



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Michael B. Brown-Fiedtkou	Project Number J1101
Project Title The Effect of a Water Based Cooling Membrane on the Radiant Heat Given Off the Surface of Astroturf	
Abstract Objectives/Goals Objective: The objective was to determine the effect of a water based cooling system/membrane installed underneath Astroturf on the amount of radiant heat given off the surface of the Astroturf. The hypothesis is a water based cooling system/membrane will reduce the amount of radiant heat given off the surface of Astroturf. Methods/Materials Methods/Materials: Two test sample groups were assembled in separate identical containers layered with equal amounts of soil, sand, rubber, Astroturf. A cooling membrane (frozen water in plastic) was added to one of the two sample groups directly under the top Astroturf layer. A third comparison sample group was assembled in a separate identical container layering soil, sand and natural sod grass. Identical thermometers were affixed to the inside of three identical domes in an identical position and placed over each of the three sample groups. An identical lamp/heat source was positioned on each dome. The temperature inside the dome of each test group was measured and recorded at zero, five and ten minute intervals on three different days. The average/mean temperature of each sample group at each time interval was then calculated, graphed and the results were interpreted. Results Results: The radiant heat in the atmosphere of the Astroturf sample WITHOUT the cooling system/membrane was significantly higher (8 degrees at 10 minutes) than the Astroturf sample WITH the cooling membrane. The Astroturf WITH the cooling membrane averaged similar radiant heat measurements to the natural grass sample at all time intervals-both groups having the ability to hold water. It is interesting to note condensation formed on the dome of the natural grass sample Conclusions/Discussion Conclusion/Discussion: As the graph demonstrates, the addition of a water based cooling system/membrane clearly reduces the radiant heat given off the surface of the Astroturf. This data is critical information which can be used to develop an Astroturf field application which can improve a player's health, safety, ability and performance. In addition, the cooling membrane application will improve spectator comfort/health and reduce surrounding air temperatures which contribute to global warming.	
Summary Statement The project addresses the concerning heat generating properties of Astroturf by measuring the effect of a water based cooling system/membrane on the radiant heat given off the surface of Astroturf.	
Help Received Teacher Brad Penkala project advisor; Mother paid for supplies, typed and provided consultation.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Jared T. Ellis	Project Number J1102
Project Title Using Kelp as an Indicator of Ocean Pollution	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine if kelp, <i>Macrocystis pyrifera</i>, is an indicator of ocean pollution</p> <p>Methods/Materials One Carolina Bacterial Pollution of Water kit, and one Tetra Easy strips water test strips kit were acquired. Then via kayak, kelp from Ocean Beach, Torrey Pines, Solana Beach, and La Jolla was collected and brought back to shore. This was then tested using Tetra water test strips, which included 25 test strips testing for Nitrate, Nitrite, Hardness, Alkalinity and pH, and a Carolina Bacterial pollution of water test kit. This test kit consisted of petri dishes that tested for both normal bacteria and coliform bacteria. The samples used for bacterial testing were then then incubated for two days. The strip testing samples were then homogenized with water and tested.</p> <p>Results In Ocean Beach, there were 21 colonies of normal bacteria and 5 colonies of coliform bacteria, and had an alk. Of 100/120, and a pH of 6.8/6.4. Torrey Pines had no normal bacteria colonies, but had two coliform bacteria colonies, and a alk. Of 80/100 and a pH of 6.2/7.2. Solana Beach no normal bacteria colonies, yet had 8 coliform colonies, and a alk. of 120/80 and a pH of 7.2/6.2. La Jolla had 15 colonies of normal bacteria and 6 colonies of coliform bacteria, and had an alk of 100/120, with a pH of 6.2/6.2.</p> <p>Conclusions/Discussion This hypothesis was used: Pollution levels in the kelp will vary between beaches by as much as 10 colonies or with pH and alkalinity as much as 20% above or below their averages. It was predicted that this hypothesis would be true because although the individual kelp beds are located in the same body of water topographical differences, land-based runoff, and current characteristics will vary between beaches. This hypothesis was proven incorrect bacterially Ocean beach, which had the highest normal bacteria count at 21 colonies. The hypothesis was also proven incorrect in strip testing by Solana Beach being 30% over average.</p>	
Summary Statement The purpose of this experiment was to find out if kelp is a valid indicator of beach pollution. Although the specific testing I used did not yield conclusive results they suggest that kelp is a valid indicator of pollution.	
Help Received Thomas Ellis my Dad, and Julie Ellis, my Mom and Mrs. Gillum.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Summer M. Faille	Project Number J1103
Project Title Eww. What's in My Water?	
Objectives/Goals This project measures how much bacteria, both living and non-living (the dependent variable), is present in the water sources tested (the independent variable). The purpose of this is not only to reduce the amount of bacteria in our drinking water, but also to detect bacterial contaminated in various types of water. An ATP (Adenosine Triphosphate) test was used to measure the amount of living and non-living bacteria. The tests create reactions that produce RLU#s (Relative Light Units), which are detected in a Luminometer.	
Abstract	
Methods/Materials Procedures: 1. Retrieve a fair amount of each water source so that there it is about 3 inches deep and put it in a plastic drinking cup. 2. Dip the Aquasnap Free (tests the amount of nonliving bacteria) into the plastic cup to gather a 100 ml sample of each water source. 3. Snap and squeeze the top of the ATP test to release the firefly juice into the sample. 4. Put the test with the new solution into a luminometer. 5. Write down the amount of RLU#s (relative light unit) in each water source. 6. Repeat steps 2-5 using the Aquasnap Total (measures the nonliving and the living bacteria) Materials: Red Solo/plastic cup; Sharpie; Multiple Water Sources; Aquasnap Free ATP tests; Aquasnap ; Total ATP tests; Luminometer; Something to record Data (notebook, pencil, paper, pen, etc.)	
Results Using the Aquasnap free (tests nonliving bacteria), the creek had the most bacteria, then the puddle water. Following was the pool water then tap water. Finally filtered and bottled water were relatively the same, but had the smallest amount of non-living bacteria. Using the Aquasnap Total (tests for nonliving and living bacteria), again the creek had the most bacteria. Following was the pool water then the puddle. Next in order was the tap water, and finally the filtered and the bottled water comes last.	
Conclusions/Discussion Knowing these results, it proves that my hypothesis was correct, where creek water has the most bacteria. Precision, when handling the ATP test, was helpful in gathering exactly one hundred micro-liters, and thus helped form an accurate and controlled experiment. This precision also helped in forming	
Summary Statement Understanding bacterial contamination of various water sources to determine the water usability	
Help Received Parent provided supplies	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Morrigin K.A. Fedinick-Emmons	Project Number J1104
Project Title Fire Resistant Flora: Fact or Fiction?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals California is in the midst of a drought. My project's objective was to determine natural fire-resistance of locally available plants.</p> <p>Methods/Materials Propane torch and burn pans were used to burn 6 species of plants: 24 samples each of both dried and fresh plants. Each specimen was burned until self-extinguished. Plant masses were obtained pre and post burn. Fire resistance was determined by percentage of mass lost and burn time.</p> <p>Results Overall, the Cryptomeria was found to have the highest degree of fire-resistance. The Leylandii Cypress had the lowest degree of fire-resistance. Both findings, along with all other samples tested, supported the hypothesis that highly fire-resistive plants had greater flexibility and moisture content, while less fire-resistive plants tended to be more dry and brittle.</p> <p>Conclusions/Discussion Based on experimental results, one can conclude that there are naturally fire-resistive plants. A homeowner's knowledge of this could potentially protect property from the effects of vegetation fires. Current drought conditions in our region make this study worthy of attention.</p>	
Summary Statement This project explored the fire-resistance level of a variety of plants.	
Help Received Neighbor provided plant samples; Mother helped with backboard; local fire department assisted with safety of experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Dawson A. Galluzzi	Project Number J1105
Project Title Bacteria Beneath the Beach: A Study of E. coli and Coliforms in Sand from Parks and Beaches in Los Angeles County	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Objective: The experiment was to measure the presence or absence of Escherichia coli (E.coli) in different samples of sand collected from different locations. It was expected that there would be more E.coli at beaches than at parks because of storm runoff and other pollutants settling into the beach.</p> <p>Methods/Materials Materials and Methods: Sand samples from 3 parks (Garfield Park, Orange Grove Park, Alhambra Park) and 2 beaches (Santa Monica Beach, Mother's Beach in Marina Del Rey) in LA County were collected. Samples of sand were each scaled to a half-cup, where the sand was mixed in with 2 cups of water in a Ziploc bag. After a vigorous hand mixing for 2-3 minutes, the water was poured out and filtered to get out any impurities. After filtering, the water was either poured into a test kit that measured presence/absence of E.coli or a lab kit that was sent back to the lab to quantify how much E.coli was in the beaker. Results from the lab were received 3 days after the samples were shipped out.</p> <p>Results Results: All 5 locations sampled tested positive for E.coli. The beaches had a lower E.coli count than the parks, but they were all unsanitary. All samples from the parks showed an incredibly high coliform count. The parks had a maximum of 1840 organisms of E.coli/100 mL of water when the standard was only 126 organisms/100 mL.</p> <p>Conclusions/Discussion Conclusions: The conclusion is that since the parks have nowhere for their runoff to go, they accumulate a higher E.coli count than beaches and other place higher E.coli count than an identical material amount that has an interaction with water or another substance that bacteria could transfer into. For public health, it is suggested that any person who goes to a beach or park uses hand sanitizer or soap and water to kill off harmful bacteria. Also, turning the sand over with backhoes so that the bacteria cannot saturate a space on the beach is also a probable solution. s that do have a place for pollution and waste to go. When a space is enclosed, it has a</p>	
Summary Statement My project was to determine the amount of fecal coliforms and E.coli present in beach and park sand at various locations throughout Los Angeles County.	
Help Received Mother drove me to locations. Sent samples to Schneider Global Laboratories to get data quantified.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Alexandra R. Garber	Project Number J1106
Project Title Decreasing the Urban Heat Island Effect	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project explores a method of reducing the Urban Heat Island Effect, which has significant detrimental effects on densely populated cities. It is proposed that the addition of vegetation into the urban environment will result in a decline of this heating phenomenon. In my experiment, I tested the effect of placing plants in a model of an urban environment compared to one without plants.</p> <p>Methods/Materials I observed the ambient temperature of the room, and the temperatures inside the two model urban environments. I tracked these temperatures three times daily - morning, noon and evening - for ten consecutive days. Materials used included; two similar size aquariums, one Aloe Vera plant, one Geranium plant, one Baby Angel plant, a sod substitute, three Succulent plants, two 60 watt Grow Lights, two probe thermometers, one indoor/outdoor temperature thermometer, and a half-bag of Dolomite rocks to simulate the concrete in the urban environment.</p> <p>Results For each of the ten days of this experiment, the temperature of the experimental environment (containing plants) was found to be an average of 4.8-4.6 degrees less than the control (urban) environment (containing no plants). This data supports my hypothesis by demonstrating that vegetation does decrease the Urban Heat Island Effect.</p> <p>Conclusions/Discussion From these results, one may conclude that increasing urban vegetation is an excellent solution to the rising temperatures in highly urban and populated cities. Vegetation can reduce air pollution and is overall better for the population. There are additional experiments that could be conducted to determine exactly how many or what types of plants are most effective in heat reduction. This is just one of the many experiments that can further our knowledge on how to decrease the Urban Heat Island Effect. In the future many have predicted that there will be an increasing number of highly populated cities. Consequently, we need to do more research on the use of plants to decrease air pollution resulting from rising urban temperatures. This is particularly important given the effects of global warming and drought, as we are currently experiencing in California.</p>	
Summary Statement This project explores the effect vegetation has on urban environments by testing how we can decrease the urban heat island effect without having to move to outlying greenbelt areas.	
Help Received My science teacher, Mrs. Faircloth, for helping me with the requirements and the due dates. My mom, for helping me organize and graph my data, as well as doing the trials that fell at mid-day while I was at school.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Anita Garg	Project Number J1107
Project Title The Effect of Competition on a Problematic Invasive Species, Brassica nigra	
Abstract Objectives/Goals My project goal was to see how the invasive species Brassica nigra (black mustard) grows when in competition with native Southern California coastal sage scrub species. By exploring the factors that affect the growth of the Brassica nigra, I wanted to find out how to limit its growth in the Southern California coastal sage scrub ecosystem. Methods/Materials I tested four different plant groups: Brassica nigra grown alone, Brassica nigra grown with native shrubs, Brassica nigra grown with native forbs, and Brassica nigra grown with its own species. Materials: The materials used were: 2 metric rulers, 28 plant pots, 21 native shrub plants, 21 native forb plants, and 49 Brassica nigra plants. Procedure: 1. Identify plant pot number. Count number of leaves, excluding any leaf which has not yet grown a visible stem. 2. Measure height of plant from soil level to highest point of the plant. 3. Measure diameter of plant 90° from the widest point on the plant. 4. Record all measurements in measurement book. Results ANOVA (Analysis of Variance) test results: Out of 23 conducted ANOVA tests, 19 produced an F-value greater than 1. Therefore, the groups I measured in my project were statistically different from each other. The average number of leaves was highest when Brassica nigra was grown with shrubs; this category also had the second-highest average plant height. The plant diameter and the average number of leaves were significantly lower in the treatment in which the Brassica nigra plant was grown with its own species than in any other treatment. Conclusions/Discussion The invasive species Brassica nigra grows the least when it is grown with its own species, and grows well with native shrubs. One key benefit of this project is the finding that scientists may identify native plants that exhibit similar characteristics to those of the Brassica nigra. These native plants, when grown in areas with a high population of black mustard, may be able to help limit the growth of the black mustard plant.	
Summary Statement The purpose of my project was to determine how the invasive species Brassica nigra grows when in competition with native Southern California plants.	
Help Received Teachers at my school guided me and reviewed my report.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Andres S. Gonzalez	Project Number J1108
Project Title School Milk: Carton or Plastic?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment is to determine if milk provided by schools to students should be served in plastic bags or paper cartons.</p> <p>Methods/Materials Many schools have chosen to change the containers of milk they serve their students. Schools now offer milk in both cartons and plastic bags. The plastic bags became available when the dairy production plants convinced schools that the plastic bags will reduce the amount trash. My experiment will show that within a few years the plastic milk bags will create more trash than the milk cartons at the county level, which contradicts the function of less trash for this consumer (student/district) product. I will show the ineffectiveness of the plastic milk bag compared to the paper milk carton by the decomposition rate. I will test to see which container loses the most mass after 190 days and then apply a decomposition rate formula to compare the two products.</p> <p>Results My hypothesis was correct. After decomposing 120 milk cartons and 120 milk plastic bags for 190 days I used a decomposition rate (using the formula: $\text{Decomposition Rate} = \text{Mass Lost} / \text{Time}$) to predict when both containers would completely decompose, assuming all of the variables stayed the same. The decomposition rate for the milk cartons showed that in 2 years the milk carton would decompose completely. In comparison, the plastic milk bags had the best decomposition at 364 years.</p> <p>Conclusions/Discussion In the district where I made my observations, there were approximately 347,400 milk cartons and 969,300 plastic milk bags placed in the trash for the 2012 - 2013 school year. Since the milk cartons averaged a mass of 10.6 grams it would total 3,682 kg of milk cartons added to a landfill. The plastic milk bags have an average mass of 2.1 grams and would total 2,036 kg added to a landfill. Assuming the actual decomposition rate was similar to the data from my experiment, in 2 years the 3,682 kg of milk cartons would be fully decomposed. Shockingly, it would take over 300 years for the 2,036 kg of plastic milk bags to decompose. Although the intended use of plastic milk bags does correctly replace a milk carton, the effectiveness of the plastic milk bag is not fulfilling its function of reducing the amount of daily trash as promised to school districts in a real world consumer oriented application.</p>	
Summary Statement To determine which school milk container (carton or plastic bag) will create less trash.	
Help Received My mom bought me the supplies I needed. My dad helped me check my report and set-up my board.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Antonio N. Gutierrez	Project Number J1109
Project Title Contamination in Urbanized Water Sources: Lakes, Rivers, and Streams	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project was to determine which water source, between L.A River, Eaton Canyon, or Peanut Lake, was the least contaminated with bacteria, nitrate, and nitrite.</p> <p>Methods/Materials I visited 3 different water sources, on 3 different days. The water sources were L.A River, Peanut Lake, and Eaton Canyon. After collecting from each water source I used a water test kit to test the nitrate, nitrite, and pH levels of each water sample. I also tested for bacterial contamination by swabbing the water and rubbing it on a petri dish. Once I had done that three times for each water source, I then placed the petri dishes in the incubator. After 3 days in the incubator, the bacteria was counted.</p> <p>Results Results showed that Eaton Canyon and Peanut Lake had no levels of nitrite or nitrate found in them, while L.A River had a 0.5 mg/L level of nitrite and a 106.67 mg/L level of nitrate. L.A River had the highest pH level with 8.4, Peanut Lake had pH 8, and Eaton Canyon measured 7.8 on the pH scale. The percentage of bacteria found in L.A River was 82.67% of the petri dish covered, Peanut Lake had 90%, and Eaton Canyon had 66.25%.</p> <p>Conclusions/Discussion My hypothesis was that Peanut Lake would have a lower pH level, and higher levels of everything else. My results don't support my hypothesis. It turned out that water in Eaton Canyon has the highest overall quality when considering pH, nitrate, nitrite, and bacterial contamination. In the future, it might be useful to test water from different lakes, rivers, and streams.</p>	
Summary Statement The project is about contamination in water sources surrounding the L.A area, that come in contact with humans	
Help Received Mother and sister helped collect water; Teacher helped write report; Teacher provided water testing kit.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Chloe L. Jenniches	Project Number J1110
Project Title The World Is Your Oyster	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My science project is about the filter-feeding Olympia oyster (<i>Ostrea Lurida</i>) native to the Pacific coast of North America. I did an experiment to see if Olympia oysters change the biological and chemical contents of bay water. In my experiment, I believe that if I compare two tanks of bay water and micro-plankton, one with Olympia oysters and one without, then after 13 hours the tank with the oysters will have decreased algae and turbidity.</p> <p>Methods/Materials Materials: -At least 20 gallons of Bay water; -Approximately 90 to 100 Olympia oysters cleaned of debris and other organisms collected from the coast of San Rafael; -Two 10-gallon fish tanks; -Two bubble bars; -Phyto-feast marine micro-plankton; -Low-cost green estuary monitoring kit; -2 pipettes; -Toothbrush (to clean oysters); -Microscope; -Microscope slide. Method: -Add nine gallons of water to each tank then test for the responding and controlled variables (RV and CV) and count the number of algae cells in a microscope grid; -Add 310 drops of micro-plankton to each tank and add 42 oysters to the test tank then test each tank for the (RV and CV) and count the number of algae cells in the microscope grid; -Photograph tanks every 15 minutes for 13 hours; -Count algae cells in the microscope grid from each tank every two hours; -After 13 hours, test both tanks for responding variables and control variables; -Remove the oysters from the tanks into a bucket of bay water; -Clean the tanks and put new bay water in them; -Repeat steps then return all oysters to their original habitat.</p> <p>Results After 13 hours, I found that the level of turbidity and the number of algae cells in the test tank dropped significantly. I repeated this experiment twice and found very similar results.</p> <p>Conclusions/Discussion In conclusion, my experiment answered my question: Will a group of Olympia oysters change the biological and chemical contents of the water surrounding them? I found that the oysters did clarify the water. I know this because the number of algae cells decreased in the test tank. My experiment supports the idea that oysters and oyster reefs can improve water clarity, but improving clarity is not all oysters can do for the environment. Oyster reefs can lower nitrogen levels, stabilize sediment, provide food and shelter for other marine animals and plants, and possibly help protect the bay</p>	
Summary Statement A group of native Olympia oysters affects the biological and chemical contents of bay water in a controlled tank experiment.	
Help Received Parents helped me gather supplies and oysters; Project Manager for Living Shorelines project helped me with research and best location to find the oysters.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Bowen Jiang	Project Number J1111
Project Title A Study on the Effect of Aqueous Carbon Dioxide on a Freshwater Microorganism Ecosystem	
Objectives/Goals This study was designed to 1) determine the change in population of keystone microorganisms with an increase in aqueous carbon dioxide, and 2) determine possible connections/applications in freshwater ecology observed from the population change.	
Abstract Methods/Materials Two identical cultures of lake water (850 ml each in volume) were placed under a grow light with microorganisms collected via a plankton net surface trawl, with a yeast carbon dioxide reactor bubbling carbon dioxide through an airstone into one of the setups. After four weeks of growth, both setups were preserved, and a Bogorov chamber and microscope were used to count the number of specific microorganisms, particularly those that were ecologically important.	
Results The total number of calcareous algae forms found in the control water sample was nearly 9 times greater than in the water sample grown with the bubbled-in carbon dioxide. There were also a total of 7 more mineral-shelled invertebrates believed to be alive at the time of preservation found in the control water sample than in the carbon dioxide sample (including species such as Chydorus sp., Bosmina sp., and an ostracod and copepod species). However, there were approximately 23% more filamentous algae colonies observed in the carbon dioxide water than in the control, along with 5 Microcystis (a cyanobacteria) colonies, whereas none were recorded in the control.	
Conclusions/Discussion Essentially, the carbon dioxide water sample has the microorganism inhabitants and in the populations, that more closely resemble a highly nutrient-rich pond or lake in the middle of summer, whereas the control sample resembled the original lake sample that was collected, at least visually. Thus, this experiment shows a connection between water eutrophy, initial carbon dioxide concentrations, and the related life associated with such conditions, and also that carbon dioxide can cause the corrosion of mineral parts of organisms in other aquatic environments than in the ocean, where its effects are the most notable.	
Summary Statement This project looks at how carbon dioxide dissolved in water affects the diversity and population of microorganisms living in that water.	
Help Received Mother helped tape-laminate board	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Jeffrey E. Jones	Project Number J1112
Project Title Ocean Acidification and Brine Shrimp (<i>Artemia salina</i>)	
Abstract Objectives/Goals When carbon dioxide reacts with saltwater, hydrogen and bicarbonate ions are released. Hydrogen ions combine with beneficial carbonate ions to create detrimental bicarbonate ions. As the bicarbonate ions increase and carbonate ions decrease, the pH of the saltwater is lowered (called ocean acidification). The reduction of carbonate ions makes it harder for organisms dependent upon calcium carbonate to maintain healthy shells. Their shells become thinner and make the organisms more susceptible to disease. The purpose of this project is to determine how ocean acidification affects Brine Shrimp (<i>Artemia salina</i>). Methods/Materials I hypothesize that the Brine Shrimp in the test aquarium (reduced pH) will grow and reproduce at a slower rate than the shrimp in the control aquarium (unmodified saltwater) because of reduced availability of carbonates to promote shell growth. When bicarbonates are formed, beneficial carbonate ions are taken out of the water. Animals such as shrimp use carbonates to make their skeletons and shells. The shrimp use up more energy as they make their shell. If the shrimp are not able to produce their shells, they will grow at a slower rate. It will be harder to reproduce if most of the shrimp's energy goes towards making a new shell. Results The shrimp in the Test Aquarium not only reproduced at a slower rate, but almost all the shrimp in the Test Aquarium had died by the end of the experiment. This was caused by the reduction of carbonate ions in the aquariums. When the levels of bicarbonate ions increased and the levels of carbonate ions decreased, the brine shrimp had to work harder to make their shells. Therefore, they had less energy to reproduce and, in some cases, perform necessary body functions. The control shrimp increased in numbers due to the availability of carbonate ions. They had enough energy to perform the necessary body functions. Conclusions/Discussion Since brine shrimp are a type of plankton, this would mean that the disappearance of brine shrimp would disrupt the whole oceanic food chain. If the brine shrimp dies, the small fish that eat the brine shrimp die. If the small fish die, then larger fish, such as mackerel, die. If the larger fish die, then even larger fish, such as tuna, die. If the even larger fish die, then largest fish, such as sharks and groupers, die. The death of the fish would lead to global starvation as well as the failure of many businesses.	
Summary Statement My project is about how Ocean Acidification affects the growth and reproduction of Brine Shrimp (<i>Artemia salina</i>) and how that impact on plankton can affect the ocean food chain, and indeed, the human food cycle.	
Help Received No help was received.	



**CALIFORNIA STATE SCIENCE FAIR
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Name(s) Priya K. Kamdar	Project Number J1113
Project Title Green Roofs: Smart and Beautiful?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Do green roofs affect the internal temperature of houses and potentially help us conserve energy?</p> <p>Methods/Materials Build 5 16"x16"x8" wooden boxes without a top. Drill a 1/2" hole on one side of each box for the temperature probe. Place a 16# x 16# piece of wood on top of each box as the roof, but do not glue it down. Put a piece of insulation, tarp, and bubble wrap on each roof top. Line each plastic planter tray with a piece of thin cloth at the bottom. Add dirt and necessary plants to each planter and put on top of roof. Set the five model houses outside the night before you begin the experiment. In the morning, insert the thermometer probe into each of the houses. Set the Lab Quest to record for 4,320 min with 1 sample a minute (3 days) After the Lab Quest has recorded data for the set amount of time, transfer the data onto the computer. Lift the roofs of the houses to level the temperature, and keep the probes in a controlled environment. Perform 4 trials.</p> <p>Results Trial 1- The temperatures for the house with the extensive roof had the lowest range, 32.56°F and hence the most consistent internal temperature. The house with the control roof showed the largest variation with a range of 50.66°F. Trial 2- The house with the extensive roof had the coolest temperature during the time of the day when the ambient temperature was the highest and the house with the semi-intensive roof had the warmest temperature during the night. The house with extensive roof showed the smallest temperature variation. Trial 3 and 4- It was found the house with the intensive roof had the coolest temperature during the day and the house with the intensive roof had the warmest temperature during the night. The house with intensive roof showed the smallest temperature variation throughout both trials.</p> <p>Conclusions/Discussion Throughout all four trials the intensive and extensive roofs had a range that was considerably lower than the other roofs. The house with the control roof had the most extreme temperatures. Green roofs improve the environment by releasing oxygen into the air and managing the urban heat island effect. It can also be used as a method to reduce our energy consumption and hence, money spent. The cost of installation and maintenance would have to be compared with the money saved in heating and cooling costs.</p>	
Summary Statement How different types of green roofs affect the internal temperature of houses.	
Help Received Father helped built house models; Used school lab equipment	



**CALIFORNIA STATE SCIENCE FAIR
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Name(s) Jaqueline Kelly; Kelly Stegemman	Project Number J1114
Project Title Let It Burn	
Abstract Objectives/Goals In our project we tested to see which type of wood would burn with less pollution. Our goal was to gather particulate matter and count the visible ones. The type of wood with the most visible particulates would be the wood with the most pollution. (out of Oak, Pine and Eucalyptus) Methods/Materials Our methods were to use a 7.62 X 7.63 cm piece of white poster board with a 2.54 X 2.54 cm square cut in the center of the larger square. we place a clear piece of tape over the centered square and after burning the wood for 3 min and 30 seconds we placed the square over the smoke. After 1 minute we counted the visible particulates and recorded the amount of particulates. We repeated 5 times Results Our results show that the Pine Polluted the most. It let off the most visible smoke particulates. Eucalyptus let off the second most and Oak came in last place letting off the least amount through smoke particulates. Conclusions/Discussion We concluded that Pine polluted with the most visible particulates. Eucalyptus came in second place and Oak polluted the least amount.	
Summary Statement We burned 3 types of wood to see which one would burn with less pollution.	
Help Received Father helped with the fire	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Cole D. Lorch	Project Number J1115
Project Title The Dew Point Dilemma	
Abstract Objectives/Goals To figure out if cars and houses on my block form frost more often than cars and houses a few blocks away. My hypothesis: If I measure dew point within a few blocks from my house, then the dew point will vary. Methods/Materials I selected 9 locations that were 1/10th of a mile away from each other using Google Maps. My driveway was the central control location. I made sure that the locations varied from lower to higher elevation. Starting at 6:00 am in the morning, for 8 days I went with my mom to each location to measure the wet bulb and dry bulb temperatures on a sling psychrometer. Then I used the temperature to find relative humidity and dew point for each location on each day. I rotated the order that I went to each location. I also used an anemometer to measure the wind, but found that there was no wind at that time of day. Results Overall, the higher elevations had a lower dew point and a lower relative humidity. Conclusions/Discussion The control location did have lower dew point and relative humidity than the locations that had a lower elevation. But the control location did not have a lower dew point and relative humidity than the locations that had a higher elevation.	
Summary Statement My goal was to find out why cars and houses in my block appeared to have frost more often than cars and houses a block or two away.	
Help Received The mentors helped me. My mother drove me to the experiments locations. Using Illustrator, she also created the diagram showing each location on the hill -- I told her what I wanted it to look like. She also printed the project text on her work printer.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Marisa K. O'Brien	Project Number J1116
Project Title Does Gasoline Affect the pH of Soil?	
Abstract Objectives/Goals The purpose of this science experiment is to study the effects of gas stations on the surrounding environment. My goal is to determine whether local gas stations and its surrounding environment are a contributing factor to the issue of soil pollution and if it will affect the soil sample's pH. If the soil is too acidic or alkaline because of the gasoline, it can prevent plants and organisms to grow and thrive. Methods/Materials To conduct my experiment, I first traveled around to different areas of the city to collect soil samples from gas stations. I also received soil samples from rural areas, suburban areas, and urban areas, or areas with a lot of commute. Those are the first two steps. The third step is to gather all your materials which are your soil samples, a marker, Petri dishes, water, a plastic dropper, a tablespoon, a universal pH indicator with a color table, and some plastic bags. The third step is to place a small portion of your samples on a Petri dish and use the universal pH indicator to test its pH. I then used the pH levels to record my data. Results My results were that all samples were close to being neutral or they were basic (alkaline), ranging anywhere from 7 to 8 on the pH scale with the exception of my suburban samples, which were on the acidic side. The suburban samples' pH levels ranged from 6 to 7 on the pH scale. Conclusions/Discussion My hypothesis was proven incorrect. Surprisingly, my results were the complete opposite. The urban area soil sample was actually tested as basic, not acidic. The gasoline did not affect a soil's pH and pollution in an urban area did not affect the soil's pH as much as I expected. There was little difference in the pH of my gasoline station soil samples in comparison to my control samples.	
Summary Statement The central focus of my project is see whether gasoline combustion from cars and gasoline stations can alter the pH of its surrounding environment's soil.	
Help Received My science teacher helped in revising my typed report to correct grammatical and spelling mistakes and make sure I was on the right track in researching.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Carson A. Pope	Project Number J1117
Project Title Fracking Earthquakes: Testing the Correlation between Deep Injection Wells and Earthquakes	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment is to test the correlation between fracking waste water disposal wells and seismic activity. I hypothesize that I can show deep injection wells can cause earthquakes by simulating a deep injection well on a fault line at different angles and running water at selected pressures inducing the fault to slip (i.e. an earthquake).</p> <p>Methods/Materials I made a model of a deep injection well on a fault line by using 2 identical slabs of concrete, one directly on top of the other. One slab contained a piece of ¼ inch copper tubing to inject water in between the slabs at six different water pressures (0lbs-50lbs at 10lb increments) causing the fault to slip, simulating an earthquake. For Test Series 1 and 2, I tested all six water pressures three times each with the apparatus set at six different angles of incline. At these angles and water pressures, I measured the time it took for the fault to slip and how far it slipped (mm)</p> <p>Results My results showed that as the water pressure increased, the fault slipped farther for five of the six angles tested in both Test Series 1 and 2. As the angle of incline of the fault line increased, the millimeters slipped increased for both Test Series 1 and 2. For every angle and water pressure the fault slipped a minimum of 2mm to a maximum of 25mm (due to stopper), except at 0lbs of water pressure where it did not slip at all. For Test Series 1 and 2, although there were fluctuations in the time it took for the fault to slip, the general trend was as the water pressure increased the seconds it took for the fault to slip decreased or stayed constant in all angle categories. The less time it took for the fault to slip, the farther it slipped for both Test Series 1 and 2.</p> <p>Conclusions/Discussion In conclusion, my results support my hypothesis. My project shows that when water is injected into fracking waste water disposal wells under high pressures, a fault can slip abruptly and farther, causing a potentially greater magnitude earthquake. This experiment shows the correlation between fracking waste water disposal wells and seismic activity along fault lines. California is a highly seismic active area and if fracking waste water disposal wells were to be used, it could potentially increase the frequency and magnitude of earthquakes.</p>	
Summary Statement Testing the correlation between fracking waste water disposal wells and earthquakes.	
Help Received Father helped build fault line apparatus and record data.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Emma R. Schaefer-Whittall	Project Number J1118
Project Title The Costs of Idling	
Objectives/Goals I estimated the amount of fuel used by idling cars in my school's pick-up line, then calculated the amount of CO ₂ emitted and the cost of the fuel wasted. I compared the CO ₂ and money wasted before and after hanging signs in the parking lot.	
Abstract Methods/Materials I recorded the following information for every car that arrived in the pickup line on 3 days: car number, arrival time, make/model, car type, idling or off, and departure time. I estimated the fuel wasted/hour of idling for different types of cars by idling in my neighbors' cars. I determined the amount of fuel wasted by idlers, the amount of CO ₂ produced (0.607kg CO ₂ per gallon of fuel) and the amount of money spent (\$4.00/gallon fuel). I posted signs in the pick-up line describing the costs of idling and recorded the number of idling cars on 2 days as described above. I calculated the change in CO ₂ emitted and money wasted before and after the signs.	
Results Before hanging the signs, 63/142 cars idled for an average of 10min. 52sec. All the cars used an average of 1.18gallons/day of fuel. This would produce 0.72kg of CO ₂ /day. This costs \$4.56/day for all the cars in the pick-up line. Assuming these results are consistent throughout the year, 128.88kg/year of CO ₂ would be emitted wasting \$820.80/year. After putting up the signs, there was an 8.8% decrease in the number of idlers. The average time idling for each car went down 2min. 5sec. that reduced the total idling time by 51min. 55sec. Only 0.89gallons/day of fuel were wasted. All the cars in the pick-up line produce 0.54kg of CO ₂ /day and cost a total of \$3.56/day. This produces 97.41kg of CO ₂ /year and costs \$641.34/year.	
Conclusions/Discussion Every idling car in the pick-up line releases approx. 9.5kg of CO ₂ /year - the amount that a Redwood absorbs while photosynthesizing/year. Since there was an average of 21 cars idling in the parking lot/day, it would take 21 Redwoods to consume the CO ₂ produced by idlers. If there are about 2,000 middle and junior high schools in the USA and each one has 21 idlers per day, then we would need 42,000 Redwoods to absorb the CO ₂ .	
Summary Statement The costs of idling cars in the middle school pickup line in terms of fuel wasted and CO ₂ produced.	
Help Received Dad helped glue papers on board and drove neighbor's vehicles to determine amount of fuel wasted while idling.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Anooshree L. Sengupta	Project Number J1119
Project Title Nanoparticle Pollution: A Growing Problem. The Effect of TiO(2) Nanoparticles on E. coli Growth in the Presence of Light	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine whether TiO₂ nanoparticle (n-TiO₂) contamination in the growth medium adversely impacts E. coli growth or viability when exposed to light.</p> <p>Methods/Materials E. coli from a common source culture were grown in LB broth in three groups of nine test tubes in an incubator at 37 degrees Celsius for 48 hours. The first group was uncontaminated, the second group had 200 ppm of n-TiO₂, and the third had 500 ppm. The groups were sub-divided into three sets. One set from each group was kept in the dark, a second was subjected to indoor lighting, and a third was exposed to bright fluorescent light measuring 2400 lux. The sets were allowed to grow for another 24 hours. The optical density of each culture was then measured in 600 nm wavelength light using a spectrophotometer. Optical density was used to estimate total cell concentration. Cell viability was measured for each of the nine combinations of contamination and illumination by plating on agar plates and incubating for 48 hours. Serial dilutions of the cultures were used for plating, and the plates that had cell colonies in the range of 30 to 300 were counted. Cell counts were used to estimate viable cell concentration.</p> <p>Results In the presence of bright light and TiO₂ contamination, total E. coli concentration was reduced by 54% compared to the control group. Viable cell concentration was reduced by 8X. The difference in the total cell and viable cell concentrations can be accounted for by the cells damaged or killed by the effect of n-TiO₂. Diffused lighting had a smaller effect. In the absence of light, n-TiO₂ did not have a measurable effect. There was no significant difference between the 200 ppm and 500 ppm levels of contamination.</p> <p>Conclusions/Discussion The results confirm the hypothesis that n-TiO₂ contamination has an adverse impact on the growth and viability of E.coli. They also clearly demonstrate the role of light in activating n-TiO₂. TiO₂ nanoparticles are used in many applications ranging from industrial to household uses. Studies have shown that nanoparticles escape through waste water treatment facilities and end up in the aquatic system. This experiment clearly demonstrates that TiO₂ nanoparticles can be harmful to microorganisms, and need to taken seriously as a source of pollution.</p>	
Summary Statement This project demonstrates that man-made TiO ₂ nanoparticles can adversely impact E. coli growth and viability in the presence of light, and must be taken seriously as a potential source of environmental pollution.	
Help Received Used lab equipment at Harker Middle School under the supervision of project mentors Ms. Kristen Morgensen and Mr. Akhil Mehta.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Eva E.D. Szoboszlay	Project Number J1120
Project Title Macroinvertebrates in Local Stream Habitats: Effects of Habitat Type on Biodiversity	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to measure the effect of habitat type in a local stream on biodiversity according to the Shannon-Wiener Index for the following habitats: 1) submersed vegetation, 2) snags, logs, and roots, 3) muddy bottom, and 4) gravel and sand. I hypothesized that the greatest biodiversity would be in submerged vegetation because the plants would provide food and shelter.</p> <p>Methods/Materials I chose a portion of the stream with many habitat types and rushing water. I selected three 1m² areas for each of the four habitat types, with fifteen samples per type. During sampling, I used a trowel to vigorously disturb the habitat and used a 0.5mm mesh net downstream of the area to catch the dislodged organisms. At my control area, I sampled in the middle of the water without disturbing the bottom substrate. For each sample, I tallied and identified each organism by drawing a quick sketch of each new species to create a key. To verify that the sampling sites were constant, I conducted pH, temperature, depth, ammonia, nitrate, nitrite, alkalinity, hardness, TDS, and EC measurements from water samples. I calculated the Shannon-Wiener Biodiversity Index for each habitat type: $-\sum_{i=1}^n [x(i) \log_2(x(i))]$ for $i = 1$ to the number of species, and $x(i)$ is the ratio of abundance over richness.</p> <p>Results According to the index, the areas with snags/logs/roots were the most biodiverse, with a value of 3.15. Muddy bottom was second with a value of 2.61, and gravel and sand was third with a value of 2.17. Submersed vegetation was the least biodiverse with a value of 1.94, the closest to the control area's value of 1.50.</p> <p>Conclusions/Discussion My hypothesis was incorrect because I believed that submersed vegetation would be the most biodiverse, although it was the least. It had the fewest number of species and the second fewest number of organisms, so it had the lowest index value. Snags, logs, and roots had the greatest number of species and the second largest number of organisms, which contributed to its high index value. This area must have had a good balance of amount and variety of food as well as protection to support a biodiverse population.</p>	
Summary Statement My project was investigating which habitat type of 1) submersed vegetation, 2) snags, logs, and roots, 3) muddy bottom, and 4) gravel and sand in a local stream was the most biodiverse using the Shannon-Wiener Index.	
Help Received My dad helped me by buying supplies, explaining the Shannon-Wiener Index, and handed me instruments and acted as another pair of hands during experimentation.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Zane F. Taylor	Project Number J1121
Project Title Benthic Macroinvertebrates as Indicators of Watershed Health	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Benthic macroinvertebrates (BMI) such as mayflies, stoneflies, and caddisflies are highly sensitive to fine sediment and other types of pollution. This is why regulators often rely on BMI sampling to help determine the water quality of streams and rivers. The objective of my project was to determine if the composition of streambed sediment and levels of urbanization affected BMI diversity and abundance.</p> <p>Methods/Materials Three creeks with different levels of urbanization were selected. Two BMI samples were collected from undisturbed areas from a riffle of each creek. I used a fine-meshed net with a one-foot wide opening. A one-foot by one-foot area of the streambed in front of the net was disturbed for 30 seconds. I classified the BMIs into their scientific Orders, counted how many BMIs were in each Order, took photographs, and released the BMIs into the creek. Pebble counts were conducted in each riffle by randomly selecting 100 rocks and categorizing their secondary axis in centimeters with a pebble-o-meter. Water temperatures were measured in Celsius. Data were entered and analyzed in an Excel spreadsheet.</p> <p>Results Widow White Creek, the most urbanized watershed, had only three aquatic worms in the sample. In the moderately urbanized watershed, Strawberry Creek, a total of 15 BMIs were sampled, including three caddisflies and five stoneflies. In Prairie Creek, located in an old growth redwood State Park, a total of 57 BMIs were collected, including 19 mayflies, five stoneflies and three caddisflies. The rocks sampled in Widow White Creek were in size classes between 8 mm and 45 mm. Rocks from Strawberry Creek were in size classes between 8 mm and 60 mm. In Prairie Creek all of the rocks sampled were in size classes between 8 mm and 128 mm. The cumulative frequency analysis clearly showed that Prairie Creek had a wider range of particle size classes as well as a higher percentage of larger particles.</p> <p>Conclusions/Discussion My research showed that a healthier watershed does influence BMI diversity and abundance. Prairie Creek, the least influenced by urbanization of the three creeks, had more BMI Orders and more numbers of BMIs collected. Most of the BMIs in Prairie Creek were also sediment intolerant. Prairie Creek's streambed composition was also the most diverse with larger rocks which created better habitat for BMIs.</p>	
Summary Statement Samples of sediment-intolerant BMIs, including caddisflies, mayflies, and stoneflies, are used by agencies such as the EPA and the California Department of Fish and Wildlife to collect legal evidence for water pollution cases.	
Help Received My dad helped me work in the creeks for safety. John Lee, an aquatic entomologist, leant me the nets and helped key out some BMI Families. My mom helped me with layout.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Anika J. Wille	Project Number J1122
Project Title Compostable Utensils: How Eco-friendly Are They?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Compostable utensils were made to reduce the ever-growing amount of landfill. However, it is not entirely clear about the compostability of compostable utensils and factors contributing to their decomposition, such as the composting conditions and the materials they were made of. This project is to investigate how compostable utensils degrade under various conditions and to compare the degree of decomposition among utensils made of various materials.</p> <p>Methods/Materials Three popular brands of compostable utensils that are made of different biodegradable materials were used in the experiments, namely World Centric, TaterWare, and Eco-Products utensils. Non-compostable generic plastic utensils made from polystyrene were included as negative controls. Utensils were incubated for 4 months in various composting environments including steer manure enriched soil, bark nuggets, vinegar, soy sauce and tap water, mimicking different amount of microbes, acids, and enzymes in natural compost.</p> <p>Results The results showed that TaterWare utensils showed the most signs of decomposition in steer manure enriched soil and in tap water, while Eco-Products were affected to a lesser degree by vinegar and soy sauce. As expected the polystyrene control utensils were unaffected.</p> <p>Conclusions/Discussion The results suggest that both composting environment and the make-up of the compostable utensils play important roles in the degree of compostability.</p>	
Summary Statement I wanted to test, if "compostable utensils" really are compostable and environmentally friendly.	
Help Received My father helped to set up the experiments, my mother helped to make the poster, and my science teacher gave me some advice.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Addison D. Williams	Project Number J1123
Project Title The Effects of Microwave Radiation on Radish Seeds and Dry Yeast	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine the effect microwave radiation has on radish seeds and dry yeast. Microwaving the seeds and the yeast before they are planted, will slow their growth rate once the seeds are planted and the yeast is grown.</p> <p>Methods/Materials 30 French Breakfast radish seeds were planted in a clay pot of fertilized soil. The next group of seeds were first microwaved on a damp paper towel for 5, 15 and 30 seconds and then planted like the control group. Six tests were done for each group. They were placed outside in the sunlight, watered daily and checked for growth. The dry yeast was microwaved in the same way, with one non-microwaved control group, and allowed to grow/proof for ten min. after being mixed with warm water and sugar. Dry yeast was then microwaved for 5, 15 and 30 seconds and allowed to grow. The growth was measured after the yeast proofed for 10 minutes.</p> <p>Results Microwaving the radish seeds and the dry yeast prior to being planted and grown did not slow their growth rate but instead helped them grow taller. The seeds microwaved for 30 seconds grew the tallest. The non-microwaved seeds did grow, but at a slower rate, and were not the tallest. The yeast microwaved for 5 seconds before it was combined with warm tap water and sugar, grew the most in height after 10 minutes.</p> <p>Conclusions/Discussion The radish seeds and the dry yeast were not effected by the microwave radiation. Microwaving the seeds and the yeast first did not stunt their growth process. Although the non-microwaved seeds and the yeast grew, they grew at a slower rate. The microwave radiation had no negative, noticeable effects on the two organisms tested. This experiment shows that both the seeds and the yeast were not damaged after being exposed to microwave radiation. Additional tests on radish seeds and dry yeast microwaved for a longer period of time may show a different result.</p>	
Summary Statement Microwave radiation will effect the growth rate of radish seeds and dry yeast.	
Help Received My mom helped me type the reports on the board and supplied the materials needed.	