



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Zavier L. Annis	Project Number J2101
Project Title Effects of Varied Ratios of Greywater to Clean Water on Tall Fescue Grass	
Abstract Objectives/Goals This experiment tested which ratio of greywater to clean water (greywater/clean water), among eleven, descending by 10% greywater, is the most effective when used to water tall fescue grass. Methods/Materials The procedure involved placing all eleven samples under a grow lamp and checking them every evening to take observations, moving to maintain evenness of light received, and watering when necessary. The approximate observations taken were written to calculate the four dependent variables: average length, longest sprout, range, and number of sprouts. Results All four variables were taken into consideration, and the ratio of 60% greywater to 40% clean water proved to be the most effective, mostly based on its superior average length and high number of sprouts germinated in a short amount of time. Interestingly, the samples (including 60/40) watered with ratios close to 1/2 greywater and 1/2 clean water seemed generally more successful than ones watered with mostly clean water (not including 10/90 and 100% clean water). Conclusions/Discussion Contrary to my hypothesis, the materials in the greywater did seem to have a substantial effect, sometimes positive and sometimes negative, on the growth of the grass. In conclusion, 60% greywater and 40% clean water is a very effective ratio to use when watering tall fescue grass, and could be used to water actual lawns and backyards.	
Summary Statement This project tested the effects of combined greywater and clean water, in varying ratios, on tall fescue grass.	
Help Received My parents provided financial support for materials. My father provided certain tools and other on-hand materials used during the experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Amruth Chilukuri	Project Number J2102
Project Title The Effects of Ultraviolet Radiation on Yeast Colony Growth	
Abstract Objectives/Goals The objective of this project is to determine which type of Ultraviolet Ray (A or B) would have the most lethal impact on yeast colony growth. Methods/Materials UV-sensitive yeast culture (mutant in several DNA repair pathways), sterile dilution tubes, sterile toothpicks, Yeast-extract dextrose medium, Petri dishes, sterile distilled water, and pipettes. Measured percentage of yeast colony death after exposure to UVA and UVB Rays. Results Petri dishes filled with YED and yeast extract from a single colony were placed in the sunlight during different times of the day. Yeast (at various concentrations from a serial dilution) was placed in the sun from 12pm-4pm for UVA exposure and then taken inside and wrapped in aluminum foil. Other petri dishes of yeast at various concentrations were placed outside from 4pm-8pm for UVB exposure and then taken inside. Percentage of yeast death was calculated and it was determined that UVA had a more significant impact on yeast colony growth than UVB because more yeast colonies grew on UVB exposed petri dishes compared to UVA exposed dishes. Conclusions/Discussion After conducting numerous trials between UVA exposed dishes and UVB exposed dishes, they reveal UVA Rays had a more lethal effect on the yeast colony growth compared to UVB Rays. It can be concluded that UVA will continually have a harmful impact on yeast colony growth. This is significant because yeast colonies in this experiment mimic human skin cells or the epidermis. The yeast used are mutated in several DNA repair pathways thus DNA cannot repair itself. When exposed to UV rays, the yeast cannot grow and we can assume that UV rays also have a negative effect on human skin cells. Repetitive damage to skin cells can result in melanomas and carcinomas for humans. Thus this experiment substantiates the claim that UV rays can cause significant damage to humans by examining a yeast model to study DNA damage.	
Summary Statement By measuring the percentage of yeast colonies after exposure to different Ultraviolet Rays, I discovered that UVA had a more overall lethal impact on yeast colony growth.	
Help Received I designed and conducted the experiment by myself.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Avery E. DeVore	Project Number J2103
-----------------------------------	---------------------------------------

Project Title
What Essential Oil Kills Flies the Fastest?

Abstract

Objectives/Goals
Which Essential Oil will kill flies the fastest between Lemongrass, Lavender, Basil or Eucalyptus?

Methods/Materials
Put the 300 unhatched fly larva in a container and cover with netting to let flies hatch for 3 days
Put fully grown flies in freezer for 15-20 minutes so they fall asleep
Separate flies into 75 fly groups and put each group into a separate container and put designated Essential Oil on Qtip and place in container and cover with netting and tape close.
Take pictures at 1, 3, 6, and 24 hour time periods and count number of active flies in each container then record the data.
Materials List:
Cage
Unhatched larvae flies
Essential Oils
Netting
Qtips

Results
After conducting 3 trials, my results indicated that Basil was the fastest in eliminating flies followed closely by Eucalyptus. Lemongrass and Lavender were significantly less effective. Of the 75 starting active flies Basil had 21.6, 10.3, 6.6, 1.6, Eucalyptus had 24.3, 13.3, 8.6, 7.6, Lemongrass had 50.3, 38, 32.6, 30 and Lavender had 49.3, 39, 32, 31.3 active flies remaining on average at the 1 hour, 3 hour, 6 hour, and 24 hour mark respectively.

Conclusions/Discussion
The average number of active flies for all three trials for Basil and Eucalyptus was consistently and significantly less than for Lemongrass and Lavender for each of the time periods tested. For example, after starting with 75 active flies, the average number of flies still active for all three trials after 1 hour was 24.3 and 21.6 for Eucalyptus and Basil, respectively. At the 1 hour time period there were an average of 50.3 and 49.3 active flies in the Lemongrass and Lavender control group. After 6 hours the average number of active flies was 8.6 and 6.6 for Eucalyptus and Basil, respectively. At the same 6 hour time period the average number of active flies was 32.6 and 32 for Lemongrass and Lavender, respectively. The results clearly show that Basil was the most effective followed closely by Eucalyptus. Lemongrass and Lavender were not very effective at all.

Summary Statement
I conducted an experiment using three trials and four different Essential Oils to determine which one would kill flies the fastest.

Help Received
My Science teacher Ms. Tammy Levy and my parents.



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Alexa N. Duran	Project Number J2104
Project Title Jellies Under Pressure: The Effects of Low Dissolved Oxygen Levels on the Pulse Rates of Aurelia aurita Ephyrae	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project is to discover whether or not there is a difference in the pulse rates of Aurelia Aurita (Moon Jellyfish) Ephyrae between normal and low dissolved oxygen concentrate levels. I believe that lower dissolved oxygen levels will cause more stress to the jellyfish which will result to a decrease in the pulse rates.</p> <p>Methods/Materials Materials used include, but not limited to: a stopwatch, Moon Jellyfish, tally counter, airlines, flasks, saltwater, and a Dissolved Oxygen measuring chemical kit. Trials were conducted by setting a timer for one minute, isolating one of the jellyfish and visually counting each time they fulfilled a pulse motion and recording the amount with the tally counter.</p> <p>Results Around a dozen of moon jellyfish ephyrae lived in the different Dissolved Oxygen levels for two weeks and tested at the end of each week. Each of the trials were run to determine their pulse rates and if they were effected by the different levels of Dissolved Oxygen. Overall, based on the results, there is a small decrease in pulse rates as the Dissolved Oxygen levels drop.</p> <p>Conclusions/Discussion In conclusion, there is only a small decrease in the pulse rates as the Dissolved Oxygen levels lower however, a lot more data is required to guarantee a decrease in pulse rates, meaning that my hypothesis is only partially supported.</p>	
Summary Statement When measuring the pulse rates of the jellyfish within a minute in different levels of Dissolved Oxygen, I found that there isn't a significant decrease in the pulse rates as the Dissolved Oxygen levels dropped.	
Help Received My designated area and materials were provided by the staff of the Cabrillo Marine Aquarium, The staff also helped me with any problems that ocured during the experiment and cared for the jellyfish when I wasn't able to. Although, I set up and performed the trials myself.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Laura E. Ellis	Project Number J2105
Project Title Copepod's Reaction to Pesticide	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to find out which pesticide effects the copepods the most and least.</p> <p>Methods/Materials Ten copepods were added into a petri dish with 50mL of water, using syringes. The appropriate amount of Ortho Insect Killer, Weed B Gon, or Animal B Gon was then added into the petri dish. For the first ten minutes, observations were recorded in a notebook every minute, then every other minute until 20 minutes. After 20 minutes passed, observations were recorded every five minutes. When recording the observations, the copepod deaths were recorded, and their activity levels were rated on a scale of one to five.</p> <p>Results The first pesticide, Ortho Insect Killer, killed the copepods within the first ten minutes. The second pesticide, Ortho Weed B Gon, killed the copepods within 45 minutes. The third and final pesticide, Ortho Animal B Gon did not kill the copepods. It can be determined that the least harmful pesticide was the animal repellent, not killing the copepods and keeping them at a normal activity level. The most harmful pesticide was the insecticide, which killed all of the copepods the fastest.</p> <p>Conclusions/Discussion The hypothesis was proved wrong, which means that copepods could have a change of adapting to certain amount any types of pesticide. The animal repellent used natural ingredients, which did not affect the copepods. The herbicide dazed the copepods for a minute, but then they would become active again. Chemicals like the ones in the Weed B Gon could be adaptable, meaning that not all of the results from these experiments could be classified as negative of positive. Pesticides from natural ingredients are better for the environment and waterways.</p>	
Summary Statement It was dicovered that the Ortho Insect Killer exhibited the worse reaction , and the Animal B Gon exhibited the least reaction among the copepods.	
Help Received I designed, conducted, and analyzed the experiment by myslef. My dad supervised me while conducting the experiment. My mom helped me gather materials and Mrs. Gillum edited my notebook.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Greta C. Feague	Project Number J2106
Project Title The Effects of Pesticides on Bees' Lifespans	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The experiment was meant to figure out whether there's a meaningful difference in the way different types of pesticide affect a bee's lifespan. I decided on my question because Colony Collapse Disorder is causing bee populations to drop alarmingly. Hypothesis: The bees ingesting neonicotinoids will have a shorter lifespan than the control, but the results will be subtle. The bees ingesting an organic pesticide will fall somewhere in between the two.</p> <p>Methods/Materials Keep six separate boxes of bees, feeding them with sugar water and maintaining appropriate temperature. For each pair of boxes, add trace amounts of A) neonicotinoid pesticide, B) organic pesticide, or C) water (control) to the sugar water, in proportions that reflect concentrations that bees would ingest near treated crops. Count dead bees daily to measure the impact of the pesticides.</p> <p>Results The bees ingesting neonicotinoids died the fastest. Between the two boxes an average of 8% of the total number of bees died each day while an average of less than 3% of the total number of bees died each day in the other three boxes together. By the end of 16 days 66.5% of the neonic boxes had died, 27% of the organic pesticide box had died, and 9.5% of the control had died.</p> <p>Conclusions/Discussion The organic pesticide is clearly much better for the bees than the neonicotinoid. In doing this project I demonstrated that neonicotinoids do not just affect bees' navigation abilities, but directly and significantly affect their mortality. Furthermore I conclude that the organic pesticide negatively affects bees' lifespans far less than the neonic pesticide, but harms their longevity nonetheless.</p>	
Summary Statement I showed that the organic pesticide tested harmed bees' longevities far less than a neonicotinoid, but harms them nonetheless.	
Help Received I received supplies (organic and inorganic) as well as lots of information on the correct handling of bees from beekeeper Arthur Hall. My dad made sure I could get all the supplies I needed, provided that it was not too expensive, as well as making recommendations on my written report.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Presley W. Golling	Project Number J2107
Project Title Growing Grass with Produced Oil Field Water	
Abstract Objectives/Goals The purpose of my experiment was to determine the efficacy of growing grass with Produced Oilfield Water. Methods/Materials Six plastic containers, 36 plots of Bermuda grass (3 in. x 3 in.), approximately 10 gallons of Produced Oilfield Water, 2 large bags of soil, and 1 bag of charcoal. Watered grass plots with different treatments (drinking water control, regular Produced Water, Produced Water to drinking water dilutions, and the charcoal mixed with the grass) and measured next day for color, height, and consistency over a 6 week period. Results The characteristics (color, height, and color consistency) of grass grown with Produced Oil Field water were similar to the grass grown with drinking water. The 1:2 and 1:4 Produced Water to drinking water dilutions worked better than untreated Produced water and the control, and the Produced Water and charcoal mix also did as well. Conclusions/Discussion Grass treated with Produced Oilfield Water was found to have a similar growth rate and color to that of grass treated with freshwater. This means that Produced Water, or dilutions of it, could be used as a suitable alternative for using drinking water to grow grass.	
Summary Statement I showed that Produced Oilfield Water can be used as an alternative watering source for grass.	
Help Received The research, set up, and experimentation were done by myself. My father explained to me how to use a conductivity probe for further research. The source of my Produced Oilfield Water has asked to remain anonymous.	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Aarzu Gupta; Maya Shukla	Project Number J2108
Project Title A Test of the Mutagenic and Carcinogenic Potential of Nicotine-Free Electronic Cigarette Additives	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Electronic Cigarette use has been rapidly increasing. In 2013-2014, the National Youth Tobacco Survey reported an increase in the number of vaping middle school students from 120,000 students to 450,000 and in high schools, the growth was even more drastic, from 660,000 to 2 million. Several studies have assessed the mutagenic potential of e-cigarettes. Research seems to indicate that two principal ingredients in e-cigarettes (nicotine and Propylene Glycol) are mutagenic. The goal of our project is to assess the mutagenicity of e-cigarette additives. The results of our experiment may have implications on the use of e-cigarettes, and may inform the regulation of these products by the government. Even the nicotine free e-juices can be as harmful as ones that contain nicotine.</p> <p>Methods/Materials We altered the traditional ames test by using polypropylene sterile tubes and plates with 96 wells each instead of petri dishes. After creating serial dilutions with each of our e-juices, we split the plate in half, 1:10 and 1:100 on one plate, and 1:1000 sharing with another sample. In addition, we put Salmonella Typhimurium in each tube before inserting the solution into the wells. In order to check the mutagenicity of each e-juice, we compared it with our positive control, 2-Nitrofluorene, and a negative control, water.</p> <p>Results All of the e-juices we tested proved to be mutagenic in various dilutions. 3.1% of any dilution has to change color in order for the substance to be deemed mutagenic, so some were more mutagenic than others. The nicotine-free flavorless e-juice produced the most mutagens in the 1:1000 dilution, but none in the 1:10 dilution, just like the other samples. The organic e-juice with nicotine made the most mutagens in the 1:100 dilution, and the nicotine-free ejuice with flavor produced some mutagens in the 1:1,000 dilution, but enough to deem it mutagenic.</p> <p>Conclusions/Discussion Our hypothesis was supported and our experiment demonstrated that all e-juices are mutagenic and possibly carcinogenic. Not only did the e-juice with nicotine turn mutagenic, but the nicotine free one also proved to be mutagenic. We have concluded that the acrolein in the Propylene Glycol made the nicotine free e-juice mutagenic, which is why our experiments tested positive.</p>	
Summary Statement We tested the mutagenic property of a variety of e-juices and found out that the ingredients in these liquids are harmful since they produce several mutagens, which could lead to cancer.	
Help Received We performed the majority of the experiment on our own. Due to the harmful nature of the bacteria, our teacher, Dr. Artiss, added it. He also gave feedback and reviewed our work.	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Vinni Jacobs	Project Number J2109
Project Title Are Green Detergents Biodegradable and Less Toxic?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In this project, four detergents, Honest Laundry, Green Works, Dreft and Tide were tested and compared for biodegradability and toxicity. Super Worms were used as testing organism. For biodegradability testing, one set of four detergents were exposed to sun for 36 hours; another set of detergents were kept regular without sun exposure. Two sets of four detergents were mixed with garden soil. Worms were then put in to see which detergent killed more worms during 9-day period. For toxicity testing, worms were tested with the set of regular detergents. Honest Laundry outperformed all three other detergents, proving its ingredients are biodegradable and less toxic. However, Green Works, marketed as a green detergent, turned out as toxic as Tide; its ingredients are not biodegradable as its company claims.</p> <p>Methods/Materials Four detergents: Green Works, Honest Laundry, Dreft and Tide; one set of four detergents with 36-hour sun exposure, another set was kept regular without sun exposure; 500 Super worms used as testing organism. Put worms in garden soil saturated with different concentrations of two sets of four detergents. Observe and log in numbers of dead worms every day for 9 days. The experiment was repeated three times. The final data used in data analysis are average data of three rounds of experiments.</p> <p>Results Honest Landry did not kill worms throughout three rounds of experiments, indicating its ingredients are environment friendly. Green Works killed just as many worms as the conventional detergents, showing Green Works is not as environmentally friendly as the company claims.</p> <p>Conclusions/Discussion Honest Landry's performance supports our hypothesis that the ingredients in green detergents are biodegradable, thus cause no harm or less harm to the environment compared with conventional detergents. However, Green Works, as another green detergents that I tested, turns out just as toxic as Tide, which means ingredients in Green Works are not biodegradable and environmentally friendly as the company claims. Meanwhile, 100% concentration Dreft does kill 80% worms, but 50% and 25% concentrated Dreft turns out much less toxic, which probably can be used to support their company's claim that diluted Dreft are mild and soft for baby skin. Also, performance of four detergents support our hypothesis that the more concentrated detergent, the more toxic it is.</p>	
Summary Statement Four detergents, Green Works, Honest Laundry, Dreft and Tide were tested and compared for biodegradability and toxicity.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Julia Jeck	Project Number J2110
Project Title Is Grey Water Green?	
Abstract Objectives/Goals The objective of this experiment was to determine whether or not biodegradable and non-biodegradable grey water affect how herbs grow. Methods/Materials The method included growing three sets of 12 herb plants from seed. Each of the three sets was watered every other day for 22 days with either grey water made in a washing machine with biodegradable soap; grey water made in a washing machine with non-biodegradable soap; or freshwater (control group). Plant growth and pH was measured to determine the impact, if any, the two types of grey water had on plant growth and soil alkalinity. Results The herbs that grew the best were watered with non-biodegradable grey water and the herbs that grew the worst were watered with biodegradable grey water. The non-biodegradable grey water lowered the pH of the soil, creating a hospitable environment for the plants to grow, while the biodegradable grey water increased the pH of the soil and created a less hospitable environment for the plants to grow. Conclusions/Discussion The results of the experiment did not support my hypothesis. I expected that both biodegradable and non-biodegradable grey water would harm plant growth, with biodegradable grey water being less harmful than non-biodegradable grey water.	
Summary Statement I learned that herb plants grow better with non-biodegradable grey water than with biodegradable grey water or plain tap water.	
Help Received My father, Eric Jeck, helped me research how to measure pH and organize my results.	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Chloe C. Kim	Project Number J2111
Project Title Beating of My Heart	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals How does the amount of energy drink given to daphnia affect the heart rate of the daphnia? Energy drinks are made to boost up energy but it can affect the heart rate. Many people are sent to the hospital because of an overdosage or a side effect of the energy drink and sometimes it can be fatal. This experiment was chosen to find out if the heart rate is affected by the different concentrations of energy drinks.</p> <p>Methods/Materials In this experiment, the concentration of the energy drink diluted in spring water was changed in order to test the heart rate of the daphnia. In addition, five popular energy drinks (Monster, Red Bull, Rockstar, Starbucks Doubleshot Energy Coffee, and 5-Hour-Energy) were used to test if different energy drinks will affect the changes in heart rate differently with concentration variation. The daphnia's heart beats will be counted for 15 seconds to find the heart rate in a minute.</p> <p>Results Although it seems as though the heart rate would increase as the concentration of the energy drink increased, the heart rate started to decrease at a different concentration levels for each energy drink. In addition, the daphnia started to die off at higher concentration levels for some energy drinks. 5-Hour-Energy had the highest increase in heart rate and the daphnia died off much earlier which also meant that it was the most dangerous.</p> <p>Conclusions/Discussion As shown from the results, the hypothesis was not entirely correct. It was thought that if the higher the concentration is, the heart rate would have the highest increase due to the higher concentration of caffeine in energy drinks. However, once it reached a certain threshold concentration, the heart rate began to decrease or stopped in some cases. The heart rate decrease and sudden stop could be an indication of failing heart due to too much stress. The results from the experiment helped support that energy drinks increase heart rate and consuming too much energy drinks may be dangerous to the heart. Although this information is helpful, the conclusion from this study cannot confirm the degree of danger of energy drinks to the human body because a daphnia's body structure and its response might be different from that of the human.</p>	
Summary Statement The heart rate of daphnia was affected by concentration variations of popular energy drinks but not at a constant rate.	
Help Received My science teacher, Mrs. Hoffman helped me understand the general concept of science fair and my parents helped me gather all my materials.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Rena N. Maduro	Project Number J2112
Project Title The Effects of Stimulants and Depressants on the Roundworm, Caenorhabditis elegans	
Abstract Objectives/Goals In this study, the effects of stimulants and depressants were tested on the roundworm, <i>C. elegans</i> . Animals exhibit a characteristic thrashing behavior when placed in liquid. The frequency of the thrashing behavior can be measured as tail whips per unit time. Drugs that stimulate muscle contractions are expected to increase body movements (stimulants). While depressants, are expected to reduce body movements. However, it is unclear what the effects will be if the drugs are combined. The purpose of the experiment was to determine if certain stimulants or depressants could modify the effects of other drugs. Methods/Materials Worms were immersed in solutions containing nicotine, caffeine, and ethanol, alone and in combination. The body movements were measured (timed) over multiple trials from video recordings using an exolabs camera attached to a dissection microscope and capture software written by the camera makers for IPAD . Results Both nicotine and caffeine (stimulants) increased the thrashing motion in liquid, as compared to untreated controls (M9). Ethanol (depressant) was found to impair this behavior. Nicotine was unable to overcome the impairment introduced by ethanol treatment, however, caffeine was able to restore the movement, and worms treated with ethanol and caffeine showed thrashing behavior similar to those of untreated controls. Therefore, caffeine can counter the impairment effect of ethanol, whereas nicotine cannot. Also, worms treated with caffeine and nicotine did not have movement consistent with an additive effect. Conclusions/Discussion The results showed that the stimulants and depressants had predictable effects on the movement of <i>C. elegans</i> , and therefore this worm is a suitable model for toxicology research. Surprisingly, only caffeine was able to counter the effects of ethanol and nicotine was not. In addition, adding the two stimulants together was not additive, as the movement did not increase as compared to each drug added individually. In conclusion, the nematode, <i>C. elegans</i> is an appropriate model to test the effects of depressants and stimulants, for potential drug interactions.	
Summary Statement I tested the response of a simple roundworm to stimulants and depressants to see if the compounds have additive or opposite effects	
Help Received I read papers about the compounds used and decided what amounts (concentrations) to use for the experiments. I had access to the Maduro Lab at UC Riverside and help from a Research Specialist and Professor	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Marta Meinardi	Project Number J2113
Project Title The Effects of Pollution on Pyrocystis fusiformis	
Abstract Objectives/Goals Millions of gallons of pollutants end up in the oceans each year, affecting millions of marine organisms. This experiment aims to understand how Pyrocystis Fusiformis (a marine dinoflagellate) is affected by pollution. Vials of Pyrocystis Fusiformis were polluted by Shell gasoline, a fungicide, and distilled white vinegar. The vinegar decreased the pH, simulating one of the effects of global warming: ocean acidification. Methods/Materials 20 10ml vials of Pyrocystis fusiformis (dinoflagellates; bought from Sunnyside Sea Farms), 1 lamp (7W LED) with an incorporated timer, 1 bowl to ensure complete darkness, fungicide, shell gasoline, distilled white vinegar (Heinz), pH strips, a stopwatch, a darkened room, Omax microscope (10-100 magnification). Measure the glow length of the dinoflagellates (seconds) once a day for about a week. Results The dinoflagellates died the first day tested after being polluted with the fungicide. When Shell gasoline was added to the vials, a steady decrease of glow length was observed and, on average, it was 73% shorter than before the pollutant was added. Finally, when the pH levels were dropped to 6.0-6.5, a steady decrease of glow time was recorded and, on average, it was 92% shorter than when the vials were unaffected. A time spike on the second day of testing was also observed in the pH trial. The 3 vials kept as controls maintained a steady glow time throughout the experiment. Conclusions/Discussion This experiment demonstrated that the tested pollutants negatively affect Pyrocystis Fusiformis. Dinoflagellates have an important niche in the marine ecosystem and many consequences would arise if their mortality rates increased. More importantly, this research can be used to predict the rate of mortality that will occur as the ocean pH levels continue to drop as a result of global warming.	
Summary Statement I tested three different pollutants on Pyrocystis Fusiformis, and proved that they all affect this marine algae negatively.	
Help Received I designed my experiment and interpreted the concluding data myself, but my parents helped me in the collection of data.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Natalie N. Mummery	Project Number J2114
Project Title Does Plastic in the Ocean Affect the Filtering Mechanism of the Common Mussel, <i>Mytilus californianus</i>?	
Abstract Objectives/Goals The purpose of my science project was to see if plastic in the ocean affects the ability of mussels to filter a fungicide containing copper from the water. My hypothesis for this project was that the mussels filtering mechanism will be diminished by the plastic in the ocean because the plastic will affect their filtering capabilities and potentially harm them. Methods/Materials Two tanks containing mussels, one with fine plastic powder. Each tank contained an equal amount of copper based fungicide in the water. Measured the concentration of copper in the water after 2,3, & 4 days to determine how much of the fungicide was filtered out. Results All of the mussels died. The mussels in the tank with the plastic (Tank 2) died the second day of the experiment. The mussels in the tank without the plastic (Tank 1) died on the fourth day of the experiment. I then took a copper test to determine how much of the fungicide they had filtered out. The mussels in Tank 1 were able to filter out 2ppm out of the 4ppm. The mussels in Tank 2 did not filter any out. All of the mussels died due to their low tolerance for copper found in the fungicide. The fungicide I used, Nature's Care Garden Disease Control, is 0.08% copper and 99.92% other ingredients. The second day of the experiment, in Tank 2, the water had a thick layer of foam on the surface of the tank as well as a foul odor. On day four, Tank 1 had a thinner layer of foam on the surface of the tank and the smell was less foul than Tank 2. This was not the expected outcome. Conclusions/Discussion In conclusion, my hypothesis was correct. The mussels in Tank 2 died because the plastic chemically reacted with the fungicide. I know this because after observing the layer of foam in Tank 2 I tried to duplicate the reaction by taking a sample of the water in Tank 1 and adding some plastic. I then added some fungicide since the mussels in Tank 1 had filtered out 2 ppm. I mixed it together and about 30 minutes later a foam layer started to form. This tells me that the combination of plastic and agricultural runoff in the ocean is quite harmful to mussels and other marine life.	
Summary Statement I showed that plastic in the ocean is harmful to filter feeders, specifically mussels.	
Help Received My Science Teacher helped me obtain the materials for my experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Shreya Ramachandran	Project Number J2115
Project Title Effect of Soap Nut Grey Water on the Environment (Soil and Plants)	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals As many parts of the world are experiencing water scarcity, there is a growing interest for reusing greywater from the laundry. Since many commercial laundry detergents contain harmful chemicals, I wanted to test if greywater from soap nuts, a natural laundry detergent derived from the Indian soap berry, could be used as irrigation water, without harming the environment. This is a continuation project where in last year I tested the effect of soapnut greywater on aquatic life and this year I am testing it on soil and plants.</p> <p>Methods/Materials To conduct my experiment I grew one type of plant species, tall fescue grass. I had 6 replicates for each grey water treatment (soap nuts, organic detergent, non-organic detergent and regular water) for a total of 24 replicates. The experiment was repeated for two types of soil, leading to a total of 48 replicates. The plants were watered every 3-4 days in a controlled environment for a period of 6 weeks. I tested the effect of the greywaters on soil health by comparing soil macro and micro nutrients, pH, CEC and EC. Plant health was evaluated by recording the plant height, the final biomass, visual health and by measuring nutrient levels in the plant tissues. The greywater and leachate (200+ samples) was tested for pH, EC, TDS and TOC.</p> <p>Results I analyzed my data using ANOVA ($P < 0.05$) followed by post-hoc comparisons where necessary. My results showed that Soapnut was not detrimental to plant growth with a trend for higher plant height and plant biomass than for regular water and the other greywaters. The soil constituents of interest with respect to greywater are boron, pH, and salinity. For all of the soil and plant nutrients tested, including these, the soapnut greywater did as well as regular water. However, the non-organic detergent led to boron toxicity issues. The soil and leachate analysis indicated high levels of salts and heavy metals such as Cu, Pb, Mn and Zn in the non-organic detergent's sandy soil. This led to the non-organic detergent's plant death at the end of 5 weeks.</p> <p>Conclusions/Discussion After the two year study I now conclude that soapnut greywater does not significantly affect the environment, and can be used for irrigation. Also, the cost of using soap nuts for 50 loads is only \$5.65 which makes soap nuts and its greywater not only a solution for California's historic drought, but also to the global water crisis.</p>	
Summary Statement This project looks at the effects of greywater from soapnuts (a berry shell that naturally produces soap) on the environment especially soil and plants when compared to other detergents and regular water.	
Help Received I conducted part of my experimentation using U.C. Berkeley's lab equipment under the supervision of Mrs. Celine Pallud.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Marley B. Rhodes	Project Number J2116
Project Title The Effects of Acid Rain on Calendulas	
Objectives/Goals My science fair project was designed to find out if and how an acidic level of pH (acid rain) would affect the health of calendula flowers.	
Abstract	
Methods/Materials I bought 24 calendulas. Then I re-planted the flowers into styrofoam cups. Each flower was placed in a group so there were 6 groups each with four calendulas. The calendulas were watered with varying levels of vinegar and observed over a period of 10 days. I watered the groups every other day. The 6 groups were labeled A through F. Each plant, with the exception of one control plant, received 100 mL of distilled water-vinegar solution (Group B-F). Group A received no vinegar in its water and group F received the most.	
Results When the experiment was over, I found that all flowers in the last 3 groups that received a stronger solution of vinegar (groups: D, E and F) were drooping; some of them were even dead. In the first 3 groups that received a weaker solution of vinegar (groups: B and C) the flowers were also drooping. Group A, however, which received only pure distilled water was doing very well and the leaves were very green. I did notice the flower petals were thinned and changing colors though.	
Conclusions/Discussion In the end, my hypothesis that a higher level of acidity would do great damage to the plants was supported by the results of the experiment. Next time, it would be interesting to use real acid rainwater to see if the results would change.	
Summary Statement I proved in my experiment that the "acid" used in my project had an overall negative effect on the calendula flowers used in mt experiment.	
Help Received I had help from my mother, who helped me choose and buy the flowers for my experiment, but I organized, documented, and conducted my experiment by myself.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Shravya S. Sanigepalli	Project Number J2117
Project Title The Effect of Ocean Acidification on Halimeda incrassata	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine the effects of ocean acidification on the growth of Halimeda incrassata.</p> <p>Methods/Materials 5 identical 2-5 gallon containers, 14 samples of Halimeda incrassata, 1 pH meter (pen type), 1 food scale, 6 CO2 generators, 1 hydrometer, 1 API calcium test kit, calcium supplements. Halimeda were grown in containers for a month in various pH levels, with weight of samples, salinity and calcium monitored and checked every 2 days.</p> <p>Results 14 Halimeda samples were grown in varying levels of pH for a month, their weight being checked every 2 days. The plants grown in a pH of 7.4 did significantly well, and had an overall growth of 6.6 grams, almost double the overall growth in the control tank, which had a pH of 8.4. The control group had the 2nd greatest growth, and the group grown in a pH of 7.8 had the 3rd greatest growth of 3.1 grams.</p> <p>Conclusions/Discussion The Halimeda samples could tolerate a lower pH, and compared to the control group grown in a pH of 8.4, grew noticeably better. This may be due to their use of both photosynthesis and calcification. Results from the experiment showed that Halimeda could sustain a pH of 7.4, and could perhaps survive ocean acidification up to that point.</p>	
Summary Statement This project showed that Halimeda could tolerate a pH of 7.4.	
Help Received I set up and performed the experiment myself, my science teacher helped edit my paper, Dr. Talina Knotchick from the Scripps Institute of Oceanography answer questions on ocean acidification	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Samantha Tovar	Project Number J2118
Project Title Arresting Mitotic Division in Allium cepa Cells: A Phase I Cancer Study	
Abstract Objectives/Goals My project is an introduction for me into cancer therapies. Many cancer therapies basically target tumors and stop mitotic division by interfering with spindle fiber formation in metaphase. Since I was not allowed to use animal tissues for this project, I chose Allium cepa roots to examine this process. I read about an ancient substance used by the Greeks and Egyptians written about in 1500 B.C. for the treatment of gout. Colchicine, a natural product originally extracted from the plant autumn crocus, Colchicum autumnale, was looked at in the 1920#s as a cancer therapy. More recently, efforts are being made to determine how to apply its properties of stopping spindle fiber formation in metaphase in animal tumors by engineering specific substances that target only tumor cells. Methods/Materials Basically I followed old homeopathic protocols and boiled the bulb, petals, and seeds of crocus plants. I created 4 different concentrations of 1 ml, 2 ml, 3 ml, and 4 ml of emulsion per 10 ml distilled water, and placed these directly into test tubes where I hydroponically grew green onions. I had no way available to me to exactly quantify any colchicine available. After one week, I prepared 28 specimen slides of the root tips and examined them for mitotic division in any stage. Results I found that concentrations of my distillate at 1 ml per 10 ml water, 2 ml/10 ml, and 3 ml/10 ml had no effect on mitotic division. There was no visible difference between any of these and my controls. All stages of mitosis were visible. When I applied 4 ml /10 ml, mitotic division appeared arrested in all slides I examined. I noted some prophase division, but nothing beyond that. Conclusions/Discussion My conclusion is that the colchicine derived from the bulb, seeds, and petals of the autumn crocus plant appears to successfully arrest mitotic division in plant cells at the metaphase stage.	
Summary Statement This project examines if colchicine from the autumn crocus plant will arrest mitotic division in Allium cepa root cells.	
Help Received My teacher provided my lab supplies and lab room. All work was mine.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Au K. Vo	Project Number J2199
Project Title Effects of Water Pollution on Radishes	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to find out which possible pollutant stops radishes from growing the most and to find out how much pollution affects plants around the world.</p> <p>Methods/Materials Radish seeds, bleach, motor oil, pesticides, ethanol, microscope, Toluidine blue, hydrochloride acid. Radishes were grown and watered with bleach, motor oil, pesticides, and ethanol. Plant growth was measured every other day for 23 days. Radishes were observed under a microscope.</p> <p>Results Bleach inhibited the growth of the radishes the most and has a negative effect on plants. Ethanol affected the radishes the least, negatively. Motor oil damaged the radishes, but not as much as bleach. Pesticides is not good for plants according to the experiment. Radishes watered with pesticide mixtures grew less than the control watered with tap water. The data was obtained from two trials.</p> <p>Conclusions/Discussion Bleach, motor oil, and pesticides affect the growth of the radishes negatively. Only ethanol has little effects on radishes. Bleach in high concentrations kills the radishes, but in low concentrations, only lessens the growth. Motor oil in small concentrations damages the radishes more than higher concentrations of motor oil. Pesticides are not good for plants as the radishes watered with pesticides has limited growth. All the pollutants tested are bad for plants, as radishes watered with tap water have the best weight and growth.</p>	
Summary Statement The project shows that the pollutants, bleach, motor oil, pesticides, and ethanol, are bad for plants' growth and cells.	
Help Received I conducted the experiment by myself, and got help from my parents in staining the radishes' cells and observing the cells under a microscope.	