *Artemia sp.*, enriched with 10mL of their respective algal enrichments daily. To measure growth, each ephyra was pipetted onto a slide, placed under the dissecting microscope, and photographed. The software ImageJ was then used to measure the diameter of each ephyra and an average diameter for each experimental group was calculated.

The comparison of the average diameter of the ephyrae in the enrichment groups to that of the control group shows that the algal enrichment did not have a significant effect on the growth of the ephyrae over time. The comparison of the average diameter of the ephyrae in each experimental group to one another shows that there was no one algal enrichment that had a greater effect on the growth of the ephyrae than another.

The knowledge gained from the experiment suggests that either the growth of ephyrae is not affected by algae consumption or that the algal enrichments used in this experiment are not the type of algae that affect ephyrae growth.

101.

MORI, Ryan
ZOOLOGY
2015

DETERMINING THE EFFECTS OF TEMPERATURE AND WATER DEPTH ON THE BEHAVIOR OF *PAGURUS SAMUELIS*

This experiment was performed in order to observe hermit crab behavioral patterns. Since in the tidepools these organisms must be able to withstand temperature surges for short periods of time, this experiment was designed to test hermit crab behavior over an extended period of time in extreme temperatures.

In order to test this, a tank was constructed with a partial divider to divide the tank into two halves. Sand was then placed in the shape of a slope on both halves and on top of the divider to create a land bridge between the

two halves of the tank. One half was filled with cold water (55F) while the other half was filled with warm water (70F) to a level just short of the height of the divider, where the water then drained out through holes in the side of the tank. The number of crabs on each side of the tank in either shallow or deep sections of each pool were counted every hour with the assistance of a camera that took pictures every 30 seconds.

It was found that no crabs actually crossed over from one pool to the other and that most of the crabs could usually be found in the deeper sections of the pools, regardless of temperature.

From this experiment, it can be inferred that hermit crabs prefer the deeper zones of water regardless of the temperature of the water. However, in order to conclude this with more confidence, further tests involving much deeper pools of water would need to be performed.

102.

SHIM, Kaitlyn
ZOOLOGY
2015

THE EFFECT OF DENSITY ON THE SPEED OF LUMBRICINA'S ABILITY TO DECOMPOSE SURFACE RESIDUE

The Lumbricus terrestris, more commonly known as the earthworm, play a vital role in the ecosystem and act as tillers to the soil by incorporating plant material. The objective of this experiment was to determine the effect of the number of worms per unit volume of soil on the decomposition of those surface residues.

Five pots were filled with top soil leaving 5.5 cm from the surface of the soil to the rim of the pot. The soil was required to be moist enough to hold the shape of a ball when squeezed in my hands. Each pot was filled with 0 worm, 10 worms, 20 worms, 30 worms, and 40 worms respectively. After the worms were placed and had moved into the soil from the surface, grass clippings were added leaving 3 cm from the top. The distance between the grass clippings and the top of the pot was recorded every day for 31 days.

It was found that the pot with the largest difference from the beginning measurement was the most efficient in decomposing surface residues was Pot #4 containing 30 in which the level of grass decreased 2.5cm. And Pot #5 showed a 5.4 decrease. The ratio of 30 worms per 1,727.88 cm^3, the volume of the soil, was concluded to be the ideal density for the earthworms to decompose surface residues.

Based on the data taken from the 31 days, my hypothesis that the pot with 40 worms would perform most efficiently was proven wrong. It may be concluded that the carrying capacity for these worms was limited to 30 worms per unit volume. However, a Chi-squared test was performed and showed that this experiment failed to reject the null hypothesis that the earthworm's efficiency was associated with the density of the worms.

103.

SMITH, Caleb
ZOOLOGY
2015

Utilizing the Nmdme Pathway To Discover Lifespan Increasing Drosophilia Genes

104.

TAJIRIAN, Margaret
ZOOLOGY
2015

THE DIETARY SELECTION OF THE CALIFORNIA BROWN SEA HARE

The California Brown Sea Hare, Aplysia californica, is a remarkable creature located in multiple tide pools along the California coast and the Gulf of California. The focus of this study is to identify the algal feeding preference of sea hares. Sea hares were collected from the Point Fermin Park in San Pedro, California and the experiment was conducted from January 16th- January 19th, 2015. My hypothesis was if the sea hares are given 18 hours to feed with the choice of red algae or brown algae, then they will consume a greater amount of red algae because of it softer and less waxy texture. After observations of their digestive process and measuring the amount of how much

red versus brown algae has been consumed by the sea hates, my results and conclusions showed that red algae is preferred over brown algae.

105.

WANG, Annie
ZOOLOGY
2015

EFFECTS OF TRAINING ON STRESS LEVELS AFTER TRANSFER OF *O. BIMACULOIDES*

The purpose of this project was to determine whether or not training the two spot octopuses,*Octopus bimaculoides*, would affect their stress responses after transferring them to different tanks. Often times, captive octopuses undergo tremendous stress when transferred from tanks and the stress from being removed from their known environment negatively affect the octopuses and their health. In an attempt to find a solution for reducing stress when transferring, eight juvenile *O. bimaculoides* were used; four octopuses was trained while the other four were not. The octopuses were trained so that they will be more comfortable with transferring.

The training regimen consisted of associating the octopuses with the ladle, which was what was used to transfer all octopuses. *Carcinus maenas* were used as positive reinforcement, or rewards, for the octopuses that respond to the ladle. After a training period of 14 weeks, the octopuses were tested for stress responses to training.

Overall, the experimental group showed lower changes in respiration numbers than the control group and also displayed less color flashes. Other responses observed were arm movements, body movements, sudden jerks, and labored respiration.

Statistical tests showed that four of the six responses observed were insignificant but the general trend of the responses shows that trained octopuses were not only transferred with less hassle and time, but they also displayed less stress responses. In order to see whether or not these trends are significant, more tests can be run an increased more number of octopuses.

106.

WILL, Isabella
ZOOLOGY
2015

EFFECTS OF DIFFERENT SUBSTRATES ON *MELIBE LEONINA* SURVIVORSHIP

The *Melibe leonina*, a member of the nudibranch family and often referred to by its less glamorous name the sea slug, forms a vital part of the kelp bed ecosystem on the west coast of North America. The *Melibe leonina* is often studied to better understand the neural sciences. Yet attempts to reproduce the *Melibe leonina* all the way to adulthood have been challenging. Developing consistent procedures for reproducing *Melibe leonina* is an important first step to performing studies of these invertebrates in a laboratory environment. This project will investigate the effects of different types of substrates on *Melibe leonina* survivorship. The hypothesis is that the real kelp group will yield the greatest survivorship.

Egg masses were collected from the Nudibranch Exhibit at Cabrillo Marine Aquarium. The egg masses were flushed with micro-filtered water, examined for fertilization, and placed into sanitized buckets containing micro-filtered water. The types of substrates used were fake kelp with kelp slime, real kelp, and fake kelp. The control group consisted of a bucket without a substrate. To determine the survivorship of the *Melibe leonina*, 3 random samples were taken from the bottom, substrate or middle, and surface of each bucket. Veligers were counted under a dissecting microscope then averaged. The amount of days veligers were seen alive represents the survivorship.

An analysis of the results revealed that the data was not statistically significant. However the averages of the raw data would suggest that the fake kelp and control groups had greater survivorship while the fake kelp with slime and the real kelp groups had lower survivorship. But as mentioned, the variability of the data was extreme in all the methods studied.

In conclusion, the results do not reject nor support the hypothesis. Although one can conclude that a substrate statistically does not affect the survivability, the extreme variability of the data would suggest that other factors were violating the stability of the environment. Namely, the absence of a current, as veligers tended to remain at the bottom of the buckets. Future experiments should evaluate the addition of a current on the *Melibe leonina* survivorship and continue to aim for extending the survivorship period.

107.

YEN, Lauren
ZOOLOGY
2015

THE EFFECT OF LIGHT ON NERVE CONDUCTION IN *LUMBRICINA TERRESTRIS* EARTHWORMS

Although low-level laser treatment has been used to treat pain, it is not known how light alters nerve cells. The objective of this experiment examines whether light can alter nerve conduction velocity.

Thirty five earthworms (lumbricina terrestris) were used to optimize the nerve conduction experiments and to test five different light conditions (unlit control, red light-650nm, green light-510 nm, violet light-400nm, red light-630nm)in triplicate samples. The earthworms were stimulated with <5mV repeat mode pulses of electric current (GRASS SD9 Stimulator) via electrodes placed into the anterior part of the worm. Two recording electrodes, 3 cm apart, were placed under the medial ventral nerve cords that were connected to a do-it yourself bioamplifier(1000X, Backyard Brains) that transmitted the amplified changes in voltage to a RIGOL DS1102E oscilloscope. The repeated pulses of electric current were recorded as action potentials passing the recording electrodes. The delay in signal between the two electrodes was digitally measured and recorded on an external USB drive.

There was no change in conduction velocity with violet light, slight change with green light and a 2-fold slow down in conduction velocity with red light. The slower conduction velocity with red light was maintained for ten minutes and gradually returned to baseline.

Red light can slow down nerve conduction velocity, a possible explanation for how LLLT can alter pain sensation in clinical applications.